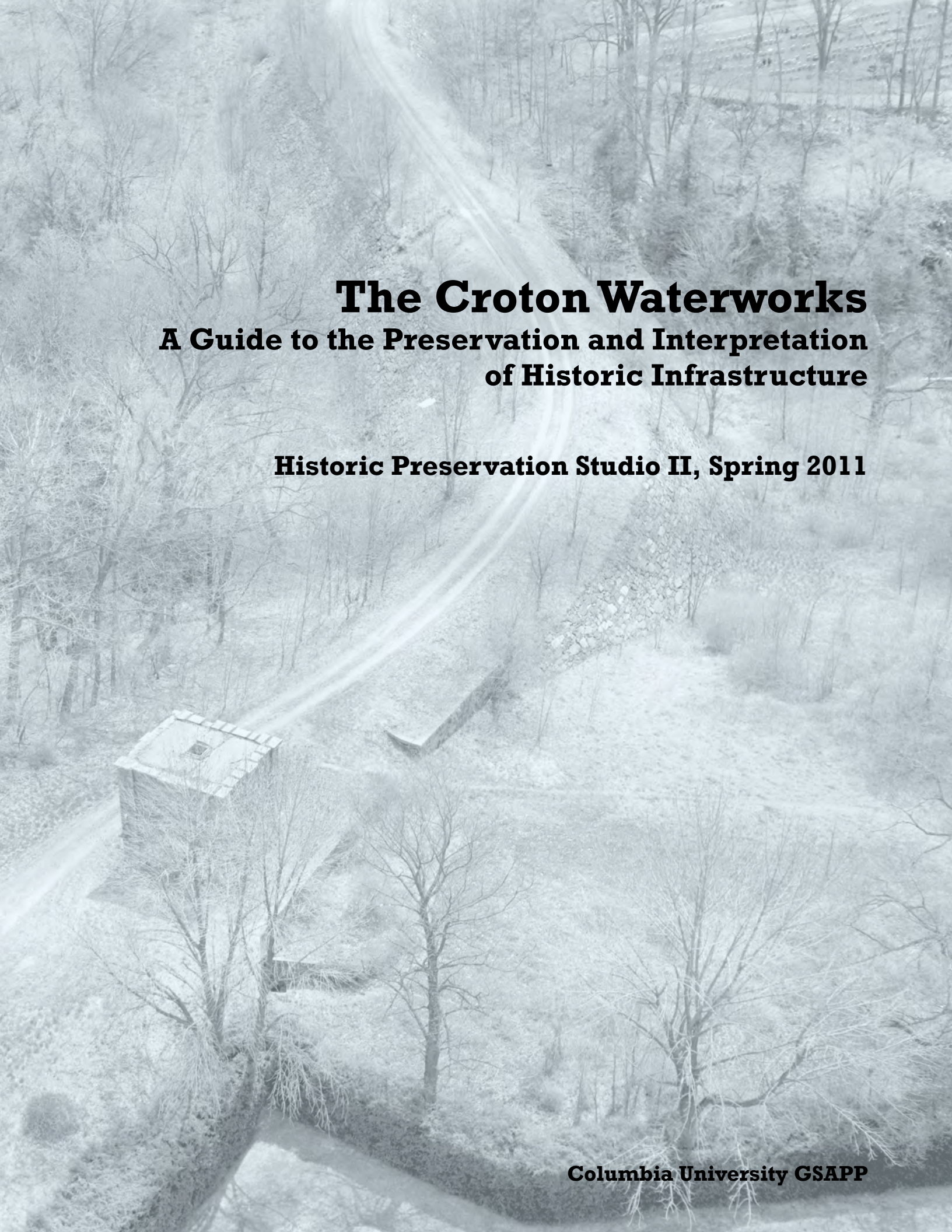

The Croton Waterworks

A Guide to the Preservation and Interpretation of Historic Infrastructure

Historic Preservation Studio II, Spring 2011

Columbia University GSAPP

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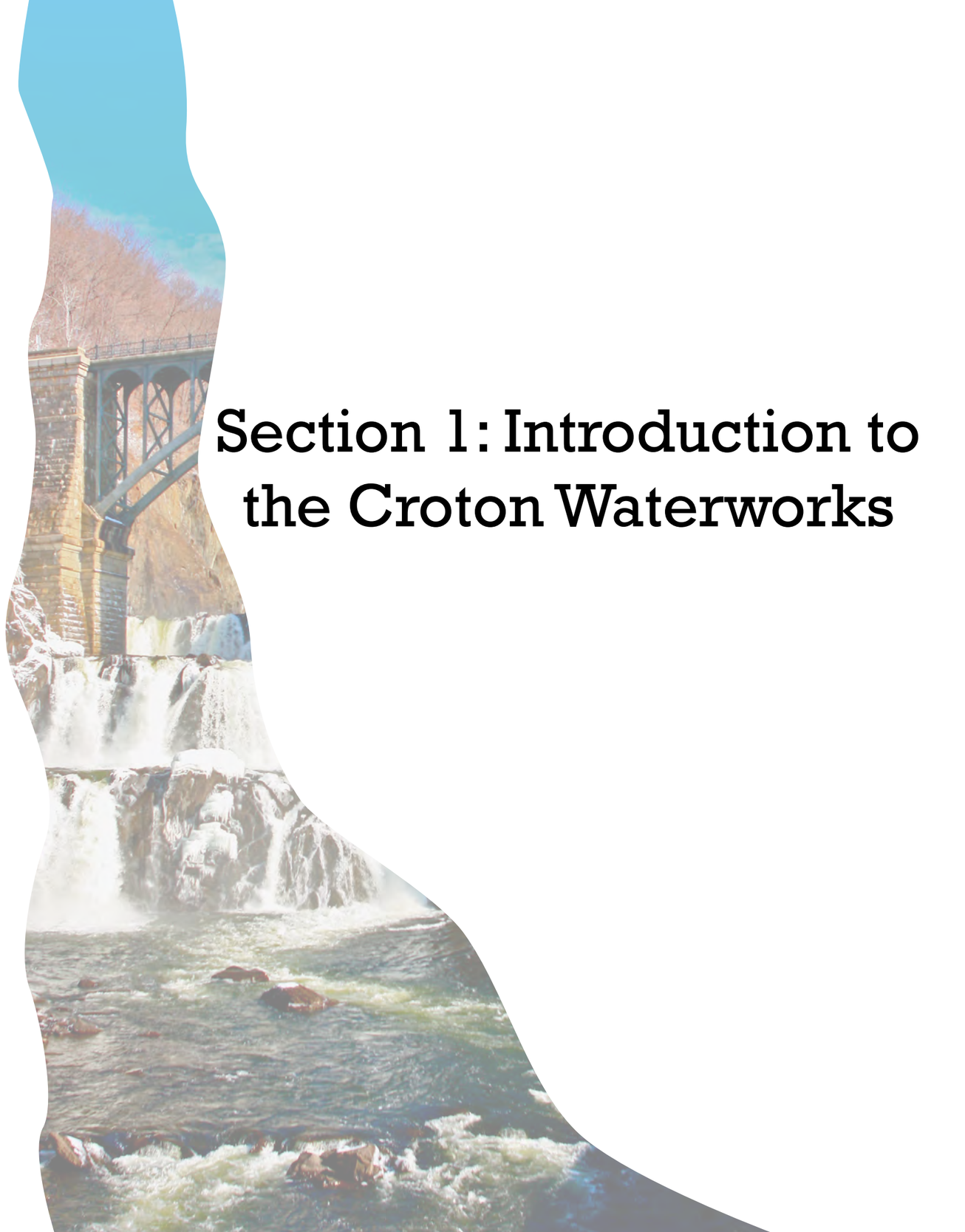
—The Croton Waterworks studio group, Spring 2011

Mission Statement

It is the mission of the Croton Waterworks studio group to conduct in-depth research into the history of the Croton Waterworks system, encompassing the Old and New Croton Aqueducts, and to document the affiliated structures, both existing and demolished. Once documented we will evaluate the significance of these various built components of the Waterworks in order to devise a preservation plan for the system as a whole. By exploring the Waterworks through varying lenses of significance: engineering, architecture, social history and landscape, we will develop a complete study of the Croton system's relevance today. A study will also be made of existing legal protections for the Waterworks, in order to establish threats to the system. We will then use our data and analysis to devise a system of preservation, focusing most extensively on, but not limited to, interpretive schemes. These strategies will be aimed at a wide variety of audiences and be designed to raise awareness of the crucial role of the Waterworks—and infrastructure in general—in the development, past and present, of New York City and its surrounding environs. They will also complement and augment already existing preservation and interpretive efforts in order to create a holistic approach. More generally we hope to develop a preservation approach that will serve as a model for the preservation of historic infrastructure elsewhere.



Section 1: Introduction to the Croton Waterworks

Preservation of Historic Infrastructure

As preservationists, we have been taught to research, analyze, document, and curate the built environment. Our predominant focus has been on what one traditionally defines as a building, from skyscrapers to brownstones. There are accepted guidelines and systems for maintenance and preservation of those historic structures, as well as formalized tools for their protection. The built environment, however, encompasses more than Rockefeller Center or the Merchant's House Museum. Integrated into the built environment is a no less vital system of connection: infrastructure.

According to the Oxford English Dictionary, infrastructure is "the basic physical and organizational structures (e.g. buildings, roads, power supplies) needed for the operation of a society or enterprise."[1] More simply, infrastructure takes the form of something which conveys something else. As a network, infrastructure can assume the form of a multitude of typologies, ranging from a mundane telephone pole to a majestic bridge. It can be the outmoded remains of past systems, as well as incorporated vestiges of past systems into current ones. By nature, historic infrastructure tells a story about the evolution of vital technology and the history of the societies it has impacted and sustained. Historic infrastructure is often overlooked and thus under threat. The obsolete is quickly torn down. Or, in some cases, especially with infrastructure that is still active, structural deficiencies may necessitate some level of intervention to ensure public safety and the continuation of utility. Many types of infrastructure were designed with a life expectancy in mind. For instance, the Association of State Dam Safety Officials (ASDSO) estimates the life expectancy of a dam to be fifty years.[2]

Studying the Croton Waterworks, New York City's first water system, in a graduate level studio course in historic preservation at Columbia University, required the widening of our preservation lens. The system is complex, spanning multiple decades and building technologies. The Croton Waterworks is a unique and mostly extant combination of a infrastructural system which is partially offline and defunct, and partially adapted to modern use. The Old Croton Aqueduct has been decommissioned, and contains more visible physical markers, while the New Croton Aqueduct is still online and has adapted over time to meet modern needs.

Historically, infrastructure was not entirely hidden, and in the case of the Old Croton Aqueduct, architectural expressions were strategically placed along the Aqueduct to signify its importance. These structures, many of which are no longer used, dot the landscape, standing as historic reminders of civic need. Modern infrastructure, however, is by nature designed to be as invisible as possible. We only see it when we are confronted with the necessities it provides.

Preservation of the Croton Waterworks requires embracing the system holistically: the seen and unseen, and the commissioned and decommissioned. Methods of documentation, maintenance, rehabilitation, and reuse, and means of protection are explored in the following pages. Ultimately, we have discovered that it is through interpretation that the Croton Waterworks, and historic infrastructure in general, can be most effectively preserved.

[1] "Infrastructure n," *The Concise Oxford English Dictionary*, Twelfth edition, Edited by Catherine Soanes and Angus Stevenson (Oxford University Press, 2008), Oxford Reference Online, http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t23.e28509.

[2] Serena McClain, Stephanie Lindloff, and Katherine Baer, "Dam Removal and Historic Preservation: Reconciling Dual Objectives," *American Rivers*, http://www.americanrivers.org/library/reports-publications/dam-removal-and-historic.html: 16.

Top: Route 66, one of the earliest U.S. highways

Middle: Boat entering a lock on the Erie Canal

Bottom left: Interior of a Metrorail station in Washington, D.C.

History of the Croton Waterworks

Any historic preservation and interpretation effort focused on the Croton Waterworks necessarily relies on an in-depth knowledge of the history of the system. However, like the system itself, the history of the Croton Waterworks is extraordinarily complex, and any thorough comprehension would require not only a command of innumerable discrete pieces of data, but also fluency with the conventions of several different forms of history, as well as a grounding in fields as diverse as hydraulic engineering, real estate law, and finance. Readers interested in obtaining an in-depth understanding of the Croton Waterworks' history should consult one of the many excellent books or essay-length histories listed in the bibliography. The following brief history seeks to highlight some of the more significant personalities, events, and themes that are crucial to a basic understanding of the system.

The Croton Waterworks was built in response to the worsening conditions of the New York City water supply in the first decades of the nineteenth century. As early as the 1770s, many different systems for the provision of clean drinking water had been proposed for New York. Of these proposals, only a handful were ever implemented, none of which ever proved adequate in the long term. The most conspicuous and notorious pre-Croton system was that sponsored by the private Manhattan Water Company, helmed by the notoriously shrewd Aaron Burr. This waterworks, which pumped small quantities of fetid well water through a network of hollowed-out logs and relied on a woefully undersized reservoir, was obsolete before it was completed, and only appears to have been devised as a front for a much more profitable banking operation. Wealthy Manhattanites imported their drinking water in casks from more pristine sources outside of the city. Remaining New Yorkers either relied on the dubious product of the Manhattan Water Company or drew their water from wells that discharged fluids of even more insalubrious character.

As a consequence of these conditions, New York regularly fell victim to the twin scourges of the nineteenth century city: fire and disease. The Great Fire of 1835 and the cholera epidemic of 1832 (a victim of whom is illustrated below) were two of the most catastrophic instances of these periodic phenomena; occurring on the eve of the construction of the Croton system, they galvanized public support in favor of a public utility designed to prevent such calamities in the future, or at least lessen their severity.

When the City and State Governments finally gave their formal support to the construction of an aqueduct that would draw water from the distant Croton River Watershed in Westchester and Putnam Counties, Major David Bates Douglass, a West Point professor

of engineering who had worked on several large canal projects, was appointed Chief Engineer. Between 1833 and 1836, Douglass surveyed land, determined the course of the aqueduct, and designed many structures. However, because of disputes with the Water Commission, Douglass was discharged from his duties before construction began. He was followed as Chief Engineer by John Bloomfield Jervis, a man with no formal training but who had developed a reputation as a skilled engineer in the construction of canals and railroads. Jervis would go on to oversee the construction of the first phase of the Waterworks—which has come to be known as the Old Croton Aqueduct—so it is his name that is commonly associated with the design of the system. It is important to note, however, that much of what Jervis accomplished was drawn directly from the designs and specifications of his predecessor, David Bates Douglass.

Construction on the system finally commenced in 1837. In addition to the many logistical and engineering-related solutions that needed to be devised in order to build such a vast and complicated piece of infrastructure in areas that were, by the standards of the day, quite remote, the public officials, engineers, and contractors responsible for completing the system also had to contend with organized resistance from both the thousands of laborers who actually built the system as well as the dozens of Westchester landowners who held the property through which the conduit would run.

The laborers, mostly recent Irish immigrants escaping economic crisis in their home country, were at first paid seventy-five cents a day, although this rate would eventually climb as high as one full dollar. Typically, wages would be cut during the winter, when little construction could be completed, and then raised again in the spring when full-scale building resumed. But if it failed to rise, as it sometimes did in the economically uncertain years following the Panic of 1837, the workers were prone to engage in strikes. The most significant strike was the so-called "Croton War" of 1840, which featured not only a work stoppage, but also the intentional destruction of work in progress, as well as the physical coercion of workers who were reluctant to participate in the job action. This last component hints at the tensions that persisted among the laborers themselves, who hailed from several different regions in Ireland, and often carried their age-old resentments with them to the New World. Following an ineffectual intervention from a New York City militia, this strike was finally put down by a Westchester posse.

Indeed, the Westchester landowners often resented the presence of the massive camps of mostly Roman Catholic Irish laborers, whom they perceived as drunk and unruly. They also resented the seizure of their lands for the aqueduct. In 1837, a group led by Theodorus Van Wyck drafted a memorial to the State Legislature noting that New York City had clearly reached the natural limits of its own expansion, and asking that the 1835 enabling legislation for the Waterworks be repealed. Sincere though it may seem, this memorial and other similar expressions may have actually been gambits calculated to raise the amounts that the State would have to pay for the condemnation of Westchester lands.[1] Elsewhere, there was a great deal of grumbling over the means by which the Aqueduct would cross the Harlem River. Local residents, who foresaw the communities along this waterway evolving into thriving independent ports, were anxious to make sure that commerce along the river would be unimpeded.

They got their wish, as the tall masonry arches of the High Bridge, eventually completed in 1848, allowed for all but the highest-masted of sailing ships to pass beneath unharmed.

In addition to the High Bridge, other key structures along the aqueduct that took shape during these years included the Croton Dam (an initial version of which ruptured in 1841, unleashing a lethal flood), the Sing Sing Kill Bridge, the York Hill Receiving Reservoir, and the Murray Hill Distributing Reservoir, in addition to countless others. Amidst great fanfare, water finally began to flow into the Murray Hill Reservoir on July 4, 1842. A massive public celebration for the completion of the Croton Waterworks followed on October 14.

These celebrations notwithstanding, the opening of the Waterworks did not immediately solve the problems it was intended to alleviate. Fires continued, and a cholera epidemic in 1849 killed five thousand citizens. Temperance reformers, who never appear to have been a significant driving force behind the construction of the system, were nonetheless hopeful that the infusion of Manhattan with free and clean water might result in less rampant drunkenness. But they were disappointed: breweries were among the first businesses to benefit from the ready supply of fresh water.[2]

Eventually, however, Croton water caught on, aided by a boost in water pressure brought on by the completion of High Bridge in 1848, the widespread installation of private bathroom fixtures, the popularization of public baths, and the introduction in the 1850s of that natural complement to the public water supply: the public sewer.[3] By the 1880s, each New Yorker was using an average of nearly one hundred gallons of water a day, the highest rate in the world.[4]

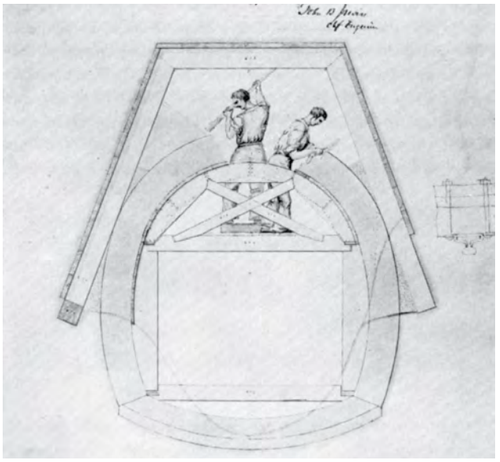
Of course, the Croton System's impact was not limited to public health issues. From the very beginning, many sites along the Aqueduct—the Murray Hill Reservoir, High Bridge, Old Croton Dam—became popular destinations for sightseeing and recreation. Also popular were the fountains fed by the Waterworks, which produced jets of water that could be shaped into a myriad of beautiful configurations. Many of the structures outside of the city, with their evocations of American industrial progress and not-so-subtle nods to classical antiquity, also became favorite subjects for painters inspired by the Hudson River School.[5]

Magnificent though it may have been, the Old Croton Aqueduct could hardly keep pace with the increased use of its waters and the explosive growth of New York City. In the years between 1842 and 1884, this growth required continuous expansion and improvement on the System. This period saw the construction of many iconic structures, including a new receiving reservoir (now the Jacqueline Kennedy Onassis Reservoir, in Central Park), the High Bridge Tower, and several new dams and reservoirs in the Croton Watershed. In order to gain some immediate, short-term relief from water shortage, the City even sponsored the construction of a small new aqueduct: the so-called "48-Inch Line," which is technically not a part of the Croton System, was named after the relatively short diameter of its conduit.

True relief came in the form of the New Croton Aqueduct, an entirely new conduit and network of support structures that was constructed between 1884 and 1893. The new conduit was much larger than its predecessor, and where the conduit of the Old Croton Aqueduct was built mostly as a covered, aboveground structure following the contours

Above: Public celebration of the opening of the Croton Waterworks

Right: Drawing of an earth-tunneling method used in the construction of the Old Croton Aqueduct



of the land, the New Croton Aqueduct was buried deep underground. The ethnic composition of the work crews who built this part of the system reflects a shift in immigration patterns and the sources of cheap, unskilled labor in the Greater New York area in the late nineteenth century: supplanting the Irish were crews of African Americans and recent Italian immigrants. When it came online in 1893, the New Croton Aqueduct provided the City with 300 million gallons of water a day, triple the rate of the Old Croton Aqueduct.

As part of an effort to wring every last drop of potable water out of the Croton Watershed, dams and reservoirs continued to be built in Westchester and Putnam Counties throughout the late nineteenth and early twentieth centuries. The most significant of these was the New Croton Dam, an awe-inspiring masonry structure constructed between 1892 and 1905 (pictured at left). This dam significantly enlarged the size of the Croton Reservoir, the main reservoir in the Waterworks and the body of water that fed both the Old and New conduits. The expansion of this reservoir also necessitated the displacement of entire communities, surviving photo documentation of which shows whole houses being picked up and transported to designated areas on higher ground.

The last major structure in the Croton Waterworks, the Croton Falls Dam and Reservoir, was completed in 1911. Even before this addition had been accomplished, however, New York City had begun construction on the Catskill Aqueduct, a much larger system that drew water from the far-more-distant Catskill Mountain region. This system and the subsequent Delaware Aqueduct would eventually eclipse the Croton Waterworks in terms of amount of water provided per day.

The technically obsolete Old Croton Aqueduct was taken offline in 1955. The New Croton Aqueduct is still capable of providing New York City with between 10 and 30 percent of its fresh water, although as of this writing it is completely shut down pending the completion of the Croton Water Filtration Plant in Van Cortlandt Park in the Bronx.

[1] Gerard T. Koeppel, *Water for Gotham: A History* (Princeton: Princeton University Press, 2000), 198.
[2] Ibid.
[3] Ibid., 287; Kroessler 15.
[4] Koeppel, *Water for Gotham*, 287.
[5] Laura Vookles Hardin, "Celebrating the Aqueduct: Pastoral and Urban Ideals," *The Old Croton Aqueduct: Rural Resources Meet Urban Needs* (Yonkers: The Hudson River Museum of Westchester, Inc., 1992. Published to coincide with the exhibition at the Hudson River Museum of Westchester, October 2, 1992 through February 7, 1993.), 51–55.

Above: Spillway of the New Croton Dam

How the Croton System Works

Time Line

Yellow fever epidemic in New York City; Bellevue Hospital established	1794	
	1795	Yellow fever epidemic in New York City; 732 people die (from population of 50,000)
Yellow fever epidemic in New York City; 2,086 people die	1798	
	1799	Aaron Burr forms Manhattan Company, brings water to New York City
Yellow Fever Epidemic in New York City	1803	
	1805	Common Council of New York City creates New York City Board of Health
Manhattan Company sells waterworks to New York City	1808	
	1811	Manhattan fire on Chatham Street; approximately 100 buildings burn down
Yellow fever epidemic in New York City	1819	
	1822	Philadelphia's steam-powered Fairmount Water Works created
Erie Canal completed	1825	
	1828	Baltimore and Ohio Railroad construction begins
Asiatic cholera epidemic; 3,515 New York City residents die (from population of 250,000)	1832	
	1833	New York City Water Commission established
Great Conflagration of New York City; hundreds of buildings destroyed	1835	
	1836	John B. Jervis appointed Chief Engineer of Croton Aqueduct project
Construction begins on Old Croton Aqueduct system, including on High Bridge over Harlem River	1837	
	1837	Panic of 1837, followed by five-year depression
Photography invented	1838	
Old Croton Aqueduct completed (includes structures such as Old 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	
	1842	New York's Croton Aqueduct opens October 14. Daylong celebration culminates in fifty-foot shower of water spouting from Croton Fountain in City Hall Park. Attending the celebration are President John Tyler, former presidents John Q. Adams and Martin Van Buren, New York State Governor William H. Seward.
	1845	New York City Police Department established
U.S.-Mexican War	1846-48	
	1846	Wilmot Proviso bans slavery in states acquired during U.S.-Mexico War
High Bridge completed	1848	
	1848	Boston's Cochituate Aqueduct opens (in use until 1951)
Cholera epidemic in New York City; 5,071 people die	1849	
	1849	California Gold Rush begins
Exhibition of the Industry of All Nations (World's Fair New York City)	1853	
	1853	New York Crystal Palace constructed next to Murray Hill Reservoir
Cholera epidemic in New York City; 2,509 people die	1854	
	1855	Fernando Wood inaugurated as Mayor of New York City (Tammany Hall begins)
Central Park opens	1857	
	1857	Dobbs Ferry Keeper's House completed
	1858	Transatlantic cable laid
Civil War	1861-65	

1862 — Lake Manahatta (now Jacqueline Kennedy Onassis Reservoir) constructed (decommissioned 1993)

1862 — Central Park South Gatehouse constructed

1865 — President Lincoln assassinated

1866 — Cholera epidemic in New York City; 1,137 die

1867 — Prospect Park opens

1867 — Central Park Keeper's House constructed (demolished 1935)

1869 — First trans-continental railroad completed

1869 — High Bridge Reservoir constructed (demolished 1934)

1870s — Clendening Valley Crossing demolished for conversion to siphon

1870 — Croton Fountain in City Hall Park demolished

1872 — High Bridge Water Tower constructed

1872 — Ninety-inch diameter pipe constructed (on top of two existing thirty-three-inch diameter pipes) inside of High Bridge. Existing pedestrian walkway elevated to accommodate new pipe.

1873 — Middle Branch Dam and Reservoir completed

1873 — Boyd's Corners Dam and Reservoir completed

1876 — 113th Street Gatehouse constructed

1877 — Manifesto for the Protection of Ancient Buildings written

1878 — Sodom Dam and Reservoir completed

1883 — Aqueduct Act passed on June 1. Commission created consisting of Mayor, Controller, Commissioner of Pubic Works of the City of New York, and James C. Spencer, George W. Lane, and William Dowd.

1883 — Brooklyn Bridge completed, connecting boroughs of Brooklyn and Manhattan

1886 — (New) Ossining Weir constructed

1890 — 135th Street Gatehouse constructed

1893 — Watershed Act passed on March 23. Grants Commissioner of Public Works powers to acquire property in Westchester, Putnam, and Dutchess Counties. Measures also include ensuring sanitary protection of rivers and other watercourses, lakes, ponds, and reservoirs contributing to water supply of New York City.

1893 — Bog Brook Dam and Reservoir completed

1894 — John Hooper Fountain (near entrance to Viaduct connecting to Macomb's Dam Bridge) constructed. Fountain supplies drinking water for both horses and people.

1895 — 119th Street Gatehouse completed

1896 — Titicus Dam and Reservoir completed

1897 — Amawalk Dam and Reservoir completed

1898 — Harlem River Speedway constructed (converted to automobile use 1919, demolished 1940s-60s)

1902 — Murray Hill Reservoir demolished (New York Public Library constructed on this site)

1903 — Wright Brothers' first successful flight

1906 — High Pumping Station completed

1906 — Jerome Park Reservoir completed

1906 — New Croton Dam and Reservoir completed

1906 — West Branch Dam and Reservoir completed

1908 — Henry Ford's Model-T introduced

1908 — Cross River Dam and Reservoir completed

1911 — Additional Putnam County dams completed (Croton Falls Diverting Dam and Reservoir, Croton Falls Hemlock Dam and Reservoir)

1912 — Titanic sinks

1914-17 — World War I

1917 — New York City Water Commission shuts down Croton Aqueduct as precaution during World War I

1923 — *Scientific American* editorial says proposed High Bridge demolition is “an act of vandalism without precedent in the history of our country”

1924 — Archville Bridge demolished (reconstructed 1998)

1927 — Five of High Bridge’s original masonry arches replaced with single steel span; makes Harlem River more navigable for larger ships

1929 — Wall Street Crash

1930 — Hoover Dam construction begins

1931 — Athens Charter composed

1933 — Golden Gate Bridge construction begins

1936 — Highbridge Pool opens on site of High Bridge Reservoir

1939-45 — World War II

1940s — West Burnside Avenue Bridge partially demolished for conversion to siphon

1964 — Venice Charter written

1965 — New York City’s Landmarks Law establishes Landmarks Preservation Commission

1966 — National Historic Preservation Act establishes National Register of Historic Places

1967 — High Bridge Water Tower designated a NYC Landmark

1968 — New York State Office of Parks, Recreation and Historic Preservation purchases 26.2 miles (in Westchester County) of original 41-mile Old Croton Aqueduct from New York City

1970 — High Bridge designated a NYC Landmark

1972 — High Bridge Aqueduct & Tower placed on National Register of Historic Places

1972 — M. Paul Friedberg designs Delacorte Fountain for City Hall Park as interpretation of original fountain erected on site for opening of Old Croton Aqueduct. Fountain remains in City Hall Park until 1999 when moved to Crotona Park (Bronx).

1972 — UNESCO World Heritage Convention held in Paris

1973 — Site of Old Croton Dam placed on National Register of Historic Places

1974 — Old Croton Aqueduct (from Westchester County to New York City line) placed on National Register of Historic Places

1979 — Burra Charter composed

1981 — High Pumping Station designated a NYC Landmark

1981 — 135th Street Gatehouse designated a NYC Landmark

1983 — 135th Street Gatehouse placed on National Register of Historic Places

1984 — U.S. Government establishes National Heritage Areas

1992 — Old Croton Aqueduct (from Westchester County to Manhattan side of High Bridge) named a National Historic Landmark

1992 — Hooper Fountain designated a NYC Landmark (along with Macomb's Dam Bridge)

1993 — Nara Document on Authenticity written

1997 — Verona Charter composed

2000 — Jerome Park Reservoir placed on National Register of Historic Places

2000 — 119th Street Gatehouse designated a NYC Landmark

2003 — Nizhny Tagil Charter composed

2005 — Helsinki Statement written

2005 — Vienna Memorandum created

2005 — Xi'An Declaration written

2007 — Highbridge Pool Complex designated a NYC Landmark

2011 — Dublin Principles written

2011 — New York City Landmarks Preservation Commission approves plans for High Bridge rehabilitation, due for completion in 2013

Typologies

The Croton Waterworks is a complex system relying on a multitude of structures that serve both functional and aesthetic purposes. One of the first steps in our investigation of the Croton system was to research these different types of structures in order to understand how they—and the overall system—work. We organized the structures of the Croton Waterworks into sixteen typologies.

Berm

Generally speaking, a berm is a space that separates two distinct areas. The conduit of the Old Croton Aqueduct was actually built aboveground. To protect it from the elements, it was covered with an earthen berm that also allowed for the conduit's path to be immediately distinguishable. In the case of the Old Croton Aqueduct, the berm functions as an elevated path with the system's pipes underneath. People have used the berm as a scenic walking path from the Aqueduct's completion to the present.

Bridges

Bridges were crucial elements of the Croton Waterworks. They directed the conduits over obstacles such as bodies of water and roads, utilizing arches to allow the water or streets to pass underneath. The water pipes running along the bridge were often covered up and topped with walking paths. The bridges ranged in style from the picturesque Archville Bridge to the High Bridge's evocation of a Roman aqueduct to the more utilitarian steel-arched bridge over the New Croton Dam.

Culverts

Culverts are stone-arched openings built into the base of aboveground portions of the Old

Top: Berm of the Old Croton Aqueduct passing through the Bronx

Bottom: High Bridge

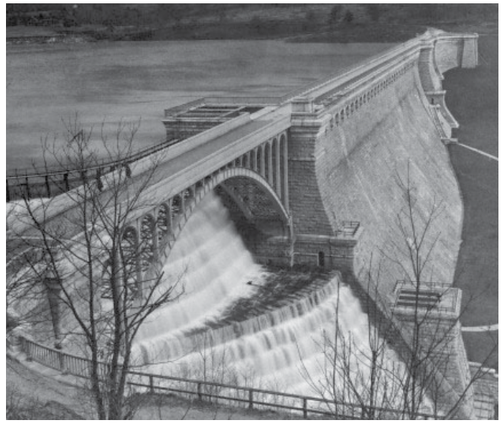
Croton Aqueduct that allowed streams or other preexisting bodies of water to flow underneath the conduit. They were sometimes associated with weirs, which could send overflow water into streams as necessary by using systems with culverts.

Dams
Dams intercepted the natural flow of water and impounded the water into reservoirs. The dams of the Croton Waterworks ranged from small, picturesque ones in Putnam and Westchester counties to the one-hundred-foot-high New Croton Dam—constructed between 1892 and 1906—with its iconic steel-arched bridge.

Fountains
Fountains built for the Croton Waterworks could be both functional and symbolic. Some fountains provided drinking water for people, horses, dogs, and cats at a time when horses were still one of the main forms of transport in New York City. Other fountains were largely symbolic, embodying the purpose of the Croton Waterworks: to provide the people of New York City with ample fresh water.

Gatehouses
Gatehouses are some of the largest structures built for the Croton Waterworks, aside from reservoirs. In addition to visually marking the paths of the Aqueducts, gatehouses provided access to the underground conduit pipes. This would enable workers to be able to regulate the flow of Croton water more easily. The gatehouses were constructed primarily of dolomitic limestone in a fortress style.

Keepers' Houses
The Old Croton Aqueduct was subdivided into regions, each of which was assigned a



Top: New Croton Dam

Bottom: 135th Street Gatehouse

caretaker. These caretakers lived in keepers' houses, fairly modest structures built in the Italianate style, which was popular during their period of construction in the 1840s and 1850s. The keeper's house at Dobbs Ferry—a brick structure—is the only extant example of this typology.

Parks
Parks were a crucial beautification and tourism feature of the Croton Waterworks, providing a way for people to interact with the system. Multiple parks lined the Waterworks, offering a buffer between the protected water and the communities it passed through. Parks such as Highbridge Park point to the tourism component of the Croton system, reminding us that people would visit parts of the system for pleasure.

Pumping Stations
Pumping stations were usually constructed adjacent to water towers, as an essential mechanism for pumping water to high-elevation areas. These stations included engines that were capable of pumping approximately ten- to twelve-million gallons of water each day. As demand for Croton water grew, so did the need for additional pumping stations south of the High Bridge Tower.

Reservoirs
Reservoirs collected and stored the millions of gallons of water that were conducted by the Aqueducts. There were three major types of reservoirs utilized in the Croton system. First were reservoirs located in Westchester and Putnam counties, which were dammed water sources that provided the Aqueduct conduits with their initial supply of water. Second were the receiving reservoirs, which were intermediate reservoirs located downstream that

Top: Keeper's House at Dobbs Ferry

Bottom: Central Park Reservoir (Jacqueline Kennedy Onassis Reservoir)

could offer an emergency supply of water in the case of the system's failure. Lastly were the distributing reservoirs, which were the final stop in the system before the water was distributed to individual New York City neighborhoods. The reservoirs of the Croton Waterworks ranged in architectural style from the organic, picturesque Jacqueline Kennedy Onassis Reservoir in Central Park to the fortress-like, Egyptian Revival Murray Hill Reservoir.

Shafts

Shafts are a building typology introduced to the New Croton Aqueduct conduit. These structures filled the niche of the Old Croton Aqueduct's ventilators in providing circulation to the water underneath. More importantly, they also provided access for workers to the underground conduit so that repairs could be made. These shafts were built as some of the few visible structures of the New Croton Aqueduct, and they stood as prominent markers for the system. They were often embellished with architectural ornamentation, such as cornices, in order to highlight the water system they represented.

Siphons

Siphons were a crucial engineering technique used in the Croton Waterworks. A siphon occurs when liquid flows uphill then downhill again on an upside-down, U-shaped trajectory. The falling liquid at the top of the U pushes the liquid in front of it uphill to continue flowing on the other side. One of the great advancements of the New Croton Aqueduct was its use of inverted siphons. Inverted siphons are right-side-up, U-shaped pipes in which the water flowing down the U pushes the water up on the other side.

Above: Ventilator along the Old Croton Aqueduct's path

Ventilators

Ventilators are chimney-like structures, ranging between approximately fourteen and twenty feet in height, that were built along the path of the Old Croton Aqueduct's conduit. They were designed to relieve the buildup of potentially destructive pressure within the tunnels, and to allow the precious water to breathe. Ventilators were placed roughly every mile for thirty-three miles along the Aqueduct, and every third one included a door allowing servicemen to access the conduit. The majority of these ventilators still exist in Westchester County, while very few seem to have been built throughout the Bronx and Manhattan. Ventilators were often constructed to resemble castle turrets and would have been important local landmarks. However, many variations exist between ventilators.

Water Towers

The Old Croton Aqueduct's first water tower, built on the Manhattan end of the High Bridge in 1845, was constructed to address issues of water availability in northern Manhattan. These locations, often at higher elevations than other portions of the city, could not be fed by the simple gravity fed system. To solve this issue, water towers would serve as booster towers, supplying enough water pressure to reach additional neighborhoods.

Weirs

Weirs are structures that regulated the flow of water through the Aqueducts. Early weirs were constructed in the 1830s and 1840s for the Old Croton Aqueduct. These weirs had the ability to let off excess water from the conduits. However, they were not capable of diverting the water completely. They utilized a system of boards that could be lowered to adjust the volume of water that could pass

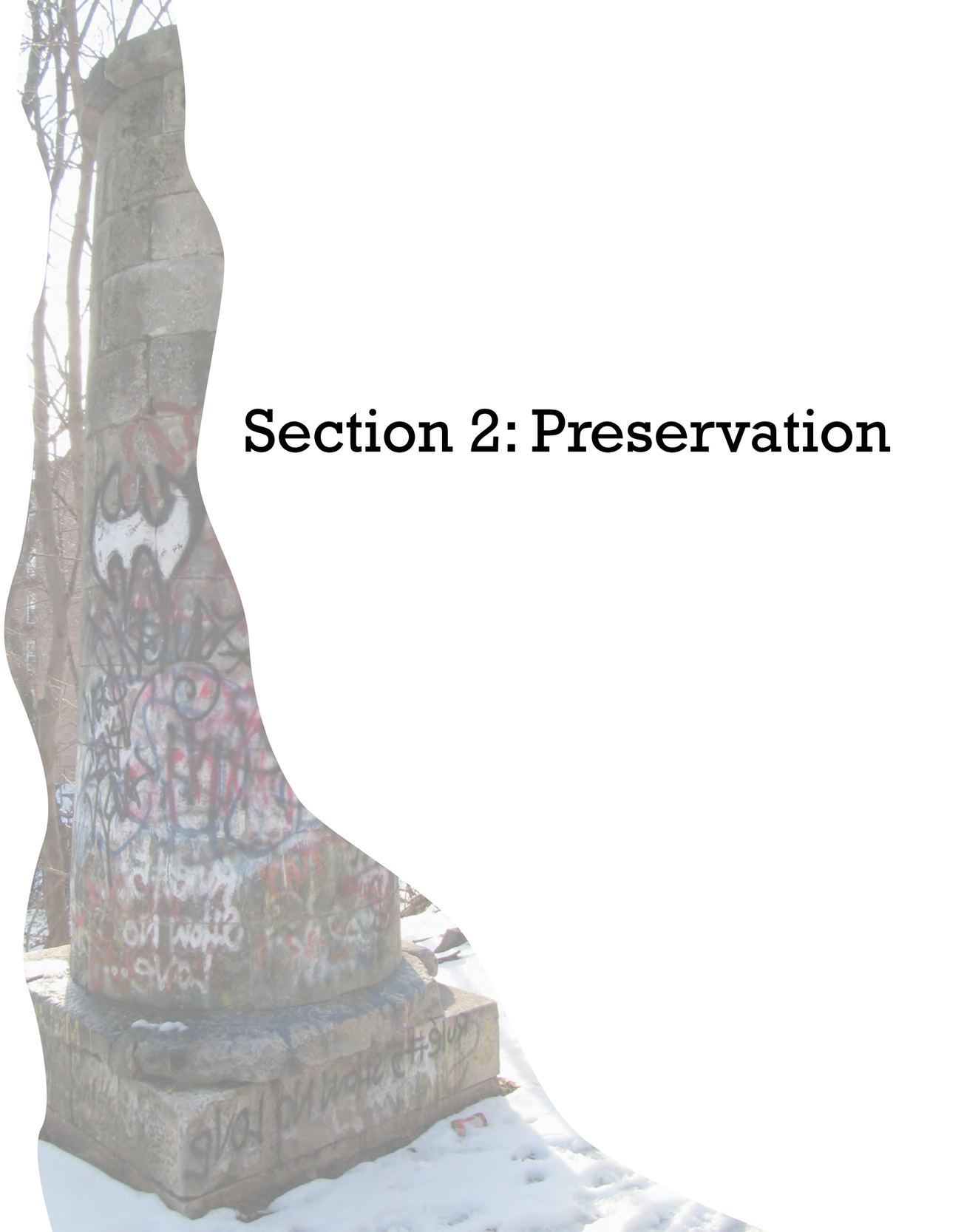
Above: Water tower at 98th Street

through. In the 1880s, new weir technology was introduced. These weirs were capable of diverting water from the system into streams, which would keep any water from going further south in the conduit. This would allow for repairs in the conduit, which were exceedingly difficult beforehand. Style was an important element of weir construction as well. Many weirs along the Croton Waterworks were constructed in the Egyptian Revival style, providing a link to ideas of permanence and water control associated with Ancient Egypt.

Above: New Ossining Weir

Support Structures

Aside from the typologies outlined, there are also other miscellaneous structures that support the Croton Waterworks. Examples of such structures are coal sheds and coal ramps, such as those located by the High Bridge in Manhattan.



Section 2: Preservation

Statement of Significance

The significance of the Croton Waterworks as a whole is established on the basis of its contributions to and/or impact on the following four categories, described below in no particular order:

Engineering

The Croton Waterworks represents a feat of engineering that is truly extraordinary—both for its sheer scale, and also for the technologies developed in the course of its construction. Many of these systems—such as the calming pool at the base of the Old Croton Dam and the overhead cableway used in the construction of the Sodom Dam—came to be accepted as standards in similar construction projects for years to come.

Architecture

The Croton Waterworks includes a diversity of structures carefully executed in a wide range of architectural styles—including Egyptian Revival, Classical, Romanesque, Gothic, and Italianate. Taken as a whole, the architecture of the system illustrates the evolution of architectural taste in the United States during one of the most significant periods of the country's growth. Although built to serve utilitarian purposes, the fine craftsmanship and attention to detail apparent in many of these structures testify to a deep concern and appreciation for architecture.

Social/Cultural History

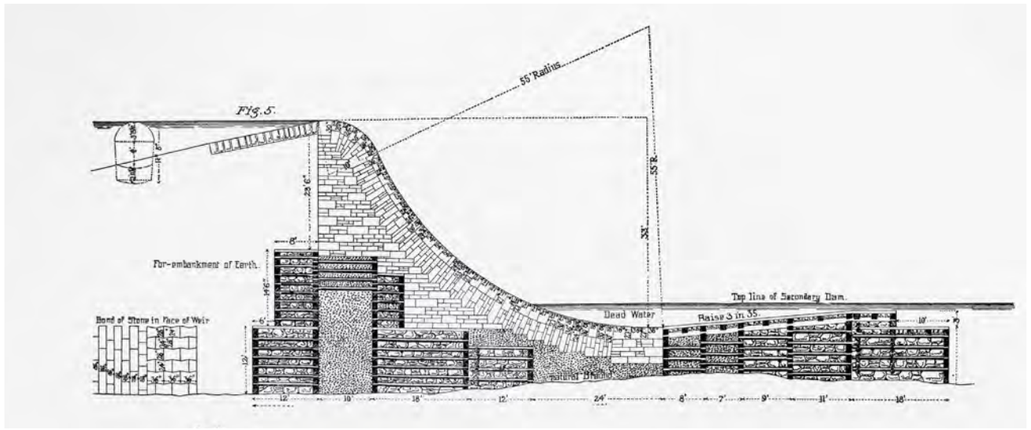
From the deadly cholera epidemics whose effect on the urban populace marshaled public and legislative support behind the construction of an aqueduct; to the lives of the laborers of varying ethnicities who constructed the system under frequently abject conditions; to the protestations of the Westchester landowners who objected to the construction and work crews in their pastures; to the new era of public sanitation that was touched off with the completion of the system; to the post-construction developments that saw many of the structures along the Waterworks becoming desirable venues for socializing, sightseeing, and recreation—all aspects of the conceptualization, construction, and development of the Croton Waterworks reflect social and cultural conditions of a particular moment in the history of the greater New York area.

Landscape

The construction of the Croton Waterworks altered the contour and character of a contiguous ribbon of land connecting New York City, the Bronx, and Westchester County. At the same time, however, the nature of the landscape itself played an integral role in the functional and aesthetic properties of the system. The resulting landscape has been a unique fixture of these communities, and in some cases a decisive factor in their economic rebirth. This landscape thus provides a vital link to the history of the region, and demonstrates the interrelationship of urban and rural areas.

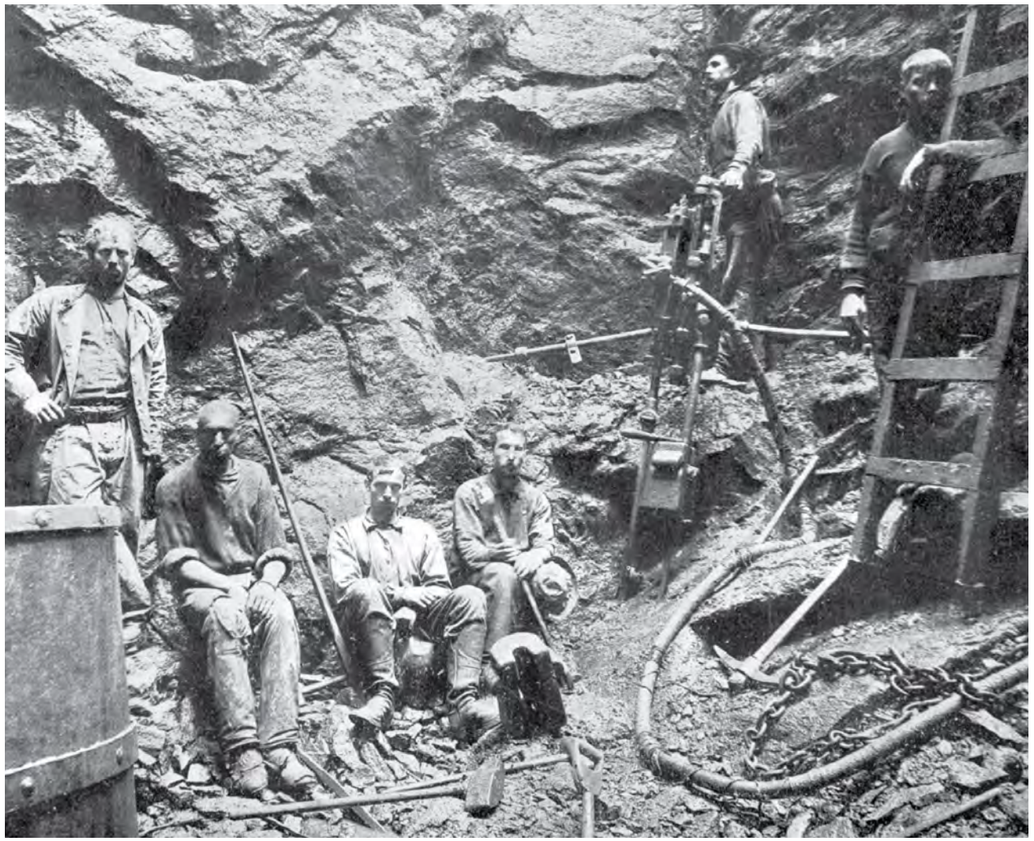
These categories may be used to determine the significance of the individual structures that comprise the Waterworks. It should be noted, however, that an individual structure need not be found significant in all categories in order for it to be considered significant as a whole. The keeper's house in Dobbs Ferry, for instance, contributes little from the perspective of engineering, but is nonetheless found to be significant on the basis of architecture and social/cultural history.

Although our holistic approach encourages the preservation of all components of the system, we recognize that the rubrics established above will lead to certain structures' being deemed more significant than others. We further recognize that in a system as vast as the Croton Waterworks, there will be many somewhat mundane structures that cannot be counted among the immediate priorities for preservation. In the event that one of these relatively insignificant structures is slated for dismantling or demolition, we encourage for procedures to be put in place that call for the documentation of the structure, and for the creation of interpretation on a scale commensurate with the structure's significance. For instance, if a portion of the conduit along the Old Croton Aqueduct becomes structurally unsound, we would be sure to preserve the integrity of the earthen berm that marks its location.



Facing Page: Cross section of the Old Croton Dam, illustrating the engineering significance of the system

Left: An 1850 painting of the Croton Water Reservoir, an architecturally significant feature of the system.



Above: Workers sinking Shaft 26 of the New Croton Aqueduct, indicating the labor history that is just one aspect of the Croton Waterworks' social/cultural significance

Right: The berm of the Old Croton Aqueduct, a feature that is ingrained in the landscape

Preservation Challenges

Multiple Stakeholders

Stewardship and interpretation of the Croton Waterworks are complicated by the number of stakeholders involved in the system at the national, state, local, and individual site levels. For example, the federal government is a stakeholder through its 1992 nomination of the Old Croton Aqueduct as a National Historic Landmark. The New York State Office of Parks, Recreation, and Historic Preservation maintains the Old Croton Aqueduct State Historic Park, which is a linear park running along twenty-six miles of the Old Croton Aqueduct's path. In New York City, the Parks Department, the Department of Environmental Protection, and the Department of Transportation all have some responsibility for parts of the Croton Waterworks. Lastly, many private organizations, including the Friends of the Old Croton Aqueduct, Groundwork Hudson Valley, and even groups like Harlem Stage, a performing arts organization that has adaptively reused a gatehouse at 135th Street, have an interest in caring for specific parts of the Croton Waterworks.

Lack of Awareness or Understanding of Historic Heritage

The actions of those who cause damage to the Croton Waterworks—through inappropriate use, littering, or vandalism—may stem from a lack of understanding about the system's historic significance. Consequently, collaboration among historic commissions, preservationists, designers, engineers, planners, and volunteers is ultimately the best tool for preventing degradation or loss of the site's original fabric. Through such collaboration, stakeholders who may have initially been on opposing sides of the issue can find common ground in encouraging the understanding and appreciation of the Croton Waterworks.

Inappropriate Zoning or Land use

Though private yards occasionally creep onto Croton land, much of the encroachment over or on top of the Croton Waterworks is municipal in nature. Land use and development can be legally controlled through zoning and legislation to make buffer zones around the aqueduct trail. Any proposed federally sponsored

project near the Waterworks should trigger a Section 106 review, where reasonable alternatives can and should be considered.

Man and Nature

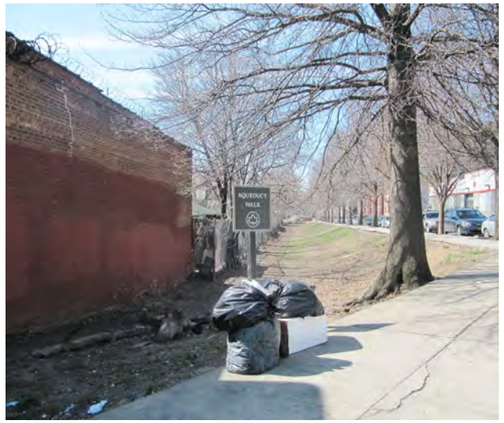
Along the aqueduct trail, trees small and large are encroaching on berms. These trees not only block the path aboveground, but their roots can permanently damage the aqueduct itself underground. In the Bronx and Manhattan, sections of the Croton Waterworks are heavily littered with trash, and in some cases, the path is enclosed by barbed wire fences that further encourage littering and mistreatment. Several of the stone ventilators along the path of the Old Croton Aqueduct have spray paint graffiti on them. The paint, barbed wire, and trash should be removed, and fences that currently keep people away from the path of the Waterworks should be moved back to the outside edge of a buffer zone on either side of the path.

Inappropriate and Inconsistent Treatment

Throughout the Croton Waterworks' history, there have been treatment programs that arguably have damaged the historic integrity of the system, including the 1927 adaptation to the High Bridge, the complete removal of the receiving reservoir in Bryant Park, the paving of walkways atop the aqueduct berm, and current plans to add eight-foot-high fencing to the High Bridge. Standard treatment guidelines have never been developed for the Croton Waterworks, leading to inconsistencies in its care. A charter of recommended holistic treatment should be written specifically for the Croton Waterworks.

Deferred Maintenance

The deterioration of many elements, both at the hands of man and nature, has left the integrity of the Croton Waterworks compromised. Clearly, cost and manpower are essential components to the maintenance equation. Perhaps more attention on a national and global level will bring with it higher funding for more careful maintenance.



Top Left: Trash by the trail in the Bronx

Top Right: Lack of interpretation at the New Croton Dam

Bottom Left: An inadequately paved stretch of the trailway in Yonkers

Bottom Right: Graffiti on a ventilator in Yonkers

Designations and Protections

Some designations offer legal protection and some simply acknowledge the Waterworks' significance, but designations can also help to heighten public awareness and promote education and action. Designations can also affect zoning as well as state and federal constructions near the Waterworks. The Croton Waterworks is well designated; some designations include the whole system, some just its components.

New York City Landmarks (Landmarks Preservation Commission)

1967: High Bridge Water Tower, 5 LP-0319
1970: High Bridge, Aqueduct, and Pedestrian Walk, LP-0639
1981: 135th Street Gatehouse, List 141: LP-1035
High Pumping Station, List 145: LP-1080
2000: 119th Street Gatehouse, List 312: LP-2051

Historic Civil Engineering Landmark (American Society of Civil Engineers)

1975: Croton Water Supply System

National Register of Historic Places (National Park Service)

*By default of the National Register process, the following listings are also designated on the New York State Register of Historic Places:

1972: High Bridge, Aqueduct, and Water Tower, reference number 72001560
1973: Old Croton Dam Site, reference number 73001289
1974: Old Croton Aqueduct, reference number 74001324
1983: 135th Street Gatehouse, reference number 83001721; High Pumping Station (Bronx, NY), reference number 83003882
2000: Jerome Park Reservoir (Bronx, NY), reference number 00001014

National Historic Landmark (National Park Service)

1974, 1992: Old Croton Aqueduct, OMB number 1024-0018 (This designation includes the submerged portion of the Aqueduct between the Old and New Croton Dams, as well as the Bronx portion of the Aqueduct running from Westchester to the Manhattan end of High Bridge. This was not previously included on the 1974 National Register nomination.)

Local Protection

New York City Landmarks Law 1965:

This law was "enacted in 1965 in order to protect historic landmarks and neighborhoods from precipitate decisions to destroy or fundamentally alter their character. The law also established the creation of a permanent Landmarks Preservation Commission. The Commission is authorized to designate a building to be a 'landmark' on a particular 'landmark site,' or to designate an area as a 'historic district.' The legal definition of a landmark stipulates that the building must be at least thirty years old, and have either historical or architectural merit, as determined by the Commission...The owner of the designated landmark, in this case, New York City and New York State, is legally required to maintain the building's exterior 'in good repair,' and to secure Commission approval before any exterior alterations are made."[1]

State Level Protection

New York's State Environmental Quality Review Act (SEQR):

All state agencies must consider environmental impact equally with social and economic factors during discretionary decision making when they are considering work near a historic, archeological, or cultural site. SEQR review is required for projects that might affect these sites.[2]

National/Federal Protection

National Environmental Policy Act (NEPA):

All federal agencies must consider the environmental impact, just as with SEQR, on any historic, archaeological, or cultural site. "NEPA requires analysis and a detailed statement of the environmental impact of any proposed federal action that significantly affects the quality of the human environment. The federal government is required to use all practicable means and measures to protect environmental values consistent with other essential considerations of national policy to avoid environmental degradation; preserve historic, cultural, and natural resources; and 'promote the widest range of beneficial uses of the environment without undesirable and unintentional consequences.' Therefore, the NEPA makes environmental protection a part of the mandate of every federal agency and department."

If a federal agency or federally funded project comes near a historic district or site, particularly one listed in the NRHP (bingo), like the Croton Waterworks, the agency is required to determine the environmental impact on the area of their proposed work with either an Environmental Assessment (EA) or an Environment Impact Statement (EIS).[3]

National Historic Preservation Act of 1966 (NHPA) has a component to it titled "Section 106." Section 106 requires federal agencies to weigh the effects of their actions on historic properties. They must also allow the Advisory Council on Historic Preservation (ACHP) a "reasonable" chance to "comment" on the federal action. The review process does not necessarily guarantee the protection of the historic site, but it demands that the federal agency follow a list of regulations (outlined in "Protection of Historic Properties" (36 CFR, part 800) in its evaluation and analysis of the proposed federal action.

Any project with federal involvement or funding, whether it be by an action using federal funds, or an action that requires federal permits, licensing or federal approvals, triggers the Section 106 process. The project leaders must first map out the "area of potential effects" (APE). Then, the federal agency must determine whether its activity has an "undertaking," that is, a federal action that could negatively impact historic properties. If not, the review process is complete, but if so, it must continue.

The project leaders must then contact the State Historic Preservation Officer or the Tribal Historic Preservation Officer to allow them to consult in the case as well. They should also identify any other parties, including the public, who should be involved and make certain to allow them their say, or they will not be completing their Section 106 obligations.

During the Section 106 review, it must be determined whether or not the project will have adverse effects on the historic site. These can be direct effects or indirect effects; examples might be visual intrusion, noise, loss of access, traffic, loss of setting or context, etc. All parties concerned are allowed to weigh in on the process. The goal of the Section 106 review is to find ways to avoid, minimize, or mitigate the adverse effects of the project.

Section 106 is the regulatory heart of

NHPA; while it requires any federal agency or federally sponsored action's careful review of historic properties, it ultimately does not prevent the federal agency from taking harmful actions on historic properties. It only requires the review and careful consideration of alternatives. Consultation within the groups typically results in a Memorandum of Agreement (MOA), where the federal agency agrees to proceed with its undertaking in accordance with the MOA.

Department of Transportation Act 1966 (DOT):
This is the strongest tool in the federal preservation toolbox. It requires "substantive protection for historic resources" by prohibiting federal approval or funding of transportation projects (like a highway) that requires the use of any historic site…unless there is no feasible and prudent alternative to the project, and the project includes "all possible planning to minimize harm" to the historic site. By use, they mean not only the actual taking of historic land for the project (typically, a highway), but any adverse affects that would substantially impair the historic site (traffic noise, pollution, etc). Any federal transportation agencies must conduct a 4(f) assessment on any federal transportation project. Section 4(f) requires the DOT to avoid harming such resources, unless no "feasible and prudent alternatives" exists.[4] There is one caveat: the Secretary of the DOT may determine a "de minimus impact" if a Section 106 review has found no adverse effect on an historic site.

[1] "New York City Landmarks Law," The New York Preservation Archive Project, http://www.nypap.org/content/new-york-city-landmarks-law.
[2] "Archeological and Historic Resources," New York State Department of Environmental Conservation, http://www.dec.ny.gov/permits/51406.html.
[3] "NEPA Activities in Site Selection," U.S. General Services Administration, http://www.gsa.gov/portal/content/104829.
[4] "Section 4(f) of the Department of Transportation Act," National Trust for Historic Preservation, http://www.preservationnation.org/resources/legal-resources/understanding-preservation-law/federal-law/transportation-act.html.

Charters and Declarations

One method of protection for historic sites is a charter. Over the last 134 years, various groups interested in preserving historic structures, landscapes, and cultural heritage have created charters to establish a systematic approach of protection for important historic sites. Initially architecture-based, the preservation effort to protect through charters has expanded to now include cultural heritage, landscapes, bridges, roads, industry, and even historic cars. Focusing on authenticity and integrity, documents and declarations politely demand that all who consider work on historic structures or areas of heritage follow their recommendations. Charters are not legally enforceable; rather, they are establishments of standards for those working in the fields of conservation and preservation.

William Morris's 1877 "Manifesto of the Society for the Protection of Ancient Buildings" is the first cohesive attempt to promote protection of old buildings in a document. Most of the Manifesto's doctrine establishes the importance of protection and preservation; its last two paragraphs offer clues on what and how to protect "anything… artistic, picturesque, historical, antique, or substantial: any work…which educated, artistic people would think it worthwhile to argue for." His elitist approach was an important beginning for preservationists; he thought that we should "protect our ancient buildings, and hand them down instructive and venerable to those that come after us."[1]

In Athens in 1931, the First International Congress of Architects and Technicians of Historic Monuments developed the Carta del Restauro, which called for international standards and oversight of restoration projects of historic sites. Their goal was to ensure integrity, offer preservation assistance, and demand protection for historic sites and their surrounding areas.[2] Since then, several charters and declarations have been written that each address a particular area of heritage, landscape, architecture, industry, or infrastructure.

In 1956, the United Nations Environmental, Scientific, and Cultural Organization (UNESCO) founded its International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM) to promote preservation of cultural heritage worldwide, and through intergovernmental cooperation they offer training, information, research, cooperation, and advocacy of preservation.[3]

Just a few years later, the Second Congress of Architects and Specialists of Historic Buildings met in Venice in 1964, where they adopted thirteen resolutions. The first of these resolutions created the Venice Charter, while the second resolution—sponsored by UNESCO—created the International Council on Monuments and Sites (ICOMOS), a non-governmental organization, to oversee the implementation of the Venice Charter. Each member of Paris-based ICOMOS must be qualified in conservation or be a practicing landscape architect, architect, archeologist, town planner, engineer, heritage administrator, art historian, or archivist. The Venice Charter stressed the importance of documentation, especially of any interventions; the importance of setting and original fabric; and the importance of contributions from any and all historic periods to a site's heritage. It gave very specific guidelines for conservationists and preservationists on how to treat historic sites.[4]

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In 1972, UNESCO adopted the World Heritage Convention (WHC), and from it, the World Heritage Committee, whose members represent 21 of their 142 member countries. The WHC declared that any great historic site is important not only to the country in which it resides, but also to the world. The committee's responsibility is to select World Heritage Sites (WHS); there are currently 911 of these sites, 4 of which are aqueducts. The Croton Waterworks' impressive combination of nature with man's knowledge and skill could well merit its designation as a WHS.

The 1979 Australian Burra Charter details preservation of places of cultural significance. With a comprehensive list of definitions and carefully noted detail, it strongly advocates significance of authenticity, existing fabric, conservation, and a cautious approach to "changing as much as necessary but as little as possible."[5] It requires the significance of any historic site to be defined, and any plans for conservation to be established and justified prior to intervention.

Stressing the importance of cultural heritage in a global world, the Nara Document on Authenticity—written in Japan in 1993—says the "cultural heritage of each is the cultural heritage of all," but the responsibility for cultural heritage and its management belongs first and foremost to the "cultural community that generated it, and subsequently, to that which cares for it." Cultural heritage preservation must be as authentic as possible, deriving authenticity from sources including form, design, materials, uses, functions, traditions, techniques, locations, setting, spirit, and feeling.[6]

The 1997 Verona Charter considers the modern purposing of ancient places of performance to be a type of sustainable development, as long as it is done with respect for the heritage of the site. If we use an ancient site today, we enhance it by its use, while potentially arousing awareness in the public, particularly the young, of its cultural and common value.[7]

Both the 2003 Nizhny Tagil Charter for the Industrial Heritage and the 2011 Dublin Principles focus on industrial heritage sites, which are defined in Nizhny as remains of "historical, technological, social, architectural or scientific values."[8] Unlike some of the other charters, these two focus on the modern era. Dublin includes the landscape surrounding industrial sites in its preservation goals, while Nizhny includes any industrial underground elements.[9] Both of these documents are applicable to the Croton Waterworks, as much of its trail is underground and unseen.

While the 2005 Helsinki Statement reiterates the importance of preserving architectural heritage, the 2005 Vienna Memorandum focuses on the urban landscape of heritage sites, most notably, World Heritage Sites. It recommends that the concept of the "historic urban landscape be included in the nomination and evaluation process" in all nominations to the World Heritage list.[10]

Lastly, the 2005 Xi'an Declaration on the Conservation of the Setting of Heritage Structures, Sites and Areas broadly defines setting to include the environment surrounding a site and recommends pursuit of legislation to create buffer zones around heritage sites to better protect them while controlling impact from ongoing transformations that surround them. Xi'an also recommends that any new development near the site be assessed for impact on the site, and then closely monitored thereafter to minimize any damage to the site's integrity.[11]

While all of these documents aid in the protection of historic sites, and could be partially applied to the Croton Waterworks, none of them handle all of the complexities and challenges of preserving historic infrastructure. We have provided a chart on the folowing page to illustrate the inadequacies of the various charters and declarations that were studied. Therefore we must seek out alternate methods of preservation, aimed at the treatment of historic infrastrucutre specifically.

[1] William Morris, "Manifesto of the Society for the Protection of Ancient Buildings," taken from William Morris, "The Principles of the Society As Set Forth upon Its Foundation," Builder 35 (25 August 1877), http://www.spab.org.uk/what-is-spab-/the-manifesto/.
[2] First International Congress of Architects and Technicians of Historic Monuments, Carta del Restauro (1931), http://www.icomos.org/docs/athens_charter.html.
[3] International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), http://www.iccrom.org/eng/00about_en/00_00whats_en.shtml.
[4] Second Congress of Architects and Specialists of Historic Buildings, Venice Charter (1964), http://www.international.icomos.org/charters/venice_e.htm.
[5] ICOMOS, Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (1979), australia.icomos.org/wp-content/uploads/BURRA_CHARTER.pdf.
[6] UNESCO, Nara Document on Authenticity (1993), http://whc.unesco.org/uploads/events/documents/event-443-1.pdf.
[7] European Network of Ancient Places of Performance, Verona Charter (1997), http://www.coe.int/t/dg4/cultureheritage/heritage/resources/Texts/Verone_EN.pdf.
[8] International Committee for the Conservation of the Industrial Heritage (TICCIH), Nizhny Tagil Charter for the Industrial Heritage (2003), http://www.international.icomos.org/18thapril/2006/nizhny-tagil-charter-e.pdf.
[9] ICOMOS/TICCIH, The Dublin Principles: Joint ICOMOS-TICCIH Principles for the Conservation of Industrial Heritage Sites, Structures, Areas and Landscapes (DRAFT -2011.03.10), per Professor Pamela Jerome.
[10] UNESCO, Vienna Memorandum on World Heritage and Contemporary Architecture: Managing the Historic Urban Landscape (2005), http://whc.unesco.org/uploads/activities/documents/activity-47-2.pdf.
[11] ICOMOS, Xi'an Declaration on the Conservation of the Setting of Heritage Structures, Sites and Areas (2005), http://www.international.icomos.org/charters/xian-declaration.pdf.

CHARTER OR LANDMARK	Does this charter provide guidelines for modifying components?	Does this charter recognize previously demolished structures?	Does this charter document technical and mechanical components?	Does this charter protect all active and inactive components?	Does this charter protect unseen components?	Does this charter protect site when public access is blocked?
Protection of Ancient Buildings (1877)	Yes	No	No	Yes	No	No
Athens Charter (1931)	Yes	Yes	No	Yes	No	No
Venice Charter (1964)	Yes	Yes	No	Yes	No	No
World Heritage Site (1972)	No	No	No	No	No	No
Burra Charter (1979)	Yes	Yes	No	Yes	No	No
Nara Document on Authenticity (1993)	No	No	No	No	No	No
Verona Charter (1997)	Yes	No	No	Yes	No	No
Nizhny Tagil Charter (2003)	Yes	No	Yes	Yes	Yes	No
Dublin Principles (2011)	Yes	No	Yes	Yes	No	No
Helsinki Statement (2005)	No	No	No	Yes	No	No
Vienna Memorandum (2005)	Yes	No	No	Yes	No	No
Xi'An Declaration (2005)	Yes	No	No	Yes	No	No
National Heritage Area	No	No	Yes	No	No	No
New York City Landmarks	No	No	Yes	Yes	No	No
National Register of Historic Places	No	No	Yes	Yes	No	No
National Historic Landmark	No	No	Yes	Yes	No	No

Preservation Plan/Guidelines

Portions of the Croton Waterworks have been recognized for their historic, cultural, social, and engineering significance through designations and listings, including the National Register of Historic Places, National Historic Landmarks, and as multiple individual New York City Landmarks. Many of these listings lack legal and regulatory measures to protect against the demolition and/or neglect of structures, and, as a result, neglect and abandonment has led to the dilapidation and misuse of parts of the Waterworks.

In the section that follows, we propose additional modes of protection for the system that emphasize documentation, maintenance, rehabilitation and reuse, and finally, interpretation. Also included is a list of potential amendments to current designation, as well as a proposal for an infrastructure-centric charter/declaration.

There is no single methodology for protecting historic infrastructure, as systems vary dramatically in size, scale, and visibility (seen and unseen). Examples of infrastructure range from telephone poles and bridges, to sewers and aqueducts. Updating the functional capacities of infrastructure often outweighs preservation as a priority, and oftentimes infrastructure is replaced and outmoded systems are demolished.

How do we set standards and establish guidelines for how to preserve historic infrastructure? We will answer this question as it relates to the Croton Waterworks, a unique and mostly extant example of a historic infrastructural system. These factors-- along with the fact that the system is significant for its engineering, architecture, landscape, and social history— warrant the development of a preservation plan, which is integral to the long-term protection of this irreplaceable historic resource.

Documentation

Documentation is an essential tool in historic preservation. The initial purpose of documenting a structure and its historic context is to record existing features, taking note of its historic, engineering, architecture, landscape, and social significances. Formal documentation includes measured drawings, many of which have already been created by the Historic American Engineering Record (HAER) for the Old Croton Aqueduct; photography; archival research; written reports; and historic images and drawings. The Secretary of the Interior's Standards for Architectural and Engineering Documentation should be followed in documentation efforts to ensure quality of content, materials, and presentation. These standards govern the HABS/HAER documentation processes and emphasize the following:

1. Documentation of the site/structure should illustrate its significance; for instance, if the structure is significant for engineering and contains extant mechanical equipment, that equipment should be documented in addition to exterior elevations, and plans.
2. Documentation should meet quality standards as set by HABS/HAER; for instance, cited extensive historical research.
3. Documentation should be produced in a medium that is easily reproducible and comprehensible.[1]

Despite HAER documentation in the 1970s of the Westchester portion of the Old Croton Aqueduct, we propose a current and complete documentation survey of the Old and New Croton Aqueduct systems, referred to in this

document as the Croton Waterworks. This evaluation would consider the entire system, and the level of documentation for each individual element will be based on the level of significance we have established for it. For instance, structures with a high level of significance might be drawn, while those with a lower level of significance may only be documented through photography. While documentation by HAER would be an ideal situation, documentation may be conducted by trained stakeholders for their archival purposes. In the latter case, we encourage following the above-mentioned guidelines, perhaps through a standard/criteria/survey form, and recommend that documentation be housed in a location accessible to all, for instance, online.

The bank of knowledge provided by documentation would allow interested parties, within and without the preservation community, access to information about the Croton Waterworks' significance and current state. Due to the nature of active infrastructure sites, documentation may be the only way researchers would be able to learn more about certain aspects of the Waterworks that are closed to the public for security reasons. While the following stages in our preservation plan will actively seek to mitigate deterioration and neglect, documentation can provide a valuable and lasting record of how the Croton Waterworks looked, worked, and related to its surrounding landscape at a particular period in time.

Maintenance

Routine maintenance of the entire Croton Waterworks system is a basic, yet costly and time-consuming, component in its preservation. According to the National Park Service's guidelines for caring for historic building exteriors, "Maintenance has preservation as its goal."[2] The primary aims of preservation maintenance include regular upkeep, retaining of historic materials, preservation of historic character, addressing of deterioration, use of traditional repair methods, and utilization of the gentlest means of cleaning possible.[3] According to Norman Weiss, "In terms of the duration of interaction with the structure, maintenance emerged as the most significant component of the conservation process."[4]

The National Park Service's "Standards for Preservation and Guidelines for Preserving Historic Buildings" are essentially a variety of treatments all rooted in building maintenance. When considering a maintenance approach, the Croton Waterworks is especially challenging, as some of the buildings/structures are still online and in service, while some are no longer functioning. Therefore, there is a potential need for two levels of maintenance plans, one for structures that are online and one for the stabilization of offline structures. Once a treatment type has been chosen (preservation, rehabilitation, restoration, or reconstruction), a suitable course of action consists of maintaining, replacing, or repairing historic materials. For the Croton Waterworks, we propose the preservation and rehabilitation of structures wherever possible. Due to funding limitations and the perception that historic infrastructural elements are defunct, preservation would be the first course of action.

According to the Standards, preservation is defined as "the act or process of applying measures to sustain the existing from, integrity, and materials of an historic property."[5] This initial stage identifies, retains, and preserves historic features and materials. Therefore, active campaigns to stabilize the structures of the Croton Waterworks would feature ongoing maintenance and repair of exterior and interior systems. Those involved in preservation of any structures within the Croton system are referred to the "Standards for Preservation and Guidelines for Preserving Historic Buildings," which emphasizes the following:

1. A property should be used as it was historically, or given a new use that maximizes its significance and distinct characteristics.
2. The historic character of a structure must be maintained.
3. The property's physical features should be stabilized, consolidated, or conserved in a way that is "physically and visually compatible, identifiable upon close inspection, and properly documented for future research."
4. Historically significant changes to a property should be considered in their own right and preserved.
5. Distinctive features that characterize the structure should be preserved.
6. Existing historic features will be evaluated to determine the level of necessary intervention. If necessary, repair and replacement should match the old composition and design.
7. Chemical or physical treatments should be as gentle as possible.
8. Archeological resources should be "protected and preserved in place."[6]

We propose that the Standards be consistently followed for every component of the Croton Waterworks, including the unseen elements. One of the challenging aspects of preserving the Croton Waterworks is its size, as well as the enormity of managing the plethora of stakeholders involved along its span. Because the system is so long, it is critical that there be a well-written maintenance plan available to all stakeholders working along the system – including both State Parks and NYC Parks. Maintenance efforts may need to be coordinated by localized community efforts rather than one overriding authority. Within these localized maintenance teams, regular inspections will facilitate ongoing care and the achievement of preservation goals. A sampling of maintenance tasks specific to the Croton system would include routine weeding, rock maintenance along the Aqueduct berm, and the exterior cleaning of ventilators.

Rehabilitation and Reuse

In the case that more attention and resources can be devoted to various structures along the Croton Waterworks, we propose a program of rehabilitation. The National Park Service's "Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings" (codified in 36 CFR 67 for use in the Federal Historic Preservation Tax Incentives program) addresses the most prevalent treatment for many types of historic infrastructure. Rehabilitation is defined there as "the process of returning a property to a state of utility, through repair or alteration, which makes possible an efficient contemporary use while preserving those portions and features of the property which are significant to its historic, architectural, and cultural values."[7] These standards emphasize the following:

1. The property should be either used as it was historically or with a new use that requires minimal change and does not alter the historic character of the property.
2. Alterations "that create a false send of historical development...will not be undertaken."
3. Both historically significant changes and distinctive original characteristics are to be retained.
4. Deteriorated historic features should be repaired rather than replaced, and where

replacement is necessary, materials and design should be researched and expertly matched. Any chemical or physical treatments should be as gentle as possible.
5. Archeological resources should be "protected and preserved in place."
6. Any new additions or construction cannot destroy historic building materials, features, or spatial relationships that characterize the structure. All such new work should be reversible.[8]

Adaptive reuse is essentially the process of finding a new use for an old building. This "recycling" of buildings has long been a historic preservation tool to protect structures whose original utility is outmoded. While reuse has mainly been utilized to preserve more traditionally "inhabitable" structures, the reuse of infrastructure has become increasingly popular. Structures that are part of the Croton Waterworks that are no longer in service can gain new life through reuse.

Already, some structures within the Croton Waterworks system are being reused. The 135th Street Gatehouse in Manhattan underwent extensive renovations and is now a theater space, Harlem Stage. Other structures that were reused along the Waterworks include the 113th Street Gatehouse in Manhattan, which has been appropriated by a nursing home for their use. These examples, along with others, point to the viability of historic infrastructure to be reintegrated into community use.

At this stage in the preservation process we have not explored many cases where restoration or reconstruction would be the advised course of treatment. Most modern interventions into the historic landscape of the Croton Waterworks have taken the form of updated infrastructural systems. Where the mechanical systems have not been replaced, as is the case for the Old Croton Aqueduct portion of the system, extant machinery is rare. If a good candidate were identified, such as a pumping station or a weir with engineering integrity, restoration could be a course of action. Another possible restoration project would be the berm and conduit beneath. Reconstruction of properties that have been severely damaged or lost is not yet a consideration because of the extensive and extant variety of typologies present in the Croton Waterworks system. However, the potential to bring the entire system back online, through restoration and reconstruction, has been suggested in conversations with experts. The thought of the entire Croton Waterworks system once again supplying water to New York is an exciting one, and speaks to the longevity of historic infrastructural systems.

Proposed Designations

Though many designations already exist that encompass both individual structures as well as larger, more continuous portions of the Croton Waterworks, a more comprehensive protective document is necessary. Currently, individual structures designated by the New York City Landmarks Preservation Commission and the National Park Service only represent roughly 4 percent of the entire built system. Even taking into consideration what has been lost due to demolition, total representation by individual landmarks and historic sites is staggeringly low, especially in Manhattan. It is imperative for the continued protection and maintained integrity of the waterworks to include what has subsequently been left out in Manhattan, as well as what comprises the New Croton System.

The most far-reaching of the existing Croton designations was the National Register of Historic Places of 1974, which encompasses most of the Westchester County portion of the Old Croton Aqueduct. However, this designation falls short of taking the entire system into consideration. Later, in 1992, the National Register designation was amended to designate the Old Croton Aqueduct as a National Historic Landmark. This amendment introduced the submerged portions between the Old and New Croton Dams, as well as the Aqueduct beginning in the Bronx and ending on the Manhattan end of the High Bridge, into its designation. Though this was a step in the right direction, it still fails to take into consideration those portions of the Aqueduct that continue into Manhattan. We propose that the designation consider the system holistically, and be amended to include all the Croton structures in Manhattan.

Other proposed designations include nominating the Croton Waterworks as a National Heritage Area (NHA), an important federal designation granted by Congress. An NHA can span large geographical areas and enlists local community members along the designated span in preservation efforts. This designation option has proven successful for several other infrastructural systems, such as the Erie Canalway National Heritage Corridor, and may be a novel approach to preserving the Croton system. While a NHA does not provide legal "teeth," the entire system would be recognized within it various contexts, including the development of communities along its path and neighboring historic sites. This designation would also provide the Croton system with limited financial and administrative assistance for the execution of management and preservation plans.

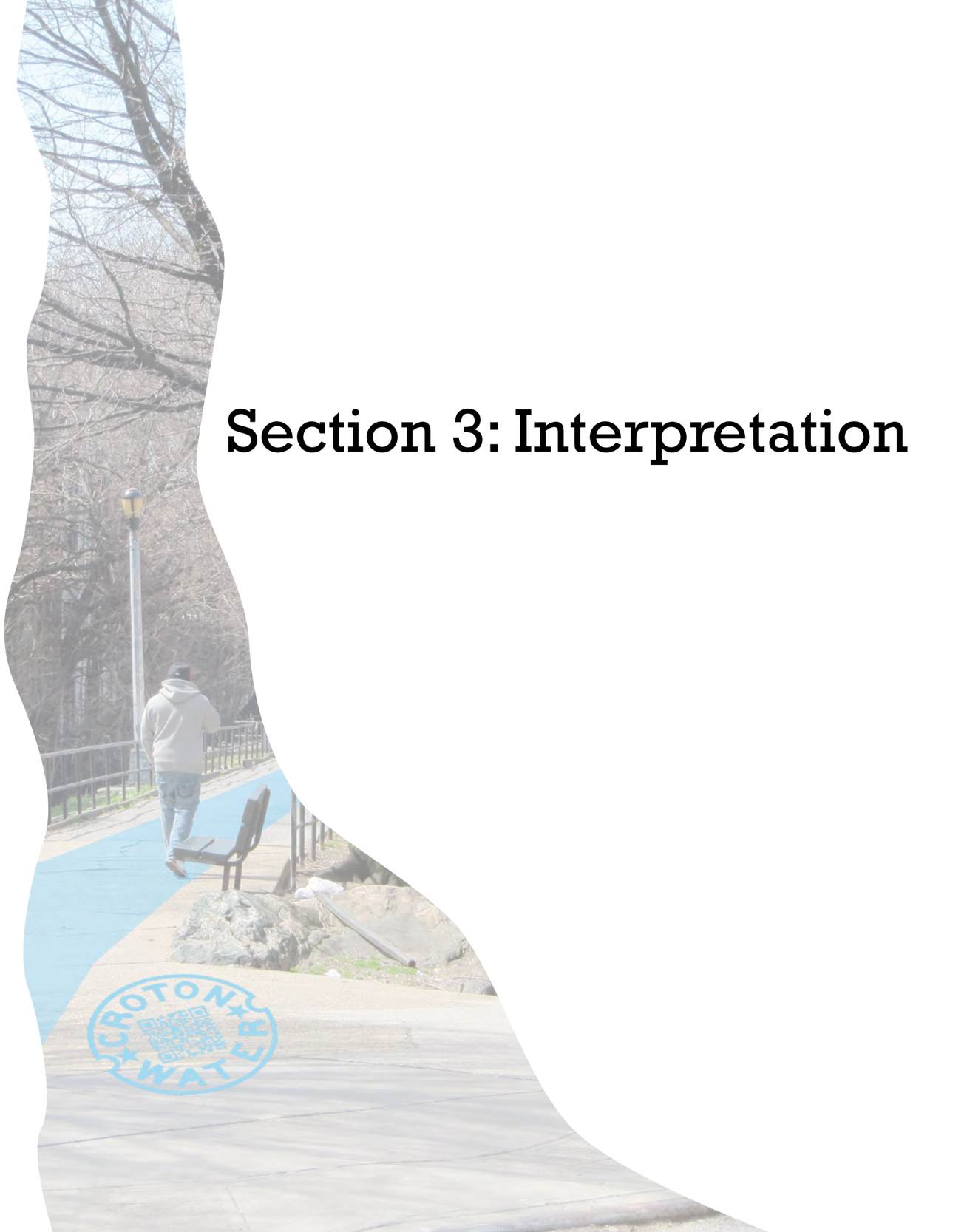
We also encourage designation of the Croton Waterworks as a UNESCO World Heritage Site. Four of the world's aqueducts already join this venerable list of sites, and we believe that the Croton Waterworks matches those other sites in national- and worldwide-level historical, engineering, architectural, and cultural value. While this designation also does not have legal "teeth," a comprehensive management plan is required for designation, and the production of this document would be an important undertaking for the entire Croton Waterworks.

Lastly, in order to further protect the Croton Waterworks, and historic infrastructure more broadly, we call for the first meeting of a Croton Congress, in order to construct the "Croton Declaration of Principles and Recommendations for the Preservation, Conservation, and Restoration of the Historic Infrastructure." For a full proposal, see page __.

While all of the protective measures within this preservation plan are to be considered, we have explored interpretation as our primary method for preserving the Croton Waterworks. We have found that interpretation serves as an engaging and flexible protective approach to historic infrastructure. The driving force behind our work is our belief that protection and interpretation are mutually dependent as integral elements of an overall preservation scheme. Our preservation plan identifies measures within established historic preservation standards and discourse to protect infrastructure. However, certain complications arise when these frameworks are applied to the Croton Waterworks holistically. Therefore in the following section we will present a survey of existing interpretation of the Croton Waterworks, as well as a range of proposed interpretation.

[1] National Park Service, Secretary of the Interior's Standards for Architectural and Engineering Documentation, http://www.nps.gov/history/local-law/arch_stnds_6.

[2] National Park Service, “Maintaining Historic Building Exteriors” (May 2006): 3.
[3] Ibid.
[4] Norman Weiss, “Preventative Maintenance in Historic Structures,” in *Conservation of Historic Stone Buildings and Monuments* (Washington DC: National Academies Press,1982), 282.
[5] National Park Service, “Standards for Preservation and Guidelines for Preserving Historic Buildings,” http://www.cr.nps.gov/hps/tps/standguide/preserve/preserve_index.htm.
[6] Ibid., http://www.cr.nps.gov/hps/tps/standguide/preserve/preserve_standards.htm.
[7] National Park Service’s “Standards for Rehabilitation and Guidelines for Rehabilitating Histovric Buildings,” http://www.cr.nps.gov/hps/tps/standguide/rehab/rehab_index.htm.
[8] Ibid., http://www.cr.nps.gov/hps/tps/standguide/rehab/rehab_standards.htm.



Section 3: Interpretation

Interpretation of the Croton Waterworks

Interpretation is a key element in the preservation of the Croton Waterworks. It may be used to support the maintenance of the system, full restorations of particularly significant buildings, and public education of its layered history and significance.

While interpretative efforts for the Croton Waterworks have been carried out in the past, the presence and means of this interpretation is quite varied, discontinuous along the length of the system, and not always easily accessible (either from a street or from the Westchester County trail). Furthermore, gaps exist in the extant and visible fabric of the Waterworks, which often leads to a lack of public understanding of the characteristics, extent, and significance of the Croton Waterworks. It is for these reasons (and many more) that existing interpretation must be adequately assessed and new interpretative measures discussed and eventually implemented.

Considerations and Challenges

Interpreting the entire forty-one-mile-long Croton Waterworks system, from Westchester County to New York City—including both structures and landscapes—is a challenging issue. It is important to understand the variety of sites associated with the Croton Waterworks, to be able to group these sites into larger thematic typologies, and to ultimately connect these sites through interpretative measures, enabling the Waterworks to be understood in a holistic manner.

Questions have surfaced as to how to interpret unseen or underground portions of the Waterworks, structures still in use, fragments of demolished structures, and even entirely demolished structures. As a result, the classification of a site as existing/demolished, accessible/inaccessible, active/decommissioned, or subgrade/abovegrade is a crucial first step that must be completed in order to obtain a full understanding of the circumstances that one may face in interpreting these sites. For a system as varied and expansive as the Croton Waterworks, these considerations (among others presented in later pages) will aid in the determination of the best use and type of interpretation.

Structures that are Existing or Demolished

The extant structures of the Croton Waterworks, even without clear interpretation components associated with them, are at least visible to passersby. There are many components of the Waterworks that have been demolished, however, that are still considered to be of enduring significance to the system's engineering, architectural, landscape or social/cultural history. Examples of demolished structures that remain significant to the Waterworks include the keepers' houses (of which only one remains, in Dobbs Ferry), the West Burnside Avenue Bridge (large fragments of which remain on either side of West Burnside Avenue in the Bronx), the Clendening Valley Crossing (demolished in the nineteenth century), Murray Hill Reservoir (of which fragments remain, and can be seen in the main branch of the New York Public Library that now occupies the reservoir's site), and York Hill Reservoir (fragments of which are scattered around the Great Lawn and incorporated into the police precinct building in Central Park).

Structures that are Accessible or Inaccessible to the Public

Many of the Croton Waterworks sites, particularly those associated with the Old Croton Aqueduct, are located in areas where members of the public may interact directly with the exterior of a structure (and even enter the structure, in some cases) or come close to more landscape-oriented features such as dams and reservoirs. Other structures are only visible from a distance (head houses over the shafts associated with the New Croton Aqueduct), surrounded by layers of fencing (Jerome Park Reservoir), or on publicly inaccessible property (York Hill Reservoir fragments in the police precinct building in Central Park).

Structures that are Active or Decommissioned

The structures associated with the New Croton Aqueduct, which is still in use, are considered "active" components of the system. The first priority of the municipal agencies (such as the New York City Department of Environmental Protection) responsible for

these structures is the safe and efficient functioning of the system. Also, because security concerns related to the water supply of New York City are so high, many sites are kept entirely off limits to the public. Information concerning the inner workings and structural systems of these buildings/sites is also not made available to the public. Decommissioned structures are more frequently available for public accessibility and on-site (and off-site) interpretation, largely due to the absence of security concerns.

Structures that are Subgrade or Aboveground

In many locations, the Croton Waterworks conduits are underground, and no obvious traces are visibly present. This is particularly the case with the conduit of the New Croton Aqueduct, which was constructed deep underground and is thus publicly inaccessible and hidden from view for the entire length of the system. The Old Croton conduit is underground primarily in New York City. A more clearly defined difference between the visibility of the Old versus the New Aqueduct conduits is illustrated as the Aqueducts cross the Harlem River between the Bronx and Manhattan. The conduit associated with the Old Croton Aqueduct is carried across the river inside of the High Bridge, while the conduit associated with the New Croton Aqueduct is buried deep beneath the river, its presence completely imperceptible.

In certain locations in Westchester County and the Bronx, a berm indicates the presence of the Old Croton Aqueduct channel. The berm serves as a halfway point between a subgrade and aboveground feature, since a somewhat clear indication of the presence of the Aqueduct is provided, yet one cannot see through the earthen covering into the conduit itself. The New Croton Aqueduct's shafts are another example of a subgrade feature that helps to tell the story of the construction and maintenance of the system. Aboveground structures and landscapes are inherently visible, and include sites such as the High Bridge, the Manhattan gatehouses, and ventilators. However, it is crucial to remember that any of these "aboveground" structures also often feature subgrade components (in order to link up with the underground conduit).

Challenges Encountered in Interpreting the Croton Waterworks

The following is a list of critical issues that were encountered while researching, analyzing, and creating interpretative measures for the Croton Waterworks. This list is by no means comprehensive or complete; its purpose is to provide additional ideas and issues to consider in working toward the creation of a holistic interpretative plan for the Croton Waterworks.

1. The balance of public education/interpretation and maintenance of scenic viewsheds, particularly in Westchester County, has become increasingly important. The definition of what a scenic viewshed might encompass in New York City has yet to be determined.

2. The possible incorporation of interpretative features into the reuse of Croton Waterworks structures—such as the 135th Street Gatehouse (adaptively reused as Harlem Stage) and the 113th Street Gatehouse (renovated as part of the Amsterdam Nursing Home)—leads to the question of how to incorporate signage, for example, into publicly accessible or inaccessible sites/spaces, particularly for those sites no longer used for Croton-specific purposes.

3. The difficulty of on-site interpretation, particularly in New York City, has become apparent. This is not only a result of security concerns related to portions of the system still in use (which extends from Westchester County to New York City), but is also due to the necessary cooperation between various New York City agencies and parks conservancies that own or maintain different pieces of land associated with the Croton Waterworks, the community boards that must approve plans, and the Public Design Commission of the City of New York's guidelines for city signage.

4. The implementation of uniform signage that is instantly recognizable by the public as being associated with the Croton Waterworks along the length of the system is an issue that must be addressed. The standardization of signage is particularly difficult when so many parties are involved and/or invested in its care (see also Challenges to the Croton Waterworks, on page __).

5. The incorporation of temporary, short-term, and/or evolving signage programs that are both dynamic and current is an important next step in the interpretation of the Croton Waterworks and should continue to be addressed.

Documentation, Analysis, and Methodology of Existing Interpretation

We examined current interpretation measures along the length of the Croton Waterworks, with an emphasis on interpretation of specific structures and landscapes that tell the story of the system. The reason for the investigation was twofold: to document existing interpretation and to assess its condition, effectiveness, and longevity. A methodology for this examination (to be used in the analysis of existing and future interpretation of the system) is subsequently presented in order to provide more specific information about the process of documenting and assessing the effectiveness of interpretative measures.

Documentation and Analysis of Existing Interpretation

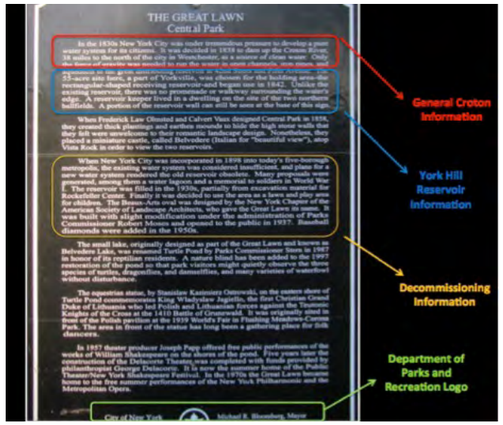
An assessment of the existing Croton Waterworks interpretation was conducted with the purpose of determining where the interpretative techniques are located, what they encompass, which measures are most and least effective, which structures are not currently interpreted, where potential exists for new interpretative projects, and what interpretation should be updated and/or expanded.

We studied each interpretative measure to determine its particular type, the organization that commissioned it, the intended audience, materials used, current condition, its visibility and accessibility, and its effectiveness. Primary goals were to determine how successful the current interpretation schemes are in reaching their intended audiences, and to decide whether the historical significance of both the individual structure and the system as a whole was clearly communicated.

One of the most apparent themes revealed in the existing interpretation analysis is that a site's signage does not always provide adequate information that connects the specific structure with the significance of the system as a whole. In addition, an important realization was that not all signage is located at specific structures, but at intermittent points along (and even off) the trail, particularly in Westchester County and the Bronx. Also, there is often no on-site interpretation at locations where a Croton structure no longer exists (such as the site of the Murray Hill Reservoir) or is in disrepair (such as the 119th Street Gatehouse). However, even sites that are that are maintained and easily accessible (such as the New Croton Dam and the North Gatehouse in Central Park) often lack on-site interpretation. Additional sites contain plaques commemorating the construction of a structure, yet do not provide historical information or an explanation of the significance of the structure or system (such as the Archville Bridge and the Old Croton Dam).

It has also become evident that most existing interpretative features associated with the Waterworks not only revolve solely around the Old Croton Aqueduct, but almost always take the form of signage, commissioned by various organizations and inconsistently designed and maintained. While the intended audiences for these interpretation methods include visitors (to the trail in Westchester and the Bronx as well as other particularly significant sites in Manhattan) as well as the people living around the system, local populations remain largely uneducated about the presence and significance of the Croton Waterworks. This prevents local investment in the preservation and celebration of this historic infrastructure.

Above: Many different types of signage have been posted at the New Ossining Weir by multiple agencies over the past couple of decades, and these signs often have overlapping information.



Right: A New York City Department of Parks and Recreation sign in Central Park has been analyzed to show what types of information it conveys.

The New York State Heritage Area Museum in Ossining is the only museum dedicated to the Croton Waterworks, although its focus is on the Old Croton Aqueduct, not the entire system. The museum contains scale models of individual parts of the system, as well as signage that educates visitors about various aspects of the system's history and significant sites and provides a necessary form of off-site system interpretation. However, the museum is located off the Old Croton Aqueduct trail, and does not incorporate any of the actual infrastructure of the system—a fundamental consideration, particularly when dealing with a system in which so much original fabric remains.

Methodology for the Analysis of Existing Interpretation

Based on the preceding analysis, we present below a methodology for use in documenting, assessing, and analyzing existing and future interpretation measures for the Croton Waterworks. The methodology may be used to determine if an interpretative measure is present for a specific site as well as for system-wide interpretative schemes.

Interpretation Typology

A determination of the specific type of interpretation is the first step in the documentation and assessment of interpretative features. The interpretation should be classified as either on-site or off-site. If on-site, the category of interpretation should be specified, such as whether the feature is a sign, plaque, or walking tour, and if individual site information is provided in addition to system-wide information. If the interpretation is off-site, the category should also be identified and may include such typologies as a museum, website, map, podcast, and so on.

Associated Structure and Location

If the interpretation is structure- or site-specific, the structures or site associated with the interpretative measure should be noted along with its location. If the interpretation is system-wide, this should be noted, along with whether the feature has a physical location (for a museum), where it may be distributed (map, educational curriculum), or if it is accessible via the Internet (website, podcast).

Commissioning Organization

The person or organization that commissioned the interpretative measure should be identified in order to keep a record of the multiple parties involved in the interpretation and preservation of the Croton Waterworks.

Property Owner

The owner of the property on which the associated structure or interpretative feature sits should be identified in order to keep a record of the multiple parties involved in the interpretation and preservation of the Croton Waterworks.

Intended Audience

Identification of the intended audience who will make use of the interpretation is crucial in evaluating the potential scale of the dissemination of information through the interpretative element. This audience may consist of out-of-town visitors, local populations, various age groups, and so on. Therefore, all of the possible audiences who may benefit (or who do not benefit) from a particular type of interpretation should be noted.

Materials

In addition to noting the specific material type used in the interpretation, additional features to note include the ease of production (and reproduction, if necessary), the cost of production (and reproduction, if necessary), and the material's durability. These materials may include wood, plastic, metal (specific metal should be noted), fabric, paper, and so on.

Condition

An assessment of the condition of the particular interpretation is necessary to evaluate its durability and effectiveness. If it is in good condition, the material may serve as a model for further interpretative schemes. If deteriorated, it will need to be replaced using more durable materials.

Visibility

If the interpretation is on-site, a determination of the level of public visibility is necessary in addition to a notation of where on the site or structure the interpretation is located.

Accessibility

If the interpretation is on-site, a determination of the level of public accessibility is necessary. Accessibility may include whether or not the interpretation may be approached at any time of day. If the interpretation is off-site, its physical location in relation to the Croton Waterworks structures should be noted, as well as its hours of operation. If the interpretation is provided via the Internet, for example, this should be mentioned, as well as how easy or difficult it is to find out about these measures and access them.

Determination of Effectiveness

The determination of the effectiveness of the interpretation involves deciding if:

1. The intended audience is being reached
2. The interpretation clearly communicates the history and significance of the individual structure/site and the system as a whole
3. The interpretation is kept up-to-date and in good condition
4. The interpretation is easily visible and accessible

Proposed Interpretation by Typology

Interpretation recommendations for seven of the Croton Waterworks typologies are presented below. This list is meant to provide ideas for "interpretation by typology," the purpose of which is to supplement the holistic interpretation plans presented later in this volume with ideas for interpretive features, which will aid in the connection of structures within each typology.

Culverts

The documentation of culverts is a difficult and continuous process due to the large number (and various sizes) constructed for the Old Croton Aqueduct. "Culvert Hunting" is a fun, engaging, and educational game for all ages, which will ultimately aid in the documentation and location of all 114 culverts present along the Old Croton Aqueduct.

Ventilators

Ventilators were originally placed at every mile along the length of the Old Croton Aqueduct. Although all have been demolished in New York City, many are extant along the Old Croton Aqueduct Trail in Westchester County. These ventilators may be used as part of a circuit-training course, with an associated map or signage developed.

QR codes will also be proposed for placement on small-scale signage at (possibly) each ventilator, which will connect a visitor to online information regarding the structures. As part of "The Ventilator Voyage," each ventilator may be numbered in sequence, with each QR code linking to one piece of a complete text or vocal explanation of the history/significance of the ventilators. The entire story will not be told until all ventilators have been visited!

Gatehouses

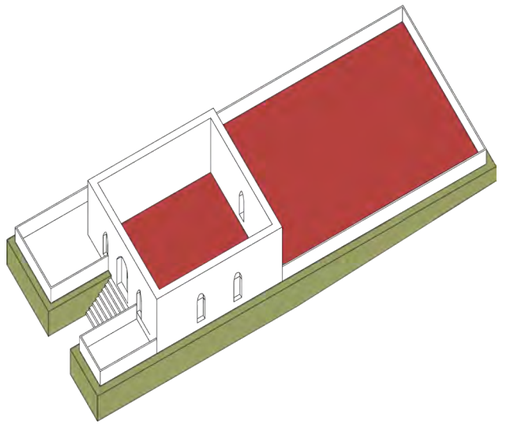
Due to the large size and durability of the gatehouses (located in Manhattan), these structures will best support adaptive reuse. The 135th Street Gatehouse has recently been renovated and reused as the home for the Harlem Stage. The 113th Street Gatehouse was renovated in the early 1990s for use as part of the Amsterdam Nursing Home. Gatehouses that remain unused include the 119th Street Gatehouse, the Central Park North Gatehouses and the Central Park South Gatehouse. Due to its incredibly large scale and prominent location near "Museum Mile" along Fifth Avenue, the Central Park South Gatehouse would provide an ideal space and location for a Croton Waterworks Museum. The High Pumping Station in the Bronx could also provide space for another Croton Waterworks Museum with a deeper focus on the engineering of the system (particularly if any of the internal structure and mechanisms still exist).

A more in-depth discussion of a reuse plan for the 119th Street Gatehouse is now presented: The abandoned 119th Street Gatehouse stands out as fertile ground for interpretative planning due to its location near Columbia University, on the southeast corner of 119th Street and Amsterdam Avenue, as well as its structural integrity (exterior), size, and relation to both the Old and New Croton Aqueducts. The need for interpretation and reuse of the building would promote the understanding of New York City's historic infrastructure and the Croton Waterworks in particular, as well as the potential for using decommissioned structures for new purposes. Proposed long-term interpretation plans for the site include an initial stabilization (masonry and roof restoration, removal of window infill, interior surveying) of the building and lot, followed by a Croton Fountain Design Competition, which would eventually lead to the construction of the winning design in the gatehouse's yard. The original Croton Fountain was erected in City Hall Park in 1842 to celebrate the opening of the Old Croton Aqueduct. Despite its dismantlement in 1870 (to make room for the new Federal Post Office), the tradition of celebrating the Croton Waterworks through fountains has continued elsewhere along the system. In 1972, M. Paul Friedberg designed and installed a contemporary Croton Fountain in City Hall Park that was in place until 1999. The installation of a new Croton Fountain behind the 119th Street Gatehouse would continue this trend of publicly visible tributes to the Croton system and make for an engaging interpretive program. For the entire structure, a new use is proposed that will focus on the historic and current connection between New York City and its rural resources in Westchester County. Both the interior and exterior space may be utilized as a Croton Waterworks New York City-Westchester Center, with the goal of fostering a link between the urban environment and its regional resources. The interior space would be used for programming, including (but not limited to) temporary exhibitions and events exploring this urban-rural relationship. The Center would also incorporate an exploration of historic infrastructure, particularly water systems, for which the urban-rural link is often invisible to the public. The gatehouse's outdoor space would also be incorporated into the proposed program and could be used for previously stated events as well as weekly farmers' markets (featuring regional farms and vendors). Especially important to this reuse proposal is the involvement of stakeholding organizations located in New York City and Westchester County.

Shafts

The Croton Waterworks shafts are associated with the construction and maintenance of the New Croton Aqueduct, which is still active. Although many of the shafts have been either filled in or are capped with masonry headhouses, and are relatively inaccessible to the public due to their active nature, they can nonetheless be interpreted. Projections

Right: Axonometric of the 119th Street Gatehouse, a New York City landmark that is located across the street from Columbia University



via monitors may be utilized at some sites to show their interiors, particularly for a shaft like Shaft 25. Off-site interpretation would include information on the Croton Waterworks website or diagrams/photographs in a museum environment.

Siphons

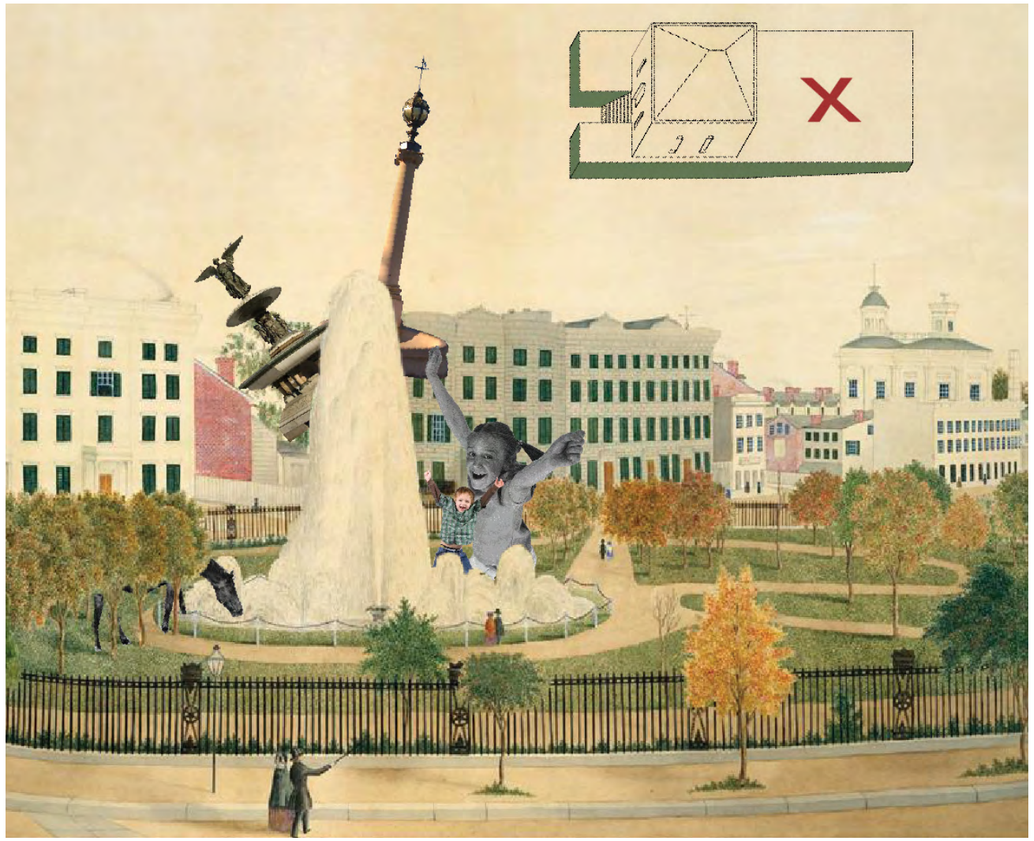
Due to the below-grade nature of siphons, projections on the ground or painted lines showing the length, depth, and shape of the siphons would be effective means of telling the public about these unseen features.

Keepers' Houses

Although six keepers' houses once existed along the length of the Old Croton Aqueduct, only the keeper's house in Dobbs Ferry is extant. Interpretation of both the demolished and extant structures is important to telling the story of how the aqueduct "keepers" lived. The conversion of the Dobbs Ferry Keeper's House into a historic house museum would aid in educating the public about the human aspect of the Old Croton Aqueduct's construction and maintenance. For the demolished structures, "On This Site" signage (with a historic photograph or drawing along with a brief history/significance statement of the structure) could be combined with a physical artistic/architectural interpretation of the houses (like Robert Venturi's Franklin Court in Philadelphia).

Water Towers

Two water towers are known to have existed along the length of the Old Croton Aqueduct: one at 98th Street (between Amsterdam Avenue and Columbus Avenue), which is now demolished and High Bridge Water Tower, which is extant. Besides "On This Site" signage (with a historic photograph or drawing along with a brief history/significance statement of the structure), blue searchlights could be put in place to mark the sites of these once-crucial features of the Croton Waterworks system.



Above: A proposed architectural competition poster calling for a new fountain design for the 119th Street Gatehouse

Holistic Digital Interpretation Methods

Digital media has expanded the versatility and availability of interpretative strategies. These outlets provide on-demand access to immense amounts of information, completely reshaping the way we encounter the world around us. In particular, the Internet, social networking services, and cell phones have drastically transformed how knowledge and experience are exchanged. No longer are we required to physically visit a building or travel to a museum in order to engage with and learn more about it.

We believe that the Croton Waterworks can benefit tremendously from these types of digital media. We recommend a variety of digital interpretative strategies that will work to engage and educate those who use them. In the following pages, we will outline how a smartphone application, an informative and interactive website and blog, and the use of quick response (QR) codes can be integrated into a holistic interpretative approach. In addition, we acknowledge many other existing or in-development tools that may prove useful in future interpretation schemes for the Croton Waterworks. For example, Google has recently introduced Google Goggles and Google City Tours, two applications that have already become indispensible tools for interpretation. Other potential resources include Broadcastr, a website and application dedicated to providing location-based stories, and GPS My City, another application that provides informative walking tours. It is through this multitude of digital media technologies that we envision the Croton Waterworks reaching more people than ever before.

Website and Forum

Recognizing the prevalence and power of digital media as a means of outreach and raising awareness, our group created two websites and a social media account on Facebook in order to establish an online presence. These resources are available to anyone with Internet access, which has allowed our group to address a broad and diverse group of individuals and organizations. Our participation in these online forums aims to fulfill two specific needs: to make our research and progress available to the general public and to encourage public discourse of the Waterworks system. These media also provide an off-site means of interpretation.

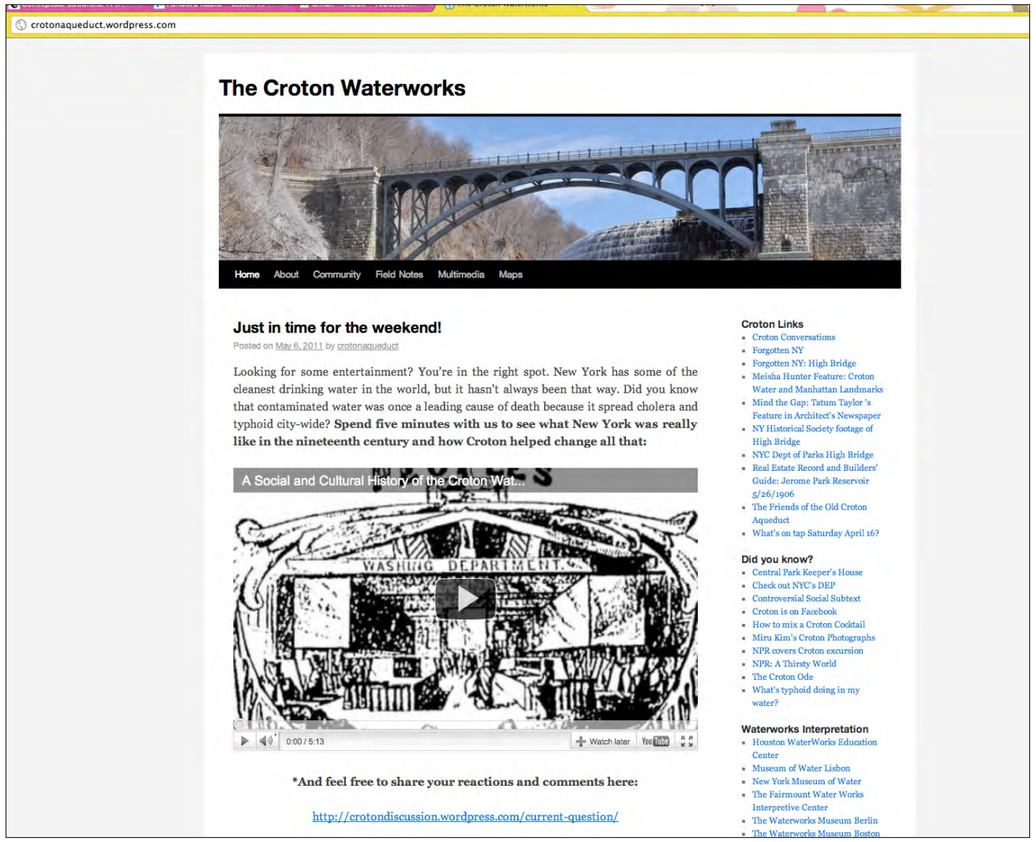
The Croton Waterworks Website

The Croton Waterworks website has served as a repository for historical research focused on system functionality, typologies, and individual structures. The website also functions as a point through which the public can access our group mission statement, images, statement of significance, videos, maps, oral histories, and Croton-related stories. We have included a varied program of references for visitors to access. These range from links to institutions like the Fairmount Water Works Interpretive Center and the Waterworks Museum in Berlin to relevant news stories like NPR's urban exploration coverage and The New York Times' exposé on hydrofracking. The site also contains a "Did You Know" section that highlights fun facts and stories such as the recipe for a Croton cocktail and Miru Kim's photographic installations.

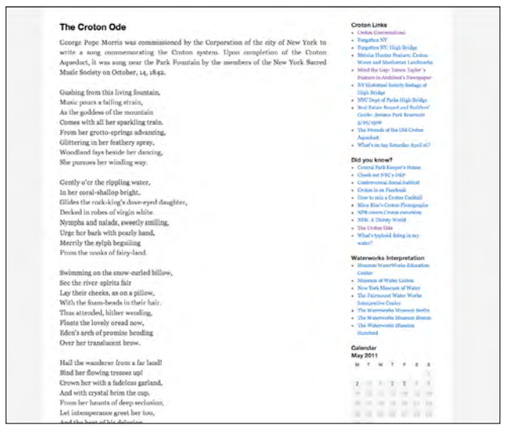
The Croton Conversations Forum

Croton Conversations is an online forum that grew out of our presentation at the GSAPP Alumni Weekend. Despite an engaging discussion at the event, we believed that the conversation should continue and decided to engage the community in an open space without constraints on time or place. Croton Conversations is aimed at generating discussion about infrastructure-related preservation, regulatory challenges, and existing and proposed methods of interpretation for the Croton Waterworks. The site is organized as an open forum in order to welcome those from outside the Columbia community to comment. To reach potential audience members, we created an email campaign through MailChimp and distributed emails prompting contacts to "join in the conversation" with a link to our site embedded within the message.

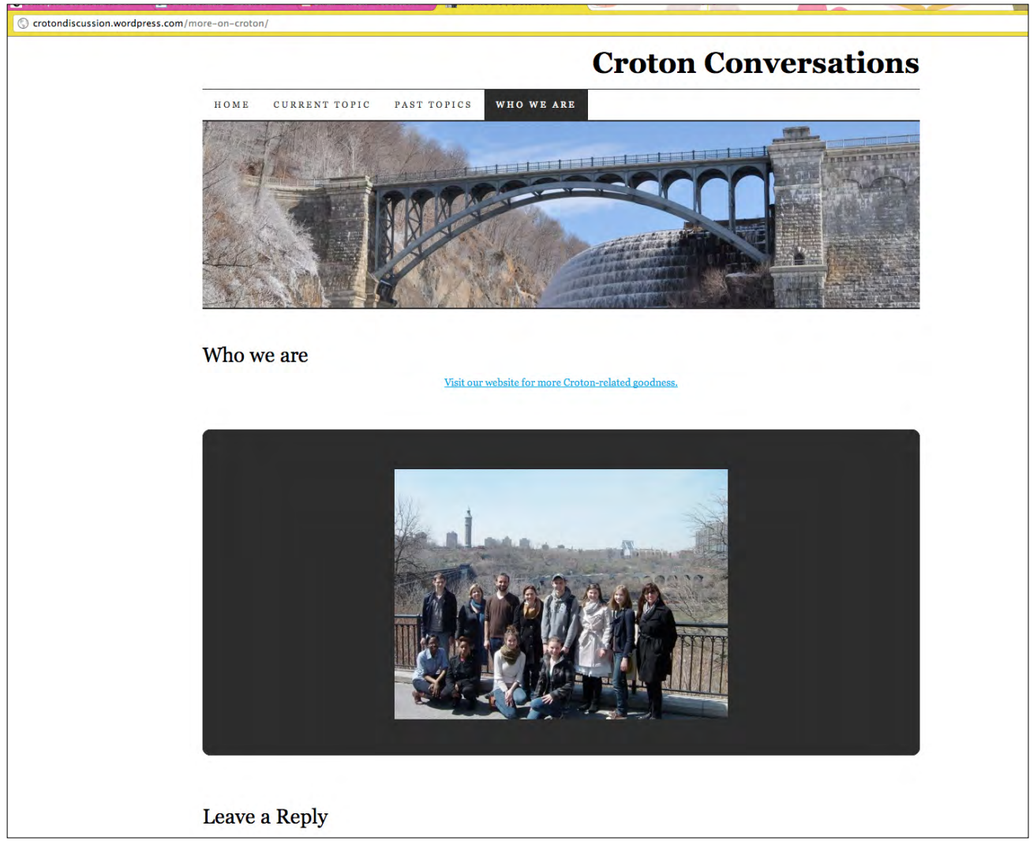
The Croton Conversations forum has allowed us to collect ideas for interpretation and receive a range of feedback on our proposed plans. For instance, many people responded with suggestions for alternatives to smartphone technology such as foldable, wallet-friendly maps, a deck of cards, and references to reading material. These ideas were helpful to our interpretative plan and gave us a sense of the types of resources that people would actually put to use if made available.



This Page: Sample webpages from the Croton Waterworks website



Facing Page: Sample webpages from the Croton Conversations forum



Past Topics

Conversation Topic from April 21st: ***Technology like smartphones is being used more and more to guide visitors at historic sites, in museums and along trails. But what if the battery dies? What if it's raining? What if visitors aren't carrying a smartphone? What if the site spans 41 miles of economically, geographically and demographically diverse land like the Croton Waterworks does? Beyond sign-posting and smartphones: what are some ideas for reaching out to everyone that uses this resource?***

Responses and Comments

JMF on April 26, 2011 at 12:06 am

Not everyone carries a smart phone. If you wanted to provide information for those who see your signs, perhaps you could provide a phone number for an audio guide, or a web address linking to information, history and photos.

Jennifer Joy Cagasan on April 26, 2011 at 12:14 am (Edit)

How about the creation of a wallet size foldable map + general history? For economic reasons, perhaps make it one-page double sided printer-friendly layout that folds into 6 sections and can be downloaded from this fabulous website.

Janet W Foster *on* April 26, 2011 at 3:23 pm (Edit)

Smartphone Application

It is currently estimated that there are more than 83 million mobile phone web users in the United States, 31 percent of whom own smartphones, a number that is projected to increase to nearly 50 percent by the end of 2011.[1] These brief yet telling statistics substantiate the need for digital interpretative strategies. To address this, we have developed our own smartphone application dedicated to the Croton Waterworks. Such a platform could either be used as it is presented here, or referenced as a simple template for future software development. This specific mockup allows and encourages users to engage with the history of the Waterworks through general information options as well as more interactive approaches, as illustrated through a walking tour component. It is also designed to promote the sharing and exchange of information across various platforms.

History of the System
App users could choose to learn about the overall history of the Croton Waterworks, while also having the ability to access informative videos and images.

Search the System
Users could discover the history of individual features of the Croton Waterworks, searching by feature name, area, or typology.

Search by Name Results
Searching for specific structures would allow users to read about their history, while also having access to structures' fiches, designation reports, and audio or video recordings. These same options would be available when searching by area or typology.

Image Results
Each structure would have numerous historical and contemporary photos to help illustrate the magnificent works of architecture and engineering found along the Croton Waterworks. The application would also encourage users to submit their own pictures taken at any structure or area of the system.

Walking Tour
The most interactive feature of the application would be a walking tour. With this option, visitors could plan their own personal walking tour by custom-choosing structures or areas of interest. This feature would also enable users to select specific structures and learn about their history, much in the same way as the general search feature. This option may prove the most successful in actually bringing people to the system.

Links
A links section would allow users to explore the Croton Waterworks beyond the smartphone application, by accessing relevant websites like those of the National Park Service, the Friends of the Old Croton Aqueduct, and the New York City Department of Parks and Recreation, among others.

[1] Nielsen Media, "State of the Media 2010: U.S. Audiences and Devices," *NielsenWire* (2010); see also Roger Enter, "Smartphone to Overtake Feature Phones in U.S. by 2011," *NielsenWire* (26 March 2010).

Top Left: The Croton Aqueduct App Logo and Homescreen

Top Right: App navigation diagram for the "Search by Name" feature

Bottom Left: Navigation diagram for the "History of the System" feature

Bottom Right: Navigation diagram showing the various ways to search for information about the Croton Waterworks within the app

Top: App navigation diagram showing how images could be provided for each site

Center: Diagram showing the various features of the "Walking Tour" part of the app

Bottom: Navigation diagram of the "Links" feature

QR Codes

QR, or "quick response," codes have increased in popularity in America as of late, but have been around for more than a decade in Japan. They are similar to bar codes, and can be scanned by a smartphone's camera to link to a specific web page. Since many smartphones come with QR-scanning abilities automatically included, they would allow people to find out about the Croton Waterworks without any prior knowledge of its existence. These QR codes can link to text pages, an audio file, or even a video on YouTube. The two codes on the center and bottom right link to the Croton Waterworks website and an interpretive Croton video, respectively. QR codes have begun to be used for interpretation of historic sites in the United States. For example, QR code signs can be found all along the Augusta Canal National Heritage Area in Georgia (top right).

QR codes are readable at many sizes, and simply require a flat surface to be placed on. What's better is that QR codes are inexpensive and can be placed in many different locations along the Croton Waterworks, and could be especially useful in urban locations where aboveground signs of the system are not apparent. QR codes can also be printed on vinyl decals to attach to the ground or a vertical surface, or they could be painted using a temporary paint directly on the sidewalk or street. QR codes promise to become an indispensible tool for all types of interpretative programs.

Additional Digital Media

Broadcastr

Broadcastr is a developing social media platform that allows for location-based story recording and archiving. Essentially, it enables a user to record anecdotes, local lore, walking tours, reviews, and oral histories to a large location-specific database, which can then be accessed and enjoyed by anyone. The Croton Waterworks can benefit from this in a variety of ways, such as the recording of site-specific information based on a structure's history, or of anecdotal stories for the system in general. Broadcastr's webpage states, "Users can take a GPS-enabled walk as stories about their surroundings stream into their headphones, like a museum tour of the entire world. Users can record their own content, create playlists, follow their friends, and share on Facebook." http://beta.broadcastr.com/

GPS My City

A simple and effective alternative to an iPhone or iPod Touch application, built from the ground up, is GPS My City, which has already developed a software platform dedicated to walking tours. What is unique about GPS My City is that the framework is already in place, requiring only textual and graphical information to be submitted. Essentially, users are able to author their very own walking tour without the daunting task of having to physically code it themselves. This type of application can also offer directions, maps, audio, and video features.
http://www.gpsmycity.com/

Google Goggles

Still a work in progress, Google Goggles is one of the most innovative digital technologies to be developed recently. Simply put, Google Goggles is image recognition software for phones. Goggles allows users to take a picture of a building, logo, book, artwork, and so on, and quickly identify what it is they are looking at. For instance, Google Goggles can quickly identify a picture of the Empire State Building and provide a list of informative links and images relevant to that very building. This software is still relatively new and continues to be fine-tuned. However, some structures of the Croton Waterworks, such as the Jacqueline Kennedy Onassis Reservoir and the New Croton Dam, have proven recognizable by this program.
http://www.google.com/mobile/goggles

Google City Tours

Another innovation from Google is Google City Tours, a web-based technology that creates and manages travel itineraries for most major cities. However, what is most important about this software is its ability to upload and customize a user's own Google Map, including specific sites and structures, to create his or her own itinerary. For example, a Google Map containing all or some of the Croton Waterworks' structures could be uploaded and then made into a walking tour or multi-day adventure. With users' information, Google will produce maps and directions to and from sites, and will also provide information about those structures.
http://citytours.googlelabs.com/

Holistic Signage Interpretation

As a continuation of our holistic approach to the interpretation of the Croton Waterworks, we have developed a universal signage scheme using a method of branding for the system in order to help connect the fragmented sites of New York City to the picturesque berm in Westchester County. One of the major problems with existing signage along the Croton system is that many different methods of branding have been employed. For instance, the NYC Department of Parks and Recreation use their own logo on signs, while many signposts in Yonkers and the Bronx have only the letters OCA (Old Croton Aqueduct) on them. Our goal is to enable people to immediately recognize a structure as being part of the Croton Waterworks.

One of our plans to visually connect the entire Croton System is through the painting of a temporary blue line through the streets of New York City and on the Croton trail through the Bronx and Westchester County to show the uninterrupted path of the conduit of the Old Croton Aqueduct. Similar projects have been permitted by the Department of Transportation (DOT) in the past, as long as the line is temporary. However, the paint used for the line can last from six months to a year, which means potentially millions of people could learn about the Croton Waterworks when they discovered the blue line. The DOT recently participated in a similar project in which a line was painted in Lower Manhattan that exposed the old shorelines of Manhattan and the extent of the city's infill.

We are also proposing a signage scheme with three different types of signs, which may be assigned to individual sites based on appropriateness. In addition to visually connecting the waterworks through visually consistent signs, we also wanted to take into consideration the varied sizes of sites as well as the different locations of structures along the system. An appendix on page __ outlines many of the Croton Waterworks' structures and their respective recommended types of signage. We believe that providing written and visual information on-site along with our website and QR code for those who do not have time to read the sign—or for those who want to learn more—will allow for large-scale dissemination of Croton information to both locals and tourists.

Instead of designing a new large signage scheme, we would like to work with Croton signs that have recently been proposed by the New York City Department of Parks and Recreation, designed by Nancy Owens Studio. These signs are three-dimensional assemblages consisting of three connected panels that form a triangle. Each panel is 7'-6" tall and 15 3/4" wide, and their size and design will easily grab the attention of passersby. These signs are already funded, but are still pending approval from the Landmarks Preservation Commission as well as community boards and park conservancies. Thirteen signs have been proposed in all, encompassing some of the major Croton Waterworks sites in New York City. We propose to employ this specific signage system for certain sites in Westchester County as well, such as at the New Croton Dam in Croton-on-Hudson and at the Sing Sing Kill Bridge in Ossining.

An important component of our signage plan is the addition of a medium-scale signage type that would be as informative as the large signs, but on a much smaller physical scale. These signs will consist of a three-panel system—similar to Nancy Owens

Studio's designs—but these panels will not form one mass. This will allow the signage to be less invasive, as the space taken up by them could be broken up. Each medium-scale panel will stand 33" high and 13" wide. The color palette of this signage type will be crucial. We will use a palette that relates to the colors used on Nancy Owens Studio's signs, which includes primarily green and brown earth tones. Since the Croton Waterworks runs through very different environments, we propose differentiating the coloration of city signs from the more rural signs, using a brighter spring green for the urban signage and a more muted sage green for the signs in less dense areas. In Westchester County, there is a larger focus on viewshed, as many natural elements have been preserved surrounding Croton structures. Therefore, muted colors that would not be too distracting from nature would be most appropriate for these sites. In New York City, the primary goal is for people to notice the signs, as the Croton Waterworks is generally less visible and less known within the city.

The signs use two typefaces: Clarendon and Bau. Clarendon is used for the larger titles and text elements in order to

grab the attention of a passerby, while Bau is used for body text as an easy-to-read sans-serif typeface. The medium-scale signs could be fabricated in a variety of ways, depending on the location. They could simply consist of laminated paper, or they could be printed on a lightweight metal or on a UV-resistant plastic. Whatever way they are fabricated, it is important that they could be easily made and easily replaced, and that they be inexpensive to produce. Just as the signs could be constructed in several ways, their method of attachment could also vary depending on the site. For example, at sites where there is already a fence, the signs could be nondestructively bolted to the fence, while at other sites they may be placed directly on a wall surface. The wide variety in site conditions makes it almost impossible to propose one fabrication solution for the entire system, but we hope to at least give a unified visual appearance to all of the interpretation signage along the Croton Waterworks.

The first panel of these medium signs will include general information about the Croton Waterworks accompanied by historical pictures. The Croton manhole cover will be prominently featured at the top of this panel, drawing parallels to the other two signage types. The content and layout of this panel will be identical for every site that uses the medium-sized signage scheme. The second panel will feature site-specific information, supplemented by photographs and diagrams. The outline of the Croton manhole cover is placed toward the bottom of this sign, with a unique number for each site in the center. These sequential site numbers will emphasize the continuity of the Croton trail, and encourage people to explore other sites along the trail as well. A map with all of the numbered sites will be located on our website, and the numbers will also correspond to our smartphone application (see page __). The final panel will primarily consist of a map of the entire Croton Waterworks. Within this map, we will mark where the visitor is in the context of the system. Toward the bottom of this panel is a QR code within the outline of a Croton manhole cover that, if scanned on a smartphone, will link the user to a webpage focused on the specific site.

The smallest signs in our scheme will feature QR, or "quick response," codes (see page __ for a thorough explanation of QR codes in general as well as of those made specifically by our group). These signs may be used for sites that are very small or that have significant natural elements around them that would be disturbed by the presence of larger signs, as well as for sites with pre-existing signs that are well-maintained and informative. We have placed our QR codes within the symbol of a Croton manhole cover as a connection to the Nancy Owens Studio sign design. The QR code signs could be made by using temporary paint similar to that proposed in the painting of the blue line along the path of the Old Croton Aqueduct. QR code signs could also be printed on vinyl decals that could be temporarily attached to a variety of surfaces.

Above: Medium-sized signage panels created for the 135th Street Gatehouse following the design guidelines established by our group

Right: Rendering of the medium panels installed on the wall of the 135th Street Gatehouse

Top: Rendering of the proposed blue-painted line running the length of the Old Croton Aqueduct, as well as a temporary QR code sign painted on the sidewalk

Facing Page: Rendering of medium-sized sign panels installed on the New Ossining Weir

Signage Design Guidelines

Panel 1: General Croton Waterworks Information

Panel 2: Site-Specific Information

Panel 3: Overall Map and Additional Resources

Logo based on Actual Croton Manhole

Color Palette for Rural Croton Signage

Color Palette for Urban Croton Signage

Interpretation through Education

In developing an interpretation plan for the Croton Waterworks, our aim is to provide the public with a means of understanding the system, remnants of which they might walk past—or over—without realizing the Waterworks' historical significance. Education is an underlying goal of much of our plan, from signage to mobile phone applications, as we view information access to be crucial for lasting preservation. In particular, we have focused on videos and curricular recommendations as tools for sharing the story of the Waterworks with a broad audience. We have introduced a series of brief educational videos, featured on our YouTube channel and website, that familiarize viewers with the history and functionality of the Waterworks. Readily available and easily passed on, this multimedia engagement has already expanded the reach of our work and provides an element of ensured longevity online. We hope to further increase long-term commitment to preservation efforts by encouraging teachers to include the multifaceted history of the Waterworks into their curricula. By exposing students to the need for preserving the system's structures and stories, we aim to foster among the next generation a consciousness of and respect for the built environment. Sustained awareness created by both the circulation of educational resources such as our videos and the incorporation of the Waterworks' history within local classrooms will continue to generate attention for the system's preservation beyond the time constraints of our project.

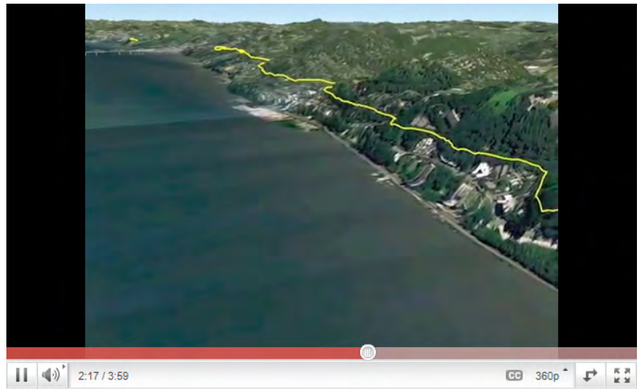
Educational Videos

Combining images, audio, and text, the medium of video possesses great potential for conveying large amounts of information in relatively short periods of time. The massive popularity of web-based services such as YouTube confirms video's status as a favored means of communication, education, and entertainment among a truly global population. The development of user-friendly video-editing software, which comes preinstalled on many consumer-grade computers, as well as the widespread availability of video-capture functions on cell phones and digital cameras, have also contributed to the ubiquity of video. Capitalizing on these conditions in order to advance our interpretive mission, we have begun to develop a series of short videos that focus on various aspects of the Croton Waterworks. In less than four minutes, our first video gives a brief historical introduction to the system, explains some of the difficult nomenclature issues that arise out of the use of the terms "Old" and "New" Croton Aqueducts, and provides a very general technical sense of how the system works. A second video, equally brief, examines the Waterworks from perspectives offered by social, cultural, and labor history. Additional, as-yet-unmade videos could cover myriad topics, such as:

—The engineering of the Croton Waterworks
—City/state politics and the Croton Waterworks
—The impact of the Croton Waterworks on the landscape
—The architecture of the Croton Waterworks
—A biography of David B. Douglass/John B. Jervis
—A profile of the High Bridge (or any other specific iconic structure)
—A chronicle of the restoration of a specific structure
—The neighborhoods that the Aqueducts pass through, then and now
—Past and present attractions and amusements associated with the Waterworks

These videos could be accessed directly from YouTube or from our website, and links to them could be sent to other relevant historical or educational organizations, who would hopefully post them to their own websites. For instance, the video dealing with the labor history of the Croton Waterworks could be sent to an organization like the Lower East Side Tenement Museum, which might be interested in publicizing the video because of its treatment of nineteenth-century immigrant issues. In such ways, awareness of the Croton Waterworks could be expanded to an audience of people who might not have discovered it while staying within their own spheres of interest. It should also be noted that the subject of the Croton Waterworks presents a particularly compelling subject for a feature-length documentary film, similar to those that run regularly on public television stations.

The considerable efficacy of the medium of video lies in its adaptability to the background and interests of the viewer. A single video can be packed with enough hard data to inform serious historians, while at the same time conveying several simple, broad statements to the layperson who stumbles across it. Everyone walks away with something. We recommend that any future interpretive effort for the Croton Waterworks take advantage of the potentialities of this powerful medium.



This Page: Stills from the educational film *Introduction to the Croton Waterworks*

Facing Page: Stills from the educational films *A Social and Cultural History of the Croton Waterworks*, Parts 1 and 2

Curricular Recommendations

Education is integral to our efforts to preserve and interpret the Croton Waterworks, as we aim to increase public knowledge of the system's historical, architectural, engineering, and cultural significance. In order to secure the legacy of the Waterworks, we believe that students should become informed about the history of their surroundings and conscious of the infrastructure that has changed the way society lives. To introduce students to these stories, both inside and outside of the classroom, is to educate future stewards of the built environment.

One Teacher's Approach

Carl Oechsner, who taught seventh grade social studies in Ossining for forty years, is well known in town for his memorable field trips to the Aqueduct. (Find out more about Oechsner and his classes in the Oral History section, starting on page __) According to Oechsner, "I think every child should be exposed to the Croton Aqueduct, even if it's just...a week's background in class, and put them on a bus, take them over and do a piece. You don't have to do the whole thing, just take them for two or three miles. And there's parks along the side, and you can actually sit down on the trailway and have a picnic lunch." Oechsner hopes that more teachers in the communities along the Aqueduct's path will take advantage of their proximity to this historic resource. "If they knew that other teachers have done this, and it is being done in some communities, and there are organizations like the Friends of the Old Croton Aqueduct, I think more and more teachers would do that."
Oechsner's approach was to begin by teaching his students about the historic context—at the local, state, and national levels—of the Waterworks' construction in the mid-nineteenth century. Introducing the Waterworks in conjunction with math, science, and English teachers, who also taught about the system through the lenses of their respective disciplines, Oechsner included discussions of the architectural styles of the period, the engineering aspects of the system, and notable characters who lived along the Aqueduct trail. He assigned research on these topics, which built up to the much-anticipated field trip to let students experience the structures they had been learning about. Encouraging the students to take photographs and mental notes along the way, he led them on a tour of a portion of the trail. Afterward, he divided the class into groups of four or five, who each developed a ten-minute presentation featuring maps, models, photographs, oral interviews, and articles. At the end of the five-week unit, the students presented their group projects to a panel of local officials, architects, engineers, naturalists, and parents. Because of this experience, many of Oechsner's former students continue to contact him to reminisce and thank him for introducing them to the Croton Waterworks.

Meeting Educational Standards

Teachers might fear that, given set curricular requirements, they lack the amount of time that Oechsner devoted to teaching his students about the Croton Waterworks. However, the layered history of the Waterworks—from its functionality as a water system to the social implications of its construction—can be taught in adaptive ways that fulfill educational standards. Following are some of the New York City learning standards (drawn from the New York State standards and available at http://schools.nyc.gov/academics/) to which lessons about the Waterworks could be applied:

Science:
Grade 8, Unit 4: How does human consumption of resources impact the environment and our health? Environmental concerns: acquisition and depletion of resources, waste disposal, land use and urban growth, water pollution
High School Earth Science, Unit 4: Water cycle, Hydrology (stream mechanics, ground water)

Social studies:
K-8 Thematic Strands: The importance of understanding the past; the complex relationship between human beings and the environment; the role of resources/their production and use
Kindergarten, Unit 4: How do neighborhoods meet our needs? Neighborhood walks and maps, special features, landmarks and monuments, neighborhood design/boundaries/architecture
Grade 1, Unit 3/4: There are important places in communities; there are natural and man-made resources in communities; communities meet people's needs
Grade 2, Unit 1/2: How does geography influence where people choose to live and why? How and why did New York City change over time?
Grade 4, Unit 5: What was the effect of industrial growth and increased immigration on New York?
Elementary School Standard 1: History of the United States and New York
Elementary School Standard 3: Geography
Middle School Standard 1: History of the United States and New York
Middle School Standard 3: Geography
High School Thematic Strands: The importance of understanding the past; the complex relationship between human beings and the environment; the role of resources/their production and use
Grade 9, Unit 1/2: Is geography the most pivotal factor in human development? How does progress change a society's/civilization's wants and needs?
Grade 9, Unit 1/2: Geographical issues today
Grade 11, Unit 3: Adjusting society to industrialism; urban growth/problems: slums, inadequate water and sanitation services
High School Standard 1: History of the United States and New York
High School Standard 3: Geography

Sample Curriculum Ideas

If teachers in New York City are still not convinced that they would have the time to take their students to commune with the Croton Waterworks in Westchester County, there is no need to forgo the experiential aspect of introducing students to the system. While bringing the Waterworks' story into the classroom will effectively broaden students' consciousness of historic infrastructure even sans field trips, it is possible for teachers to bring the class to the Waterworks without leaving the city. The following curricular idea would ideally feature a visit to the Jacqueline Kennedy Onassis Reservoir and gatehouses in Central Park, as well as encourage students to engage with and think critically about historic documents. This activity could be adapted to focus on other structures along the system's path. A significant amount of such documentation is available; see our bibliography for further resources.

Touring the Central Park Reservoir: Then and Now
Grade level: High school
Objectives: To allow students to experience the Croton Waterworks, both through exposure to primary sources and a visit to the referenced sites, and to provide them with a framework by which to consider the significance of and changes undergone by the system through time
Begin by introducing students to the system's history and function; depending on the focus of the class, this could include examining its significance in the context of engineering and architecture (perhaps by comparing the different structural typologies) and/or of social history (in terms of the fires and diseases the Waterworks was built to eradicate, the labor that produced it, and the celebratory response of local residents). Use historic maps as a means of conveying to students the extent of the system and emphasizing its vital linkage of Westchester County to New York City.

In order to focus on a more easily manageable portion of the Waterworks, ask students to read the following primary sources (available online). The articles are not long and would be well-suited for in-class reading and discussion:
— William H. Rideing, "Croton Water," Scribner's Monthly 14, no. 2 (June 1877): 170-72, http://tinyurl.com/CentralParkReservoir. This article provides a good overview of the history of the Croton Waterworks. In the section assigned to students, "VI. The Reservoirs," the author visits the Central Park Reservoir (now the Jacqueline Kennedy Onassis Reservoir) and is taken on a guided tour of the South Gatehouse.
—"From Croton to Town," Appletons' Journal of Literature, Science, and Art 8 (July to December 1872): 21-22. , http://tinyurl.com/CentralParkReservoir1.
After following the course of the Aqueduct down from the Old Croton Dam (replaced at the turn of the century by the New Croton Dam), the author recounts in these pages his guided tour of the South Gatehouse, complete with illustrations of the structure's now-closed interior.
—"Local Intelligence: The New Reservoir," The New York Times, 30 June 1862, http://tinyurl.com/CentralParkReservoir2.
The New York Times announces the completion of the South Gatehouse at the new Central Park Reservoir and invites the public to visit and marvel at this feature of the "Croton Aqueduct, which, with these latest connections, presents a specimen of engineering skill and Metropolitan enterprise, before which the old Roman aqueducts pale into insignificance."

Take students to Central Park to walk around the reservoir and visit the three gatehouses, encouraging them to make connections between what they have studied and what they are experiencing. Upon viewing the explanatory signage in the windows of the South Gatehouse, ask them if there is information from in-class readings and discussion that they would suggest adding to the signs. Throughout the trip, urge students to take notes—written or mental—and if possible, photographs and video, in preparation for the next segment of the lesson.

Back in the classroom, assign students—individually or in groups—to produce their own accounts of their reservoir tour. With the three articles they read in mind, students should consider the following questions: How was their visit different from those recounted by the first two articles and advertised by the third? How would they tell others about their own visit? Why is it important today for people to know about and continue to visit the reservoir and gatehouses? Creative expression of their experience could feature photographs, illustrations, written descriptions, video, or audio.

If your class completes this assignment, please let us know; we would love to feature their work on our website!

Online Curriculum Resources

For more information about the Croton Waterworks that might be useful in teaching about the system, visit our website: http://crotonaqueduct.wordpress.com/. Friends of the Old Croton Aqueduct are also involved in Waterworks-related educational programming: http://www.aqueduct.org/. Other examples of infrastructure-centered curricula are available through such organizations as the National Canal Museum: http://www.canals.org/educators/My_Curriculum.

Oral Histories

The Croton Waterworks' century-and-a-half and forty-one miles have left a trail of not only structures but also stories. As it wends its way, both seen and unseen, through varying communities, the Waterworks creates different senses of place and types of human interaction. Remnants of the system's conclusion in Manhattan are quiet: fragments of the Murray Hill Reservoir lie generally unvisited in the New York Public Library, and it is easy to walk past a gatehouse and, without knowing its significance, perceive it as simply one more handsome structure fading into the crowded city's built landscape. For residents of Westchester County, where the system originates, the Aqueduct has a louder presence. They might not be acquainted with the history of the Waterworks—although a number of residents at least know of its underground existence—but at some point, they have likely walked or biked along the Aqueduct's path marked by periodic ventilators and culverts; its raised berm might even run through their backyards. To supplement our interpretation plan, we have conducted oral histories with longtime residents of Croton-on-Hudson and Ossining, two towns where the Waterworks are integrated into everyday life.

We hope that the following oral histories are only the beginning of an ongoing collection of memories from residents in the diverse communities traversed by the Aqueduct. Oral history is a vital tool for discovering and recording the human impact of the structures we are working to preserve. By safeguarding and sharing the stories of people's experiences with the Waterworks, we can convey the importance of protecting these structures and cultivate a more widespread connection to them at a personal level.

Oral History 1: Carl Oechsner

To Carl Oechsner, a beloved longtime middle school teacher known throughout Ossining as Mr. O., the Croton Aqueduct is "a diamond, because here is this narrow, linear, green space filled with history... It's this wonderful resource, and unfortunately a lot of our citizens in our communities have no clue." In Ossining, however, many residents remember the history of the Croton Waterworks from field trips to the Aqueduct in Mr. O's social studies class. According to Ossining policeman Scott Craven (the subject of Oral History 2), "One man made all the difference in the world to this community for knowing about the Aqueduct." That man is Mr. O. (pictured during the filming of his oral history on the facing page)

What follows is an extract from the oral history conducted on April 12, 2011, by Tatum Taylor at the Croton Free Library. More extensive videos and transcripts from the interview will be available on our website: http://croton-aqueduct.wordpress.com/.

Hello, my name is Carl Oechsner. I am presently a resident of Croton involved in local history—actually, I like to refer to it as "backyard history." I was a social studies teacher in the Ossining school system for forty years, and during that time, I worked with my seventh graders a lot on backyard history. One of the themes that I focused upon was the history of the NYC water supply system. People always ask me, "Well, how did you get interested in the water supply system, of all topics?" And I guess it goes back to my childhood because when I was born and raised in downtown Ossining, my father worked as the baker in the Sing-Sing Correctional Facility—then Sing-Sing Prison—and we lived right across the street. So I had to walk to school—it was about four blocks to my elementary school—and I walked on this kind of dirt pathway. I never knew what it was, and I do remember that there were stones on both sides of this pathway, and that along the path was this stone figure that came out. It was like a monstrous stone structure that came out of the bottom of the path. Never really looked at it, never really noticed it for the most part. So, that was the Old Croton Aqueduct that actually still runs today through the middle of the Village of Ossining. So I think one of the motivating factors was, when I went through the Ossining schools, none of my teachers—through no fault of their own—ever mentioned the history of the Hudson River Valley, never mentioned the history of the Hudson River, never mentioned the history of Sing-Sing Prison, never mentioned Andre and Arnold and West Point, and they certainly never really talked about the water system. So when I graduated from college and went to the United States Army and came back, got a job as a teacher in Ossining, I think it was kind of my genealogy. It was kind of my background and desire to not only find out more about local history itself, but it was my childhood that kind of started to come out.

(...)

When I was teaching at Ossining at the middle school, my curriculum was simply backyard history, or local history, and one of my themes was to try to get the kids out of school, and get them into the streets to study architecture, to study a variety of things. The Hudson River, restoration of downtown Ossining, because we were going through in the 1970s, 80s, even into the early 90s, going through some urban removal—urban renewal—whatever you wanted to call it. So the kids were always working on projects, etc. One of the key times of the year, we took the kids on the aqueduct in the spring and in the fall, and we walked over a period of five school days, not successive but throughout the year. We would take them from Croton all the way down to Van Cortlandt Park in Yonkers, using buses; we would do, oh, five to six miles each trip. Lunch was planned; I had chaperones of course going with us, etc. And what I would do is, I would teach that particular part of the aqueduct, let's say the Tarrytown-Irvington-Dobb's Ferry portion. I would show them slides and show them photographs and teach them about that particular

segment, whether it was the architecture, the social history, the Revolutionary War, what was going on during the war, Native Americans, whatever I could tie in chronologically to that particular piece. So I would pretty much hammer at them for about a week to two weeks. They took tremendous notes, and we had lively discussions, and I could feel the energy building in the class. Again, we're talking about 130 kids over a school day, right, broken into about 6 classes, but...one of the exciting things for me as a teacher was to feel the energy growing, like, "We wanna go, we wanna go, we want to see these things." Because I was kind of teasing them over that two week period, like, "Well this is what you're going to see, I won't show you too much of it, but this is one of the things you're going to see."

As far as the aqueduct itself, the trail, I'm not talking about buildings along both sides of the aqueduct, but, what did the kids find fascinating from going from the classroom to actually getting off the bus, getting their little hiking sticks and tying their sneakers and putting on their hats and their backpacks and they had their lunch with them, and off we would go...They were interested in things like the stone sides of the aqueduct, the fact that John Jervis, who was the chief engineer, and his predominantly Irish workmen put stones along the outside of the aqueduct...The aqueduct was built primarily of stone, cement, and brick, and then covered in earth, and then stones were laid on the sides of the aqueduct to prevent water from getting down into the aqueduct itself, and to prevent erosion, etc. And the kids used to love the sidewalls of the aqueduct, and when they could, when I felt it wasn't too dangerous, I would actually let them crawl up and down the sidewalls. Sometimes it got a little scary, like down at Sleepy Hollow Cemetery, where it crosses the Solemn River there, it's got to be 150 feet high. And there were times when the kids—you know, I'd say to the kids, "Okay, you can go up about 20 or 30 feet, but then you have to come back down, because I don't want anyone getting hurt." They were just, they were so excited, they would scramble up, and up they would go, and I'd have parents standing next to me going, "Mr. Oechsner, do you think maybe this is a little too dangerous?" And I would say, "Yes it is, but I think, you know, I think they can handle it, and let's see how they do," and I must admit to you, those were nervous times. But when those kids—some of them, some of those were challenged kids—when those kids would make it to the top of the side of that wall, to see the expressions on their face, and to see the fact that they had done it, and here was this 1842 piece of architectural engineering history that was still there in their backyard—it was kind of exciting stuff.

Another thing that the kids loved were the culverts, which were tunnels that were built by the engineers either underneath the aqueduct or over the top of the aqueduct. The job of the culvert was to divert water from streams that were running from above the aqueduct down to below the aqueduct. So whenever there was a storm...or there was freezing in the spring from winter snow, the water would come pouring down over the top of the aqueduct, so the engineers had to make sure that that water was diverted or redirected so that it wouldn't actually hit the side of the aqueduct or the upper part of the aqueduct where you'd have erosion and the aqueduct would have collapsed. And of course from 1842 until the 1950s, the Old Croton Aqueduct pretty much took care of the water needs of the city of New York, so it was a valuable, valuable resource for the city. Another thing that the—and the kids, some of the, some of the culverts were so small you could just put your hand through them and of course those are little culverts that probably run twice a year when there's a heavy rain. Then there were other culverts where you could actually walk through, you could actually drive your car through. And the kids loved that. "Mr. O, Mr. O, can we go through the aqueduct, through the culverts?" I used to say to them, "When you're inside the culvert, be careful, but look at the stonework. Look at the incredible stonework that those engineers and artisans and stonemasons, what they did in 1842. I mean, you don't see work like that anymore."

And a third thing that the kids loved on the aqueduct, especially loved, were the ventilators. The ventilators were put in each mile along the pathway of the aqueduct to allow fresh air and to relieve the water pressure inside the tube. And they're absolutely wonderful because they're made of different stone. The engineers chose whatever stone they found in whatever community they were in, so when you're in Croton it's kind of a granitey, a granitey, kind of a brownish stone. When you get into Ossining, you're dealing with a limestone; it's called Sing-Sing marble because much of it was quarried at Sing-Sing Prison. So you're dealing with more of a whitish color. When you get down around Yonkers and Hastings, it turns a dark brown, and that's called Tuckahoe Marble. And it's just, again, a different color. So the ventilators were inserted one every mile, and the kids used to love when we would get to the ventilators; they would all crowd around the outside of the ventilator, and they would look, they would ask me, "Well what number ventilator, how many miles have we walked so far?" and, "Look at this ventilator!" And then, we would usually choose a half a dozen boys and girls, and we would form like a human ladder, and we would have them hop up on shoulders, okay, kind of like Ringling Brothers, Barnum and Bailey, so that a few of them could actually climb right up to the top of the ventilator and then look down into the ventilator, down into the aqueduct, and they would then report to the rest of the group, "Well this is what we see, and this is what we don't see." So the ventilators were also a wonderful source of enthusiasm and excitement for the kids.

Again, for my kids, most of them living in the village and town of Ossining, most of my seventh graders hadn't done any traveling, they didn't have automobiles, most of them were low, middle, blue collar, middle-class families, so taking the kids out of the classroom and getting them out into the field, out into Mother Nature, was just an absolutely wonderful experience. And, as I said before, I still get comments, letters, emails, Facebook, whatever, from former students talking about those kinds of experiences, so again, especially thirteen year old middle school kids. Today, I mean to see some of the adults, and today when I do walks on the aqueduct and talk about the dams and the aqueduct and the water supply system, I average about twenty or thirty adults, and they come out with the same enthusiasm, and when I take them up to see a ventilator, you know, I have people in their seventies and eighties whose jaws drop to think that, wow, this was built in 1842 and how magnificent it is that these structures still survive and that we have this wonderful history that still is truly in our backyard.

Oral History 2: Scott Craven

Scott Craven, a former student in Mr. O.'s class, is now a captain of the police force in Ossining. A lifelong resident of the village with a background in history, he "loves to speak about the aqueduct." For him, the Croton

Aqueduct is integral to the setting of his everyday life—a life that just happens to include making arrests.

What follows is an extract from the oral history conducted April 12, 2011, by Tatum Taylor at the Ossining police station. The interview will be available in audio format on our website: http://crotonaqueduct.wordpress.com/.

My name is Scott Craven, and I'm a captain here in the Village of Ossining Police Department, and I've been a police officer here for twenty-six years. I've lived in Ossining and the Lower Hudson River Valley for my entire fifty years, and I'm never gonna leave. I talk on various topics of the Hudson River to different groups, I have a master's degree in American history, and I wrote my master's thesis on the mouth of the Croton River and how it's changed over the years. Growing up, I lived in Ossining, and everybody knew about the aqueduct, or at least they knew about the shaded path that ran through here. But in the 1970s my mother went back to college, to Briarcliff Women's College in Briarcliff for a degree in cartography. At the time, one of the students' assignments was to assist the state in mapping the state park that was the aqueduct through Ossining, so my mom would come back and talk to us about Ossining and how they mapped part of it today, and where they were working, things like that, and it was pretty neat. At the time, Ossining was a pretty densely packed place, and it was different; it was neat talking to her about that.

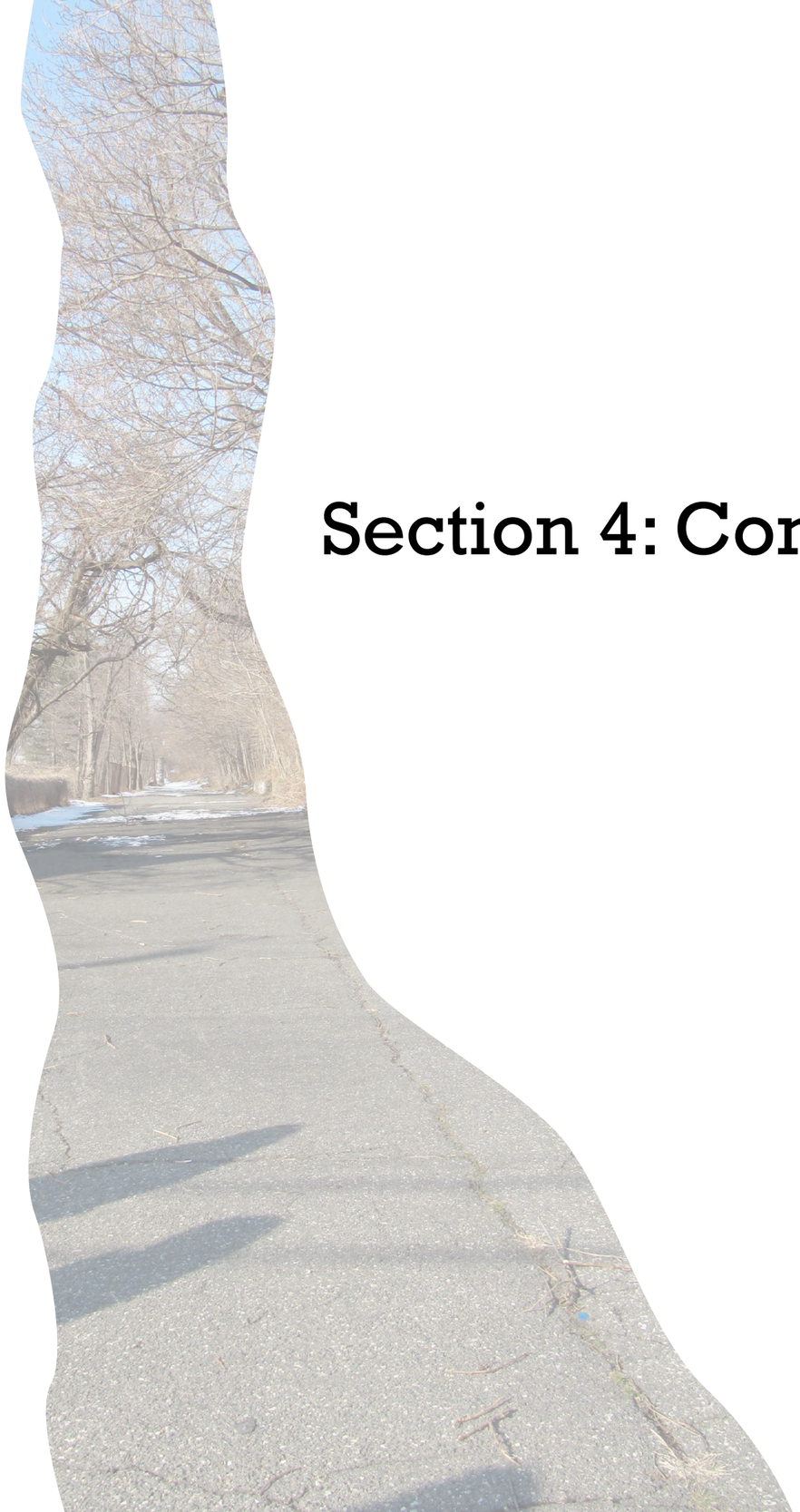
As a police officer, we use the aqueduct all the time. A lot of people walk on it; it's a common thoroughfare for the village. The big double span over the Kill Brook is on our patch, it's so unique. And it used to be quite the social place a hundred years ago to walk—not so much now, but it is commonly used by the people of Ossining because Ossining is so hilly and it has such rugged terrain. It's just about the only level north-south route there is, even more so than Route 9. So, they use it all the time, and the police bikes love it because police bikes are heavy and carry a lot of gear. Getting north-south in the village is always difficult, so we use the aqueduct all the time on the police bikes, especially at night, so it's been good for us that way. Like I was saying, I used it, I used to use it years ago; we could, at midnight, we'd... get on our mountain bikes and ride down to Sleepy Hollow High School and back through the cemetery. But it was always safe and it was level, and we knew there weren't going to be any cars on it so we didn't care, and it was always fun. That was great. And that one time, I was riding my mountain bike down there, and Khalid Khannouchi at the time was the world record holder in the marathon who lived in Ossining at the time and trained locally, passed me on the aqueduct on foot while I was on my bicycle. I was pretty hurt by that. I think I yelled at him or something. But he blew my doors off, and I was riding a bicycle at the time. But he used to run on it all the time

(...)

The aqueduct's great, and as I was saying, you know, years ago, the only time they opened up the aqueduct and the only time most people in Ossining got the opportunity to see it was during the Village Fair, which was the second Saturday in June. And the cops used to love going out to the weir chamber because it was usually blazing hot for some bizarre reason and the weir chamber's always really cool. So we'd go down there and cool off, and my first year here, one of the things they wanted me to do was, since I was a junior patrolman, was check the aqueduct to make sure no kids were down there before we closed the weir chamber. Unfortunately when I walked to the south, it was a couple of hundred yards to the gate, and by the time I turned around, it was a pinpoint of light. And I am claustrophobic on the best of days, and it was quite the experience getting back out of the aqueduct. I never volunteered for that again. That was tough.

Years later, not too long ago, we were having an ongoing issue—people are assaulting or robbing our day laborers. Most of Ossining now, Ossining's traditionally an immigrant community, always has been, and our current immigrant group is Ecuadorians from the province of Azuay in southern Ecuador around Cuenca. And we have a lot of folks here who are day laborers, and unfortunately, nothing new with immigrants, people have preyed on them, and robbed them, and because there's a language barrier, we always have an issue of things getting so violent because there could be no demand for money, they just start beating them up and taking their money. And we had a difficult time getting people to come forward, we had a difficult time with people following through with prosecution because they couldn't miss work. So what we did is we put our own officers out there dressed as day laborers, and then we put the SWAT team next to them, and when they came by and robbed the police officer, we'd arrest them, and then it got out that, hey, some of these people we think are victims are actually police officers, and we cut down on the crime. But what we did was, we went inside where we were going to do it, right outside the weir chamber, so we took our officer and we dressed them up as a day laborer, and we put them out there, sitting on the aqueduct. Inside the weir chamber, we lined up the entire SWAT team inside that door, and we had the two sergeants standing on a stool looking out through the sill, the transom, that's open, above the door, watching our guy to make sure that when it happened, there'd be no problem. What they didn't know was, that the aqueduct at that point's filled with bats, and there's a ventilation hole on top of the weir chamber. So as they were sitting there in complete darkness, what they later found out was a bat was coming, was flying between them, circling around, coming back through the vent hole, and flying between them again. And they kept thinking that they were speaking to each other. So they hear "Ssshhww!" "Hey what?" "I didn't say anything." And they hear "Ssshhww!" "Was that you?" "No, that wasn't me." And then they realize that there were bats flying between them though the transom; they decided to go to another location, they'd do better. They all piled out of there in an awful hurry.

So, I mean, the Aqueduct is something we use and think about on a daily basis. I'm not so sure many people think of it in its historical context. But it's just like an old road in Ossining, an old level road in Ossining, that people unfortunately take for granted, and is used tremendously by the cyclists and the runners and the walkers and things like that. And it doesn't take much to look at it and see that it is, you know, worn ground. I was saying before, we run a 5K race on it today, we start right there at the double arch, run north, 2.5K and back, and it's always a lot of fun. Originally we used to give bricks to the people who won the races, so that was a lot of fun.



Section 4: Conclusion

Introduction

While the Croton Waterworks studio project was only a semester-long undertaking, there is much more work that can be done to further ensure the protection of the system. Our research and analysis informed our preservation plan and interpretive schemes. We have outlined short- and long-term approaches, best-practice methods, and platforms to encourage preservationists and partner organizations to build upon this work. The following section attempts to frame the continuation of our work by making a variety of resources available. First, we have listed the "key players" and stakeholders involved in the future of the Croton Waterworks, with the hope of connecting all interested parties so that partnerships can form between stakeholders. The subsequent section provides information regarding funding sources, preservation initiatives, and strategies suited to the Waterworks. The next section outlines our online forums, including the Croton Waterworks website and the Croton Conversations online discussion page. These tools have illustrated the wide range of interest in the future of the Waterworks and will continue to engage interested parties. Lastly, our glossary serves as a synthesized collection of key terms for easy understanding of the extensive components of the Croton Waterworks system.

This project has opened our eyes to the value of historic infrastructure and the importance of protecting and preserving systems such as the Croton Waterworks. Therefore, we would very much like to see the "Croton Conversation" kept open, and for further surveying and research to build upon our work, ultimately leading to the development of more comprehensive maintenance and interpretive plans for the system as a whole.

Key Players

System-Wide Partners

NYC Department of Environmental Protection:

The Department of Environmental Protection is a governmental agency that now oversees all aspects of the Croton waterworks, including maintenance, protection, conservation, and construction of new infrastructure (i.e., the Water Treatment Plant in Van Cortlandt Park) related to the regulation of the New York City water supply system. Prior to the formation of the DEP in 1978, numerous commissions and agencies had been formed as early as the 1830s that were focused on providing and regulating water for New York City:

1833: State Water Commission formed
1849: The State Water Commission was disbanded and the Croton Aqueduct Board established
1870: Department of Water Works supersedes the Croton Aqueduct Board
1883: New York City establishes the Board of Aqueduct Commissioners
1905: The Board of Water Supply was created by the state legislature
1978: Department of Environmental Protection established

The DEP is also the main guardian of most of the archival material pertaining to the New York City Water supply and the Croton Waterworks.
website: http://www.nyc.gov/html/dep/html/home/home.shtml

New York State Office of Parks, Recreation & Historic Preservation (Old Croton Aqueduct State Historic Park):

The segment of the Old Croton Aqueduct trailway located in the Old Croton Aqueduct State Historic Park is owned and managed by the NYS Department of Parks and Recreation. The trail begins on the south side of the New Croton Dam, farthest from the spillway, and works its way down following the path the aqueduct took from the dam to New York City. The trail offers a scenic walk from Northern Westchester County to New York City.

New York/New Jersey Trail Conference (Old Croton Aqueduct State Historic Park):

The New York-New Jersey Trail Conference is a not-for-profit organization that has been partnering with parks since the 1920s to create, protect, and promote a network of over 1,700 miles of public hiking trails (including the various hiking trails that run along the Croton Waterworks) in the New York/New Jersey metropolitan area.
website: http://www.nynjtc.org/park/old-croton-aqueduct-state-historic-park

Westchester-Area Partners

Friends of the Old Croton Aqueduct (Westchester):

The Friends of the Old Croton Aqueduct is a private, not-for-profit, volunteer organization that was formed to protect and preserve the Old Croton Aqueduct and trail. The mission of the Friends is to act as the public voice of the Aqueduct and raise public awareness about the system, to serve as an information resource for those who want to learn more about the Aqueduct, and to secure resources that will aid in the preservation of the historic greenway for years to come.

The Friends carry out their mission through various mediums, such as sponsored talks, guide-led walks on the trail, tours inside the Aqueduct tunnel in Ossining, and events such as Aquafest, a two-day festival

that celebrates the Croton Aqueduct with tours, live music, and children's activities. The Friends of the Old Croton Aqueduct have also published a map detailing the route of the Croton Aqueduct trail and attractions along the way. An ongoing project is the restoration and adaptive reuse of the keeper's house in Dobbs Ferry into a visitors center, and the Friends also play an active role in the High Bridge Coalition, working to gather support of the restoration and reopening of the High Bridge and adjacent parks.

Groundwork Hudson Valley (Westchester):
Groundwork Hudson Valley is an environmental justice nonprofit that works with communities to improve their physical and social environment. Groundwork Hudson Valley is currently leading an environmental justice initiative to reclaim the section of the Old Croton Aqueduct State Historic Park that runs through Yonkers. In Yonkers, the Aqueduct trail is underutilized and its upkeep is neglected, making it hard for community members to utilize the trail as other towns along the Hudson River have done. The goal of the initiative is to reconnect the communities in Yonkers with the Aqueduct trail and to work toward the cleanup, improvement, and long-term utilization of this section of the Aqueduct.

Groundwork Hudson Valley
22 Main Street, 2nd Floor
Yonkers, NY 10701
website: www.groundworkhv.org

Rivertown Runners (Westchester):
Rivertown Runners is an organization that organizes community running events for its members and other runners in the towns along the Hudson River. The main goal is to raise money to benefit local charities and to promote the joys of running. The Runners make use of the parts of the Old Croton Aqueduct trailway that run through the river towns along the Hudson River.

Rivertown Runners
P.O. Box 8384
Sleepy Hollow, NY 10591
website: www.rivertownrunners.org

Historic Hudson Valley (Westchester):
Historic Hudson Valley is a not-for-profit, educational organization that celebrates the history, architecture, landscape, and material culture of the Hudson Valley through the preservation, restoration, interpretation, and promotion of various historic landmarks for public enjoyment. The Croton Waterworks and its various auxiliary components serve as a unique component of the Hudson Valley landscape, and is one of many historic landmarks that the organization works toward promoting and preserving.

Historic Hudson Valley
150 White Plains Road
Tarrytown, NY 10591
website: www.hudsonvalley.org

Historic Hudson River Towns (Westchester):
Meant primarily as a way of promoting and increasing awareness of the amazing aspects of the many historic towns located along the Hudson River, the Historic Hudson River Towns is an online consortium of communities located on the east and west banks of the Hudson River extending from Yonkers to Albany. Each community within the consortium has an online page that provides visitors with town history as well as tourism information for each location. For most of the historic river towns along the Hudson River (Croton-On-Hudson, Ossining, Tarrytown, Irvington, Hastings-On-Hudson, Dobbs Ferry and Yonkers), the Old Croton Aqueduct trailway serves as a key recreational attraction.
website: www.hudsonriver.com

Rivertowns Guide (Westchester):
This is a resource guide geared toward children and families living in towns along the Hudson River. The online guide provides users with information on various recreational, arts, and cultural events and activities going on in the area; restaurant listings; local blogs; shopping guides; and a list of resources for parents with children (with school information, children's activity listings, classes, birthday party resources, and so on).
website: http://www.rivertownsguide.com/

National Park Service (Westchester to Highbridge Park, Bronx):
The National Park Service is a U.S. federal agency that manages all national parks, national monuments, and various conservation and historical properties of varying significance. The National Park Service has listed several components as well as stretches of the Croton Waterworks on their list of National Historic Landmarks and on the National Register of Historic Places. These designations afford certain federal protections to the Croton Aqueduct.

1. High Pumping Station, National Register of Historic Places (1983)
2. Jerome Park Reservoir, National Register of Historic Places (2000)
3. Old Croton Aqueduct, National Register of Historic Places (1974)
4. Old Croton Aqueduct running from Croton to New York City, National Historic Landmark in (1992)
5. The High Bridge Aqueduct and Water Tower, National Register of Historic Places (1972)
6. 135th Street Gatehouse, National Register of Historic Places (1983)
7. The Old Croton Dam Site, National Register of Historic Places (1973)

Individual Site Partners

Croton Friends of History (Croton-On-Hudson):
This group was started in 2002, when a group of citizens of Croton-On-Hudson who shared an interest in the local history of Croton and the surrounding areas within the Hudson Valley got together. The Croton Friends of History is a not-for-profit organization whose purpose is to encourage the sharing of interest in various historical topics through lectures, discussions, and newsletters. The history of the Croton Waterworks is strongly intertwined in the history of Croton-on-Hudson and the surrounding villages and towns, and serves as a major topic of interest for the Croton Friends of History.

Croton Friends of History
P.O. Box 193
Croton-on-Hudson
New York 10520
website: http://www.crotonfriendsofhistory.org/

Village of Ossining (NYS Heritage Area Museum):
The town of Ossining, located in Westchester County, is home to the Village of Ossining Museum, a New York State Heritage Area Museum focused on the history of the Croton Waterworks and the Sing Sing Prison.

Village of Ossining Museum
95 Broadway
Ossining, NY 10562
website: http://www.villageofossining.org/Cite-Access/webpage.cfm?TID=24&TPID=3536

New York City Partners: Citywide

New York City Department of Parks and Recreation:
New York City's Department of Parks and Recreation is in charge of the Old Croton Aqueduct Trailway, the segment of the Croton aqueduct that runs through the Bronx and Manhattan.
website: http://www.nycgovparks.org/sub_your_park/virtual_tour/croton_aqueduct/index.html

High Bridge Coalition:
Since 2001, the High Bridge Coalition—an alliance of various public agencies, nonprofit organizations, community leaders, residents, and individuals—has been leading a New York City–wide campaign to restore and reopen the High Bridge and its adjacent parks for public use. Due to the hard work and dedication of the High Bridge Coalition and its various partners and constituents, the High Bridge is slated to be restored and reopened for public use by 2013.
website: http://www.nycgovparks.org/sub_your_park/highbridge/html/hb_coalition_programs.html

New York City Partners: The Bronx

The Van Cortlandt Park Conservancy:
Van Cortlandt Park, the fourth-largest park in New York, once served as the right-of-way for the Old Croton Aqueduct. The Old Croton Aqueduct Trailway, operated by the New York City Department of Parks and Recreation, is a walking trail that follows the path the Aqueduct took as it traveled through the Bronx and Manhattan. A segment of this trail cuts through Van Cortlandt Park, extending for 1.1 miles and providing users with an understanding of how the aqueduct engages the landscape as well as views of a weir building and an exposed section of the aqueduct tunnel.
websites: http://vcpark.org/park/features/old_croton_aqueduct_trail.html; see also http://www.nycgovparks.org/sub_your_park/virtual_tour/croton_aqueduct/index.html

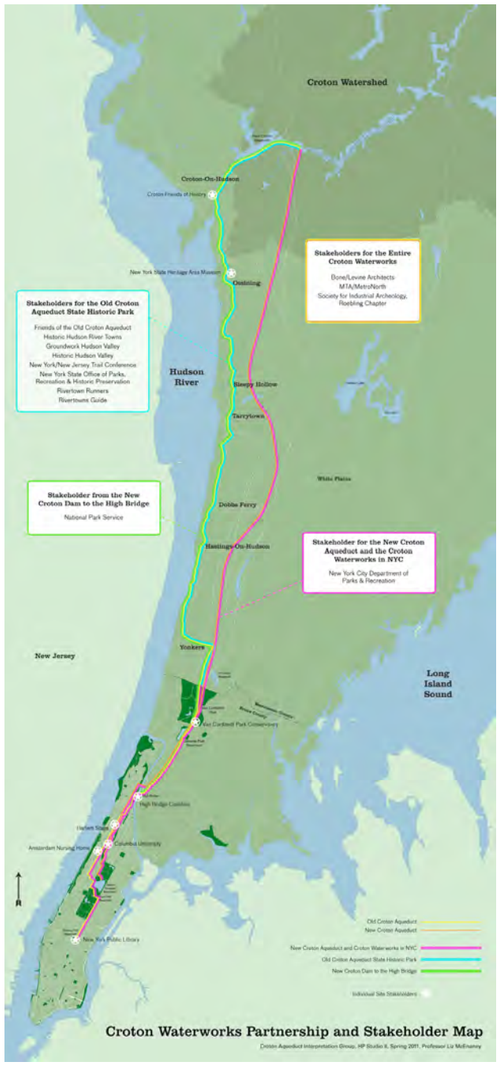
New York City Partners: The Bronx

Amsterdam Nursing Home (113th Street Gatehouse, Manhattan):
The Amsterdam Nursing Home operates as a residence for older adults and is located on Amsterdam Avenue and 112th Street in the Morningside Heights section of Manhattan. The Adult Day Health Care Program, a program established by the nursing home to assist older people who are able to live at home but require special assistance, is housed in the 113th Street Gatehouse. The nursing home adaptively reused the 113th street Gatehouse, carrying out an extensive renovation program that restored much of the structure's exterior.

Amsterdam Nursing Home
1060 Amsterdam Avenue
New York, NY 10025
website: http://www.amsterdamcares.org/

Harlem Stage (135th Street Gatehouse, Manhattan):
Harlem Stage is a performing arts organization that works to develop, support, and promote new works by artists of color in and around New York City as well as around the world. They also provide multicultural arts-education programming for children and families in and around New York City. In 2006, the Harlem Stage moved their headquarters into the adaptively reused 135th Street Gatehouse. Restoration and adaptive reuse of the structure was carried out by Ohlhausen Dubois Architects, working with Wank Adams Slavin Associates and the theater design firm Harvey Marshall Berling Associates.
website: http://harlemstage.org/

Potential Partners
Some potential partners along the Croton Waterworks are the New York City MTA and MetroNorth Railroad. Both of these transportation systems could work in conjunction with other agencies to raise awareness of the Croton Waterworks by displaying posters to advertize the Aqueduct in trains/subway cars as well as providing directions on how to reach the various components/key features along the system. Two other potential partners are Columbia University and the New York Public Library. The 119th Street Gatehouse is located across the street from Columbia University on Amsterdam Avenue, and the fragments of the Murray Hill Reservoir—the distributing reservoir of the Old Croton Aqueduct—still reside in the lower levels of the building. If any type of adaptive reuse or interpretation project were to be pursued in the future, it would be beneficial to have these organizations as partners.



Right: Map showing stakeholders and partnerships for the Croton Waterworks

Possible Funding Sources

Federal Grants

Many federal grants are available to non-profit projects focused on parks and transportation. The National Park Service offers the Save America's Treasures Grant Program. This grant program provides funding for preservation and conservation work on nationally significant intellectual and cultural artifacts, and historic structures and sites, and could be used toward the stewardship of various aspects of the Croton Waterworks. The Department of Transportation offers the Transportation Equity Act for the 21st Century (TEA-21) grant. This grant, often associated with highways, can also be applied to recreational trails and has precedence related to the Croton Waterworks, as it is being used by the Friends of the Old Croton Aqueduct for their restoration of the Keeper's House in Dobbs Ferry.

A similar grant that could be utilized for the rehabilitation of Croton structures is the Recreational Trails Program grants. Sponsored by the Federal Highway Administration, this grant is given to states in order to rehabilitate trails. It could also be used to acquire easements, which may be beneficial to the Croton Waterworks when considering issues such as encroachment on the historic viewshed.

Private Business

A crucial component of funding the rehabilitation, maintenance, and interpretation of Croton structures would be to have some private business backing. One organization that may be useful would be American Express, which in partnership with the National Trust for Historic Preservation has formed the Partners in Preservation Initiative. This is a five-year initiative in its final year that aims to preserve historic places across the United States. City Lore has successfully used funding from this program in New York City preservation projects in the past.

The Andrew W. Mellon Foundation supplies funding for projects related to conservation and the environment, which could be useful in restoring the historic landscape of the Croton trail and its many parks and natural features.

A few other sources of funding that have already aided with the High Line project in Chelsea are the Ford Foundation and The New York Community Trust. The Ford Foundation has rather general guidelines for its grants, which are awarded in a variety of disciplines. The New York Community Trust donates money to aid projects involving community development and the environment. Funding from this organization would likely benefit site-specific projects more than holistic projects, and would depend on how individual site projects would benefit their respective communities.

Other large businesses such as Coca Cola also have funding available for non-profit projects. The Coca Cola Foundation awards money for projects related to water and the provision of clean drinking water, and its water stewardship funding is also available to projects that promote water conservation through education. This foundation could possibly aid our endeavors in designing and implementing a Croton-based educational curriculum.

Cultural/Nonprofit Funding

Obtaining funding from cultural and non-profit organizations would be another way to support the rehabilitation, maintenance, and interpretation of the Croton Waterworks. The National Trust for Historic Preservation, a private, non-profit organization geared toward the preservation of historic places, offers multiple grants awarded to non-profit organizations and public agencies that could be used toward the stewardship of the system. First, the National Trust Preservation Fund is a matching grant of $500 to $5000, dedicated to preservation planning and education. The second possible fund is the Johanna Favrot Fund for Historic Preservation, which is geared toward National Historic Landmarks and provides grants ranging from $2,500 to $10,000 to contribute to the preservation or the recapture of an authentic sense of place.

The last fund for which the Waterworks might be eligible is the Cynthia Woods Mitchell Fund for Historic Interiors, which provides between $2,500 to $10,000 toward the preservation, restoration, and interpretation of historic interiors. This fund in particular could be used to restore and reinterpret a structure's interior such as the High Bridge Water Tower or the Dobbs Ferry Keeper's House. Each of these grants is specifically tailored for supporting educational initiatives and programming that will raise awareness about the Waterworks, while also maintaining and rehabilitating various landmarked properties.

Other organizations that could be strong sources of support and that are already working toward the preservation of different segments of the Croton Waterworks are Groundwork Hudson Valley, Historic Hudson Valley, and the High Bridge Coalition. More information on the work of these organizations is included in the Partners section of this book.

Lastly, the High Bridge Coalition has been leading a New York City-wide campaign to restore and reopen the High Bridge and its adjacent parks for public use. Due to the hard work and dedication of the Coalition and its various partners and constituents, the High Bridge is slated to be restored and reopened for public use by 2013. Partnering with any of these organizations could greatly augment any efforts to maintain, rehabilitate, and spread awareness about the historical, cultural/social, and architectural significance of the Croton Waterworks.

Neighborhood

Neighborhood organizations could be used in gaining support for Croton projects; some of this support could perhaps be financial. If neighborhood organizations are invested in our projects, individual community members as well as local businesses could learn about the projects and invest through neighborhood meetings. Examples of some organizations we could reach out to are the following:

1. Morningside Heights Residents Association
2. Bronx Coalition of Parks and Green Spaces
3. Friends of Jerome Park Reservoir
4. Friends of Van Cortlandt Park
5. Federated Conservationists of Westchester County

New York City Organizations

Aside from the Department of Transportation as a potential funder on the federal level, the New York City Department of Transportation could help subsidize the cost of adding signage on the sidewalks of New York City. They would be able to provide good deals on signage if we worked in conjunction with them on some of our projects. Our medium-sized signage project and the blue Croton trail line are two examples of projects that we could do with the City Department of Transportation. Similarly, the Department of Parks would be a very useful partner in subsidizing initiatives

on parkland, which is often adjacent to Croton structures.

The rehabilitation of the Croton Waterworks and, more importantly, the reinstatement of many of its elements of beautification would fit into Mayor Bloomberg's New York City PlaNYC initiative. The PlaNYC program's vision is to provide a better standard of living to New Yorkers as the population continues to increase. One major component of this project is to provide support for the expansion of New York City green space. The program has already resulted in financial backing for the restoration of the High Bridge, and further funding could likely be used for future Croton projects.

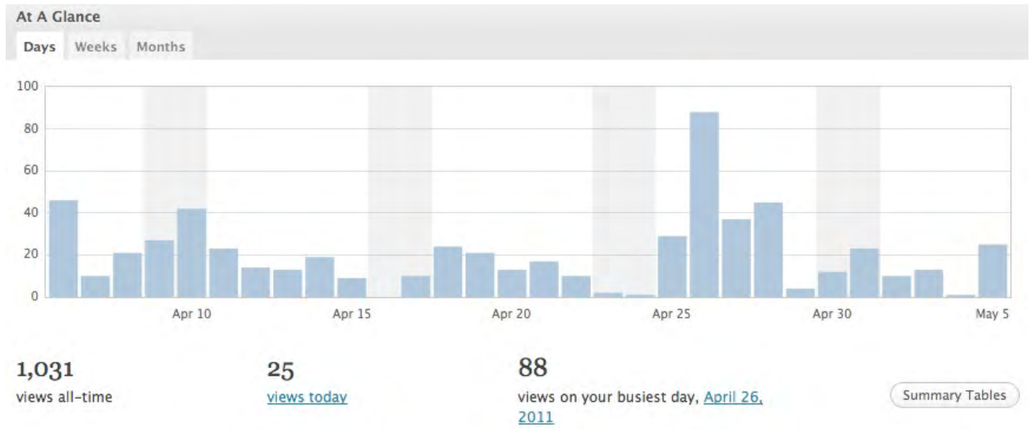
Online Forum Analysis and Conclusions

The online forums that our group initiated were very effective: the number of visitors to our main Croton Waterworks website grew from 329 people in March 2011 to 622 in April 2011, translating to an increase from 11 to 21 daily visitors on average. Our e-mail campaign method of audience targeting generated a significant increase in both blog and website traffic, surging from an average of 88 visits cper week to 238 visits per week after the initial launch was sent. Following the second e-mail campaign, the visitation activity on the Croton Conversations page skyrocketed to 98 visits in one day, versus 10 visits on the day prior and 3 visits on the day before that. Likewise, activity on the Croton Waterworks page increased by a remarkable 170 percent for the week after the second e-mail campaign was distributed. Posting activity also correlated and increased with our subsequent second and third e-mail campaigns. The most effective portal to both the Croton Waterworks page and the Croton Conversations page was Facebook. The Croton Conversations page was the second-most-effective portal to the main Croton Waterworks page.

These results not only reinforce the efficacy of our efforts, but they also demonstrate the potential for raising awareness and advocacy beyond the local community. Furthermore, e-mail campaigning provides a means for work to continue with Croton following the conclusion of the Columbia studio project. We have created a template for future mailings, so that if and when someone inherits this project, they can simply input a question in the allocated space and distribute it to the mailing list. There is also flexibility for more e-mail addresses to be added to the distribution list.

The quantifiable results of these digital approaches are evident in the numbers we've reported. There is also much to be said for the intangible benefits that these sites have fostered: they have and are still raising awareness of the Croton Waterworks. Awareness is at the heart of our mission because it is a key step to advocating for the protection of the system.

Croton Waterworks Website Statistics



Croton Waterworks Site

Months and Years

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2011		7	329	622	72								1,030

Average per Day

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
2011		0	11	21	12								12

Recent Weeks

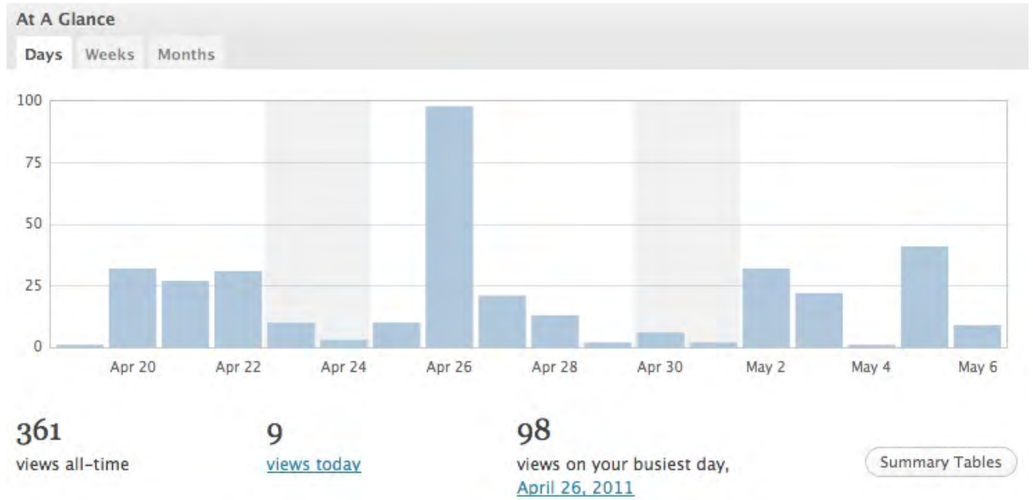
Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total	Average	Change
Mar 28	Mar 29	Mar 30	Mar 31	Apr 1	Apr 2	Apr 3			
51 Apr 4	48 Apr 5	13 Apr 6	19 Apr 7	4 Apr 8	10 Apr 9	6 Apr 10	151	22	
39 Apr 11	26 Apr 12	46 Apr 13	10 Apr 14	21 Apr 15	27 Apr 16	42 Apr 17	211	30	+39.74%
23 Apr 18	14 Apr 19	13 Apr 20	19 Apr 21	9 Apr 22	0 Apr 23	10 Apr 24	88	13	-58.29%
24 Apr 25	21 Apr 26	13 Apr 27	17 Apr 28	10 Apr 29	2 Apr 30	1 May 1	88	13	0%
29 May 2	88 May 3	37 May 4	45 May 5	4	12	23	238	34	+170.45%
10	13	1	25				49	8	-76.47%

Top Left: Number of Visits to the Croton Waterworks website per day

Bottom Left: Number of Visits to the Croton Waterworks website per week

Top Right: Croton Waterworks website visitation data

Croton Conversations Statistics



Croton Conversations Forum

Months and Years

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2011				254	107								361

Average per Day

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
2011				21	20								21

Recent Weeks

Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total	Average	Change
Apr 18	Apr 19	Apr 20	Apr 21	Apr 22	Apr 23	Apr 24			
0 Apr 25	1 Apr 26	32 Apr 27	27 Apr 28	31 Apr 29	10 Apr 30	3 May 1	104	15	∞
10 May 2	98 May 3	21 May 4	13 May 5	2 May 6	6	2	152	22	+46.15%
32	22	1	41	9			105	24	+10.53%

Top Left: Number of participants in the Croton Conversations per day

Bottom Left: Number of participants in the Croton Conversations per week

Top Right: Croton Conversations site-visitation data

Glossary

A
American Society of Civil Engineers Landmark: Structures, projects, and/or sites that have been designated by the American Society of Civil Engineers as being significant feats of engineering and construction.

Aquafest: A two-day festival organized by the Friends of the Old Croton Aqueduct in celebration of the Old Croton Aqueduct.

Aqueduct Commission: Created by the passage of “An Act for the Appointment of Commissioners in Relation to Supplying the City of New York with Pure and Wholesome Water," by the New York State Legislature on February 26, 1833.

Aqueduct Commissioners: Appointed in 1833 by New York Governor William Marcy; Commissioners included grocer Charles Dusenberry, hardware merchant Benjamin M. Brown, Whig William W. Fox, retired merchant Saul Alley, and ex-senator Stephen Allen.

B
backbay: Found in the Central Park Gatehouse; Works in conjunction with a forebay in order to receive water from both sides of the Jacqueline Kennedy Onassis Reservoir, allowing one side of the reservoir to be drained for repairs while water distribution continued from the other.

beltcourse: A continuous row/layer of stones or bricks in a wall.

berm: Generally speaking, a space that separates two distinct areas; In regards to the Old Croton Aqueduct, the berm functions as an elevated path that encases the system's pipes underneath.

Board of Water Supply: Created by the New York State legislature in 1905 to replace the Board of Aqueduct Commissioners.

C
conduit: A tunnel or channel for carrying water or other fluids.

cornice: An ornamental, horizontal molding or band that completes a building or wall.

Croton Aqueduct Board: Superseded the State Water Commission; The first board was established in 1833 with the task of providing New York City with fresh water, and was disbanded in 1849.

“Croton War”: As many as one thousand Irish laborers gathered on Thursday, April 2, 1840, to protest for higher wages, bullying and fighting anyone who crossed their picket line. The following Monday, New York City Mayor Isaac Varian sent up about one hundred troops to put down the protest, but found laborers and their families taking a few days off. They were able to chase down two "would-be rabble rousers," whom they arrested. The bloodless Croton War was a laughingstock.

Croton Water Filtration Plant: A water purification and filtration plant currently being constructed in Van Cortlandt Park beneath the Mosholu Golf Course in the Bronx to filter water coming through the aqueduct tunnel from the New Croton Reservoir.

Croton Watershed: Consists of twelve reservoirs and dams (Amawalk, Bog Brook, Boyd's Corner, Cross River, Croton Falls, East Branch, Middle Branch, Muscoot, New Croton, Titicus, West Branch) and four controlled lakes (Cross River, the east and west branches of the Croton River, and the New Croton Dam) that supply drinking water via aqueduct to New York City.

culvert: Stone-arched openings built into the base of aboveground portions of the Old Croton Aqueduct that allowed streams or other preexisting bodies of water to flow underneath the conduit.

cyclopean masonry: A type of stonework found in Mycenaean architecture; Huge unworked boulders, usually of limestone, are roughly put together with minimal clearance between adjacent stones and held together without the use of mortar.

D
dam: A structural barrier that impounds or retains water.

Department of Water Works: Superseded the Croton Aqueduct Board in 1870.

distributing reservoir: A reservoir from which water is distributed; In the Croton Waterworks system, distributing reservoirs were the final stop before water was distributed to individual New York City neighborhoods.

Douglass, David Bates: Conducted surveys and determined the course and basic shape for the Old Croton Aqueduct; Douglass planned many of the prominent structures of the system before disputes with Commissioner Stephen Allen led to his dismissal.

E
Egyptian Revival: An architectural style that uses motifs and imagery from Ancient Egypt.

embankment: An artificial raised bank of land used to serve as a water barrier.

F
forebay: Found in the Central Park South Gatehouse; A small reservoir at the head of a pipeline through which water passes from the Jacqueline Kennedy Onassis Reservoir into pipes that distribute water along the main avenues into lower Manhattan.

fortress style: Resembling a fort or a fortified structure.

G
gabbro: A large, coarse-grained, igneous rock.

gatehouse: Large structures located along the Croton Waterworks that provide access to the underground conduit pipes.

girder arch: An H-section steel girder bent to a circular shape.

Gothic: In reference to the Croton Waterworks, gothic refers to one of the many architectural styles used in the construction of the structural components comprising the aqueduct system.

gravity-fed system: A water system designed to be operated by the force of gravity.

Great Fire of 1835: Occurred on December 16th and 17th, 1835; Fifty acres and seventeen blocks burned in downtown Manhattan, leaving two dead and more than five hundred buildings destroyed. What little water there

was for fighting the fire in storage tanks was frozen solid in the unseasonably cold weather.

H

High Service Reservoir: A reservoir that provided an emergency supply of water to areas located at higher elevations than the Croton Dam.

Historic American Engineering Record (HAER): A program established in 1969 by the National Park Service, the American Society of Civil Engineers and the Library of Congress to document historic sites and structures related to engineering. Such sites include: bridges, ships and steel works as well as railroads, canals, parkways, roads and other types of industrial/engineering related structures.

hydrofracking: Short for “hydraulic fracturing”; A process that results in the creation of fractures in rocks. This fracturing is done from a hole drilled into reservoir rock formations to increase the rate and recovery of oil and natural gas.

I

inverted siphon: A pressure pipeline that carries water downhill, then uphill again in a U-shaped trajectory; The rising liquid at the bottom of the U pushes the liquid in front of it uphill to continue flowing on the other side by means of gravity.

Italianate: Refers to a popular architectural style during the 1840s and 1850s that was also the architectural style of the keepers’ houses, important structures built along the Old Croton Aqueduct.

J

Jervis, John Bloomfield: The successor to Douglass, Jervis managed the building of the Old Croton Aqueduct from 1836 to 1842, remaining as chief engineer until the completion of the High Bridge in 1848.

K

keeper’s house: One of the fairly modest homes built for caretakers in charge of a specific region along the Old Croton Aqueduct.

M

Manhattan Water Company: Established ostensibly to supply much-needed pure water to New York City by Aaron Burr in 1799, who also opened a bank under the same name; It ultimately failed as a bank, but now survives under the name of J.P. Morgan Chase.

Metropolitan Waterworks Museum (Boston): Opened on Beacon Street on March 27, 2011, to display information about the Boston Waterworks.

N

National Heritage Area (NHA): A site designated by Congress, intended to encourage historic preservation of the area designated by involving communities in which the site is located; There are currently forty-nine NHAs in the United States.

National Historic Landmark: A site, structure, district, or building that is officially recognized by the U.S. Government for its historical significance. Currently there are fewer than 2,500 NHLs.

National Register of Historic Places: A list of districts, sites, buildings, structures, and objects worthy of preservation and listed as such by the U.S. Government.

New Croton Aqueduct: Opened on July 15, 1890, to increase water supply to New York City; Runs roughly parallel to the Old Croton Aqueduct.

New York City Landmark: A building, structure, district, or site that is designated by the New York City Landmarks Preservation Commission as having great significance.

New York City Scenic Landmark: A landscape, site, or viewshed deemed by the New York City Landmarks Commission as having great cultural and/or historical significance.

O

Old Croton Aqueduct: Opened on October 14, 1842, as a forty-one-mile-long aqueduct bringing water to New York City from the Croton River in Westchester County; Became a National Historic Landmark in 1992.

Old Croton Aqueduct State Historic Park: A linear park that runs from Van Cortlandt Park in the Bronx to the Croton Dam in Croton -on-Hudson.

Old Croton Dam: Completed by John B. Jervis in 1842, but later submerged underwater after the construction of the New Croton Dam in 1905; Now located about thirty feet below the water's surface in the new dam.

P

Panic of 1837: An economic depression built on speculative fever that started on May 10, 1837, when the bubble burst in New York City; The Panic was followed by six years of depression.

pilaster: A slightly projecting, rectangular column applied to the face of a wall; A decorative architectural element.

Pont du Gard: An ancient Roman aqueduct bridge that runs across the Gard River located in southern France. The Pont du Gard was a component of the Nîmes Aqueduct, a large gravity- fed water system built between 40–60 A.D to supply fresh water to the ancient city of Nîmes. The design of the High Bridge component of the Croton Waterworks was meant to resemble a Roman aqueduct, of which Pont du Gard is a prime example.

pumping station: A facility used to pump water from one place to another; Within the Croton Waterworks, pumping stations were usually constructed adjacent to water towers as an essential mechanism for pumping water to high-elevation areas. These stations included engines that were capable of pumping approximately ten- to twelve-million gallons of water each day.

Q

QR (quick response) code: A two-dimensional bar code encoded with information that is readable by QR barcode readers and smartphonessmart phones.

R

Renwick, Jr., James: A prominent American architect who worked as an assistant engineer during the construction of the Old Croton Aqueduct system.

receiving reservoir: One of two types of reservoirs utilized in the Croton system; Receiving reservoirs were intermediate reservoirs, located downstream, that could offer an emergency supply of water in the case of the system’s failure.

Romanesque Revival: An architectural style

used in the mid nineteenth century that was inspired by the Romanesque architecture of the eleventh and twelfth centuries.

S

screw gates: Valves located in weir structures like the New Ossining Weir that allow for the release of water from a section of the aqueduct.

shaft: An underground vertical passageway; Shafts are a building typology introduced to the New Croton Aqueduct conduit. These structures filled the niche of the Old Croton Aqueduct's ventilators in providing circulation to the water underneath. More importantly, they also provided access for workers to the underground conduit so that repairs could be made.

siphon: A pressure pipeline that carries water uphill then downhill again on an upside-down, U-shaped trajectory. The falling liquid at the top of the U pushes the liquid in front of it uphill to continue flowing on the other side by means of gravity.

spillway: A channel for the overflow of water from a reservoir, dam, or levee.

stopcock: A value used to stop the flow of liquid or gas through a pipe.

stop planks: A set of planks used to form a dam in a hydraulic system. In the New Ossining Weir, stop planks were used to completely block the flow of water in the aqueduct tunnel.

T

Tweed, William "Boss": An American politician most known for being the "boss" of Tammany Hall, the Democratic Party political machine that greatly influenced politics in New York City and State during the nineteenth century. During his time as mayor of New York City, he was involved in many corruption scandals. In relation to the Croton Waterworks, Tweed and his friends would buy up undeveloped properties in the Upper East Side, especially in the areas of Yorkville and Harlem. He would use city resources to give improvements—such as installing pipes to bring in water from the Croton Aqueduct—to these areas, which increased the value of the land. After the improvements were made he would sell the land and take the profits for himself.

V

ventilators: Chimney-like structures, ranging between approximately fourteen and twenty feet in height, that were built along the path of the Old Croton Aqueduct's conduit; They were designed to relieve the buildup of potentially destructive pressure within the tunnels, and to allow the precious water to breathe.

viewshed: The natural environment that is visible from one or more viewing points.

voussoir: A wedge-shaped element used in a building arch.

W

wasteway: A channel for conveying or discharging excess water.

watershed: An area of land where all of the water that is under it or drains off of it goes into the same place.

water tower: A vertical structure into which water is pumped to an appropriate height in order to provide adequate water pressure; In the Croton Waterworks, water towers served as booster towers, supplying enough water pressure in order to provide neighborhoods at higher elevations with water.

weir: One of several small structures that were built over or next to the Croton Waterworks conduits, allowing weir tenders to regulated the flow of water through the aqueduct tunnel.

World Heritage Site (WHS): A place, structure, or natural landscape (such as a forest, mountain, desert, city, or monument) that has been designated by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as having cultural or physical significance.

Croton Waterworks Structure Guide

The following pages constitute a list of all structures connected with the Croton Waterworks. In addition to a brief description, for each structure the list identifies typology, area(s) and degree(s) of significance, existing interpretation, signage recommendations, and designation status.

In assigning our different sign types to Croton sites we took into account the size of the structures and their locations so as to not overwhelm the sites and their respective environments, as well as their levels of evaluated significance and proximity to other site signage. Overall, we envision a kinesthetic scheme of primarily small (QR barcode) and medium signs along the Croton Waterworks, with the largest and most significant structures in the system receiving the large signs.

Also of note, designations are only noted for specific structures listed in the relevant designation report.

Structure Guide Legend

Typologies

 Bridges

 Culverts

 Dams

 Fountains

 Gatehouses

 Headhouses

 Keeper's Houses

 Parks

 Reservoirs

 Shafts

 Siphons

MISC Support

 Ventilators

 Water Towers and Pumping Stations

 Weirs

Significances

eng/ENG	Low/High Degree of Engineering Significance
arch/ARCH	Low/High Degree of Architectural Significance
land/LAND	Low/High Degree of Landscaping Significance
soc/soc	Low/High Degree of Social and Cultural Significance

Interpretation

ON	On-Site
OFF	Off-Site
N/A	Unknown

Sign Proposals

	Small Sign
	Medium Sign
	Large Sign

Designations

NH CEL	National Historic Civil Engineering Landmark
NHL	National Historic Landmark
NR	National Register of Historic Places
NYC	New York City Landmark

86TH STREET KEEPER'S HOUSE 1866
(Demolished 1935)
Plate 32-9, Old Croton Aqueduct

A three story stone dwelling with a neat landscaped lot, this structure provided a home for the overseer of the Central Park reservoirs. It was located on the south side of the 86th Street transverse between a stable and shop.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

86TH STREET KEEPER'S HOUSE SHOP
1869-1872
Plate 32-8, Old Croton Aqueduct

A mix of brick, cast-iron and stone, the shop was a part of a triptych of structures for the overseer in Central Park. Like most of the service buildings in the park, it was screened from view by a depressed roadway.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

86TH STREET KEEPER'S HOUSE STABLE
1869-1872
Plate 32-10, Old Croton Aqueduct

Designed by Calvert Vaux's associate, Jacob Wrey Mould, the low triangular stable complex had a gateway facing the 86th Street transverse in Central Park. The stable was built to accommodate 30 horses.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

93RD STREET GATEHOUSE 1876
(Demolished)
Plate 32-1, Old Croton Aqueduct

The 93rd Street Gatehouse controlled the outlet of water from six pipes buried in conjunction with the removal of the masonry conduit in Clendenning Valley between 92nd and 113th Streets.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

98TH STREET HIGH SERVICE WORKS 1879
(Demolished)
Plate 30-10, Old Croton Aqueduct

Dressed in Wyoming Valley blue sandstone, the coal powered High Service Works on 98th Street was tasked with raising water 100 feet high. The accompanying tower was 170 feet high with a six foot diameter stand pipe.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

113TH STREET GATEHOUSE 1876
(Adaptive Reuse - Amsterdam Nursing Home)
Plate 30-8, Old Croton Aqueduct

Constructed in conjunction with the removal of the masonry conduit in Clendenning Valley between 92nd and 113th Streets, the 113th Street Gatehouse controlled the inlet of water from six lines of pipes sunk beneath the ground.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

119TH STREET GATEHOUSE 1894-1895
Plate 30-6, Old Croton Aqueduct

The existing 119th Street Gatehouse replaced one built in the center of Amsterdam Avenue. Like its predecessor, it provided an outlet for the water under pressure in the Manhattan Valley Siphon, and regulated the movement of water to southern Manhattan.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

119TH STREET GATEHOUSE c 1840
(Demolished)
Plate 30-7, Old Croton Aqueduct

Located in the middle of Amsterdam Avenue, the original 119th Street Gatehouse regulated the southern outlet of the Manhattan Valley Siphon.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

135TH STREET GATEHOUSE 1884-1890
(Adaptive Reuse - Harlem Stage)
Plate 30-12, Old/ New Croton Aqueduct

As one of the more architecturally expressive gatehouses, the 135th Street Gatehouse was constructed to receive water from both the Old and New Croton Aqueducts, and regulate its distribution to Manhattan. In the case of the New Croton Aqueduct, the gatehouse served as the terminus of the conduit and the beginning of the pipe line.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

142ND STREET GATEHOUSE c 1840
(Demolished)
Plate 30-5, Old Croton Aqueduct

In conjunction with a gatehouse near 135th Street in the center of Amsterdam Avenue, the 142nd Street Gatehouse regulated the northern inlet of the Manhattan Valley Siphon.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

179TH STREET HIGH SERVICE WORKS 1894
(Demolished)
Plate 29B-, New Croton Aqueduct

An addition to the High Service Works at High Bridge, this somber stone and brick Romanesque Revival engine house and tower was sited near Shaft 25. Six machines powered by coal, were capable of pumping 14 million gallons a day.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

AMAWALK AUXILLARY DAM 1897
Plate 9-, New Croton Aqueduct

Earthen with a length of 400 feet and height of 25 feet, the Amawalk Auxiliary Dam is sited on the west side of the Amawalk Reservoir.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

AMAWALK DAM 1897
Plate 9-, New Croton Aqueduct

Earthen with a masonry core, the Amawalk Dam runs across a valley of the Muscoot River. Its length is 1270 feet with a height of 82 feet. The earthen portion of the dam is broken by a 50 foot spillway with an ogee curve profile.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

AMAWALK FOUNTAIN 1897
Plate 9-, New Croton Aqueduct

Aeration is achieved with this 50 foot diameter fountain. From the fountain-basin, water flows to the channel of the spillway.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

AMAWALK GATEHOUSE 1889-1896
Plate 9-, New Croton Aqueduct

Located south of the main dam, the gatehouse receives water from the tower and sends it to the fountain-basin for aeration.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

AMAWALK RESERVOIR 1889-1896
Plate 9-, New Croton Aqueduct

Formed by impounding the middle of the Muscoot River, the Amawalk Reservoir has a capacity of 6.7 billion gallons of water. It is named after the town of Amawalk, which was submerged when the reservoir was constructed.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

AMAWALK TOWER 1889-1896
Plate 9-, New Croton Aqueduct

A 32 X 34 foot tower, located near the base of the main dam, is divided into two chambers. Water is drawn from the reservoir and sent through a tunnel on the dam side that connects with the gatehouse.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

ARCHVILLE BRIDGE 1837-1842
(Demolished 1924)
Plate 22-4, Old Croton Aqueduct

A single arched granite bridge stretching 160 feet, the Archville Bridge carried the Croton Aqueduct across the Albany Post Road.

See Fiche on page XX for more information.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

ARDSLEY GATEHOUSE c 1890s
Plate 24-10, New Croton Aqueduct

A masonry substructure with a 37 X 55 foot chamber divided by an overflow weir, the Ardsley Gatehouse is similar in form to the two other gatehouses placed between Croton Lake and the Harlem River. Here, where the aqueduct is considerably below the surface of the ground, waste water is carried nearly 800 feet through a culvert to the Saw Mill River.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

ARDSLEY OPEN-CUT c 1888s
Plate 24-11, New Croton Aqueduct

The open-cut is a portion of the New Croton Aqueduct that was run through an open trench when soil and rock conditions were not conducive to boring.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

BARNHILL TRIANGLE 1999-2000
Plate XX

A vacant traffic island with plantings reaching into the cross section of the Old Croton Aqueduct running beneath it.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

BOG BROOK BASIN FOUNTAIN c 1891
Plate 5-, New Croton Aqueduct

Aeration of the water from the Bog Brook Reservoir is achieved with a 30 foot diameter fountain with vertical jets.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

BOG BROOK DAM NUMBER 1 1889-1893
Plate 5-, New Croton Aqueduct

Modestly comprised of an earthen embankments with masonry core walls embedded in solid rock, the dam spans 1340 across Bog Brook and rises 60 feet high. The inner wall is covered in paving, while the top and outer wall are sodded.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

BOG BROOK DAM NUMBER 2 1891-1893
Plate 5-, New Croton Aqueduct

Spanning 1956 feet, Bog Brook's smaller dam is 24 feet high. The inner wall is covered in paving, while the outer wall is sodded.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

BOG BROOK GATEHOUSE 1891
Plate 5-, New Croton Aqueduct

Outflow is regulated at Bog Brook Reservoir by a 25 X 27 foot granite masonry gatehouse at the center of Bog Brook Dam Number 1. Also containing a waste weir, the gatehouse admits water at three elevations.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

BOG BROOK RESERVOIR 1892
Plate 5-, New Croton Aqueduct

The Bog Brook Reservoir was formed by damming Bog Brook, a small tributary of the East Branch of the Croton River. It has a holding capacity of 4.4 billion gallons and drainage basin of 4 miles.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

BOYD'S CORNERS BARN c 1870s
Plate 1-, Old/ New Croton Aqueduct

Part of the compound reserved for the overseer of Boyd's Corners.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

BOYD'S CORNERS DAM 1866-1870
(Demolished 1980s)
Plate 1-, Old/ New Croton Aqueduct

Simple in design, the Boyd's Corners Dam was 670 feet long and 57 feet high. Stretching across the West Branch of the Croton River, the masonry dam was faced in ashlar and had a concrete core. Boyd's Corners Dams was one of the first dams to utilize concrete technology. The overflow spilled down a wasteway cut from the natural bedrock.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

BOYD'S CORNERS GATEHOUSE 1866-1873
Plate 1-, Old/ New Croton Aqueduct

A small stone gatehouse located at the base of the downstream face.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

BOYD'S CORNERS KEEPER'S HOUSE c 1870s
(Status Unknown)
Plate 1-, Old/ New Croton Aqueduct

A structure of unknown dimensions and form served as the home for the overseer of Boyd's Corners.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

BOYD'S CORNERs RESERVOIR 1873
Plate 1-, Old/ New Croton Aqueduct

The damming of the middle of the West Branch of the Croton River submerged the village of Boyd's Corners and formed a reservoir with a capacity of 2.7 billion gallons.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

CARMEL AUXILIARY DAM 1890
Plate 3-, New Croton Aqueduct

Constructed one mile southwest of main dam, the Carmel Auxiliary Dam is 800 feet wide and 50 feet high. Earthen with a masonry core, provisions were made for a highway to cross along its 22 feet wide of top.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

CARMEL AUXILIARY DAM GATEHOUSE 1890
Plate 3-, New Croton Aqueduct

Located in the center of the Carmel Auxiliary Dam, the gatehouse contains a single water chamber 5 X 17 feet in size.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

CARMEL DAM 1890
Plate 3-, New Croton Aqueduct

With a spillway functioning as an overflow weir, the Carmel Dam stretches across West Branch of the Croton River running 1800 feet long and rising 65 feet. The masonry portion is flanked on each side by earthen dam. The upstream face is paved in stone while the downstream side is sodded.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

CARMEL DAM GATEHOUSE 1890
Plate 3-, New Croton Aqueduct

Constructed on the north side of the spillway, the gatehouse has one inlet chamber and two outlet chambers to control the flow of the reservoir.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

CARMEL OVERFLOW WEIR 1890
Plate 3-, New Croton Aqueduct

Faced with blue-gray limestone, the Carmel Overflow Weir is 260 feet in length and 53 feet high.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

CARMEL RESERVOIR 1896
Plate 3-, New Croton Aqueduct

Comprised of two dams impounding the West Branch of the Croton River, the Carmel Reservoir has a capacity to contain 9 billion gallons of water.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

CENTRAL PARK 1858-1870
Plate 32-14

An urban oasis designed by Frederick Law Olmsted and Calvert Vaux, Central Park embraced the Old Croton Aqueduct in design.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

CLENDENING VALLEY BRIDGE 1839-1841
(Demolished 1870)
Plate 30-9, Old Croton Aqueduct

Emerging near 95th Street, the aqueduct spans the once rural Clendening Valley on a solid masonry wall broken in three places by tripartite arches before submerging near 102nd Street.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

COAL INCLINE AND RAILROAD, HIGH SERVICE WORKS - HIGH BRIDGE 1873
(Demolished)
Plate 29, Old Croton Aqueduct

Supporting the High Service Works located at the end of High Bridge, the dock and incline were built with a hoisting engine erected for delivering coal to the boiler house.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

COAL STORE c 1879
(Demolished)
Plate 30-11, Old Croton Aqueduct

Provided coal storage for the 98th Street High Service Works.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

COAL WHARF c 1890s
(Demolished)
Plate 29, New Croton Aqueduct

A wharf on the Harlem River below Shaft Number 25 that received coal shipments to power the engines in the pump house and Shaft Number 25.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

CONVENT AVENUE 1888
Plate 30-14, New Croton Aqueduct

Convent Avenue was created on unoccupied land to provide a bed for the pipes leading from the 135th Street Gatehouse.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

CROSS RIVER DAM 1905-1908
Plate 16-, New Croton Aqueduct

Constructed of cyclopean masonry, the Cross River Dam is 772 feet long and rises 170 feet. Precast concrete blocks, a novel application, were used to face the upstream and downstream walls.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

CROSS RIVER RESERVOIR 1905-1908
Plate 16-, New Croton Aqueduct

Impounding the Cross River created the Cross River Reservoir, which has the capacity to collect 10 billion gallons of water.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

CROSS RIVER WASTE WEIR 1905-1908
Plate 16-, New Croton Aqueduct

Roughly 240 feet long, the waste weir at Cross River Dam runs along the hillside. The weir is faced with precast concrete blocks and filled solid with cyclopean masonry.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

CROTON FALLS DAM 1906-1911
Plate 7-, New Croton Aqueduct

Stretching 1,110 feet and rising 173 feet, the Croton Falls Dam employed reinforced concrete in its construction.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

CROTON FALLS DIVERTING DAM 1911
Plate 4-, New Croton Aqueduct

Earthen with a stepped concrete channel, the Diverting Dam is 1,185 feet long.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

CROTON FALLS DIVERTING RESERVOIR 1911
Plate 4-, New Croton Aqueduct

Connected to the Croton Falls Reservoir by a channel and dividing weir, the Croton Falls Diverting Reservoir has a capacity of nearly 900 million gallons of water.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

CROTON FALLS RESERVOIR 1906-1911
Plate 7-, New Croton Aqueduct

Formed by impounding the West Branch and Middle Branch of the Croton Reservoir, the Croton Falls Reservoir has a capacity of about 14 billion gallons of water.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

CROTON FOUNTAIN 1842
(Demolished 1870)
Plate 33-1

The circular stone fountain shot Croton water fifty feet in the air and was built to celebrate the opening of the Old Croton Aqueduct in 1842.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

CROTON LAKE 1838-1841
(Submerged)
Plate 14-, Old Croton Aqueduct

An artificial four mile lake formed by damming the Croton River, Croton Lake or "Fountain Reservoir," as it was called, was capable of impounding 600 million gallons of water. Croton Lake was absorbed into New Croton Reservoir.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

DOBBS FERRY BARN c 1880s
Plate 24-2, Old Croton Aqueduct

A maintenance building for the use of the principal superintendent of the aqueduct north of New York City.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

DOBBS FERRY KEEPER'S HOUSE 1857
Plate 24-3, Old Croton Aqueduct

Italianate in form, the two story masonry structure provided a home for the principal superintendent of the aqueduct north of New York City.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

DOBBS FERRY KEEPER'S HOUSE STABLE
(Demolished)
Plate 24-4, Old Croton Aqueduct

The stable was part of the complex at Dobbs Ferry for the principal aqueduct superintendent.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

DOBBS FERRY TOOL SHED
(Demolished)
Plate 24-5, Old Croton Aqueduct

The tool shed was a miscellaneous maintenance building located on the aqueduct embankment.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

EAST BRANCH FOREMAN BARN 188-1892
Plate 5-, New Croton Aqueduct

Part of the complex allotted to the overseer of the East Branch Reservoir.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

EAST BRANCH GATEHOUSE 1888-1892
Plate 5-, New Croton Aqueduct

The flow of water between Sodom Reservoir and Bog Brook Reservoir is controlled by a gatehouse located near Bog Brook Dam Number 1. The superstructure measures 23 X 27 feet and is built of granite masonry.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

EAST BRANCH RESERVOIR 1888-1892
Plate 6-, New Croton Aqueduct

The East Branch Reservoir is formed by the Sodom and Bog Brook Reservoirs, which are connected by a 1,778 foot long tunnel.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

GOULD'S SWAMP SIPHON c 1888
Plate 23-7, New Croton Aqueduct

At Gould's Swamp, the soil was found to be insufficient, so between Shaft No 11A and 11B, the New Croton Aqueduct was built under the bedrock forming an inverted siphon.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HARLEM RIVER SIPHON 1886-1888
Plate 29, New Croton Aqueduct

The composition of rock under the Harlem River necessitated the tunnel to be placed 307 feet under the river bed. Here, the size of the tunnel was reduced to 10 ft. 6 in., and the water is under great pressure.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HARLEM RIVER SPEEDWAY 1894-1898
(Demolished 1940s and 1960s)
Plate 31-2

Two miles in length and following the sinewy curves of the Harlem River, Calvert Vaux's speedway served as a picturesque roadway for fast-trotting horses. Before the automobile gained favor, the Harlem River Speedway was a popular pleasure destination.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGH BRIDGE 1837-1848
(Altered 1927)
Plate 29, Old Croton Aqueduct

Serving as the Harlem River crossing for the Old Croton Aqueduct, the monumental pedestrian bridge with stunning views of the landscape was a popular tourist destination.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGH BRIDGE ENGINE HOUSE c 1870
(Demolished)
Plate 29, Old Croton Aqueduct

Part of the High Service Works at High Bridge, the stone engine house was comprised of two buildings: a boiler house with a tall smoke stack and a building containing the engines for pumping the water from the aqueduct to the High Service Reservoir and High Bridge Tower.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGH BRIDGE ENGINEER'S Office c 1840s (Demolished)
Plate 29, Old Croton Aqueduct

A stone office for the engineer of the Old Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGH BRIDGE KEEPER'S HOUSE (Demolished)
Plate 29, New Croton Aqueduct

A building constructed for the overseer of the High Bridge section of the aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGH BRIDGE GATEHOUSE (EAST) 1837-1848
Plate 29, Old Croton Aqueduct

Regulating the inflow of the aqueduct, the stone gatehouse stands sentry at the eastern entrance to High Bridge. In addition, it is outfitted with a waste weir.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGH BRIDGE STEPS 1891
Plate 29

A series of short flights of bluestone steps broken by generous gneiss landings linked the entrance to High Bridge, at the top of the hill, to the road and wharf on the river below.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGH BRIDGE GATEHOUSE (WEST) 1837-1848
Plate 29, New Croton Aqueduct

The western gatehouse at High Bridge discharges water to Manhattan Island.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGH BRIDGE STORE
Plate 29, Old Croton Aqueduct

Part of the complex allotted to the overseer of the High Bridge section of the aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGH BRIDGE TOWER 1872
Plate 29, Old Croton Aqueduct

Rising 185 feet on a bluff in Highbridge Park, High Bridge Tower contained a water tank for high-storied buildings in Washington Heights.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGH SERVICE RESERVOIR 1866-1869
(Adaptive Reuse - Highbridge Pool 1934)
Plate 29, Old Croton Aqueduct

Part of the High Service Works at High Bridge serving the area of Manhattan above 135th Street, the earthen embanked reservoir also contained a promenade at the top with view of High Bridge and the Harlem River.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGH SERVICE RESERVOIR GATEHOUSE
(EAST) 1866-1869
(Demolished)
Plate 29, Old Croton Aqueduct

The eastern gatehouse regulated the inlet of the aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGH SERVICE RESERVOIR GATEHOUSE
(WEST) 1866-1869
(Demolished)
Plate 29, Old Croton Aqueduct

The western gatehouse regulated the outlet of the reservoir.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGH SERVICE RESERVOIR FOUNTAIN c 1869
(Demolished)
Plate 29, Old Croton Aqueduct

The High Service Reservoir Fountain had an 80 foot diameter basin for aerating the reservoir water.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGHBRIDGE PARK 1871- c 1915
Plate 31-3

Rugged in landscape, the original park wrapped around the High Service Reservoir. At the turn of the nineteenth century its acreage was increased with the addition of Fort George Park, Speedway Park, and Washington Park.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HIGHLAND AVENUE BRIDGE 1838-1841
Plate 23, Old Croton Aqueduct

Rising 14 feet with a span of 20 feet, Highland Avenue Bridge is an archway over what was then known as the Highland Turnpike, nearly eleven miles south of the Old Croton Dam.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

HOOPER FOUNTAIN 1894
Plate 30-1

Commissioned by John Hooper and sited near the entrance to the Harlem River Speedway, the fountain quenched the thirst of pedestrians, as well as horses.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

INDIAN CREEK CULVERT 1837-1839
Plate 18-7, Old Croton Aqueduct

An eight foot culvert provided passage to Indian Creek with a foundation wall rising 45 feet to meet the grade of the Old Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

JEROME PARK 1866
Plate 29A-

Developed by the American Jockey Club, Jerome Park was the first commercial racetrack in the City. The original home of the Belmont Stakes, Jerome Park closed in 1887.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

JEROME PARK BRIDGE c 1890
(Demolished)
Plate 29A-, Old/ New Croton Aqueduct

Elaborately arched, the bridge provided access to Shaft Number 21 from Gatehouse Number 5.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

JEROME PARK GATEHOUSE NUMBER 1 c1890
Plate 29A-, Old/ New Croton Aqueduct

Designed in an “L” plan with a 31 X 35 foot main body and 22 X 27 foot wing, Gatehouse Number 1 was constructed below grade with no superstructure. Here the New Croton Aqueduct divides with one branch leading to the reservoir and the other leading to Shaft Number 20 where the pressure tunnel begins.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

JEROME PARK GATEHOUSE NUMBER 2 1900
(Superstructure added 1938)
Plate 29A-, Old/ New Croton Aqueduct

Comprised of two inlet chambers and a central chamber into which the waste water from the reservoir passes over three waste weirs, the stone substructure at Gatehouse Number 2 measured 27 X 30 feet.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

JEROME PARK GATEHOUSE NUMBER 3 c1890
Plate 29A-, Old/ New Croton Aqueduct

The 29 X 35 foot substructure was constructed to control the outflow of water.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

JEROME PARK GATEHOUSE NUMBER 4 c1890
Plate 29A-, Old/ New Croton Aqueduct

The 29 X 35 foot substructure was constructed to control the outflow of water.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

JEROME PARK GATEHOUSE NUMBER 5 1900
(Superstructure added 1938)
Plate 29A-, Old/ New Croton Aqueduct

A gatehouse crucial to Jerome Park’s functioning, Gatehouse Number 5 received water from the Old and a branch of the New, discharging the water into the east and western divisions

of the reservoir. The gatehouse controlled the inlets to gatehouses 2, 3, and 4. If the reservoir was emptied, Gatehouse Number 5 could maintain a supply to New York City.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

JEROME PARK GATEHOUSE NUMBER 6 c1890 (Demolished)
Plate 29A-, Old/ New Croton Aqueduct

The southeastern gatehouse.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

JEROME PARK GATEHOUSE NUMBER 7 c1905
Plate 29A-, Old/ New Croton Aqueduct

A later addition to the Jerome Park complex, the gatehouse connected the Old and New while anticipating the Catskill Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

JEROME PARK KEEPER'S HOUSE c 1890s (Demolished)
Plate 29A-, Old/ New Croton Aqueduct

Designed by F. S. Cook, the Jerome Park Keeper's House was an elaborate home for the overseer of the aqueducts in the Bronx.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

JEROME PARK HIGH PUMPING STATION 1901-1906
Plate 29A-, Old/ New Croton Aqueduct

The expansion of the Bronx necessitated a pumping house to pump water to higher-storied buildings. The building's form and Romanesque Revival detailing is similar to the pumping station constructed at 179th Street.

Fo

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

JEROME PARK RESERVOIR 1895-1906
Plate 29A-, Old/ New Croton Aqueduct

Strategically sited with access to both the Old and New Croton Aqueducts, the Jerome Park Reservoir assumed a curvilinear form reminiscent of Lake Manahatta.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

JEWELL'S BROOK CULVERT 1838-1841
Plate 23-5, Old Croton Aqueduct

Engineered to prevent direct pressure, the sloping wall of Jewell's Brook Culvert rose 50 feet high and ran 148 feet long.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

JUMMELL TUNNEL c 1840
Plate 31-4, Old Croton Aqueduct

On the land of Etienne Jummell, a tunnel was driven 234 feet through solid rock.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

JUNCTION GATEHOUSE c 1860
(Demolished)
Plate 32-2, Old/ New Croton Aqueduct
pg 67 pic plate 49

Square in plan at 22 ft. 6 in. X 22 ft. 10 in., the gatehouse directed water to either of the two reservoirs in Central Park by the opening and closing of sluice-gates in the eastern and southern walls.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

LAKE MANAHATTA 1858-1862
(Renamed Jacqueline Kennedy Onassis Reservoir)
Plate 32-5, Old/ New Croton Aqueduct

Designed by Frederick Law Olmstead and Calvert Vaux, the free form northern reservoir in Central Park countered the rectilinear collection pool that predated the parks design.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

LAKE MANAHATTA FOUNTAIN 1858-1862
Plate 32-6, Old/ New Croton Aqueduct

A fountain in the center of the Lake Manahatta for the purpose of aerating the reservoir water.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

MANHATTAN VALLEY SIPHON c 1840
Plate 30-4, Old Croton Aqueduct

Residing 105 feet below the Old Croton Aqueduct's grade, Manhattan Valley, two miles south of High Bridge, was traversed by an inverted siphon of cast iron pipes.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

MANHATTAN VALLEY WASTE WEIR c 1840
(Demolished)
Plate XX, Old Croton Aqueduct

Located at the deepest depression of Manhattan Valley, the waste weir was built with the purpose of emptying the aqueduct for repair or to remove sediment.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

MIDDLE BRANCH DAM 1874-1878
Plate 4-, New Croton Aqueduct

Earthen with a masonry core-wall, the 515 foot long dam stretches across the Middle Branch of the Croton River. It reaches a maximum height of 94 feet.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

MIDDLE BRANCH RESERVOIR 1874-1878
Plate 4-, New Croton Aqueduct

With the capabiltiy of storing four billion gallons, the water is impounded by damming the Middle Branch of the Croton River.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

MILL RIVER CULVERT 1837-1841
Plate 22-7, Old Croton Aqueduct

Spanning a depression of 72 feet below grade, the Mill River Culvert's 172 foot long embankment reaches 87 feet above the river bed. The 25 foot span allows free passage along Mill River under the aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

MILL RIVER WASTE WEIR 1837-1841
Plate 22-6, Old Croton Aqueduct

Spanning a depression 72 feet below grade, the Mill River Culvert's 172 foot long embankment reaches 87 feet above the river bed. The 25 foot span allows free passage of Mill River under the aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

MURRAY HILL RESERVOIR 1839-1842
Plate 32-13, Old Croton Aqueduct

Imposing and massive, the Egyptian Revival reservoir contained two collection pools with a capacity of 24 million gallons of water. City dwellers frequently took advantage of the generous promenade atop the structure for its views of Manhattan.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

MUSCOOT DAM 1905
Plate 15-, New Croton Aqueduct

Sited at the division of the New Croton Reservoir and the Muscoot Reservoir, the Muscoot Dam ensures that the latter was maintained at a sufficient depth.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

MUSCOOT RESERVOIR 1905
Plate 15-, New Croton Aqueduct

The Muscoot Reservoir, capable of impounding 5 gallons of water, is the collection point for all reservoirs in the Croton Watershed, with the exception of the New Croton Reservoir.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

MUSCOOT RESERVOIR BARN c 1905
Plate 15-, New Croton Aqueduct

Part of the compound allotted to the overseer of the Muscoot Reservoir.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

MUSCOOT RESERVOIR FOREMAN'S HOUSE c 1905
Plate 15-, New Croton Aqueduct

A structure serving as the dwelling house of the overseer of the Muscoot Reservoir.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

MUSCOOT RESERVOIR GATEHOUSE 1905
Plate 15-, New Croton Aqueduct

The gatehouse regulated the flow of the Croton Watershed into the New Croton Reservoir, where it entered the New Croton Aqueduct conduit.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

NEW CROTON DAM 1892-1906
Plate 18-2, Old/ New Croton Aqueduct

Located three miles south of the Old Croton Dam, the central masonry dam is 600 feet long and is paired with a dramatic 1000 foot long overflow weir. The Old Croton Aqueduct crosses the line of the dam on the south side of valley.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

NEW CROTON DAM GATEHOUSE 1892-1906
Plate 18-3, New Croton Aqueduct

Constructed on the upstream side of the New Croton Dam, the masonry substructure is divided into three water chambers.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

NEW CROTON DAM OVERFLOW WEIR 1892-1906
Plate 18-1, New Croton Aqueduct

Parallel with the contour lines of the hillside, the stepped overflow weir is a dramatic feature of the New Croton Dam.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

NEW CROTON GATEHOUSE 1890
Plate 13-, Old/ New Croton Aqueduct

Provided with five different inlets drawing water from different points and depths of the New Croton Reservoir, the gatehouse controls the inlet of water into the Old and New Croton Aqueducts.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

NEW CROTON RESERVOIR 1892-1906
Plate 13-, New Croton Aqueduct

Following the contours of the valley, the New Croton Reservoir absorbed Croton Lake and the Old Croton Dam, ultimately achieving a capacity of 20 billion gallons of water.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

NEW OSSINING WEIR 1881-1886
Plate 20-7, Old Croton Aqueduct

Egyptian Revival in style, the New Ossining Weir was built to avoid updating the Old Ossing Weir. Within the 20 X 10 foot stone structure, water from the Old Croton Aqueduct could be discharged.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

NORTH GATEHOUSE
Plate 32-4, Old/ New Croton Aqueduct

With a granite superstructure, the eastern North Gatehouse forms the terminus of the pipe line of the New Croton Aqueduct in Central Park.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

NORTH GATEHOUSE
Plate 32-3, Old Croton Aqueduct

Positioned on the northwestern edge of Lake Manahatta and at 72 X 40, the North Gatehouse serves as the inlet feet of the aqueduct into the reservoir.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

NORTH TARRYTOWN KEEPER'S HOUSE
Plate 22, New Croton Aqueduct

The dwelling house for the overseer of the North Tarrytown section of the Old Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

NORTH TARRYTOWN KEEPER'S HOUSE BARN
Plate 22, Old Croton Aqueduct

Part of the complex allotted to the overseer of the North Tarrytown section of the Old Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

NORTH TARRYTOWN KEEPER'S HOUSE
STABLE
Plate 22, Old Croton Aqueduct

Part of the complex allotted to the overseer of the North Tarrytown section of the Old Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

OLD CROTON DAM 1838-1841
(Submerged)
Plate 13-, Old Croton Aqueduct

Originally designed with earthen embankments flanking a masonry dam, the Old Croton Dam suffered damage in a flood during construction. The plans were modified and a 250 foot long dam of continuous stone was built. Fifty feet high, the profile of the dam was curved in form so that the water flowed in a stunning fashion.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

OLD CROTON DAM BARN
(Submerged)
Plate 13-, Old Croton Aqueduct

Part of the complex allotted to the overseer of Croton Dam.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

OLD CROTON DAM GATEHOUSE 1838-1841
(Submerged)
Plate 13-, Old Croton Aqueduct

A stone structure with an inlet chamber connected to a tunnel leading from the Old Croton Dam. The masonry conduit began at the outlet chamber of this gatehouse.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

OLD CROTON DAM KEEPER'S HOUSE
(Submerged)
Plate 13-, Old Croton Aqueduct

The dwelling house of the overseer of the Croton Dam.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

OLD CROTON DAM STABLE
(SUBMERGED)
Plate 13-, Old Croton Aqueduct

Part of the complex allotted to the overseer of Croton Dam.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

OLD CROTON DAM WASTE WEIR 1838-1841
(Submerged)
Plate 13-, Old Croton Aqueduct

Accessed by a bridge, the overflow weir was protected by a small stone building. Inside, two sets of gates were capable of drawing water from Croton Lake at a greater depth.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

OLD OSSINING WEIR 1837-1842
Plate 20-2, Old Croton Aqueduct

In a style similar to the other five weirs constructed for the Old Croton Aqueduct, the excess water exited through a stone wall shoring up the aqueduct. It was also used to measure the water in the aqueduct.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

OSSINING KEEPER'S HOUSE
(Demolished)
Plate 20-3, Old Croton Aqueduct

A two story dwelling with a porch that functioned as the home of the overseer of the Ossining section of the Old Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

OSSINING KEEPER'S HOUSE BARN
(Demolished)
Plate 20-5, Old Croton Aqueduct

Part of the complex allotted to the overseer of the Ossining section of the Old Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

OSSINING KEEPER'S HOUSE STABLES
(Demolished)
Plate 20-4, Old Croton Aqueduct

Part of the complex allotted to the overseer of the Ossining section of the Old Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

PIPE YARD
(Demolished)
Plate 34-1

Located on a city block adjacent to the East River, the pipe yard provided a storage area for piping and other aqueduct appurtenances.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

POCANTICO GATEHOUSE c 1890s
Plate 22-13, New Croton Aqueduct

A masonry substructure with a 37 X 55 foot chamber divided by an overflow weir, the Pocantico Gatehouse is similar in form to the two other gatehouses placed between Croton Lake and the Harlem River. Here, the waste water passes through a 15 foot culvert to the Pocantico River west of the aqueduct.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

POCANTICO OPEN-CUT c 1888
Plate 22-11, New Croton Aqueduct

A portion of the New Croton Aqueduct was run through an open trench when soil and rock conditions were not conducive to boring.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

QUAKER BRIDGE DAM
Plate 18-5

Four miles south of the Old Croton Dam in a narrow portion of the Croton River, the Quaker Bridge Dam was designed to increase the capacity of Croton Lake. Never built in that spot, a location further north was chosen instead. The New Croton Dam resembles the design for the Quaker Bridge Dam, the only essential changes being that it is not as tall and that the polygonal faces have been rounded off.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

QUARRY RAILROAD BRIDGE 1838-1839
Plate 24-7, Old Croton Aqueduct

Designed to accommodate the pre-existing transportation route of Harvey's Marble Quarry, the stone arch of the Quarry Railroad Bridge spanned sixteen feet over the railroad tracks below.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

RESERVOIR PARK 1871
(Renamed Bryant Park 1884)
Plate 32-12

Reservoir Park occupied the land made vacant by the burning of Crystal Palace. Originally formal in design, the park was redesigned on several occasions. As part of a WPA initiative, Bryant Park, as it was renamed in 1884, was redesigned in a faux Victorian style.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

RIDER'S BROOK CULVERT c 1840
Plate 22-1, Old Croton Aqueduct

The culvert resides 34 feet beneath the conduit of the Old Croton Aqueduct. The embankment is 100 feet long.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SAW MILL RIVER BRIDGE 1838-1839
Plate 27-2, Old Croton Aqueduct

The stone arch spanned 16 feet across a road at Saw Mill River.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SAW MILL RIVER CULVERT 1838-1839
Plate 27-1, Old Croton Aqueduct

The design was chosen for its engineering efficiency, as two smaller arches sharing a common footing was less expensive to build than a single, larger arch. Each culvert spanned 25 feet within the 90 foot long embankment.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 0
Plate 13-, New Croton Aqueduct

Shaft Number 0 was dug at an incline on a grade of 12 feet per 100 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 1
Plate 19-1, New Croton Aqueduct

Engineers designed Shaft Number 1 to be sunk to a depth of 343 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 1 HEADHOUSE
(Status Unknown)
Plate 19-2, New Croton Aqueduct

A headhouse was placed over Shaft Number 1.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 2
Plate 19-3, New Croton Aqueduct

Shaft Number 2 was designed at a depth of 343 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 2 HEADHOUSE
(Status Unknown)
Plate 19-4, New Croton Aqueduct

A headhouse was placed over Shaft Number 2.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 3
Plate 19-5, New Croton Aqueduct

Shaft Number 3 was engineered at a depth of 380 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 4
Plate 21-1, New Croton Aqueduct

Engineers designed Shaft Number 4 at a depth of 246 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 4 HEADHOUSE
(Status Unknown)
Plate 21-2, New Croton Aqueduct

Also referred to as the Briarcliffe Farms Headhouse, the structure covered an unpressurized portion of the New Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 5
Plate 21-3, New Croton Aqueduct

Shaft Number 7 was engineered at a depth of 109 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 6
Plate 21-3, New Croton Aqueduct

Shaft Number 6 was designed to reach a depth of 173 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 7
Plate 22-9, New Croton Aqueduct

Shaft Number 7 was engineered at a depth of 163 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 8
Plate 22-10, New Croton Aqueduct

Shaft Number 8 was cut at the Pocantico River.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 8 HEADHOUSE
(Status Unknown)
Plate 22-11, New Croton Aqueduct

Also referred to as the North Tarrytown Headhouse, the structure covered an unpressurized portion of the New Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 9
Plate 22-13, New Croton Aqueduct

Shaft Number 9 was designed level with the aqueduct and paired with the Pocantico Gatehouse.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 10
Plate 22-15, New Croton Aqueduct

Engineers designed Shaft Number 10 to be sunk to a depth of 126 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 11A
Plate 23-6, New Croton Aqueduct

Shaft 11A, on the nouthern side of Gould's Swamp Siphon, was engineered at a depth of 32 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT 11B
Plate 23-8, New Croton Aqueduct

Shaft 11B, on the southern side of Gould's Swamp Siphon, was engineered at a depth of 36 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 11C
Plate 23-9, New Croton Aqueduct

Shaft 11C was constructed with a 14 foot diameter so that pumping apparatus could be lowered down to the New Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 11C HEADHOUSE
Plate 23-9, New Croton Aqueduct

The headhouse at Shaft Number 11C was designed to contain appurtenances necessary for the emptying of the Gould's Swamp Siphon.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 12A
Plate 23-10, New Croton Aqueduct

Shaft Number 12A was engineered at a depth of 43 feet.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 12B
Plate 23-11, New Croton Aqueduct

Shaft Number 12B was designed to be sunk to a depth of 40 feet.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 13
Plate 24-8, New Croton Aqueduct

Shaft Number 13 was designed to be sunk to a depth of 153 feet.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 14
Plate 24-9, New Croton Aqueduct

Engineered to a depth of 28 feet, Shaft Number 14 was paired with the Ardsley Gatehouse.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 15
Plate 24-12, New Croton Aqueduct

Designed to be sunk to a depth of 128 feet.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 15 HEADHOUSE
Plate 24-13, New Croton Aqueduct

Also referred to as the Mount Hope Headhouse, the structure covered an unpressurized portion of the New Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 16
Plate 26-3, New Croton Aqueduct

Shaft Number 16 was engineered at a depth of 72 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 16 HEADHOUSE
Plate 24-12, New Croton Aqueduct

Also referred to as the Nepperhan Headhouse, the structure covered an unpressurized portion of the New Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 17 1887
Plate 26-4, New Croton Aqueduct

In digging Shaft Number 17 to a projected depth of 60 feet, sand and gravel was encountered. A cave-in occured killing 3 people.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 18
Plate 28-XX, New Croton Aqueduct

Level with the New Croton Aqueduct tunnel, Shaft Number 18 was paired with the South Yonkers Gatehouse .

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 19
Plate 28-XX, New Croton Aqueduct

Shaft Number 19 was engineered at a depth of 63 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 19 HEADHOUSE
(Status Unknown)
Plate 28-XX, New Croton Aqueduct

An headhouse for an unpressurized shaft was placed over Shaft Number 19.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 20
Plate 28-XX, New Croton Aqueduct

Shaft Number 20, engineered at a depth of 115 feet, marked the beginning of the pressurized portion of the New Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 21
Plate 29, New Croton Aqueduct

Shaft Number 21 was engineered at a depth of 103 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 22
Plate 29, New Croton Aqueduct

Shaft Number 22 was designed at a depth of 82 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 23
Plate 29, New Croton Aqueduct

Engineers designed the shaft to be sunk to a depth of 65 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT NUMBER 24
Plate 29, New Croton Aqueduct

Marking the eastern end of the Harlem River Siphon, numerous difficulties were encountered in its construction.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SHAFT 24 HEADHOUSE
Plate 29, New Croton Aqueduct

A diminutive stone structure was placed over Shaft Number 24 on the eastern side of the Harlem River.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 25 1886-1890
Plate 29, New Croton Aqueduct

Marking the point where the New Croton Aqueduct entered Manhattan Island, Shaft Number 25 employed revolutionary engineering in its design.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 25 HEADHOUSE
(Demolished)
Plate 29, New Croton Aqueduct

Built to house a powerful steam-engine used to power the pump shaft in Shaft Number 25, an expressive Romanesque Revival style was employed. The headhouse overlooked the Harlem River Speedway.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 25 STEPS AND
RETAINING WALL c 1892
Plate 29, New Croton Aqueduct

An elaborate stairway was built into the side of Shaft Number 25 with access to the Harlem River Speedway through a glorious arch.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 26
Plate 29, New Croton Aqueduct

Engineered at a depth of 120 feet, Shaft Number 26 was also designed to protect Manhattan from any undue pressure resulting from the Harlem River Siphon.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 26 HEADHOUSE
(Demolished)
Plate 29, New Croton Aqueduct

A brick vault with two manhole covers served as a headhouse for Shaft Number 26. Critical to the equalizing of the pressure from the Harlem River Siphon, it served as an overflow dam.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 27
Plate 29, New Croton Aqueduct

Shaft Number 27 was sunk to 144 feet.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 28
Plate 31-1, New Croton Aqueduct

At Shaft Number 28, engineers predicted a necessary depth of 128 feet.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 29
Plate 30-3, New Croton Aqueduct

Shaft Number 29 was designed to a depth of 114 feet.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 30
Plate 30-15, New Croton Aqueduct

At Shaft Number 30, engineers planned on sinking the shaft to a depth of 81 feet. Soft clay and decomposed rock was encountered, however, causing a cave-in and loss of life.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 31
Plate 30-14, New Croton Aqueduct

On 141st Street, engineers expected Shaft Number 31 to sink to a depth of 82 feet.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SHAFT NUMBER 32
Plate 30-12, New Croton Aqueduct

Engineers expected the Shaft Number 32 to reach a depth of 87 feet.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SING SING BRIDGE c 1840
Plate 22-2, Old Croton Aqueduct

Spanning 20 feet the Sing Sing Bridge arches over a street in the village of Sing Sing.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SING SING KILL BRIDGE 1842
Plate 20-8, Old Croton Aqueduct

Constructed across a valley where a stream had worn a deep channel, the Sing Sing Kill has an elegant arch spanning 88 feet.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SODOM AUXILIARY DAM 1888-1892
Plate 5-, New Croton Aqueduct

Running parallel to the Croton River, the earthen Sodom Auxiliary Dam is nearly 600 feet long and 75 feet high.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SODOM DAM 1888-1892
Plate 5-, New Croton Aqueduct

Faced with blue-gray limestone, the solid masonry dam rises to a 75 foot height. The battered stone portion is flanked by earthen walls with a masonry core that when combined stretch 500 feet along the East Branch of the Croton River.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SODOM DAM FOUNTAIN 1888-1892
Plate 5-, New Croton Aqueduct

Vertical jets sprout from a 80 foot diameter fountain that aerates water from the Sodom Reservoir.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SODOM DAM GATEHOUSE 1888-1892
Plate 5-, New Croton Aqueduct

A 37 X 42 foot stone gatehouse near the center of the Sodom Dam regulates the water in the Sodom Reservoir at three elevations.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SODOM OVERFLOW WEIR 1888-1892
Plate 5-, New Croton Aqueduct

A continuation of the Sodom Auxiliary Dam, the overflow weir stretches 500 feet and is 8 feet high.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SODOM RESERVOIR 1888-1892
Plate 5-, New Croton Aqueduct

Comprising two dams and an overflow weir, the Sodom Reservoir, a part of the East Branch Reservoir, is capable of impounding nearly 5 billion gallons of water.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SOUTH GATEHOUSE 1862
Plate 32-7, Old Croton Aqueduct

With a substructure at 83 X 40 feet, the South Gatehouse at Lake Manahatta in Central Park was composed of a sturdy granite exterior with a small balcony overlooking the reservoir.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

SOUTH YONKERS GATEHOUSE c 1888
Plate 28-XX, New Croton Aqueduct

A masonry substructure with a 37 X 55 foot chamber divided by an overflow weir, the South Yonkers Gatehouse is similar in form to the two other gatehouses placed between Croton Lake and the Harlem River. Here, Tibbit's Brook, into which the waste water is discharged, passes under the gatehouse through two circular culverts.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

SOUTH YONKERS OPEN-CUT c 1888
Plate 28-XX, New Croton Aqueduct

A portion of the New Croton Aqueduct was run through an open trench when soil and rock conditions were not conducive to boring.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

TIBBIT'S BROOK CULVERT c1840
Plate 28-XX, Old Croton Aqueduct

At the crossing of Tibbit's Brook, a culvert is constructed with a 107 foot long embankment with a bed 40 feet below the Old Croton Aqueduct conduit.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

TITICUS DAM 1890-1895
Plate 7-, New Croton Aqueduct

The Titicus Dam stretches 1,519 feet. The masonry portion, including the spillway, is 732 feet long and is flanked by earthen portions. The granite used on Titicus Dam came from a quarry opened nearby.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

TITICUS DAM GATEHOUSE 1890-1895
Plate 7-, New Croton Aqueduct

Constructed on the upstream side of the masonry dam, the 32 X 35 foot granite gatehouse regulates the flow of the Titicus Reservoir.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

TITICUS ENGINEER'S HOUSE c 1895
Plate 7-, New Croton Aqueduct

A dwelling house for the engineer of the Titicus Reservoir.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

TITICUS RESERVOIR 1890-1895
Plate 7-, New Croton Aqueduct

The damming of the Titicus River created a reservoir capable of storing 7 billion gallons of water.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

VAN CORTLANDT PARK 1888
Plate 28

Parkland in the Bronx containing the Nation's first public golf course.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

VAN CORTLANDT PARK KEEPER'S HOUSE (Demolished)
Plate 28-, Old Croton Aqueduct

A dwelling house for the overseer of the Van Cortlandt Park section of the Old Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

VAN CORTLANDT PARK KEEPER'S HOUSE BARN (Demolished)
Plate 28, Old Croton Aqueduct

Part of the complex allotted to the overseer of the Van Cortlandt Park section of the Old Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

VAN CORTLANDT PARK KEEPER'S HOUSE
STABLE (Demolished)
Plate 28-, Old Croton Aqueduct

Part of the complex allotted to the overseer of the Van Cortlandt Park section of the Old Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

VAN CORTLANDT PARK WEIR
Plate 28, Old Croton Aqueduct

The Van Cortlandt Park Weir, like the six others built at the time of the construction of the Old Croton Aqueduct, controlled the waste of water from the aqueduct.

For more information, see fiche on page XX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

VENTILATORS 1838-1841
Old Croton Aqueduct

Cylindrical in form, the ventilators were placed every mile or so on the Old Croton Aqueduct. While their purpose was to provide ventilation to the masonry conduit beneath them, several ventilators were constructed with entrances to the tunnel.

Ventilator 1 (Submerged or demolished)
Ventilator 2 (Submerged or demolished)
Ventilator 3, Plate 18-4
Ventilator 4, Plate 18-6
Ventilator 5, Plate 18-8
Ventilator 6, Plate 20-1
Ventilator 7, Plate 20-9
Ventilator 8, Plate 20-10
Ventilator 9, Plate 22-3
Ventilator 10, Plate 22-5
Ventilator 11, Plate 22-8
Ventilator 12, Plate 23-1
Ventilator 13, Plate 23-2
Ventilator 14, Plate 23-3
Ventilator 15, Plate 23-4
Ventilator 16, Plate 24-1
Ventilator 17 (Demolished), Plate 24-6
Ventilator 18, Plate 26-1
Ventilator 19, Plate 25-1
Ventilator 20, Plate 25-3
Ventilator 21, Plate 25-5
Ventilator 22, Plate 28-1
Ventilator 23, Plate 28-
Ventilator 24, Plate 28-
Ventilator 25 (Demolished)
Ventilator 26 (Demolished)
Ventilator 27 (Demolished)
Ventilator 28 (Demolished)
Ventilator 29 (Demolished)
Ventilator 30 (Demolished)
Ventilator 31 (Demolished)
Ventilator 32 (Demolished)
Ventilator 33 (Demolished)

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

WEST BRANCH BARN c 1895
Plate 2-, New Croton Aqueduct

A maintenance building allotted to the supervisor of the West Branch Reservoir.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

WEST BRANCH RESERVOIR 1895
Plate 2-, New Croton Aqueduct

The West Branch Reservoir was formed by the Carmel Dam.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

WEST BRANCH SUPERVISOR'S HOUSE c 1895
Plate 2-, New Croton Aqueduct

A dwelling house for the supervisor of the West Branch Reservoir.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

YONKERS BARN
(Demolished)
Plate 25, Old Croton Aqueduct

Part of the complex allotted to the overseer of the Yonkers section of the Old Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

WEST BURNSIDE AVENUE BRIDGE 1838-1841
(Demolished)
Plate 29-, Old Croton Aqueduct

Built as a component of the Old Croton system, this feature originally took the form of a three-arched bridge spanning a country road. A central, 30-foot-wide vehicular arch was flanked by smaller arches for pedestrian traffic.

For more information, see fiche on page XXX.

Type	Significance(s)				Interpretation	Sign

Current Designation(s)					

YONKERS KEEPER'S HOUSE
(Demolished)
Plate 25, Old Croton Aqueduct

A dwelling house for the overseer of the Yonkers section of the Old Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

YONKERS KEEPER'S HOUSE STABLE
(Demolished)
Plate 25, Old Croton Aqueduct

Part of the complex allotted to the overseer of the Yonkers section of the Old Croton Aqueduct.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

YONKERS TOOL SHED
(Demolished)
Plate 25-4, Old Croton Aqueduct

The tool shed was a miscellaneous maintenance building located on the aqueduct embankment.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

YONKERS WEIR 1837-1842
Plate 25-2, Old Croton Aqueduct

The Yonkers Weir, controlled the discharge of water from the aqueduct.

For more information, see fiche on page XX.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						

YORK HILL RESERVOIR 1842
Plate 32-11, Old Croton Aqueduct

York Hill Reservoir, the main receiving reservoir for the Old Croton Aqueduct, was capable of collecting 180 million gallons of water. The reservoir was constructed on several city blocks which would later become the heart of the Central Park land.

For more information, see fiche on page XX.

Type	Significance(s)				Interpretation	Sign
Current Designation(s)						