

Management Plan

For

Old Croton Aqueduct State Historic Park

Westchester County



Andrew M. Cuomo
Governor


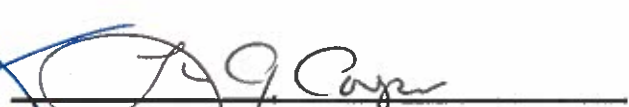
Rose Harvey
Commissioner

AGENCY DECISION

Adoption of a Management Plan for the Old Croton Aqueduct State Historic Park

The New York State Office of Parks, Recreation and Historic Preservation has prepared a management plan dated August 31, 2016 for the Old Croton Aqueduct State Historic Park. By the authority vested in State Parks, Recreation, and Historic Preservation Law, we do hereby adopt the Management Plan.

The adoption of this management plan identifies strategies and sets forth actions which continue the preservation and protection of the resources while enhancing the recreational experience for park patrons.

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and Historic Preservation

Linda Cooper
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and Historic Preservation

8/30/16
Date

9/6/2016
Date

Management Plan
for
**The Old Croton Aqueduct
State Historic Park**

Westchester County

Prepared by
The New York State Office of Parks, Recreation
and Historic Preservation

Completed: August 31, 2016

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Acknowledgements

The Old Croton Aqueduct State Historic Park Management Plan is a result of a cooperative effort by many persons. The Office of Parks, Recreation and Historic Preservation (OPRHP) acknowledges the time and effort of each individual and interest group who participated in the development of the park and this Management Plan.

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**The Old Croton Aqueduct State Historic Park Management Plan
is dedicated to the memory of
Brian Goodman and Ken Lutters**

Brian was the former Park Manager who devoted over 10 years of his life to building partnerships and improving the park for all.

Ken was a tireless advocate for the Aqueduct as its role moved from water supply system to parkland. He thoughtfully encouraged its early preservation, at the time by no means certain, and wisely guided its subtle transformation into a linear park and historic site.

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Abbreviations Used

AASHTO	American Association of State Highway Transportation Officials
DEC	New York State Department of Environmental Conservation
IDA	International Dark-Sky Association
DOT	New York State Department of Transportation
FOCA	Friends of the Old Croton Aqueduct
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NPS	National Park Service
NYC	New York City
NYS	New York State
OCA	Old Croton Aqueduct State Historic Park
OPRHP	New York State Office of Parks, Recreation and Historic Preservation
TBD	To Be Determined
TEP	Transportation Enhancement Program

Management Plan - Statement of Purpose

The purpose of the Old Croton Aqueduct State Historic Park (OCA) Management Plan (Plan) is to provide direction for the continued and improved provision of recreational opportunities, provide recommendations for patron amenities with an emphasis on the safety of park patrons, provide guidance for protection of cultural and natural resources and recommend programming for improved cultural resource interpretation.

This plan provides direction for managers and staff for the day-to-day operations, stewardship, maintenance, protection and improvement of the trail. This Plan provides a profile of current conditions and operation of the OCA as well as recommendations to improve its management and use by patrons. It also identifies the type of actions that may require environmental review.

Introduction

The New York State Office of Parks, Recreation and Historic Preservation (OPRHP) administers over 200 state parks and historic sites encompassing more than 330,000 acres of parkland.

Under Section 3.02 of the Parks, Recreation & Historic Preservation Law, OPRHP is directed "...to conserve, protect and enhance the natural, ecological, historic, cultural and recreational resources contained therein and to provide for the public enjoyment of and access to these resources in a manner that will protect them for future generations." Planning is a critical element in the process to meet the substantial responsibilities to provide recreation while at the same time protecting and interpreting resources. The planning process explores the parks' or sites' existing physical, natural, cultural, recreational, and structural resources. It evaluates the condition of these resources to provide recreation and interpretive opportunities within healthy and productive environments. The process calls for the development and consideration of alternatives that enhance the stewardship of cultural, historic and natural resources and improve the recreational opportunities and experiences offered at the park. The Plan is the preferred choice that best meets OPRHP's mission and the vision for the park or site.

OPRHP has determined that the preparation of this management plan for the park will further its mission to provide safe and enjoyable recreational and interpretive opportunities for all New York State residents and visitors and to be responsible stewards of our valuable natural and cultural resources.

Preparation of This Plan

Purpose

This Plan is being prepared to provide direction for the management and use of the Old Croton Aqueduct State Historic Park (OCA) for the next 10-15 years, with reviews due every 5 years. It addresses the entire park and recommends strategies:

- to manage the OCA
- to protect and preserve the historic structures

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- to enhance the recreation and economic benefits to the public and local communities
- to enhance connectivity by developing missing portions of the trail corridor
- to preserve physical links between ecological communities

Factors such as budget constraints, changing intensity and type of use, natural disasters and other unforeseen occurrences may necessitate deviations from scheduled management activities.

Public participation

There were two (2) public information meetings held to receive public input during the course of developing this plan. The meetings took place in August of 2013 in the towns of Ossining and Yonkers. A public comment period of approximately 30 days followed the public meetings. Comments made during the meetings and the comment period were collected and evaluated. These comments were important to the planning process and were considered during the development of this management plan.

Previous Planning

Soon after the OCA's purchase by OPRHP from New York City (NYC) in 1968, a planning process began. Two years later, in 1970, a final master plan was completed and provided direction for the initial development of the OCA. Revisions to this plan have not been undertaken.

Description

The OCA is a 26.2-mile corridor that follows the route of the Old Croton Aqueduct (active from 1842 to 1955) and extends to the NYC boundary where the trail continues under NYC management. It includes a public, multi-use trail and natural and historic resources. The OCA passes through woodlands, river and stream valleys, and historic villages in the Lower Hudson River Valley. Like other linear parks, such as "rail-trails" across the country, the OCA provides opportunities for public recreation, an off-road link to communities, parks, other trails and attractions in the region.

The Region

Medium to high-density residential and commercial uses predominate around much of the trail. Where the OCA passes through parkland, or on land that is not easily developed, forest land predominates. The OCA increases people's access to scenic, historic and community features such as estates, parks, schools, forestland, and adjacent community centers.

Location and Access

The Old Croton Aqueduct State Historic Park extends from the New Croton Dam in Cortlandt through Westchester County to the northern NYC boundary. It travels in a north/south direction, following the topography for much of its path. Much of the OCA traverses the eastern slope of the Croton River and Hudson River Valleys through areas of woodlands, scenic rivers and stream valleys, along steep gorges as well as directly through residential and commercial development.

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The OCA successfully links a large urban area, rural forested areas, recreational parks, educational institutions, and towns and villages. It traverses the land linking parkland from the New Croton Dam and Croton Gorge Park at its northern endpoint through or adjacent to the following parks: Rockefeller State Park Preserve, The Croton River Gorge Unique Area, Gerlach Park, Lyndhurst, Gracemere Park, Draper Park, Sunnyside, Untermyer Park, Lenoir Preserve, Douglas Park, Zinsser Park, Tibbetts Brook Park, Memorial Park, the proposed Quarry Park and leads into Van Cortlandt Park at its southern endpoint.

The OCA is easily accessible to a large number of people. It connects people in numerous towns and villages and several parks to and from NYC, with a population of more than 8,336,697 persons as of July 2012 (Source: US Census Bureau). It is also within close proximity to the Metro North Hudson Rail Line, a commuter rail service that provides convenient access to the OCA from outside the community.

Several schools and colleges are located in close proximity to the OCA, including Mercy College, Dobbs Ferry High School, Sleepy Hollow Middle School and High School, John Paulding School, Washington Irving Middle School, Gorton High School, Sacred Heart High School, Ossining High School, The Ossining Extension Center of Westchester Community College, and the Park Elementary School among others.

History and Development Timeline

- 1833** – The New York City Water Commission is established.
- 1835** – Appointment of David Bates Douglass as Chief Engineer.
- 1836** – John B. Jervis is appointed as Chief Engineer of the Croton Aqueduct Project.
- 1837** – Construction begins on the aqueduct system.
- 1842** – The construction of the aqueduct is completed, including such structures as the Ossining Weir, Archville Bridge, Murray Hill Reservoir, Yonkers Weir, West Burnside Avenue Bridge, Sing Sing Kill Bridge, ventilators, Clendening Valley Crossing, Nepperhan/Saw Mill River Bridge.
- 1842** – The aqueduct opens on October 14th. A daylong celebration culminates in a 50’ shower of water from Croton Fountain in City Hall Park.
- 1848** – The High Bridge in NYC is completed.
- 1849** – Creation of the Croton Aqueduct Department , Alfred W. Craven, Chief Engineer.
- 1857** – The Dobbs Ferry Keeper’s House is completed.
- 1862** – Lake Manahatta (now Jacqueline Kennedy Onassis reservoir) constructed (decommissioned in 1993).
- 1862** – Central Park South Gatehouse constructed. The capacity of the High Bridge is increased with the addition of a 90 inch diameter pipe.
- 1867** – Central Park Keepers House constructed (demolished in 1935).
- 1869** – High Bridge Reservoir constructed (demolished in 1935).
- 1870** – The takeover of the Croton Aqueduct Department by NYC Department of Public Works, William M. Tweed (“Boss Tweed”), Commissioner.
- 1870** – Croton Fountain in City Hall Park removed.
- 1870’s** – Clendening Valley Crossing is demolished for conversion to a siphon.
- 1872** – The High Bridge Water Tower is constructed and a 90 inch diameter pipe is constructed on top of two existing 30 inch diameter pipes inside of the High Bridge. The existing pedestrian walkway is elevated to accommodate the new pipe.
- 1875-c1889** – The top of the original masonry arch forming the conduit was reinforced to allow for increase water flow.
- 1882** – Construction of a new weir in Ossining.
- 1917** – The New York City Water Commission shuts down the Croton Aqueduct as a precaution during WWI.
- 1924** – The Archville Bridge is demolished (replaced in 1998).
- 1927** – Five of the High Bridges’ original masonry arches are replaced with a single steel span making the Harlem River more navigable for large ships.
- 1955-65** – The aqueduct is withdrawn from service.
- 1968** – OPRHP purchases 26.2 miles of the original 41 miles from New York City for use as a linear park.
- 1972** – High Bridge Aqueduct and Tower placed on the National Register of Historic Places.
- 1973** – The site of the Old Croton Dam placed on the National Register of Historic Places.
- 1974** – The Westchester County portion of the OCA placed on the National Register of Historic Places.
- 1975** – The OCA is designated as a National Historic Civil Engineering Landmark.
- 1984** – The Nepperhan Bridge in Yonkers is modified by the addition of a fourth arch.

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1987 (ca.) – Ossining begins using the OCA to provide part of its local water supply

1992 – The OCA is listed as a National Historic Landmark.

2013 – Waste weirs, ventilation shafts and the Ossining Bridge rehabilitated as part of the New York Works Program.

Relationship to Other Plans

Statewide Plans

OPRHP's 2009-2013 *Statewide Comprehensive Outdoor Recreation Plan* (SCORP) and the 2010 New York Statewide Trails Plan (OPRHP 2010) list the OCA as a "primary greenway trail" of statewide significance. (OPRHP 2009) Primary greenway trails are the longer multi-use trails of national, statewide, or regional significance that form the basis for a statewide network. Primary trails frame governmental planning initiatives and support the efforts of municipalities and volunteers to develop local trail networks. Secondary greenway trails are generally shorter in length than primary trails and cross fewer political boundaries. They often provide linkages to support services, attractions, and communities from the primary greenway trails. Stand-alone greenway trails are often shorter still and are considered locally important but may not be connected to a trails network.

More information on these statewide plans can be found on the following webpage:

<http://nysparks.com/recreation/trails/statewide-plans.aspx>

Local Plans

Many local plans have been developed by the communities along the trail. These plans include but are not limited to the following:

Village of Ossining Comprehensive Plan

Developed in 2009, the objective of this plan is to "establish an integrated open space and trail network connecting parks, preserves, open spaces, institutional properties, schools and other community resources which will provide important aesthetic and environmental functions as well as opportunities for the community to more fully enjoy the resources."

The plan recommends that "the Town, environmental groups, Villages of Ossining and Briarcliff Manor, Town of New Castle, Westchester County and local property owners should create walking/biking trails and connections to the Briarcliff-Peekskill Trail, Old Croton Aqueduct Trail and the North County Trailway from the various neighborhoods, parks, schools, waterfront and other areas in Ossining." The OCA Management Plan supports these types of connections and encourages formal connections with adjacent stakeholders to enhance connectivity, pedestrian circulation and partnerships.

For more information on this plan, please visit the following webpage;

http://www.villageofossining.org/documents/planning%20comp%20plan/finalcompplan2009_8_reduced.pdf

Village of Ossining Local Waterfront Revitalization Program (LWRP)

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The Village of Ossining's LWRP was created in 1991 and amended in 2011. The plan identifies the OCA as a key resource on a variety of levels. Not only is it a valuable recreational resource within the village, it also is used to encourage other activities associated with park patrons' use of the trail. The development policies within the LWRP state that they would like to "Improve the Old Croton Aqueduct so as to encourage more commercial activities in the Crescent Area which would be geared to serve visitors attracted by this recreational, educational and historic resource."

For more information on this program, please visit the following webpage; :

<http://www.villageofossining.org/documents/Village%20of%20Ossining%20LWRP%20Final.pdf>

Village of Dobbs Ferry LWRP

The Village of Dobbs Ferry LWRP was approved in 2006 to aid in the preservation and development of the Village's historic waterfront and downtown areas. The plan identifies the OCA as a resource which should be improved to promote pedestrian circulation both to and throughout the Village.

http://docs.dos.ny.gov/communitieswaterfronts/LWRP/Dobbs%20Ferry_V/Original/DF%20WRPPost.pdf

Village of Sleepy Hollow LWRP

The Village of Sleepy Hollow LWRP was approved in 1997 and supports the protection of the OCA's significant cultural, natural, recreational and scenic resources and recognizes its significance as a pedestrian corridor.

http://docs.dos.ny.gov/communitieswaterfronts/LWRP/Sleepy%20Hollow_V/Original/Village%20of%20Sleepy%20Hollow%201997.pdf

The Village of Ossining Waterfront Access and Trail Plan This 2011 plan provides guidance to development along the Hudson River and potential alignments for segments of the Riverwalk Trail including connections to the OCA. The OCA Management Plan supports these potential trail connections. More information on this plan can be found at the following webpage; :

http://www.villageofossining.org/Documents/Waterfront_Access_Trail_Plan_-_FINAL_for_website.pdf

The Village of Sleepy Hollow Hazard Mitigation Plan – This plan was developed as a means to reduce the effects of natural, technological and human-caused hazards. Village officials have discussed the potential failure of the aqueduct tube causing a release of water into the community. More information on this plan can be found at the following webpage:

http://www.sleepyhollowny.gov/index.php?option=com_content&view=article&id=220:hazard-mitigation-plan

The Village of Dobbs Ferry Vision Plan – Dobbs Ferry has created a vision plan to help guide its development for the next 20 years. This plan addresses connectivity to the OCA and improvements that will increase patron satisfaction. OPRHP supports and encourages the direction of this vision plan. More information on this plan can be found at the following webpage: <http://www.dobbsferry.com/Projects-and-Initiatives/129-dobbs-ferry-vision-plan.html>

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Yonkers Comprehensive Plan – A Comprehensive Plan for Yonkers has been developed along with several other area specific plans to improve neighborhoods and provide additional community services.

Many other towns and villages along the route of the OCA are presently developing master plans. Those towns include Tarrytown, Dobbs Ferry, Cortlandt, New Castle, Irvington, Hastings-on-Hudson, Briarcliff Manor and Greenburgh.

Transportation Links

Road Crossings

The Old Croton Aqueduct State Historic Park crosses nearly 100 residential roadways, several parking lots, as well as Interstate 87/287. At points where the trail follows roadways and city streets, additional way-finding signage is needed to help guide trail users.

Intersecting Trails

A network of inter-connected trails is vital to encouraging pedestrian circulation as a means of not only recreation but transportation. Providing connections between trails increases pedestrians' ability to safely travel farther away from heavily trafficked roadways. OPRHP supports formal trail connections to the OCA.

The OCA connects to or is within close proximity to the following trails:

- North County Trailway
- South County Trailway
- Briarcliff-Peekskill Trailway
- Tibbetts Brook Park Trails
- Blue Mountain Reservation Trail System
- Westchester County Riverwalk Trail

These trail systems are a critical component to providing enhanced usage of the OCA. When feasible, wayfinding signage should be provided at trail intersections to encourage patron use of these pedestrian corridors. More information on these trails can be found at the following website: <http://parks.westchestergov.com/trailways>

In addition to these larger trail systems, there are also smaller, separate trail systems located within adjacent parks and in communities which could provide additional recreation and pedestrian connectivity linkages.

The Yonkers Land Conservancy is presently working with Westchester County and the NYS Department of Transportation to improve connectivity from the Park Hills neighborhood to the Tibbett's Brook Park and the OCA. Formalizing this connection will substantially improve access opportunities for the entire Park Hills area for both recreation and connectivity to other municipalities.

Train Stations

The OCA is within close proximity to several train stations, allowing for convenient access from points outside the local area. These train stations can provide a vital link to enhancing tourism opportunities along the OCA. Bicycles are allowed on trains with the purchase of a

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Metro-North bicycle permit. The train stations serving the communities adjacent to the OCA can be found on Table 1 below.

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Table 1 – Train Station Locations

<p>Ossining Station 1 Main Street and Westerly Road Ossining, NY 10562</p>	<p>Dobbs Ferry Station 11 Station Plaza, Dobbs Ferry, NY 10522</p>
<p>Scarborough Station 156 Scarborough Station Road Scarborough, NY 10510</p>	<p>Hastings-on-Hudson Station 134 Southside Avenue Hastings-on-Hudson, NY 10706</p>
<p>Philipse Manor Station 78 Riverside Drive & 270 Millard Avenue North Tarrytown, NY 10591</p>	<p>Greystone Station 61 Harriman Avenue, Yonkers, NY 10701-1201</p>
<p>Tarrytown Station 1 Depot Plaza Tarrytown, NY 10591-3605</p>	<p>Glenwood Station 2 Glenwood Avenue, Yonkers, NY 10701-2134</p>
<p>Irvington Station 1 Astor Street Irvington, NY 10533-1616</p>	<p>Yonkers Station 5 Buena Vista Avenue Yonkers, NY 10701-3544</p>
<p>Ardsley-on-Hudson Station Ardsley Avenue Irvington, NY 10533</p>	<p>Croton-Harmon 4 Veterans Plaza Croton-on-Hudson, NY 10520-3054</p>

Bus System

Bus service is provided to the surrounding communities by Westchester County’s Bee-Line Bus System, the second-largest bus system in New York State, connecting Westchester County with the Bronx, Manhattan and Putnam County. Bicycles are not presently allowed on buses, however, this topic has been discussed in the past and if implemented would aid patrons.

Existing Conditions

The information below provides a brief introduction to the existing conditions in and along the 26.2 mile park corridor. For a detailed report on various resources, please refer to the webpage links provided.

Physical Resources

Precambrian gneisses, including Yonkers Gneiss and other metasedimentary rocks form the bedrock along the OCA from high grade, high temperature metamorphism. The bedrock in this area is generally very hard and a limiting feature with small scale construction. The more recent geology and topography of the park has been significantly altered by the erosional forces of the Wisconsin Glacial Episode which retreated from North America 10,000 years ago.

The main soil types in the OCA consist of a mix of well drained, sandy loams to moist, poorly drained soils and rock outcrops consisting mainly of gneiss and granitic material. During the design of the OCA, these significantly different soil types and bedrock influenced decisions as to the construction practices implemented.

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The OCA is located in the New York, New Jersey, Connecticut, and Long Island non-attainment area for failing to meet the National Ambient Air Quality Standard for air pollutants, specifically, ozone (EPA 2008).

Natural Resources

Flora

The Old Croton Aqueduct passes through a varied landscape. While the northern portion is more undeveloped and forested, primarily due to its location adjacent to the New York State Department of Environmental Conservation (NYSDEC) Unique Area, much of the remaining trail consists of hedgerows of trees separating the aqueduct from adjacent development. There are also sections of open lawn along the aqueduct, such as at Mercy College. In more developed sections, the trees and understory along the trailway provide important green space. Due to a long history of human disturbance, there are also many invasive plant species within the OCA corridor, both in number of species and quantity. Invasive species such as black swallow-wort are of particular concern as they can easily become a monoculture, smothering habitat and making control efforts more difficult and spreading to areas outside the park.

Fauna

The Old Croton Aqueduct, while linear in nature, helps to support a varied assemblage of fauna typically found within the region. Common mammals seen in and adjacent to the park include white-tailed deer (*Odocoileus virginianus*), Eastern gray squirrel (*Sciurus carolinensis*), and Eastern chipmunk (*Tamias striatus*). Many species of birds have been seen in the park, including migratory species like the broad-winged hawk (*Buteo platypterus*) seen during fall migration, to species like the yellow warbler (*Dendroica petechia*), to name a few. Reptiles and amphibians present in and around the park include the common snapping turtle (*Chelydra serpentina*) and painted turtle (*Chrysemys picta*), green frogs (*Rana clamitans*) and Eastern red-backed salamanders (*Plethodon cinereus*).

Significant Ecological Communities

The New York Natural Heritage Program (NYNHP) has not conducted a survey for significant ecological communities of the OCA, however one was completed for Rockefeller State Park Preserve in 2001 (Evans 2001). At two locations, the OCA borders a state significant Oak-Tulip Tree Forest community at Rockefeller State Park Preserve.

More information on ecological communities can be found at the following website;
<http://www.dec.ny.gov/imsmaps/ERM/viewer.htm>

Rare and Endangered Species

The NYNHP has not undertaken surveys for rare and endangered species on the OCA, however, there are rare species known within Westchester County that could potentially use habitat found along the trail. For more information on rare animals, please visit the following webpage; <http://www.dec.ny.gov/animals/29373.html>

Water Resources

Rivers and Streams

The primary water resources along the OCA are the various Hudson River tributaries which cross under the OCA. There are also several small unnamed streams that cross it. Several of these rivers and streams are listed below in Table 2.

Table 2 – Rivers and Creeks

River/Creek	Location
Sing Sing Kill	Ossining
Indian Brook	Ossining
Sparta Brook	Briarcliff Manor
Barney Brook (Jewels Brook)	Irvington
Sunnyside Brook	Irvington/Tarrytown
Pocantico River (Mill River)	Tarrytown
Wicker Creek	Dobbs Ferry
Rowley's Brook	Hastings
Saw Mill River	Yonkers

Ponds and Lakes

There are no ponds or lakes within the Old Croton Aqueduct State Historic Park. The New York City Department of Environmental Protection owns the Croton Reservoir, located at the northernmost portion of the trail.

Wetlands

Because of the topography chosen for the OCA route, state and federally protected wetlands do not occur along the OCA. At certain points along the trail, there are areas that are seasonally moist, however, these are not identified on NYS state wetland or National Wetland Inventory maps.

Cultural Resources

Designations

As noted in the “History and Development Timeline” section of this document, historical designations of the OCA began in the early 1970’s. The first aqueduct structure placed on the National Register of Historic Places was the New York City Park Department’s High Bridge Aqueduct and Tower in 1972. In 1973, the underwater site of the original Croton Dam was placed on the National Register of Historic Places. In 1974 the Westchester County portion, owned by OPRHP, was placed on the National Register of Historic Places.

In 1975 the entire OCA was designated by the American Society of Civil Engineers as a National Historic Civil Engineering Landmark. In 1992 the entire aqueduct system was designated as a National Historic Landmark by the United States Secretary of the Interior for its exceptional value and quality in illustrating or interpreting the heritage of the United States.

For additional information on the National Register of Historic Places designation, please visit the following website. <http://pdfhost.focus.nps.gov/docs/NHLS/Text/74001324.pdf>

Historic Physical Appearance

On February 26, 1833 the New York State Legislature authorized the appointment of five water commissioners to plan for the acquisition of land and construction of a dam and aqueduct system. This system, constructed between 1837 and 1842, originally consisted of a forty-mile long, enclosed conduit running from a dam on the Croton River, through western Westchester and Bronx Counties, and southward to central Manhattan. The aqueduct property is 66 feet wide throughout most of its length, narrowing to 33 feet, and widening to as much as 200 feet in several short sections. Granite



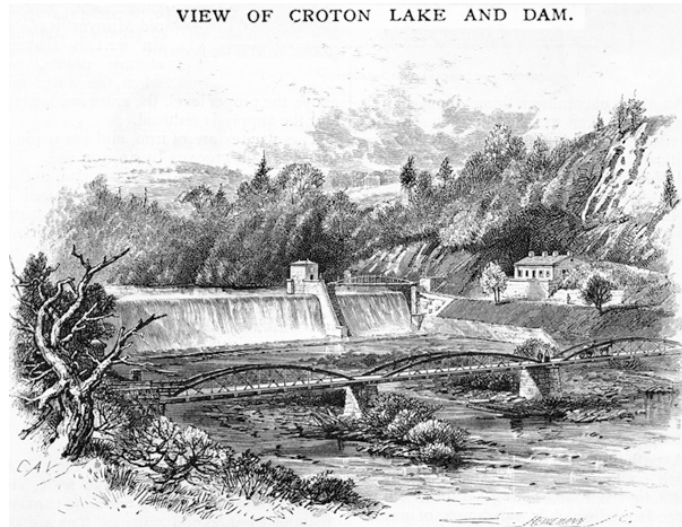
markers and locust fence posts can still be seen identifying the boundary. Except where it was bored through solid rock, the aqueduct was constructed by cut and cover method. The aqueduct tube is a brick lined, horseshoe-shaped tunnel measuring eight and one-half feet high by seven and one-half feet wide. The complete aqueduct structure, including compacted soil, rests on a stone foundation. The actual conduit, or tube, stands on a bed of concrete and is sheathed with walls of hammered stone. In addition to several major engineering features, the aqueduct required the construction of 16 tunnels (varying in length from 160 feet to 1,260 feet), 114 culverts, 33 ventilator shafts, and six waste weirs. (NPS, 1991)

Throughout most of Westchester County and what is now the Bronx, the aqueduct appears as a level or bermed tree covered grassy or dirt path. In the sections that were tunneled through rock, the aqueduct is indistinguishable from the natural topography. At several points the path of the aqueduct is obscured by paved parking lots and streets. Traveling short

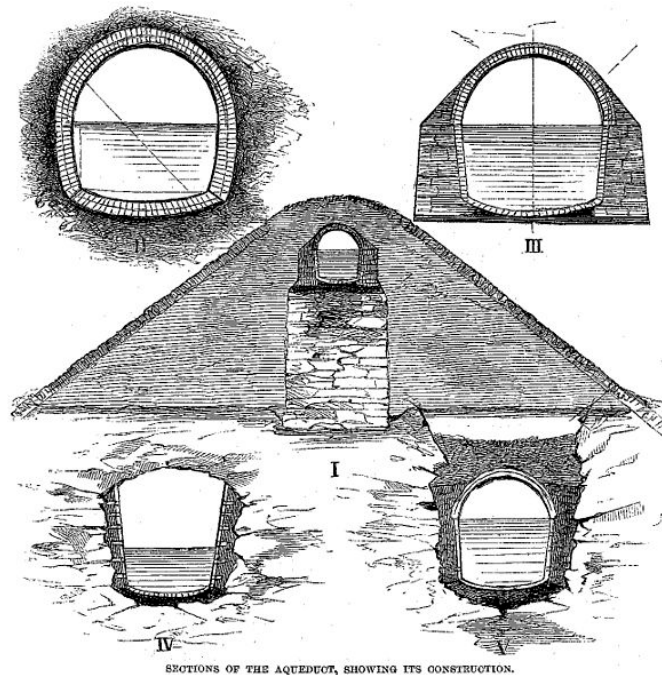
Old Croton Aqueduct State Historic Park Management Plan

distances along the corridor many above ground features, ranging from relatively modest masonry ventilator shafts, gatehouses, waste weirs and culverts to more substantial engineering features such as the large bridges and viaducts required to maintain the aqueduct's gradual descent across undulating topography, are encountered. As the Aqueduct passes farther south through the Bronx, it is in a more urban context.

Today, the original dam and the northernmost portion of the aqueduct are submerged under the greatly enlarged reservoir which was created behind the New Croton Dam after 1907. The portion of the aqueduct below the new Croton Dam, in Westchester and Bronx Counties, possesses a high level of integrity. However, after crossing the High Bridge to Manhattan, virtually all of the above ground features and much of the underground conduit have been obliterated.



During the planning phase for the Old Croton Aqueduct, it was decided that due to the imperfect operational abilities of early 19th century steam engines, the water would flow by gravity. Therefore, the aqueduct's route, design and construction were determined by topographical considerations. In order to maintain sufficient water pressure to service New York City's fire hydrants and multi-story buildings, the gradual declination of the conduit had to be maintained. The engineers conducted careful surveys of the best route to avoid sudden variations in elevation. The terrain over which the aqueduct traversed, however, varied widely. Throughout most of its route, the aqueduct conduit was set as a shallow tunnel excavated through level ground. Where excavations were made in the side of hills, retaining walls were built on the lower side to support a covering of earth over masonry. In places where level ground was not available,

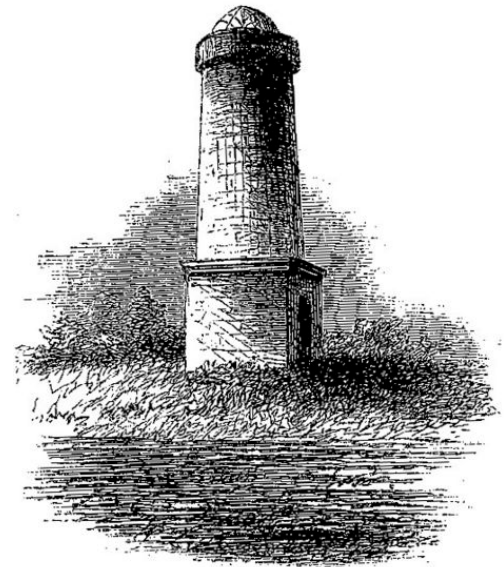


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the aqueduct was tunneled through hills or carried across valleys on bridges or earthen embankments. In such cases, the cut and cover method of excavation had to be replaced with more expensive and time consuming methods which required more building materials and more complicated design and workmanship.

Standardized construction designs were developed for many of the features which occurred at multiple places along the aqueduct. For example, Chief Engineer John B. Jervis' staff prepared standard designs for the culverts used to carry natural streams under the aqueduct. These designs were prepared for culverts ranging from two to twelve feet in width. A given standard design was merely applied to each stream depending on its size.

The culverts were constructed of cut stone and were designed so that the stream could flow in its natural course without damaging the aqueduct. Cut stone lines the bottom of the waterway; there are stone side walls surmounted by an arch of stone. Buttresses and wing walls are at each end of the culvert to guide the water to and from the channel-way and parapet walls are located over the tops of the channel-ways at each end to sustain the embankment of earth over the culvert. To reduce the risk of creating irregular air pressure within the aqueduct and to allow a certain "freshness" of the water during its forty-mile journey, Chief Engineer Jervis estimated that ventilation shafts should be incorporated at one-mile intervals. (In case his estimate was wrong, he included additional openings for future ventilation and access in the top of the conduit at quarter-mile intervals.) The ventilators, most of which remain today, are hollow stone cylinders, usually about 10 to 14 feet high, capped with an iron grate to discourage vandalism and unauthorized entry into the Aqueduct. Every third ventilator shaft included an entrance door for authorized access into the conduit. Six waste weirs along the Aqueduct's route allowed for more convenient draining and filling of the water within the conduit. A section of the Aqueduct could be drained and made accessible for repair by diverting water at the upstream waste weir. The water was thereby drained from this portion of the conduit into a culvert connected to a nearby stream. The presence of these control structures meant that only a portion of the conduit required draining, thus shortening the duration of the interruptions of water service to the City. Finally, workers waiting to enter the conduit would not have to wait as long as they would have if the entire system required emptying. These non-roofed weir structures also served as ventilators. Unlike the standardized designs for repetitive features discussed above, the Aqueduct's major features required more specialized design and are discussed in the following sections. (NPS, 1991)



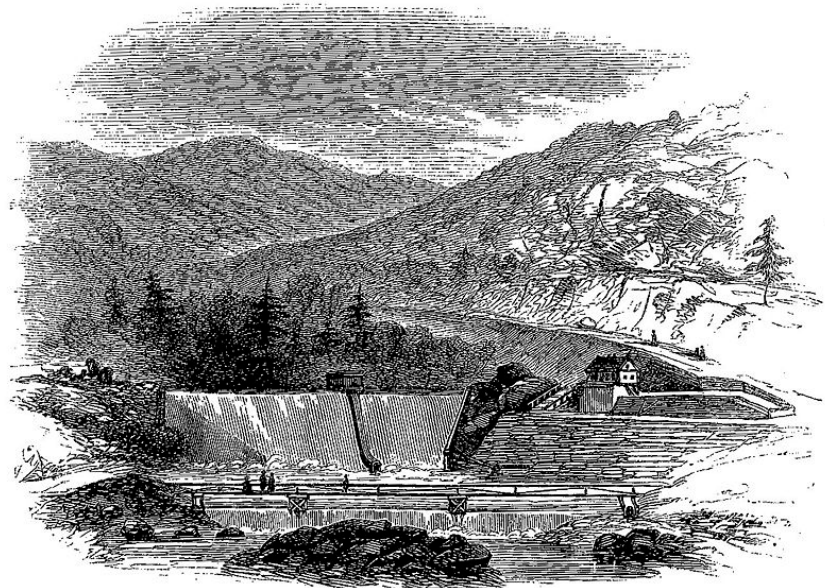
AN AQUEDUCT VENTILATOR.

Original Croton Dam and Gatehouse

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The original Old Croton Dam failed on January 8, 1841, shortly before the 90-foot granite dam with large earthen embankments would have been completed. Heavy rains on snow-

covered frozen ground caused the Croton Reservoir to rise at a rate of fourteen inches an hour. When the dam's waste weir proved too small to discharge the rising water, the reservoir crested the dam, washing away the earth adjacent to the dam's masonry north bank. Although the masonry portion of the dam remained, the gap at its northern bank caused a flood which killed three people and



SCENE BELOW THE CROTON DAM.

destroyed three mills, four bridges, and six houses. The Chief Engineer's new dam design replaced the earthen embankment with a stone barrier and tripled the length of the dam. A stilling basin was added immediately downstream of the dam to break the impact of the cascading water. The second Old Croton Dam now lies submerged within the New Croton Reservoir, slightly west of Croton Dam Bridge, between New York Route 129 and Arcady Road. A gravity dam constructed with a rubble core and granite ashlar facing, it is 670' long and 57' high. At the time of completion, the dam backed-up the Croton River to a reservoir of about 400 acres. According to Carl Condit's *American Building*, this was the first large masonry dam in the United States. It served as a model for a number of municipal water supply dams built during the mid-nineteenth century. (NPS, 1991)

Sing-Sing Kill Bridge

The first major engineering feature south of the dam, other than the Aqueduct conduit itself is the Sing Sing Kill Bridge at Ossining. At this site the Aqueduct crosses a valley 536 feet wide and 70 feet deep. While the Sing-Sing Brook itself would have required only a modest arch, a much larger arch was required to



Old Croton Aqueduct State Historic Park Management Plan

accommodate a 20-foot roadway bridge which crossed the line of the Aqueduct at an odd angle. Required by state law to minimize the creation of impediments to local landowners, the Chief Engineer also had to include a small passageway through the bridge to provide a land owner access from his house, which was on one side of the aqueduct bridge to his field on the other side. The bridges designed for valleys such as this had the appearance of massive masonry berms with minimal archways for streams or roads. Historian Larry D. Lankton presented the following description of Jervis' design for the Sing Sing Kill Bridge:

“Although Jervis referred to the entire 536-foot long structure as a bridge, for most of its length a solid stone wall, laid in cement, supported the conduit. Where the wall intersected the first road, Jervis put in a low arch spanning 20 feet, built slightly askew since the road and the wall did not quite meet at right angles. After passing the first road, the wall resumed for some 120 feet, its façade broken by a small arch for the home-owner, before it encountered the second road and its wooden bridge. To pass this obstacle, Jervis specified an impressive aqueduct bridge having a single elliptical arch spanning 50 feet. The underside of the arch stood nearly 70 feet above the stream's bed. At the termination of the bridge, Jervis again commenced the solid wall and carried it approximately 190 feet to complete the crossing. Jervis' design for the internal structure of this bridge is noteworthy. Concerned that such an elevated structure would be seriously undermined by the freezing and thawing of any leakage from the conduit, Jervis studied the examples of Roman, English, and more recent American canals and aqueducts. The first step in alleviating this problem, he determined, was to build a watertight aqueduct. Following the successful practice of the English engineer, Thomas Telford, Jervis concluded that these structures should not only be built of the best hydraulic masonry, but should be lined with cast iron to afford the greatest protection against leakage. As a final precaution, Jervis' design also included copper drains to carry any leakage safely away from the structure.”.

Another major design feature to protect the long-term structural integrity of Jervis' elevated structures involved reducing the load of the structures themselves. As Historian Lankton explained:

“The bridge's deck--the masonry conduit, lined with cast iron, filled with water, and topped with earth—would place a heavy load on the arch that Jervis could not reduce. He could, however, reduce the dead-load imposed by that part of the bridge that supported the deck and carried its load down to the arch. In most masonry bridges of the period, builders used an earthen or rubble fill to support the deck. Jervis chose not to follow this practice. Instead of totally filling the space bounded by the arch barrel, the exterior spandrel walls and the deck, he supported the deck on a series of interior spandrel walls, tied together with cross walls. By leaving large spaces between the walls, and by leaving hollow spades in the walls

Old Croton Aqueduct State Historic Park Management Plan

themselves, he significantly reduced the dead-load on the arch.” (NPS, 1991)

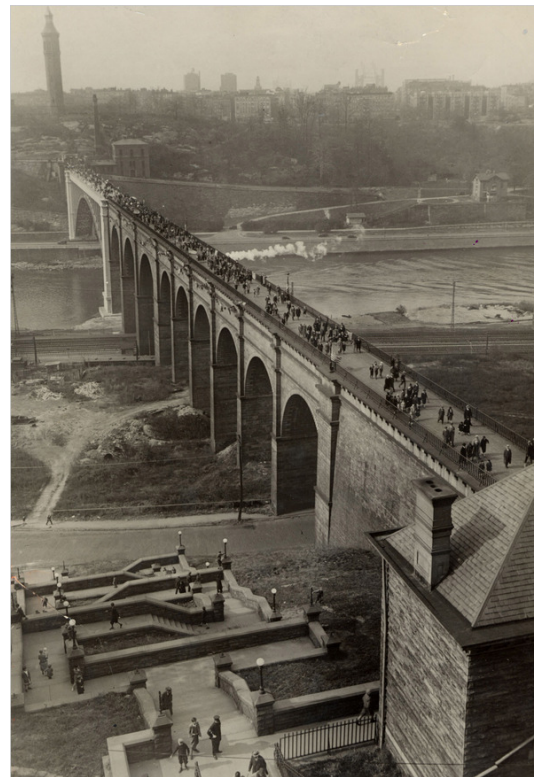
Jewells Brook Culvert

Also known as the Station Road viaduct, this 148-foot long, 60-foot tall embankment structure in Irvington is similar in construction to the Mill River culvert. A 14-foot wide, 12.5-foot high arch allows Station Road to pass below the massive embankment. A 6-foot wide, 6-foot high culvert allows Jewells Brook to flow unimpeded below the aqueduct.



High Bridge

Crossing the 1,450-foot wide Harlem River Valley to Manhattan proved to be the most politically divisive aspect of Jervis' work. Had economy been the primary determinant, the Aqueduct would have been carried across an "inverted siphon." The syphon would have descended in elevation at the upstream end of the Aqueduct, crossed the river on a low bridge, and risen up the opposite slope. Despite the resulting loss of water pressure such a design would have caused, this plan was favored by Jervis and others as an alternative to constructing an expensive high bridge. However, the political influence of land owners, who wished to maintain the option of making this portion of the Harlem navigable, prevailed. Jervis' final design repeated the light-weight, watertight construction used for the Sing-Sing Kill Bridge. Until the 100-foot tall, 1,200-foot long bridge was completed in 1848, the Croton's water traversed this valley on a temporary inverted siphon. Despite the difficulty in securing stable foundations, the sixteen giant bridge piers were erected with arch widths varying from 50 to 80 feet. As the

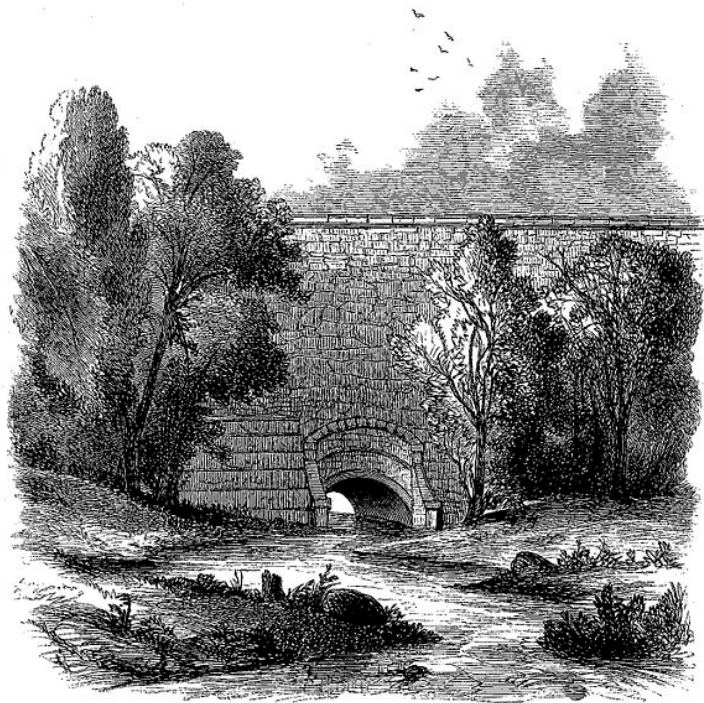


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city's demand for water grew, the High Bridge was modified to increase its capacity. In 1927 a steel arch over the river portion of the valley took the place of five of the bridge's original masonry piers. (NPS, 1991)

Mill River Culvert

The next major feature to receive Jervis' attention was the Mill River (Pocantico River) Culvert, which ran north of Tarrytown's Sleepy Hollow Cemetery. Instead of designing a multiple-arch bridge for this site, Jervis yielded to economic considerations and built an enormous embankment across a valley 300 feet long and more than 80 feet deep. At the bottom of the valley, the Mill River passed through a 25-foot wide culvert arch. In contrast to the hollow construction method utilized for the Sing-Sing Kill Bridge, this massive structure featured a tall, dry-laid



BRIDGE OVER MILL RIVER AT TARRYTOWN.

masonry foundation for the Aqueduct tunnel, flanked by massive earthen embankments, all of which was contained within a stepped-buttressed masonry retaining wall. (NPS, 1991)

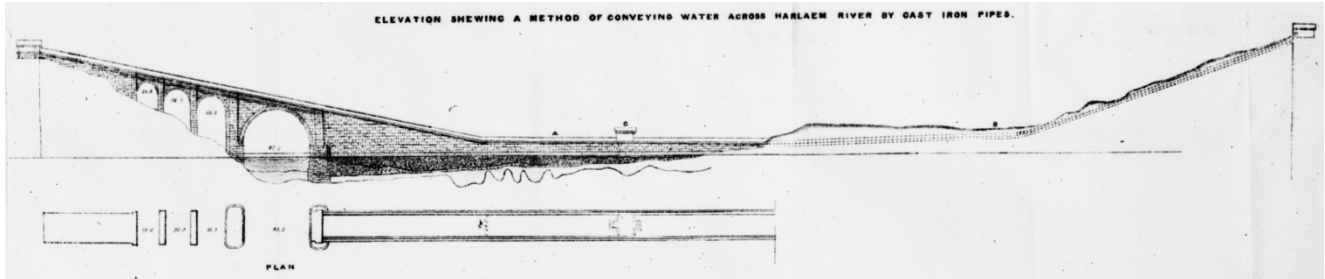
Saw Mill River Culvert

The portion of the Aqueduct which crosses over the Saw Mill River and Nepperhan Avenue in Yonkers spans a valley approximately 300 feet wide. Jervis designed this engineering feature much like the other earth-filled embankments. The embankment which carries the gradually declining Aqueduct conduit across this valley was originally punctuated by a 20-foot wide road culvert and two 26-foot double arch river culvert. Jervis utilized the double culvert because it was less expensive to build than a larger single arch. During the late 19th century the original 20-foot road culvert was doubled in size. In 1984, when Nepperhan Avenue was realigned, a large portion of the Aqueduct embankment immediately northwest (upstream) of the roadway arch was demolished. A new arch spanning the realigned roadway was designed to blend in with the remaining fabric. The earlier road arch was converted to pedestrian use. (NPS, 1991)

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Inverted Siphons

Inverted siphons were constructed at points along the aqueduct corridor to avoid having to use large viaduct bridges or embankments. Inverted siphons used 3-foot diameter cast iron pipes to cross the deep Manhattan Valley at 125th Street in New York City. To increase the flow, the elevation at the exit was three feet lower than at the entrance.



Inverted siphon detail - Library of Congress

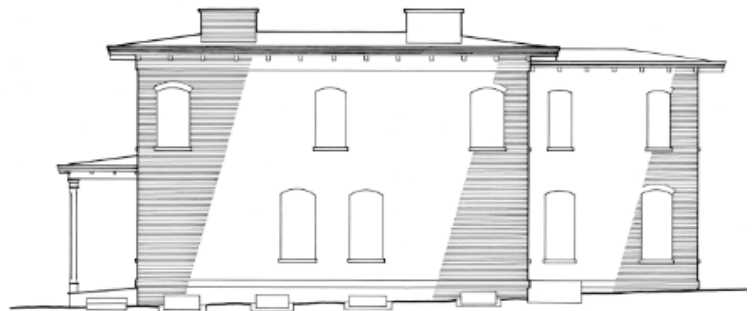
Keeper's House and Barn

In the vicinity of each waste weir, a residence for the weir tender and area overseer was provided. One of these keeper's houses is located on the aqueduct in Dobbs Ferry. A second house, virtually identical to the one in Dobbs Ferry, was recently identified in Ossining. The structure was moved off the aqueduct in 1928 and is currently a private residence. With the exception of these two structures, none of the keeper's houses are known to have survived. The more substantial masonry residence at Dobbs Ferry replaced a wood framed building in 1857. This two-story keeper's house sits along the eastern side of the Aqueduct, south of Walnut Street. A large two-story rear addition was added around 1884. Immediately north of Walnut Street, along the western side of the Aqueduct, stands a two-story barn which was constructed for the keeper around 1884 and is adjacent to the park office. It is currently used by OPRHP as a maintenance building. Construction is ongoing to rehabilitate the Keeper's House.

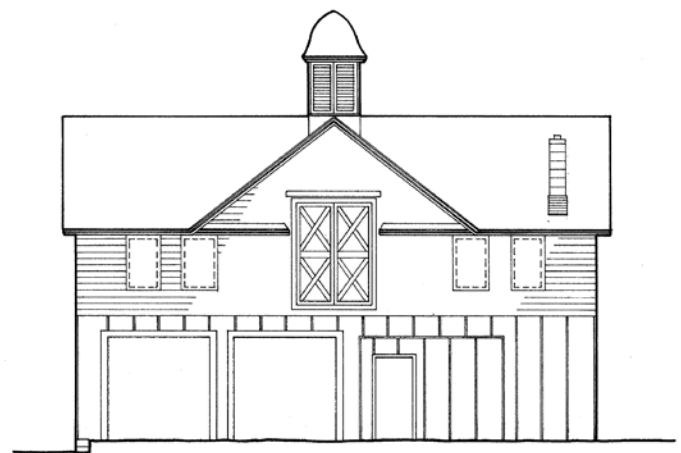
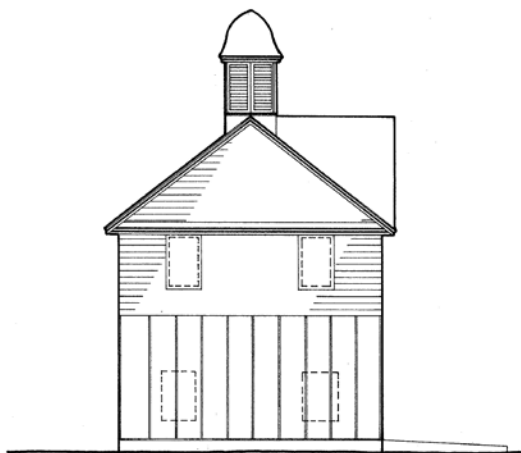
Manhattan Features

Fewer visible remains of the original Old Croton Aqueduct exist on Manhattan Island than elsewhere along the aqueduct. Portions are visible in Highbridge Park and at various undeveloped points to 152nd Street. Underground portions of the Aqueduct may remain in places undisturbed by later construction. Jervis' elevated Receiving Reservoir, located on land which later became Central Park, was replaced by the larger Central Park Reservoir in 1862 and served New York City in conjunction with the York Hill Reservoir. . Similarly, Jervis' Egyptian Revival-style Distributing Reservoir at Murray Hill was later removed to make way for the construction of the main branch of the New York City Public Library. The High Bridge Water Tower is one of the few surviving features that was added later in the 19th century. (NPS, 1991)

Keeper's House



Maintenance Barn



Archaeological

As a result of thousands of years of human habitation, the area encompassing the Hudson River Valley has been found to be rich in both historic and prehistoric archaeological resources. The New York State Archeological Sensitivity map (<http://nysparks.com/shpo/online-tools/>) depicts portions of the OCA within areas of sensitivity. While many areas within the park boundaries have seen significant disturbance from the construction of the aqueduct and other infrastructure, there may still be undisturbed areas containing intact archaeological resources. Some of these undisturbed areas include locations where the aqueduct construction involved tunneling and filling. Additionally there may be significant historical resources deposited on the site after the construction of the aqueduct. Archaeological excavations could prove useful in answering questions concerning the construction of various features of the aqueduct itself as well as provide insight in to the lives of those living and working on or near the aqueduct. Excavations performed at the Caretakers House in Dobbs Ferry have uncovered evidence of an 18th century pre-aqueduct occupation at that location.

Scenic Resources

Many scenic vistas have closed due to vegetation growth along the aqueduct corridor. As adjacent development continues, some vistas have been blocked by multi-story buildings. Only a handful of the original vistas remain from the trail and should be protected and enhanced when possible. See the management plan map for some of the more prominent scenic vista locations. The trail corridor itself is also very scenic at many points. It provides views to both pastoral and forested scenery within close proximity to downtown areas.



Trail Resources and Uses

Recreational Resources/Activities/Education

The OCA offers a variety of recreational opportunities including hiking, bicycling, photography, running, geocaching, equestrian use, snow shoeing and cross-country skiing. It provides 26.2 miles of multi-use trail traversing both forest and communities. Nine tenths of a mile of the trail is available for equestrian use as the trail passes through Rockefeller State Park Preserve.

Guided walks are provided along the trail and FOCA provides scheduled tours inside the aqueduct in Ossining. Events such as bike rides and running races are also held on the OCA trail throughout the year.

The Ossining Heritage Area Visitor Center and the Keepers House Visitor and Education Building are both adjacent to the trail and provide educational and interpretive programming and exhibits.

Trailheads

There are no designated trailheads on the OCA, however, on street parking is available at many of the 94 street crossings. Municipal metered parking lots are available within adjacent communities. Access to the OCA for hiking and equestrian use can be achieved by parking at Rockefeller State Park Preserve. Access to the OCA for cyclists is not allowed within Rockefeller State Park Preserve.

Connectivity

The trail is also used as a functional means of travel from community to community. Trail users frequently use the trail as a safe way to commute to work, school, restaurants, local events and activities or to the store.

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Barriers

Trail gates are located at 18 road crossings along the trail as a barrier to unauthorized vehicular traffic. Other barriers include curbing and boulders. Some road crossings do not have barriers and as a result, unauthorized vehicular access occasionally occurs.

Bridges and Culverts

There are many culverts located along the trail, sixty-six of which, within the park boundaries and are designated as contributing historic structures. Generally, each low point or valley on the upslope side of the trail has a culvert. The culvert size varies with the size of the watershed for that particular area. Larger watersheds have larger culverts. Within Ossining, the Sing Sing Kill Bridge was constructed to cross not only the river but a roadway and is considered a double arch bridge. See Cultural Resources – Historic Physical Appearance section for more information on bridges and culverts.

Signs

Signage is provided as a means to either identify the trail or to inform adjacent landowners and patrons of infractions to park policy or state law as needed. Wayfinding signage along the trail includes a “QR code” which allows patrons with smart phones to access the internet for additional information. On portions where the trail follows roadways, signage is not presently provided.

Trail Furnishings

There are four benches and four interpretive panels located at various points along the trail. Throughout the years, requests have been made to provide additional benches.

Illegal and prohibited uses

The OCA is used illegally for dumping of trash and yard waste, artistic expression and “tagging” through graffiti, parking of equipment and vehicles and for riding all-terrain vehicles. None of these activities are allowed but do occur. Patrons are encouraged to report illegal uses to the park manager.

Motorized vehicles are not permitted on the trail with the following exceptions: maintenance vehicles; motorized wheelchairs and electric bicycles.

The discharge of any weapon, firearm, or a bow and arrow on, from, or across the trail and walking dogs off leash are also prohibited.

Adjacent Parks and Historic Sites

The OCA passes through or is adjacent to a number of different state, county, and local parks as well as national historic sites which provide picnic and additional facilities for trail users.

State Parks

Rockefeller State Park Preserve is bisected by the OCA in Sleepy Hollow. Access to the trail is allowed through the park for hiking and equestrian activities.



Trail Sign

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Local/County Parks

There are many local and county parks adjacent or within close proximity to the OCA including: Tibbetts Brook Park, Untermyer Park, Lenoir Preserve, Draper Park, Zinsser Park, Gracemere Park, Taxter Ridge Park, Riverwalk and the planned Quarry Park. At the northern terminus of the trail is the Croton Gorge Park and at the southern end of the OCA is Van Cortlandt Park where the Old Croton Aqueduct continues under management and ownership of the New York City Department of Parks and Recreation. See the management plan map for other park locations.

Historic Sites

The area that the OCA traverses not only has a great number of parks but also many historic sites including: Philipse Manor Hall State Historic Site, Villa Lewaro, Sunnyside, Washington Irving Memorial, Belvedere, Lyndhurst, the First Baptist Church, the Grove Street and Main Street Historic Districts in Tarrytown, the Irvington Historic District, The Philipsburg Manor, the Old Dutch Church, Kykuit, the First Baptist Church and the Calvary Baptist Church in Ossining, the Van Cortlandt Manor and the New Croton Dam. See the management plan map for historic site locations.

Tourism Resources

Several hotels and motels are located less than one mile from the OCA. A few bed and breakfasts and golf courses can also be found within close proximity. Numerous restaurants and coffee shops are located less than one-quarter mile from the trail at various downtown locations, including Ossining, Mount Pleasant, Sleepy Hollow, Tarrytown, Hastings, Irvington, Dobbs Ferry and Yonkers. Bicycle rental opportunities are available in Dobbs Ferry and Hastings. Several Metro-North train stations are located within close proximity to the OCA and provide convenient opportunities to access the trail at many locations.

Numerous other attractions (such as local museums, the Ossining Visitor's Center, historic villages and sites, local parks, seasonal festivals, farmers markets and events) are located close to the OCA, providing opportunities for lengthening the stay of visitors.

Community Services

Enforcement

In addition to the New York State Park Police, the Westchester County Department of Public Safety, the New York State Police and all local community police departments, which the OCA passes through, provide enforcement assistance when requested.

Fire and ambulance

Local fire and ambulance companies respond to emergencies along the trail.

Agency Mission

The mission of the Office of Parks, Recreation and Historic Preservation is to provide safe and enjoyable recreational and interpretive opportunities for all New York State residents and visitors and to be responsible stewards of our valuable natural, historic and cultural resources.

Goals and Objectives

Vision

The Old Croton Aqueduct State Historic Park will continue to offer recreational opportunities and safe connectivity between communities while promoting the history of the aqueduct system and its significance to the area and providing stewardship for future generations.

Management Goals

Public Use and Recreation

- Continue to provide and enhance recreational opportunities for the public (walking, bicycling, running, horseback riding, nature observation, snow shoeing and cross-country skiing.).
- Provide opportunities to identify and interpret significant natural, cultural and historic resources located along the OCA.
- Continue to provide access to other public resources.
- Provide a safe, alternative transportation route between and within communities.

Real Property

- Identify and communicate boundaries through surveys and signage.
- Address encroachments which impede connectivity on the OCA corridor.
- Coordinate with landowners or municipalities to improve connectivity through easements.

Resource Protection

- Protect, preserve and interpret historic and cultural resources along the OCA.
- Protect, preserve and enhance natural resources and maintain habitat linkages.
- Continue to partner with the Friends of the Old Croton Aqueduct to provide public outreach programs and educational opportunities.

Community Involvement

- Promote the value of the OCA to local tourism and economic development organizations.
- Encourage and coordinate individual, group, and business contributions to the enhancement of the OCA.

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- Increase outreach to community groups, municipalities and adjacent landowners for support and maintenance.
- Continue the relationship with the Friends of the Old Croton Aqueduct.
- Develop an Ambassador Program for formal patron assistance along the trail.

Alternative Transportation

- Provide a safe, bicycle and pedestrian route between and within communities.
- Encourage links with other regional trail systems.
- Encourage links with other transportation systems.

Staffing and Maintenance

- Provide adequate staffing for the operation and maintenance of the OCA.
- Increase funding within the agency's budget for maintenance.
- Increase secured equipment storage in Yonkers..

Operation and Management

The following sections outline the strategies that will be followed by the agency and its partners in order to manage the OCA in a manner that is consistent along its entire length and in keeping with the principles of land stewardship that are part of the OPRHP mission.

A primary goal of the management of the OCA is to improve connectivity along its entire length. In light of that goal, priority will be given to eliminating obstacles to public use of public lands.

Entities Responsible for the OCA Operation and Management

OPRHP, as owner of the land and in its role as representing the welfare of the people of the State of New York, will have ultimate responsibility for the operation and management of the trail.

OPRHP will enter into agreements with volunteer organizations, local governments, state agencies and others who are interested in assisting with specific management activities such as adoption of sections of the trail, trail ambassador assistance and maintenance activities. One agreement is in existence at this time: an MOU between OPRHP and the Friends of the Old Croton Aqueduct (FOCA) identifying the mutual and complementary interests in the protection and operation of the park.

Land

Encroachments and Boundary Line Surveys

The agency will uphold its right to ownership of the OCA land and to clear obstacles, both legal and physical which inhibit the free and clear use of the trail for the public at large. The integrity and continuity of the corridor will be protected and preserved to all reasonable extents. It is recognized that this may be dependent on the practicality, availability of resources, impacts to the environment and priorities.

A boundary line survey and permanent marking of the boundary lines of the OCA corridor should be undertaken. Priority for this activity will be given to segments of the trail where boundary lines and ownership disputes inhibit that segment from public use.

Erosion and Wash-Outs

The agency will take necessary and prudent steps to protect the OCA land and associated resources from the forces of erosion. OPRHP will develop a design to improve the previous culvert wash-out in Cortlandt near the DEC Croton Gorge Unique Area. Priority will be given to erosion that is impacting the historic structure. Improvements will be designed to protect historic, cultural and natural resources.

Discontinuities

Discontinuities in the OCA result from a variety of factors. These range from encroachments to the lack of ownership of surface rights. OPRHP will categorize and

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prioritize these and other discontinuities with the intention to overcome them to the extent possible. First priority will be given to discontinuities which create impassable sections of the trail corridor causing pedestrian roadside travel. Table 3 shows the present top four discontinuities, location and the level of priority they represent. Additional survey work may be required at these and other points to further define boundaries.

Table 3 – Discontinuity priorities

Priority	Location	Map Page
1	Tappan Zee Bridge/Route 87/287, Tarrytown	D
2	Sleepy Hollow Country Club, Sleepy Hollow	C
3	General Electric, Crotonville	A
4	Sleepy Hollow High School, Sleepy Hollow	D

Trail Design

General Guidelines

Throughout its length, the OCA will provide continuous travel and a treadway in as natural a setting as possible while providing a surface suitable for its use. Wherever possible recreational development will reflect the character of and will be integrated into the landscape. Grading and landform modifications will be as minimal as possible.

Accommodations for visitor comfort such as benches and pocket parks will also be of low density and blend visually with the characteristics of the landscape. Overall aesthetics of the OCA shall be consistent along its length while respecting the historic character of the trail as well as meeting the needs of park patrons.

Trail Surface

Throughout the majority of the trail, the trail surface will remain in a natural state. In areas of high use and/or where erosion has occurred, the tread surface will be improved with crusher fines providing a smooth and stable surface. In areas where severe erosion is evident, with exposed roots and rocks or ruts, improvements will be made to include either cover or removal of these obstacles. At points of relatively high use within residential or forested areas, soil stabilizers may be used as a means to minimize erosion and create a firm and stable surface for patrons. Park and regional staff will determine key locations for the use of soil stabilizers.

In the downtown areas identified (see map), including Dobbs Ferry and Ossining, the trail surfacing will shift from a natural surface to a harder surface through the use of soil stabilizers.

This shift in surfacing will better meet the needs of these heavily used areas. The trail width for these sections will meet OPRHP Class 1 Bike Path standards which follow AASHTO standards. Additional information can be found on the OPRHP website.

<http://nysparks.com/recreation/trails/documents/TrailsTechnicalStandardsandGuidelines.pdf>



Crusher Fines Trail Surfacing

Trail dimensions

The OCA corridor is generally cleared of trees and shrubs to 12 feet wide or greater and up to 12 feet high wherever possible. Exceptions presently include several backyard gardens and other encroachments which will be addressed. The trail tread (generally considered the worn pathway in grass) itself varies in places from 12 feet to 1 foot depending upon usage and natural conditions. OPRHP recommends that a multi-use, Class 1 trail corridor be cleared of trees and shrubs to between 12 feet and 16 feet for two way low to moderate volume traffic with a vertical clearance of 8-10 feet.

Table 4 - OPRHP Trail Development Standards

Trail Type	Vertical Clearance	Corridor Clearance	Treadway Width	Surfacing Materials	Sight Distance	Grade
Class1 (Greenway Trail)	8-10 feet	10-12 ft. (1 lane) 12-16 ft. (2 lane) 16-20 ft. (2 lane – high volume)	6 ft. (1 lane) 8-10 ft. (2 lane) 12-14 ft. (2 lane – high volume)	Smooth pavement, asphalt, concrete, crushed stone, clay or stabilized earth.	Min. of 50 ft. up to 100 ft. on downhill curves or road crossings	0-5%; Max: 5-10% sustained; 15% shorter than 50 yd. Outslope of 2-4%

Lighting

Throughout several higher populated areas, including Yonkers, Ossining, Dobbs Ferry and the Mercy College campus, the trail is used as a means of connectivity during the day and night. To improve trail users’ visibility at night in these areas, low level lighting will be considered (see map). In areas where adjacent landscape lighting may exist, lighting selection should be of a similar design aesthetic and consistent with the surrounding architectural amenities. In areas where a specific design aesthetic does not exist or is incompatible with OPRHP design aesthetics, Park and Regional staff will develop and implement lighting standards for the area. When feasible, energy efficient lighting and photovoltaic power sources will be used to further promote OPRHP’s commitment to sustainability. The OPRHP Sustainability Plan can be found at the following website:

<http://nysparks.com/inside-our-agency/documents/OPRHPSustainabilityPlan.pdf>

All lighting used will be consistent with the International Dark-Sky Association low level down-lighting guidelines. More information concerning these guidelines can be found at the following website:

<http://www.darksky.org/outdoorlighting-29>.



Steps

At the trail crossing with Piping Rock Drive in Ossining, there is a steep, heavily eroded portion of the trail. At this point, the aqueduct tube was tunneled through the bedrock leaving the surface topography intact. Through the years, natural and user-based erosion has taken place on this very steep slope exposing bedrock ledges. To enhance public access and reduce erosion within this area, steps will be placed on the existing slope. Natural materials will be used to blend in with the surroundings. OPRHP landscape architects will develop a plan to assist bicyclists pushing their bicycles up and down this slope while walking on the steps. See the management plan map, Section B for location.

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Table 5 – Trail Improvements

Improvement	Location	Comments
Surfacing	Mercy College, Downtown locations in Yonkers, Dobbs Ferry, Ossining	See map for detailed locations
Lighting	Mercy College, Downtown locations in Yonkers, Dobbs Ferry, Ossining	See map for detailed locations
Steps	Piping Rock Road, Ossining	See Section B for location

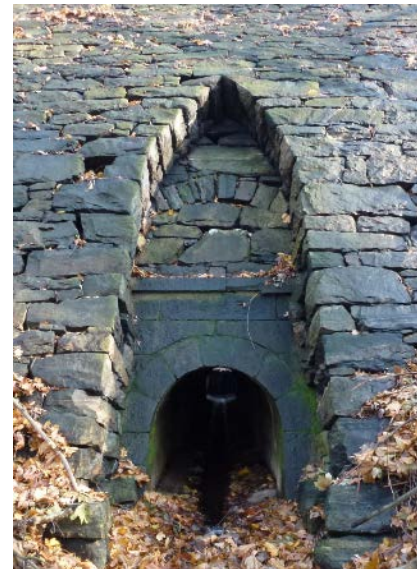
Resource Management

Cultural resources

The care and management of cultural resources within the OCA shall be guided by the “Standards for Preservation” as defined in the Secretary of the Interior’s Standards for the Treatment of Historic Properties (NPS, 1995). This category of resource management focuses on conducting routine maintenance and preventative care for the purpose of sustaining the existing form, historic appearance and materials of each historic structure. Alterations or improvements that change the historic character of a structure or feature generally are not necessary and should not be permitted. More information on these standards can be found at the following website:

<http://www.nps.gov/hps/tps/standguide/>

The Old Croton Aqueduct State Historic Park contains a large number of historic structures. In addition to the 26.2 mile-long buried conduit on the property, there are two large masonry bridges (or viaducts), five weir buildings, 21 stone ventilators, and over 74 stone culverts. Repairs have been completed in 2013 on several of these structures including the Ossining Double Arch Bridge and its associated waste weir (the “new” Ossining weir), three other waste weirs, and all 21 stone ventilators. Rehabilitation of the Keeper’s House in Dobbs Ferry is nearly complete. This leaves the old Ossining waste weir and the Aqueduct’s stone culverts still needing some level of maintenance or repair. While the condition of the Aqueduct’s conduit is thought to be relatively sound, a detailed inspection of the interior of the structure is long overdue and should be undertaken.



Stone culvert

Routine maintenance and preventative care includes the following activities (refer to Appendix B, “Guide for Routine Maintenance and Preventative Care of Historic Structures on the OCA” for specific recommendations);

- Removing vegetation (primarily trees, vines and woody shrubs) growing on or within masonry structures;
- Removing debris at culvert inlets/outlets;
- Repointing deteriorated mortar joints and resetting loose or dislodged masonry;
- Repairing damaged or broken masonry units;
- Maintaining roofs to prevent water infiltration;

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- Maintaining and applying protective coatings on ferrous metal components to prevent rust;
- Removing graffiti using materials and methods that do not damage the historic materials; and,
- Taking measures to protect structures from acts of vandalism, including using non-destructive means of securing structures to prevent unauthorized access or entry.
- Providing a yearly visual inspection as a means to identify any issues or damage associated with falling trees or limbs, the freeze/thaw process or vandals. Issues should be documented and submitted to the capital facilities manager for funding and repair.

The OCA is located within the Hudson River Valley geographic area that is known to contain cultural resources associated with Prehistoric Native American occupations as well as Colonial and post-Colonial development. Additionally, archaeological sites associated with the construction and operation of the aqueduct, such as workers camps and early keepers' dwellings, have not been adequately researched or located. Since archeological resources may exist almost anywhere within the boundaries of the OCA, a professional archeologist should evaluate the potential impact of any excavation work on a case-by case basis. The use of metal detectors and the associated digging on state land is prohibited by State law; any such activity within the OCA should be strictly forbidden.

Projects involving the repair, alteration or installation of utility systems within the Aqueduct (including within the buried conduit) warrant special consideration and should be evaluated on a case-by-case basis. The following guidelines are intended to assist with making decisions regarding this type of work. Since these actions may be subject to review under SEQRA as well as State or Federal historic preservation regulations, OPRHP's Division of Historic Preservation (SHPO) should be consulted early in the decision-making process.

1. Repairs and alterations of existing utilities located within the aqueduct conduit.
 - Existing public utilities should be permitted to remain provided that their presence does not cause any further damage or deterioration to the Aqueduct. The creation of any new or enlarged openings in the top of the Aqueduct should be discouraged and permitted only when proven necessary to meet a clear and present public need. When permitted, new or enlarged openings should be constructed using materials and methods that are similar to those used in the Aqueduct's original construction.
 - Existing private utilities should be removed when any component reaches the end of its normal expected life or whenever a viable alternative means of routing the utility becomes available, whichever comes first.
2. The installation of any new public utility (or expansion of an existing public utility) that requires any alteration to the aqueduct conduit or associated historic structures

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should be discouraged and permitted only when proven necessary to meet a clear and present public need.

3. The installation of any new private utility should not be permitted.
4. The removal or alteration of any historic stone culvert should not be permitted except in situations where existing drainage flows cannot be accommodated or adequately managed through some alternative routing.

Review of Projects

All trail development work will be conducted in a manner that ensures the proper protection, preservation, and interpretation of the aqueduct elements. These elements include, but are not limited to, stone culverts, waste weirs, bridges, aqueduct tube and surrounding soil prism, any other buildings, foundations, structures, artifacts, and land forms in order to ensure the public's ability to appreciate the unique and historical significance of these resources. For more information on cultural resource management, please see the following appendices. Projects that are subject to federal or state historic preservation laws will be conducted in accordance with OPRHP's Policy on Historic Preservation within the New York State Park System." This policy is posted on the agency's intranet as HP-POL-001 and HP-PDC-002.

Appendix D	Preventative Maintenance Inspection Checklist
Appendix E	Guidelines for Removing Vegetation from Historic Masonry Structures
Appendix F	Guidelines for Removing Graffiti from Historic Masonry
Appendix G	Masonry Repointing Specifications

Inventory of Historic Structures

The Division for Historic Preservation is currently completing a survey of all historic resources associated with the OCA that are under the jurisdiction of OPRHP. This information will be available to park management soon after the completion of this plan and will be a resource used to assist in project funding prioritization.



Archaeological resources

The Hudson River Valley is rich in both historic and prehistoric archeological resources. While much of the narrow aqueduct corridor is disturbed land, there are also areas which have minimal or no disturbance. Additionally, there may be significant historical resources deposited on the site after the construction of the aqueduct. The Division for Historic Preservation will be consulted in any instance where the New York State Archeological

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Sensitivity Map indicates an archaeological site may exist in an area where construction activity is proposed. Archaeological review is required in accordance with OPRHP's Policy on Historic Preservation.

Natural Resources

OPRHP will continue to recognize and, where possible, enhance the OCA as a biological corridor. OPRHP and its partners will encourage cooperation with local educational institutions and other volunteers to conduct surveys of the flora and fauna and control invasive species along the OCA and incorporate interpretation of the natural history of the area wherever possible.

Rare and endangered species

The OCA has not been surveyed for rare and endangered species by the New York Natural Heritage Program. Some rare species are found on adjacent parkland and many historical records are known from the vicinity. However, due to the highly disturbed nature of the trail corridor, there is a very low likelihood of rare plants or other rare animals to be on the actual trail. Where practical, a field check of existing rare and endangered species will be undertaken by the Regional Biologist prior to beginning construction projects.

The Indiana bat, a federal and NY State listed Endangered species, and the northern long-eared bat (recently added to the Threatened Species list) may be found in Westchester County. These species use loose bark and the hollows of living or dead trees as daytime roosts outside the hibernating season. Female Indiana bats use this type of habitat as nursery areas, as well. Therefore in order to avoid potentially impacting these species, non-hazardous trees will only be removed between October 1 and March 31 while this species is in hibernation.

Flora

OCA vegetation management will be implemented to:

- Remove vegetation from buildings and structures.
- Maintain trail clearances (both horizontal and vertical) and scenic vistas, and to eliminate hazardous conditions.
- Minimize the spread of invasive species

The following guidelines for vegetation management will be followed to meet the above objectives while protecting habitat:

Tree and Shrub Disposal: Depending on the amount of material involved and whether there is room in the area adjacent to the trail, branches and small limbs can be used to create brush piles that can provide habitat for small mammals and can help with tree regeneration by protecting seedlings from deer browse. If space allows, trunks and larger limbs can be cut into larger sections that can be placed on the forest floor to provide habitat for woodland salamanders and other wildlife. Caution should be taken when spreading woodchips, as a thick layer can smother habitat on the forest floor.

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Timing of removals: Tree and shrub removal will be timed to take place in the late fall and winter to avoid periods of greater biological activity such as bird breeding and nesting periods. This does not include hazardous tree removals which are required year-round.

Invasive species management: Invasive vegetation poses a threat to both the historic masonry and the overall biodiversity of this corridor; therefore, priority will be given to controlling invasive species on historic structures and invasive vines on trees. Vines, such as oriental bittersweet, weaken trees making them more susceptible to storm damage and increase the likelihood that they will become hazardous to public safety. Priority will also be given to early detection species such as mile-a-minute vine and kudzu, which can easily become a monoculture, smothering habitat, making control efforts more difficult, and spreading to areas outside the park. FOCA and OPRHP have partnered with the New York/New Jersey Trail Conference (NYNJTC) to map the location and abundance of 14 selected invasive plants along the trail; the second phase, started in 2015 and to be completed in 2016, will map an additional 11 invasive species.

OPRHP is a partner of the Lower Hudson Partnership for Regional Invasive Species Management (Lower Hudson PRISM) and will work with other partners in this group, as well as OPRHP staff, FOCA, the NYNJTC and other volunteers, to inventory invasive vegetation along the trail corridor and develop a management plan for their removal that is data driven. OPRHP's seasonal Invasives Strike Team will be able to assist with and train volunteers in invasive inventories, controls and educational outreach as time allows.

Invasive vegetation removals will be considered as part of "I Love My Park Day" and other volunteer activities. For more information on invasive species, please visit the following webpage; http://www.nyis.info/index.php?action=invasive_detail&id=20

Native Plantings: New plantings at pocket parks or any other areas will be selected based on the following criteria:

- Native to the area
- Suitability of characteristics of growth and habitat
- Low maintenance
- Resistant to impacts by deer
- Has a shallow root system to eliminate impacts to aqueduct tube

Fauna

Where appropriate, and in conjunction with adjacent landowners and partners, wildlife management strategies will be supported. The OCA will continue to be managed in a way so as to protect water quality and maintain populations of fish and other aquatic wildlife. This includes applying best management practices to all culvert repair projects to reduce erosion and siltation, and following all NYSDEC guidelines and regulations for work in or near waterways.

Watershed and Water Quality Protection

Best management practices will be followed for any construction activities and will be in compliance with all federal and state regulations and standards. OPRHP and its partners will work with other agencies dedicated to research, monitoring, and education within adjacent watersheds.

Accessibility

ADA Compliance

The Americans with Disabilities Act (ADA) requires, and OPRHP considers it part of its duty as a public entity to thoroughly examine each of its programs and services to determine the level of accessibility provided. This self-examination involves the identification of existing programs and services and a formal assessment to determine the degree of accessibility provided to each. This involves the use of the standards established by Federal Department of Justice Rule as delineated by the Americans with Disabilities Act Accessibility Guidelines (ADAAG either adopted or proposed) and/or the New York State Uniform Fire Prevention and Building Codes, as appropriate.

OPRHP has implemented a statewide assessment process for all state parklands. The Old Croton Aqueduct State Historic Park will be assessed as part of that program. The assessment will establish the need for new or upgraded facilities or assets necessary to meet ADA mandates. The State is required to make continuing efforts to render facilities accessible where possible.

Other Power-Driven Mobility Devices (OPDMD)

To protect the significant cultural resource and auditory impacts to adjacent landowners, gas powered OPDMD's will not be allowed on the trail.

Electric-powered OPDMD: Preliminary assessments of a range of OPDMD's have led OPRHP to conclude that use of most electric-powered mobility devices should be allowed subject to the category (type and physical characteristics) of the trail or facility as assessed to be appropriate by the facility manager. Typically, a Special Use Permit is not required unless the use of a particular electric-powered OPDMD in a particular facility on a specific trail presents risks or concerns that involve one or more assessment factors.

OPRHP Interim Justification: §35.137 Assessment Factors (i.-v.) In general, electric-powered mobility devices (as compared to gas-powered devices) present a lesser risk of serious harm to operators, park visitors and the immediate environment, due to the absence of volatile fuels, ignition and internal combustion engines, and generally reduced horsepower, range and speed capacity of these devices. Moreover, these devices present virtually no noise or air quality issues. Accordingly, these devices generally will be allowed on trails and bikeways under the specific trail type categories as established herein. Users of these devices are required to observe the applicable speed limit and to accommodate other trail users; and stay within the authorized trail footprint to avoid serious harm to natural or cultural resources. All OPDMD may be restricted from narrow or single track trails that do

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not provide appropriate terrain or lack adequate space for safe passage of other-users traveling in opposing directions or for OPDMD to overtake (pass) pedestrians.

Wide Unpaved Trails for OPDMD

Typical examples of this type of trail are natural surface (unpaved) fire and park roads, carriage roads and mowed trails, usually greater than 8 feet in width. In-line and tandem devices should not exceed 36” inches in maximum width. Per the OPRHP Interim Justification: §35.137 Assessment Factors (i., ii., iv. and v.). Characteristics of these devices create a substantial risk of harm to the environment or natural resources. These trails are typically wide enough for one-way vehicle traffic, and this width restriction allows for safe passing of other OPDMD, bicycles and pedestrians on unpaved roads.

The park staff shall enforce the following rules;

- OPDMD must not be gas powered
- OPDMD must yield to other non-powered users
- OPDMD must stay on the designated trail at all times. Exceptions can be made when crossing turf areas to leave or rejoin a trail
- Unless designated otherwise, OPDMD are not permitted in historic structures, ruins or other sensitive historic or cultural areas
- When required by New York State Law, OPDMD users shall wear an appropriate helmet while operating.

OPRHP employees will not ask an individual using a wheelchair or OPDMD questions about the nature and extent of the individual’s disability, but rather may ask such person to provide a credible assurance that the mobility device is required because of the person’s disability. OPRHP will accept the presentation of a valid, state-issued, disability parking placard or card, or other state-issued proof that the OPDMD is needed for the individual’s mobility disability. In lieu of valid, state-issued proof of disability, OPRHP will accept as a credible assurance a verbal representation, not contradicted by observable fact, that the OPDMD is being used for a mobility disability.

Park staff may post speed limits depending upon the conditions of the particular portion of trail.

More information can be found in Appendix C or on the OPRHP website at:

- [OPRHP guidance on OPDMD](#)
- [OPRHP Accessibility Policy](#)

Signage, Interpretive Panels and Kiosks

Signage, interpretive panels and kiosks are an important component to any trail system. They provide a wide variety of information to the trail users while assisting park staff with the management of the facility.

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Signs

Additional way-finding signage should be installed at key areas along the OCA including intersections with other local trails, points where the trail follows roadways and any other known point where trail users are unclear as to the trail direction.

All signs and their locations must be approved by the park manager and/or regional office before being posted. *All signs will conform to the OPRHP statewide trail sign guidelines as to design, installation and materials.* Volunteers operating under an agreement with OPRHP may install signs which have been approved.

The following signs may be used on the trail where appropriate. Care should be given to the placement and design of any signage to avoid distracting from the natural setting.

- Trail mileage markers showing number of miles from the north terminus of the OCA
- Information signs identifying the land as the Old Croton Aqueduct State Historic Park and contact information will be placed at key road/trail intersections and periodically along the trail as deemed necessary by OPRHP.
- The FOCA designed signage with the QR code linking to the FOCA website will continue to be used.
- Warning signs where appropriate for road, driveway, and other crossings posing an unforeseen danger.
- Street identification signs at key intersections.
- Interpretive signage at locations of particular natural or historic interest.
- Regulatory signs will be posted at the park office, key road/trail crossings, the north and south terminus points, and wherever deemed necessary by OPRHP. These signs will indicate, but not be limited to:
 - Exclusion of motor vehicles
 - Approved activities
 - Operating hours
- Adopt-a-Trail/Trail Ambassador Program signs identifying the organization volunteering to maintain the section of the trail. These signs will also show contact information for the Adopt-a-Trail/Trail Ambassador Program and for patrons to report trail problems.

Interpretive Panels

Interpretation is an important feature within parks. OPRHP will work with local historians and historical societies, NYS Natural Heritage Program, local naturalists, college departments, and others to develop additional interpretive signage panels for appropriate locations. The panels will interpret the natural and historic elements associated with the OCA corridor and meet OPRHP standards.

All interpretive signage will be approved



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by the Taconic Regional office and will conform to the regional and statewide OPRHP signage guidelines. Care should be given when determining location and quantity of signage and interpretive panels to avoid saturation and visual impacts.

OPRHP signage guidelines can be found at the following website.

<http://nysparks.com/recreation/trails/documents/TrailsTechnicalSignageGuidelines.pdf>

Kiosks

Kiosks are used to assist patrons as well as display regulatory information, location signs plus any other interpretive or promotional signs approved by OPRHP. Information presented at the kiosks will include:

- Map of the entire trail and more detailed map of the current section,
- Current location identified on the detailed map,
- Rules and Regulations,
- Nearby services – accommodations, restaurants, bike shops, municipal parking lots, and
- Trail Etiquette.

Other Facility Amenities

Gates

All gates are designed to prohibit access by trucks and cars but allow access to permitted uses to enter the trail. There are 19 gates located at key intersections. There is presently no need for additional gates. If additional gates are required in the future, the Taconic regional office shall be consulted for design standards which are consistent with the character of the OCA. Consideration will be given to improving gated access points that are not visually compatible with the character of the OCA.

Parking Areas

Due to the significant parking opportunities located throughout each town along the OCA, a designated parking area has never been constructed. Due to the linear nature of the park, no additional designated parking areas will be constructed. Patrons wishing to park will be directed to the nearest municipal parking lot or available on-street parking. Asphalt parking areas located along the trail will be removed to reclaim the trail corridor as funding allows. The following table identifies all existing parking areas that are located on the Old Croton Aqueduct and impact the trail. Improving the connectivity of the trail system through these areas is a high priority of OPRHP. Priorities are included in the table below to help



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identify key areas for trail improvements.

Table 6 – Parking Lot Removal

Address	Town/Village	Map Section	Priority Level
Prospect and Martling	Tarrytown	D	High
South of Cedar Street (two parking lots)	Dobbs Ferry	E	High
Washington Avenue	Hastings	F	High
Highland Terrace apartment complex	Ossining	B	Medium
North of Mckeel Ave	Tarrytown	D	Medium
South of Leroy Ave	Tarrytown	D	Medium
South of 119, North of I-87	Tarrytown	D	Medium
North of Main Street	Irvington	E	Medium
South of Main St	Irvington	E	Medium
South of Lamartine Ave.	Yonkers	G	Medium

Benches

Benches may be installed adjacent to the trail at locations approved by OPRHP. All benches shall be designed and installed according to OPRHP specifications available at the regional office and must not impede patron travel along trail. Volunteers may be used for building and installing benches but the installation must be inspected by a qualified OPRHP staff person.

Benches will be inspected at least once each year for structural integrity and utility. Benches not suitable for use on the trail will be repaired or replaced. Inspections may be done by OPRHP staff or volunteers from partner organizations who have been instructed in the proper method of inspection.

Pocket parks

Pocket parks consisting of a small land area with a bench and/or picnic table and possibly a kiosk or other interpretive signage will be located at places where the construction of such a park facilitates a pleasing environment for patrons. All pocket park features will be designed and built according to OPRHP specifications.

The pocket parks will contain no structures within 10 feet of the edge of the trail tread way and will be designed not to impede travel along the trail by any allowed uses and by maintenance and emergency vehicles. Table 5 below identifies sites presently identified as suitable locations. Additional locations may be considered including other proposed locations identified in Appendix B “Old Croton Aqueduct State Historic Park Trail Revitalization Project”. Care must be given when identifying pocket park locations and their amenities as to not impact the overall character of the trail.

Table 7 – Possible Locations for Pocket Parks

Map reference	Location	Comments
P1	Ashburton/Broadway - Yonkers	Coordinate with Yonkers Parks Department
P2	TBD, Yonkers Ave to Ashburton - Yonkers	Coordinate with Yonkers Parks Department
P3	Northern park entrance – Cortlandt	Coordinate with NYC and County
P4	Cedar Street access - Dobbs Ferry	Coordinate with Dobbs Ferry

Curb Cuts

Curbing is present at several locations on the OCA. To improve access for bicycles, pedestrians, and meet Americans with Disabilities Act requirements, OPRHP staff will coordinate with local transportation departments to eliminate these barriers.

Crosswalk striping

Road crossings along the OCA are not currently delineated/designated by crosswalk striping. OPRHP staff will coordinate with state and local transportation departments to encourage striping and improved signage to reduce vehicular and pedestrian conflicts.

Maintenance

The intent of maintenance is to preserve the OCA, throughout its length, in a condition that allows patrons to utilize its recreational resources and appreciate the historic and natural resources. The OCA will also be maintained in a sustainable way, utilizing methods which promote a balance between enhancing the recreational experience and preserving resources.

Maintenance Inspection Scheduling

OPRHP will develop and administer inspection and maintenance schedules that will ensure routine and periodic assessment of all OCA's structures.

Inspections may be performed directly by OPRHP staff or their trained designee. Appendix D – Preventative Maintenance Inspection Checklist provides assistance to park staff when identifying potential maintenance issues. All deficiencies noted by trail users to staff will be reported to the park manager for investigation and maintenance when appropriate.

Maintenance Agreements

OPRHP has ultimate responsibility for the maintenance of the OCA. In acting as the primary maintainer of the trail, OPRHP may enter into agreements with organizations, municipalities, other state agencies and corporations that will foster adoption of sections of the trail for the purpose of trail maintenance.

OPRHP will be responsible for major capital repairs and construction projects as well as large scale trail maintenance such as cleaning of culverts or removal of large trees overhanging the trail.

Maintenance Equipment Storage

Minimal opportunities exist for equipment storage along the trail. To keep maintenance equipment secure, it is brought back to the park maintenance office regularly. To improve maintenance of the southern trail segment, a maintenance shed will be constructed at the intersection of Walnut Street in Yonkers on park property presently being encroached upon by a vehicle repair and/or storage yard. See adjacent photograph and the management plan map,



section G for the building location.

Trail Clearance

Maintaining trail clearances is the responsibility of OPRHP, or in some cases the municipal public works departments. This may include clearing fallen trees or large limbs and other tasks which need specialized or motorized equipment. Brush clearing and light duty removal of encroaching limbs which may be removed with hand pruning equipment by FOCA members, Adopt-a-Trail or Trail Ambassador groups or other volunteers with park manager approval. OPRHP or municipal public works departments may provide dump trucks or other vehicles to haul away brush and branches.

Throughout the majority of its length, the OCA is maintained as a 12-foot wide grass and soil trail surface with a 12-foot height clearance suitable for all users. At points of constriction due to either vegetation or obstacles placed by adjacent landowners on OPRHP property, efforts will be made to maintain the standard trail clearances.

Trail Surface

The trail will be maintained as a smooth continuous path in order to facilitate use of all permitted activities and to maintain compliance with ADA requirements of grade, surfacing, and cross slope. Erosion, washouts, or trail surface disturbance due to improper or heavy trail use will be corrected as soon as possible to avoid adverse user reaction and to improve trail safety.

Where these conditions are minor, requiring only raking and shoveling, volunteer labor, such as from an Adopt-a-Trail group or organized work day, may be employed. Where extensive work is required to repair or re-build major erosion, washouts, or otherwise improve trail surfacing, the work will be conducted by OPRHP maintenance crews or others approved by the OPRHP Taconic region.

Mowing

The trail corridor will be mowed by OPRHP on an as needed basis. Pocket parks and other off-trail amenities maintained by OPRHP will be mowed as often as necessary to keep them functional and aesthetically pleasing for park patrons.

Mowing may be done by OPRHP staff or others as approved by the park or regional manager. Volunteers may mow trail segments and lawn areas through such programs as an Adopt-a-Trail program.

Partnerships

Friends of the Old Croton Aqueduct

The Friends of the Old Croton Aqueduct is a vital partnership for OPRHP and provides many valuable services to assist both staff and patrons while protecting and preserving the many resources along the trail. OPRHP will continue to support and strengthen this partnership.

Adopt-a-Trail and Trail Ambassador Program

Adopt-a-Trail and Trail Ambassador programs will be investigated by park staff for future implementation on the OCA. The management of any Adopt-a-Trail or Trail Ambassador programs will be conducted according to existing OPRHP policies. These programs may be administered collectively by a partnering organization under the supervision and management of the park and region. OPRHP will coordinate with FOCA during the development of this program.

Rules and Regulations

The OCA operates according to the New York State Parks Rules and Regulations. These rules and regulations are found in Parts 370 through 378 of Chapter I of Subtitle I of Title 9 of the Official Compilation of Codes, Rules and Regulations of the State of New York (9 NYCRR 370-378). They have been adopted pursuant to subdivision 8 of section 3.09 of the Parks, Recreation and Historic Preservation Law. More information can be found at the following website:

<http://nysparks.com/publications/documents/NYSParksRulesRegulations.pdf>

Enforcement

Role of Enforcement Agencies

Ensuring the safety of trail users and adjacent landowners is a high priority for OPRHP and its partners. OPRHP encourages cooperation between enforcement agencies along the entire length of the trail. These agencies include the State Park Police, the State Police, county sheriffs, and local police forces, in addition to first responders such as fire companies, volunteer fire companies, and EMTs.

The dumping of trash along the trail has been a problem for many years and posed challenges for enforcement. The City of Yonkers has increased the fine for littering and posted a \$1,000 reward for information leading to the conviction of the perpetrator. OPRHP will assist the City as needed to prosecute these offenders.

Emergency Action Plan

OPRHP has an emergency action plan for the park that is available at the park office and at the regional park headquarters for all enforcement agencies.

Security

Several waste weirs on the trail are in need of additional security measures to adequately protect the structures. Taconic Regional staff will coordinate with Division for Historic Preservation staff upon the completion of this plan to identify specific measures required for securing each individual structure.

Tourism and Economic Development

OPRHP and its OCA partners are committed to promoting the trail. Promotion will result in additional tourism in the surrounding areas and a resultant increase in activity at related local businesses.

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The OCA encompasses more than 26 miles of trail with direct links to communities and businesses. Partnering with local tourism departments to enhance trail usage and the associated local benefits is encouraged.

Land acquisition

Acquisition of land at fair market value and from willing sellers will be considered if the property enhances off-road connectivity of the trail corridor or other criteria as deemed appropriate by the Commissioner and the Taconic Regional Director.

Implementation of Goals and Objectives

Implementation Schedule

This management plan sets forth OPRHP’s vision for management and operational enhancements with minor capital improvements to the park for the next ten years. OPRHP has not developed detailed cost estimates for the proposed components. The pace and sequencing of recommended actions will be determined by the availability of funding, which is a function of OPRHP’s annual capital budget and the need to balance investments throughout the entire park system. The plan will be reviewed annually and include consultation with FOCA to identify components that will be added to the park budget for implementation and to assess the progress of plan implementation.

The implementation of the plan is divided into three priority phases. The priority groupings described below are conceptual and subject to reorganization based on available funding and available resources for specific components in any given group.

Table 8 – Priority Implementation Phases

Implementation Priorities	Component Description
Priority 1	
	Implement sign plan
	Complete rehabilitation of the Keepers House.
	Begin vegetation removal on historic structures.
	Remove debris from culverts.
	Develop culvert rehabilitation priorities.
	Coordinate with local transportation departments to remove curbs.
	Coordinate with local public works departments to provide crosswalk striping.
	Coordinate with Mercy College for surfacing and lighting improvements through campus.
	Coordinate with local communities to enhance connectivity between trails.
	Install additional directional signage.
	Address encroachments on state property to improve connectivity.
	Develop and implement an Adopt-a-Trail and/or a Trail Ambassador Program.
	Conduct a boundary survey.
	Coordinate with local officials for road crossing improvements.
	Address trail erosion issues.

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	Train staff on proper graffiti removal methods and begin removing graffiti from structures.
	Install additional information and maps in existing kiosks.
	Improve culvert area washed out by Hurricane Floyd.
	Rehabilitate Existing Maintenance Structures including garage and historic barn for continued use.
	Rehabilitate retaining wall, armored slopes, and embankments.
	Determine maintenance authority for the new Nepperhan Avenue Bridge structure constructed by NYS DOT during Nepperhan Avenue widening project.
	Construct new equipment storage building.
Priority 2	
	Coordinate with local groups/partners to assess roadway crossings.
	Coordinate with local groups/partners to identify and remove invasive species.
	Secure vacant structures per SHPO guidelines.
	Install soil stabilizers and lighting improvements in identified areas.
	Investigate alternatives to solving trail discontinuities.
Priority 3	
	Survey flora and fauna.
	Install Piping Rock steps.
	Enhance scenic vistas.
	Partner with groups to develop identified pocket parks.
Ongoing	
	Inspect historic resources for vandalism and deterioration.
	Litter clean up.
	Documentation of graffiti for the City of Yonkers.
	Signage installation.

State Environmental Quality Review (SEQR)

Introduction

The State Environmental Quality Review Act (SEQR) requires that state and local agencies incorporate the consideration of environmental factors into their planning and decision-making. This chapter contains a description of the potential environmental impacts associated with the implementation of the Old Croton Aqueduct State Historic Park Management Plan. The management plan provides a consistent approach for the day-to-day operations of the park and provides guidance on maintenance, protection and improvement of the trail and largely formalizes existing practices.

In general, activities that involve maintenance, rehabilitation, replacement in kind, minor construction, minor temporary uses, and mapping and information collection do not require further environmental review under SEQR. On the other hand, new actions or actions involving a significant change from the existing conditions or uses are likely to require further environmental review under SEQR. The extent of environmental review needed can vary depending on the scope of the project and its expected impacts. Because the park is already built and in use, there are few new actions or facilities proposed that could potentially generate environmental impacts. The type and extent of environmental impacts were identified primarily through the completion of a Full Environmental Assessment Form and through public input during the public comment period and from public information meetings held in August of 2013.

A number of actions within the plan are procedural such as addressing encroachments and issuing permits. Activities identified that will potentially generate environmental impacts are maintenance of masonry structures, rehabilitation of culverts, construction of a new maintenance building, and installation of new lighting. Resources that could be affected include physical (soil, water), biological (flora, fauna), historic, and aesthetic. These actions, their impacts, and mitigation measures are discussed below.

Physical Impacts

Many trees, vines, and woody shrubs are currently impacting the exposed masonry of the aqueduct causing displacement of stones and disintegration of mortar. The features affected include stone-faced embankments, culvert headwalls and wing walls, vents, and waste weirs. The management plan calls for the removal of vegetation from these structures in order to rehabilitate them and preserve them. A methodology for priority ranking vegetation removal projects is provided in the plan as are guidelines for the actual removal, disposal and control of future regrowth. Vegetation removal will be done using both in-house staff and outside contractors and will take place at various locations along the entire length of the 26 mile trailway. The size of areas affected will vary, but no one location is expected to be larger than one acre.

Vegetation removal can result in the movement of soils and potential runoff and erosion. The OCA Management Plan vegetation removal guidelines specify, however, that stumps will not be removed and roots will not be extracted as these activities could damage the masonry further. This approach will result in minimal soil disturbance.

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The OCA will be managed in a way so as to protect water quality and aquatic habitat. This includes applying best management practices to all construction and repairs in order to reduce erosion and siltation, and following all DEC guidelines and regulations for work in or near waterways and the New York State Stormwater Management Design Manual (NYSDEC 2010.) If it is expected that soil disturbance might occur, for example using heavy equipment to remove trees on sloped areas, measures such as silt fencing will be installed to protect downstream resources from erosion and siltation. Any areas where soil is disturbed will be seeded with an annual rye, mulched with straw within a week of disturbance and regularly maintained until vegetation has become established.

There are multiple culverts that carry DEC regulated streams under the trailway. Any rehabilitation projects that involve these culverts will require consultation with DEC regarding water quality protective measures that should be incorporated into the construction design. The plan calls for regular maintenance of culverts to insure that debris does not impede normal stream flow. Keeping the culverts clear will protect the aqueduct structure and also be beneficial to the stream habitat. Once removed, debris will be disposed of properly.

The plan calls for some new construction including an additional small maintenance building, new steps, and adding paving and lighting in certain sections of the trail. The actions will involve relatively minor amounts of clearing, excavation and grading. Best practices will be incorporated into the design to insure erosion impacts are not significant.

Biological Impacts

The removal of vegetation is not expected to have a significant impact on flora and fauna. The trees, shrubs and vines that will be removed from the masonry are not old growth and many are non-native species as well. Page 40 of the plan includes guidance on vegetation removal techniques that can be used to provide habitat when feasible. Guidelines regarding invasive vegetation control are also provided as a means to improve habitat in this narrow corridor.

The park has not been surveyed by the New York Natural Heritage Program. Some rare species occur in adjacent parks and many historical records are known from the vicinity. However, due to the highly disturbed nature of the trail, there is a very low likelihood of rare plants or other rare animals to be on the actual trail, so additional surveys were not warranted (Lundgren, J. pers. comm. 2014.) Where practical, the OPRHP Regional Biologist may conduct field checks for rare species where larger areas are proposed for clearing.

Historic Impacts

The OCA is a significant cultural and archeological resource and a designated National Historic Landmark. Implementation of this management plan will provide additional protection of this significant historic resource primarily through improved maintenance practices. For example, the document, "Guidelines for removing vegetation from historic masonry structures" (Appendix F) will be used to further protect masonry structures. Also, a complete inventory of all historic structures is underway so that rehabilitation needs can be

prioritized. All work will be subject to OPRHP's Policy on Historic Preservation within the New York State Park System.

Aesthetic Impacts

In some places vegetation removal may result in currently heavily vegetated areas to become more open in character. This change in local aesthetics may make the trail more visible to adjacent landowners and also make surrounding land use more visible to trail users. These changes could be considered beneficial or adverse depending on one's viewpoint. In areas where such removals are planned, OPRHP staff will reach out to adjacent landowners to alert them to the upcoming vegetation removals. Under some circumstances, removals may be phased to make these changes more gradual which may be more acceptable to neighboring properties.

There are certain scenic vistas that are partially blocked by vegetation. The plan calls for enhancing these views, primarily through tree trimming, although some trees may need to be removed in their entirety. These views will result in an improved trail user experience.

New lighting may be installed through Mercy College to provide added security. It is not expected to result in additional light pollution as the new fixtures to be used will have the International Dark-Sky Association Fixture Seal of Approval.

Beneficial Impacts

The plan will have several important beneficial impacts. It will provide additional protection of this significant historic resource through improved maintenance practices. It will also result in an improved recreational experience for its users. Examples include: elimination of impediments to access such as encroachments, curb cuts, and discontinuities, improvements to trail surfaces and additional signage and mapping to provide additional trail information.

Summary of Environmental Effects

Based on the review of the impacts OPRHP determined that the short and long term actions associated with the management plan are not expected to be potentially large or significantly adverse. OPRHP has issued a negative declaration under SEQR on this project.

Supplemental Environmental Review

As part of the agency's responsibility under SEQR, new projects described in this plan, such as the additional maintenance building or repair of masonry structures, will be reviewed for consistency with the plan. Other types of proposals may require additional review under SEQR. The following are types of actions that are likely to require additional review under SEQR:

- Any new actions not addressed within the plan that do not meet the Type II criteria in NYCRR Part 617, the rules and regulations implementing SEQR;
- Any leases, easements, designations, memoranda of understanding, or other agreements between OPRHP and private entities or other agencies that affect resources in a manner that is not sufficiently addressed in this plan;

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- Any project determined through a Section 14.09 review by the OPRHP Division for Historic Preservation to have an Adverse Impact on historic or cultural resource at the parks;

Coastal Zone Management Program Consistency

Due to its proximity to the Hudson River the park falls within the boundary of New York's coastal area. In addition, the trail crosses through three communities, Ossining, Sleepy Hollow, and Dobbs Ferry, which have adopted Local Waterfront Revitalization Plans. In accordance with the New York Waterfront Revitalization and Coastal Resources Act (Executive Law Article 42.), state agency actions within the coastal area must be evaluated for their consistency with both state and local coastal policies, if applicable. The overall objective of this program is to assure a balance between development and preservation of the State's coastal areas.

All state policies (NYCRR Title 19, Part 600.5) and local policies were reviewed and an assessment was made as to those that were applicable to this plan. A Coastal Assessment Form (CAF) was also completed to assist in the identification of applicable policies. The CAF and discussion of those policies are provided in Appendix G.

Summary

Based on the coastal policy discussion contained in Appendix G, it is OPRHP's determination that the actions contained within the management plan will not substantially hinder the achievement of any of the policies and purposes of the Coastal Policies as described in the New York Coastal Management Program or the Local Waterfront Revitalization Plans for Ossining, Sleepy Hollow or Dobbs Ferry.

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