United States Department of the Interior
National Park Service

DEC 0 5 1989

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *Guidelines for Completing National Register Forms* (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

1. Name of Property

historic name Water Supply System of Metropolitan Boston, Thematic Multiple
other names/site number Properties Submission

2. Location

street & number Multiple — N/A not for publication
city, town See District Data Sheet — N/A vicinity
state MA code 025 county Worcester, Middlesex, Suffolk, Norfolk, code 027, 017, 025, 021 zip code

3. Classification

Ownership of Property
- [ ] private
- [X] public-local
- [ ] public-State
- [ ] public-Federal

Category of Property
- [X] building(s)
- [X] district
- [ ] site
- [X] structure
- [ ] object

Number of Resources within Property

Contributing	Noncontributing	
8	4	buildings
0	0	sites
90	4	structures
0	0	objects
98	8	Total

Name of related multiple property listing:

Number of contributing resources previously listed in the National Register See Continuation Sheet

4. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this [X] nomination [ ] request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property [X] meets [ ] does not meet the National Register criteria. [ ] See continuation sheet.

Valerie A Talmage — November 27, 1989
Signature of certifying official — Executive Director, Massachusetts Historical Commission; Date
State Historic Preservation Officer
State or Federal agency and bureau

In my opinion, the property [ ] meets [ ] does not meet the National Register criteria. [ ] See continuation sheet.

Signature of commenting or other official — Date

State or Federal agency and bureau

5. National Park Service Certification

I, hereby, certify that this property is:
- [X] entered in the National Register.
  - [X] See continuation sheet. — Supplementary Record Sheet
- [ ] determined eligible for the National Register. [ ] See continuation sheet.
- [ ] determined not eligible for the National Register.
- [ ] removed from the National Register.
- [ ] other, (explain:)

[signature] — 01-18-90

Signature of the Keeper — Date of Action

6. Function or Use

Historic Functions (enter categories from instructions)	Current Functions (enter categories from instructions)
Industry/Water Works	Vacant/Not in use
Domestic/Single Dwelling	Transportation/Bridge
Agriculture/Animal Facility	Industury/Waterworks
Transportation/Bridge	Domestic/Single Dwelling
Commerce/Warehouse	Agriculture/Animal Facility
Landscape/Natural Feature	Landscape/Natural Feature

7. Description

Architectural Classification (enter categories from instructions)	Materials (enter categories from instructions)
Mid-19th Century/Greek Revival, Gothic Revival	foundation Earth, Granite
Late Victorian/Renaissance Revival,	walls Steel, Stone, Concrete Brick, Sandstone, Limestone
Second Empire, Richardsonian Romanesque	roof
Classical Revival	other
Beaux Arts	

Describe present and historic physical appearance.

The Water Supply System of the Metropolitan Boston Thematic Resource Area is functionally organized around a series of linear features that extend eastward from the Central Massachusetts uplands to the coastal metropolitan area. The nominated components represent the evolution of the metropolitan water supply between 1845 and 1926, first under the City of Boston and, after 1895, under the Metropolitan Water Board (now Metropolitan District Commission). The nominated components are associated with the three principal functions of the water supply system: collection and impoundment of water behind dams; conveyance through aqueducts east to distribution points; and distribution through reservoirs, standpipes and pumping stations to local metropolitan communities. They are the products of 19th century public works engineering and architectural design, illustrating a notably successful integration of functional requirements with aesthetics. Since 1926, the continued increase in demand for pure water has extended the water supply system further west to Quabbin Reservoir (since the 1940's the primary source of supply), and many of the 19th and early 20th century components of the system included in this nomination have been bypassed or otherwise removed from service. The later Quabbin related components are not included in this nomination, but may be considered in a future amendment.

Although the purpose of water supply (collection, conveyance, and distribution) is relatively straightforward, the continued expansion of the metropolitan Boston system has resulted in a network of great complexity. In order to present the resources in this nomination, they have been organized into three categories: linear aqueduct districts; districts more traditionally defined by physical concentration of elements, usually around a reservoir; and individual resources which lack these two major types of connections (see Methodology section, below). Within these categories, five major types of properties associated with water supply are illustrated: reservoirs, dams, aqueducts, chambers, and pumping stations. The inventory forms for nominated districts and individual properties provide specific descriptions. The overview discussion thus focuses on the salient characteristics of each type of property. Inventory numbers are referenced when nominated resources are cited. In cases where a letter (A, B, C, . . .) preceeds the number, the letter refers to the district within which the resource is located.

[x] See continuation sheet

Reservoirs: The reservoirs included in this nomination are those that perform an "active" function, either to equalize flow or pressure during conveyance (and as such are "above ground" sections of aqueducts), or as points from which water is pumped or otherwise distributed into local mains. Generally, "passive" collection reservoirs have not been included due to their great size and to their general lack of noticeable man-made features (i.e.: they appear as natural, rather than man-made, bodies of water). In several cases the dams and/or associated structure of these reservoirs have been included (Areas F and G; #'s 3-2, 3-3, 3-4, 4-3, 4-4, 6-6, 15-2, 1-3) One of those included in this nomination, Spot Pond Reservoir (H14-2), was originally developed for the "passive" function of receiving water from rain and runoff, and was subsequently enlarged and improved for use as a high-service distribution point for the northern metropolitan area. Other reservoirs were developed specifically for equalizing or distribution purposes. For example, Chestnut Hill (E13-9) Weston (D12-2) and Brookline (A2-4) reservoirs are reservoirs that function as segments of aqueducts, in which water enters the basin through one aqueduct chamber and leaves by another. Several, such as Bear Hill (H14-7), Middlesex Fells (H14-6) and Weston (D12-2) reservoirs, were developed in natural depressions that required relatively little shoreline

construction. Others, such as Fisher Hill reservoir (16-10), were built on hills or other suitable elevations by construction of high earthen embankments in a square or rectangular plan.

In addition to "basin"-type, uncovered reservoirs, the Metropolitan water system features several covered or enclosed reservoirs known as standpipes; all are associated with distribution. These structures consist of steel tanks, surrounded by masonry shells, located on prominent elevations. The masonry shells of these reservoirs were, under the Metropolitan Water Board, designed in somewhat picturesque flights of fancy. The Arlington (16-3: NR 1985) and Bellevue (16-1) standpipes were modeled on classical Greek and Roman forms, while the Forbes Hill standpipe (16-4) resembles a medieval castle keep, complete with crenellated parapet. The Roxbury standpipe (16-2; NR 1973) is also derived from Gothic Revival sources. For many years, these structures, supplied with stairs and viewing platforms, were popular points from which to enjoy views of the surrounding neighborhoods and the city of Boston. Vandalism, however, has caused them to be locked on an essentially permanent basis.

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Dams. Development of the Boston Metropolitan Water Supply System involved construction of a variety of solid gravity dam structures. One was the earthen embankment, commonly having a core wall of some impermeable material, such as stone or concrete. Embankments such as those forming Fisher Hill reservoir (16-10), are easily recognized due to their linear forms. Many others, however, have irregular or curved plans with naturalistic plantings that have blended into the surrounding landscape. Examples include Weston (D12-2), Spot Pond (H14-2; NR 1984), Middlesex Fells (H14-6) and Bear Hill (H14-7) reservoirs.

Another dam type is built of stone and/or concrete. Sudbury Dam (F7-2) is constructed of rubblestone with cut stone facing. The Wachusett Dam (G9-2), built of concrete with cut stone facing, consists of a main dam structure and an adjacent waste or trim weir, over which excess water flows into a waste channel leading to the Nashua River below. Both the Sudbury overfall and the Wachusett main dam have approximately vertical upstream sides, and concave downstream profiles extending to long, paved "toes." Among the smaller masonry dams are those built in the late 1870s at Framingham Reservoirs 1, 2 and 3 (3-2, 3-3, 3-4). In section, each of these structures presents a near-vertical downstream face ending in a stone-paved, stepped apron. The stone spillway is backed by a rubblestone core set against an earth embankment built up from the floor of the reservoir.

The flow of water over the Framingham dams and the Wachusett waste weir is controlled by wooden flashboards mounted on metal stanchions set along the crest of each dam. At Sudbury Dam, gates built into the dam structure admit water into a wet well, which leads to pipes laid horizontally through the base of the structure. These pipes carry excess water into a waste channel below the dam. A similar system is employed at Wachusett Dam except that there is both an upper and lower gate chamber, and water flows from the former through the latter, generating hydropower as it goes, before entering the Wachusett aqueduct.

The chief function of dams such as these is to impound water behind a barrier and to control the release of water from the reservoir. Other dams can be used to control the movement or level within a reservoir or channel. Such structures are much smaller than impounding dams, and are of masonry (stone and/or concrete) construction. The oldest extant control dam is the Mystic Dam (15-2), located between upper and lower Mystic Lakes. Built in 1868, Mystic Dam consists of a row of granite piers, the sides of which are grooved to hold wooden stop planks. Four smaller control

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dams are also included in this nomination, three in the Wachusett Aqueduct (Area C) open channel, the fourth in Sudbury Reservoir. The "upper" and "lower" channel dams (C8-8, C8-7) are low masonry structures that retard the flow of water down the channel and thus prevent scouring in the channel banks and floor. Both have indented spillways that provide a longer overfall than a straight configuration would. For example, the width of the open channel at the lower dam is about nineteen feet. With the indented spillway, an additional forty feet of overflow area is provided. Also in the channel is a circular dam (C8-15), which as its name suggests has a nearly circular plan. The function of this dam is to raise the water level behind it sufficiently to enter the Hultman Aqueduct (associated with the Quabbin Reservoir; not included in this nomination). In Sudbury Reservoir, the circular dam (6-6) maintains the level of water above it at about eight feet, when the reservoir is low.

Aqueducts. Aqueducts are the means by which water from upland reservoirs is carried to distribution centers for the Boston metropolitan area. Until 1940, water for the Boston area was conveyed primarily by systems that utilized the force of gravity to move the supply from the high ground of central Massachusetts to the lower eastern portion of the state. Beginning with construction of the Hultman Aqueduct in 1938-1940, conduits were of the pressure type, which followed land contours or were built as deep-rock tunnels. (As has been mentioned, these later resources are not included in this nomination.)

The location of a gravity aqueduct was determined by the need to keep the conduit at hydraulic grade throughout its length. In so doing, engineers had to deal with a wide variety of topographic and geologic conditions, from hills and mountains to valleys, and from solid rock to soils of many different consistencies. As a result, a given aqueduct contained a number of different segments, rather than being the same from one end to the other. Tunnel segments were excavated through both rock and firm soil. On the surface, the aqueduct might be built in an earth or rock trench, then covered with four to six feet of earth in a technique known as "cut and cover." In other cases, the conduit was built along a raised embankment that when completed resembled an abandoned railroad grade. To carry the aqueduct over rivers, engineers built long, multi-arched masonry bridges or, for shorter spans, channeled water through lengths of steel pipe, arched over the watercourses as pipe bridges. Inverted siphons, on the other hand, continued an aqueduct below a stream or across a valley below the surface; these structures consisted of steel pipe laid with each end at hydraulic

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grade. In addition to these closed conduits, an aqueduct might also include an open channel segment, which commonly followed an existing stream but was dug to a standard width and depth, and lined with sand, gravel, or stone riprap along the banks.

The Cochituate (A1-4), Sudbury (B5-1), Weston (D12-1) and Wachusett (C8-1) aqueducts all feature cut and cover segments, and the last three have tunnel sections as well. The Cochituate, Sudbury and Weston have masonry bridges (Charles River [A1-12], Echo [B5-3], Waban [B5-4] and Assabet [C8-9]) that carry the aqueducts over major river courses. The Cochituate, Sudbury and Weston also feature inverted siphons (see Cochituate Aqueduct [A1-4], Rosemary Brook Siphon [B5-2], Happy Hollow Siphon [D12-3] and Sudbury River Siphon [D12-5]). The Weston and Wachusett aqueducts feature open channel segments leading into the Weston and Wachusett reservoirs, respectively. The open channel of the Wachusett is about three miles long, its undulating course a reminder of Stony Brook that originally flowed there. The Weston open channel is only about 1,500 feet long, and quite straight from one end to the other.

The shape and typical materials of masonry aqueducts vary considerably. Cochituate, the oldest, has an egg-shaped section and is built almost exclusively of brick. Sudbury features brick linings for base and arch, but the base is set in concrete, and the cross section is horseshoe-shaped. The same shape is employed on the Weston and Wachusett aqueducts, whose masonry sections are characterized by brick linings on the base, while the arch is largely concrete with or without brick lining.

Although the Cochituate, Sudbury, Weston and Wachusett aqueducts lie for the most part underground, numerous indications of their presence are visible on the surface. Most obvious are the great masonry bridges that carry aqueduct segments over large watercourses. Most numerous, perhaps, are the culverts, which channel "outside" water over or under the aqueducts. More subtle are the surface traces of undeveloped rights-of-way and the miles of narrow embankments running through parks, playgrounds, backyards, front yards, and farmland.

Chambers. Along each aqueduct are a number of structures, or chambers, which may be located within a few yards of one another or several miles apart, depending upon their purpose. Each chamber has two parts: a substructure of stone or concrete, and a superstructure, usually of brick or stone construction. The substructure is basically a covered, concrete room within which water makes a transition from one aqueduct segment to another, or

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passes into, or out of, a reservoir. Some chambers function as "manholes" in which measuring apparatus can be inserted; others provide ventilation, or allow water in the aqueduct to be diverted into waste channels over low weirs.

Water moves through the chamber under its own force, guided by masonry partitions and regulated by vertical sluice-type gates of metal or wood, or by stop planks laid up horizontally in metal stanchions or grooves to the desired height. The gates are raised and lowered manually from above by means of floor stands and gears. Stop planks are manipulated with simple pulley hoists or cranes hung from I-beams. Many chambers also contain mesh screens in wood or metal frames; these screens catch debris and are raised and lowered like stop planks.

To shelter the substructure, floor stands, hoists, and equipment, each chamber has a superstructure, which is basically a single room open to the roof. The minimum height of the superstructure is determined by the height of the floorstands when the gates are open, and by the height required to operate the hoisting mechanisms. The superstructures are square or rectangular in plan, commonly with a single entrance, and windows for light and ventilation. Some have truncated chimneys, mounted on brackets or I-beams, to which stovepipes and stoves were originally attached to heat the interior.

Beginning with the Cochituate, the chambers associated with each aqueduct were designed with a particular architectural theme. Granite was the preferred material, used on the Cochituate (Area A), Weston (Area B) and Wachusett (Area C) aqueducts, while red brick and sandstone were employed on the Sudbury (Area B). The structures display simplified versions of styles popular in their times: Greek Revival for the Cochituate (1845-1848), Victorian Romanesque for the Sudbury (1875-1878), and Neoclassical and Renaissance Revival for the Wachusett (1896-1906) and Weston (1901-1903). The solid construction and formality of design give many chambers the air of miniature monuments or diminutive public buildings. Unlike such structures, however, many chambers are oddly situated with respect to their environment, appearing in backyards, fields, or isolated hilltops rather than in expected "public" settings. Their locations are understood only in the context of the aqueducts of which they are a part. (For the purposes of this nomination, chambers located at the intersection of aqueduct and reservoir districts have been included with the reservoirs; see methodology)

Pumping Stations. Pumping stations, located at the distribution end of the system, pump water from storage reservoirs to the network of

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distribution pipes that runs through MDC communities. For the public, pumping stations tend to be, physically and conceptually, the most easily accessible manifestations of the water supply system. It is perhaps for this reason that many of the system's pumping stations are architecturally interesting. Since they are located in the heart of neighborhoods, they provide not only water, but also a sense of good will, stability, and permanence.

Most pumping stations were built in the last quarter of the 19th century and the first quarter of the 20th century as an increasing population placed greater and greater demands on the system. The stations' size and shape were, for the most part, determined by the size of the pumping engines and boilers within. The Mystic Pumping Station (15-4), a handsome red brick, mansard-roofed structure, was originally only one-third its present size. The addition of two more steam engines required construction of wings large enough to contain engines that were two and three stories high. Perhaps the most visually spectacular pumping stations are those at Chestnut Hill. The High Service Building (E13-4), designed by then City architect Arthur Vinal in 1887, is an exuberant and skillfully rendered example of the Richardsonian Romanesque style. In 1894, the station was equipped with a Leavitt Pumping Engine, itself a National Historic Mechanical Engineering Landmark. The Low Service Pumping Station (E13-3), completed in 1901, and designed by Shepley, Rutan and Coolidge, is the only limestone-covered Beaux Arts structure in the system. Its size was also dictated by the massive pumping engine and the equally large boilers needed to supply steam. Spot Pond Pumping Station (H14-3, NR 1985), also designed by Shepley, Rutan and Coolidge, has the same plan as Chestnut Hill Low Service, albeit in a more subdued skin.

Survey Methodology

The resources included in this nomination were inventoried in 1983-1984 during a survey jointly funded by the Massachusetts Historical Commission and the Metropolitan District Commission. The purpose of the survey was to identify and record resources associated with the development of the metropolitan Boston water supply system between 1845 and 1926. All resources were recorded on MHC inventory forms, and a narrative report on the history and construction of the water supply system was prepared and submitted to the MDC and MHC in June of 1984.

The results of that survey were evaluated by MHC and MDC to aid in planning decisions by those agencies. The evaluations also formed the basis of this nomination. The evaluation divided surveyed

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resources into four groups. Group I resources possessed a high level of integrity as well as clear architectural significance and strong historical associations with the development of the system. Group II resources included those significant primarily for their architectural qualities. Group III resources included those whose significance derived primarily from their historical associations. The remaining Group IV resources were modest in their architectural aspirations, had indirect associations with the principal functions of the system, and in some cases lacked integrity. Only resources in Groups I, II, and III were thus considered for nomination.

Boundary Justification

Included in this nomination are eight districts (four linear and four traditional) and nineteen individual resources. Each of the four linear districts consists of a series of above-ground elements, in some cases miles apart, that are physically connected by a below-ground aqueduct. The physical and functional connection of the chambers to the aqueduct, as well as the presence of shared design elements, warrants their organization for nomination purposes as linear districts. Each of the remaining four districts consists of visual as well as functional concentrations of elements that, due to physical proximity, can be viewed as architectural groupings created in the furtherance of public works that possess not only functional importance but also make an aesthetic contribution to the communities in which they occur. These collections of buildings were built in association with reservoirs. In the cases of smaller reservoirs where the buildings are placed around the body of water, the reservoirs themselves are included; in the cases of large reservoirs where the buildings are clustered at one end, the reservoir is not included.

It should be noted that a few resources, although technically parts of aqueducts (either head chambers or terminal chambers), occur as integral visual and functional elements of above-ground concentrations of structures.

For nomination purposes, these resources are included within the latter districts, so that both their functional associations and their contribution to a particular built environment can be appropriately addressed.

It should also be noted that post-1926 structures, associated with the Hultman Aqueduct or Quabbin Reservoir have been defined as NC for the purposes of this nomination. Their states will be re-evaluated in a future post-1926 amendment

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The remaining resources are associated neither with a particular aqueduct nor with a significant concentration of structures. Rather, they possess historical and/or architectural values that merit their nomination as individual resources within the Thematic Resource Area.

Summary of Nominated Resources

The Cochituate Aqueduct historic district (Area A), built between 1845 and 1848, extends 14.5 miles from Lake Cochituate in Wayland, through the towns of Natick, Wellesley, Newton and Boston, terminating in Brookline. Associated with the Cochituate aqueduct (A1-4), are the following structures: Headhouse (A1-5) (Wayland), Morse's Waste Weir (A1-6) and the Charles River Bridge (A1-12) (Wellesley), Webers Waste Weir (A1-7) and the Cochituate Ventilator (A1-11) (Newton), Cochituate Waste Weir (A1-10) (Brookline), Terminal Chamber (A2-3) (Brookline) and Distribution Chamber (A2-2) (Brookline).

The Sudbury Aqueduct Historic District (Area B) (1876-1878) extends 16.5 miles from Farm Pond in Framingham, through Wellesley, Needham Natick, and Sherborn to Newton. The Sudbury aqueduct (B5-1) was constructed to convey water from several reservoirs in the watershed of the Sudbury River in east-central Massachusetts to Chestnut Hill Reservoir in Boston (see below). Associated with the aqueduct are the following structures: Farm Pond Gatehouse (B3-6) and Gaging Chamber (B5-7) (Framingham), Waste Weir A (B5-5) (Sherborn), Waban Bridge (B5-4) and the Rosemary Brook Siphon (B5-2) (Wellesley), Echo Bridge (B5-3) (NR 1980) (Needham/Newton), and Waste Weir D (B5-6) (Newton).

The Wachusett Aqueduct Historic District (Area C) (1896-1898) extends about 12 miles from Wachusett Reservoir in Clinton, through Berlin, Northborough, and Marlborough to Southborough. Wachusett Aqueduct (C8-1) was built to convey water from Wachusett Reservoir (on the Nashua River) to Sudbury Reservoir, the largest of the seven reservoirs in the Sudbury River watershed. It includes not only closed conduit but three miles of open channel. Associated with this aqueduct are the following structures: Shaft 4 Chamber (C8-2) and Metering Chamber (C8-3) (Berlin), Assabet River Bridge (C8-9) (Northborough), Terminal Chamber (C8-4) (Marlborough), Crane Meadow Road Arch (C8-10) (Marlborough), Hultman Aqueduct Shaft 1 diversion dam (C8-15) (Marlborough), Hultman Aqueduct Shaft 1 headhouse (C8-5 NC) (Southborough), and, also in Southborough, the Upper Control Dam (C8-7), Northborough Road Arch #1 (C8-10), Northborough Road Arch #2 (C8-11), Lynbrook Road Arch (C8-13), Chestnut Hill Road Arch (C8-14), Lower Control Dam (C8-8), and Flagg Road Arch (C8-12).

The Weston Aqueduct Historic District (Area D) (1901-1903) extends 13.5 miles from Sudbury Dam (see Sudbury Dam Historic District, below) through Framingham and Wayland to Weston. Weston aqueduct was built to convey water from Sudbury Reservoir to the distribution reservoir at Spot Pond in Stoneham (see Middlesex Fells Reservoirs Historic District, below). Associated with the Weston aqueduct (D12-1) are the following structures: Weston Metering Chamber #1 (D12-9) (Framingham), Weston Metering Chamber #2 (D12-10) (Framingham), Happy Hollow Siphon (D12-3) (Wayland), Sudbury River Siphon (D12-5) (Framingham/Wayland), Channel Chamber (D12-8) (Weston), Ash Street Bridge (D12-4) (Weston), Weston Reservoir (D12-2), Screen Chamber (D12-7) (Weston), and Terminal Chamber (D12-6) (Weston).

The Chestnut Hill Reservoir Historic District (Area E), located in the Brighton section of Boston, was initially developed between 1865 and 1870 to supplement the Cochituate Aqueduct's Brookline Reservoir as a distribution point. It experienced periodic expansion into the 20th century, and served as the major distribution point for the metropolitan water supply system until the 1950s. Structures associated with Chestnut Hill Reservoir (E13-9) are the Intermediate Gatehouse (E13-8) and Effluent Gatehouse #1 (E13-7) (1868-1870), Sudbury Aqueduct Terminal Chamber (E13-5) (1878), High Service Pumping Station (E13-4) (1888), Low Service Pumping Station (E13-3) (1898-1901), Effluent Gatehouse #2 (E13-2) (1900-1901), Connection Chamber (E13-6) (1901), Pipe Yard (E13-10 NC), and Garage (E13-11 NC).

The Sudbury Dam Historic District (Area F) consists of a group of buildings and structures located at the foot of (and including) Sudbury Dam in Southborough. Sudbury Dam (F7-2) was built between 1893 and 1898 to impound water in what provided to be the largest, and last, of the reservoirs of the Sudbury watershed collection system. Associated with this initial development are the Gatehouse (F7-3) atop the spillway, and the Route 30 bridge (F7-5), a small span which carries Route 30 over a small open channel. Also present within this district are the Weston Head Chamber (F7-7) and Section 1 Bridge (F7-6) (1902-1903); a stone storehouse (F7-4) (1900), the headhouse for Hultman Aqueduct Shaft #4 (F7-8 NC) (1939-1940), a 19th century farmhouse (F7-9) and two outbuildings (F7-10,11) that were relocated to their present site during construction of Sudbury Reservoir, plus two 1970s office/laboratory buildings (F7-12,13 NC).

The Wachusett Dam Historic District (Area G), in Clinton, consists of resources at the base of (and including) Wachusett Dam (G9-2), constructed in association with the development of a new water

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supply on the Nashua River between 1900 and 1906. In addition to the dam, structures in the district include the lower gatehouse/powerhouse (G9-5) (1903-1904), Grove Street Bridge (G9-4) (1904), Central Massachusetts Railroad Bridge (G9-3) (1905) and lightning arrestor chamber (G9-6) (1911), all elements within a designed, parklike landscape. Also present on the grounds are three maintenance buildings, on Grove Street (G9-7,8,9 NC).

The Middlesex Fells Reservoirs Historic District (Area H) is located within the 2,060-acre Middlesex Fells Reservation in Stoneham. Acquired for the Boston metropolitan park system in 1894, portions of the area were also developed by the Metropolitan Water Board between 1898 and 1903 as a water supply distribution point for communities north of Boston. The three reservoirs (Spot Pond, Bear Hill and Middlesex Fells) were carefully landscaped to blend with the surrounding woodland environment. Properties included within this district are Spot Pond Reservoir (H14-2), Pumping Station (H14-3) (1898-1900) (NR 1984), East Gatehouse (H14-4) (1897), and South Gatehouse (H14-5) (1900) (all on Spot Pond), Bear Hill Reservoir and Gatehouse (H14-7) (1902-1903), Middlesex Fells Reservoir and Gatehouse (H14-6) (1898-1900), and Bottume House (H14-8 NR 1984) and Stable (H14-9 NR 1984).

Of the individual resources included in this thematic nomination, eight are associated with the development of a water supply in the Sudbury River watershed, a development begun in the late 1870s and realized with completion of Sudbury Reservoir in 1898. These resources are:

Framingham Reservoir #1 Dam and Gatehouse (3-2) (1876-1878), Framingham
Framingham Reservoir #2 Dam and Gatehouse (3-3) (1877-1879), Framingham
Framingham Reservoir #3 Dam and Gatehouse (3-4) (1876-1878), Framingham
The Bullard Place (3-7) (ca. 1840s), Framingham
Ashland Reservoir Spillway (4-3) (1885), Ashland
Hopkinton Reservoir Spillway (4-4) (1891-1894), Ashland
Marlborough Filter Beds (6-2) (1895-1899), Marlborough and Southborough
Sudbury Reservoir Circular Dam (6-6) (1897-1898), Southborough

Associated with the development of the Wachusett Reservoir (1897-1907) is the Quinepoxet River Bridge (10-3) (1903), which carries Thomas Street in West Boylston over the river at the point where it enters the reservoir.

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Associated with development of supply from the Mystic Lakes for Charlestown in the 1860s (and taken over by the City of Boston in 1874 and subsequently brought into the metropolitan system) are three properties:

Mystic Dam (15-2) (1864), Winchester
Mystic Pumping Station (15-4) (1862-1864), Somerville
Mystic Gatehouse (15-3) (1862-1868), Winchester

Associated with the Cochituate supply is Lake Cochituate Dam (1-3) in Framingham, constructed in 1890 to replace earlier timber dams at this site on Lake Cochituate.

Six individual resources represent elements of the distribution system, by which water collected in reservoirs and conveyed east in aqueducts was distributed among the cities and towns that were members of the metropolitan water supply "district":
Bellevue Standpipe (16-1) (1914-1915), Boston (West Roxbury)Roxbury Standpipe (16-2) (1870), Boston (Roxbury)
Arlington Standpipe (16-3) (1921), Arlington (NR 1985)
Forbes Hill Standpipe (16-4) (1900-1902), Quincy
Medford Pipe Bridge (16-8) (1897-1898), Medford
Fisher Hill Reservoir and Gatehouse (16-10) (1887), Brookline

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Archaeological Description

While no prehistoric sites are currently recorded on the properties listed in this nomination, sites may be present. Many of the water supply features associated with the collection and impoundment of water behind dams, the conveyance of water through aqueducts east to distributions points and the distribution of water to local metropolitan communities are located in areas exhibiting locational characteristics favorable for native settlement and subsistence. In addition, the general area included in this nomination, from the central Massachusetts uplands to the coastal metropolitan area, contains one of the more densely settled prehistoric areas in eastern Massachusetts. In inland locales sites are generally smaller and less numerous than coastal zones where larger multicomponent sites are common. In the central Massachusetts uplands prehistoric sites are concentrated in riverine drainages where many of the properties listed in this nomination are found. These drainages include the Nashua, Sudbury and Assabet Rivers all tributaries of the Merrimack River, and each of which has been documented as a locus of prehistoric activity. Several of these rivers and their tributary streams have been dammed creating reservoirs, portions of which are also included in this nomination. In the coastal metropolitan area, properties listed in this nomination are concentrated along the Mystic and Charles River drainages, both of which drain into Boston Harbor and Massachusetts Bay. Prehistoric sites have been recognized in each of these locales in spite of intense urban development.

Prehistoric sites in both the central Massachusetts uplands and coastal metropolitan area have been recognized covering the full range of prehistory thus far recognized for northeastern North America. Sites ranging from the Paleoindian (10,500-9,000 B. P.) through Contact Periods (1500-1620 B. P.) have been documented for both areas. Some specific settlement trends have also been recognized such as the concentration of middle Archaic sites along interior riverine locales, particularly the Sudbury and Assabet drainages and the concentration of Woodland period sites along the coast.

While the potential for locating prehistoric sites within the nomination areas is great, construction of water supply features have likely destroyed many of these resources. Systematic bulldozing of reservoir basins, excavation of below ground aqueducts, construction of dams and other facilities have resulted in extensive subsurface disturbances which prohibit the survival of

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significant archaeological remain either prehistoric or historic. Cultural resources may, however, survive where subsurface excavations have been minimal or non-existant. These areas may include above ground aqueducts, aqueducts in rock, deep under ground where surface soils have not been disturbed and some reservoir areas.

While construction of water supply facilities have also likely destroyed historic resources predating their constructions, some early historic resources may survive in similar locales as listed for prehistoric resources. More importantly, however, are the survivals of mid-19th through early-20th century engineering and construction features associated with facilities that still exist. These survivals may include structural and artifactual remains of temporary facilities used during construction of facilities or, below ground components of surface facilities which can only be viewed in an archaeological context.

(end)

8. Statement of Significance

Certifying official has considered the significance of this property in relation to other properties:
☐ nationally ☒ statewide ☒ locally

Applicable National Register Criteria ☒ A ☐ B ☒ C ☐ D

Criteria Considerations (Exceptions) ☐ A ☒ B ☐ C ☐ D ☐ E ☐ F ☐ G

Areas of Significance (enter categories from instructions)
Architecture
Community Planning & Development
Engineering

Period of Significance
1845-1926

Significant Dates

Cultural Affiliation
N/A

Significant Person
N/A

Architect/Builder
Vinal, Artine; Clough, George A. ; Shepley, Rutan and Coolidge

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

The resources included in this nomination are significant under Criterion A and/or C, in the areas of government, architecture, and engineering. They possess integrity of location, design, setting, materials, workmanship, feeling and association. They illustrate or represent important elements or events in the development of a public water supply system for the Boston metropolitan area during the period 1845-1926. They also possess aesthetic or design values characteristic of, or notable in public works engineering and architecture of their time. Under Criterion A, the metropolitan water supply system is associated with the history of public works in Boston and Massachusetts, the emergence of public health as a major concern at both state and local levels, and the beginnings of the metropolitan, as opposed to local, approach to the solution of many problems of urban life. Criterion C is applicable in several respects. Within the system are represented works by important Boston-area architects (Shepley, Rutan & Coolidge, Wheelwright & Haven), landscape architects (Olmsted Bros., Arthur Shurcliffe), and engineers (Frederic Stearns, Joseph P. Davis, Desmond Fitzgerald). Many of the chambers and pumping stations also represent excellent adaptations of major period architectural styles to utilitarian structures. In addition, aqueducts, chambers, and pumping stations have considerable importance as manifestations of nineteenth-century hydraulic engineering and construction techniques, as do a number of the dams in the area of civil engineering. Finally, there exist among these resources significant concentrations of sites, structures, and buildings united historically by their function in the water supply system and aesthetically by plan and architectural characteristics.

Areas of significance pertaining to these resources are architecture, engineering, and government. Under government, the resources are associated with the development of local public services in Massachusetts, and especially with the development of the metropolitan concept in the Commonwealth as a vehicle with which to meet the needs of a group of municipalities in an efficient and effective manner. The areas of architecture and engineering obviously apply, because the resources variously represent aspects of

☒ See continuation sheet

9. Major Bibliographical References

[X] See continuation sheet

Previous documentation on file (NPS):

- [ ] preliminary determination of individual listing (36 CFR 67) has been requested
- [X] previously listed in the National Register
- [ ] previously determined eligible by the National Register
- [ ] designated a National Historic Landmark
- [ ] recorded by Historic American Buildings Survey # ____
- [ ] recorded by Historic American Engineering Record # ____

Primary location of additional data:

- [X] State historic preservation office
- [ ] Other State agency
- [ ] Federal agency
- [ ] Local government
- [ ] University
- [ ] Other

Specify repository:
~~Massachusetts Historic Commission~~

10. Geographical Data

Acreage of property Aproximately 1208 Acres

UTM References Various, See Forms

	Zone	Easting	Northing
A			
B			
C			
D			

[x] See continuation sheet

Verbal Boundary Description

The boundaries of this nomination follow the boundaries of the MDC Water Supply System.

[ ] See continuation sheet

Boundary Justification

[X] See continuation sheet

11. Form Prepared By

name/title Candace Jenkins, Consulting ed., with Jane Lardan & Martha Bowers, Consultant,

organization Massachusetts Historical Commission 11/16/89 date Betsy Friedberg, NR Di., MHC

street & number 80 Boylston telephone (617) 727-8470

city or town Boston state MA zip code 02116 nineteenth and early twentieth century public architecture, civil engineering, and hydraulic engineering.

HISTORICAL DISCUSSION

The evolution of a public water supply system for Boston and the metropolitan area has proceeded in four well-defined stages, the first three of which are represented by resources in this nomination. The initial stage (1825-1848) resulted in development of Boston's first public water supply, brought by aqueduct from Lake Cochituate in Natick to the Brookline Reservoir, in Brookline (Area A). The second stage (1871-1895) saw the extension of Boston's system to reservoirs on the Sudbury River and construction of another aqueduct (Areas B, E). The third stage (1895-1926) resulted in the creation of the Metropolitan Water District and further expansion of the system to the Nashua River at Clinton (Areas C, D, E, F, G). The fourth stage (1926-1947) was dominated by construction of Quabbin Reservoir on the Swift River, supplemented by diversion from the Ware River (this fourth phase may be the subject of a future amendment).

Each stage progressed through a cycle of investigation, recommendation, legislation, and implementation. Responding to public and/or professional concern about existing water resources, local or state government commissioned a study by a special board and/or expert consultant. The study projected future population statistics for the area, and estimated per capita consumption from those figures. Projection of anticipated demands were then considered in the context of existing supplies, and if the demand threatened the upper limits of available capacity (which it invariably did), the study then recommended development of an additional supply (Harbridge House 1972:I-1,2). The general recommendations in each study were accompanied by proposals for development of specific sources, including description of construction programs required to carry them out. The study became the basis for legislation authorizing construction of new works, which were duly completed and put into service. Within 30 years of each piece of enabling legislation, the cycle began again.

Prior to initiation of the first cycle, Boston-area inhabitants obtained water from springs, wells, ponds, and small streams. The few limited supply and distribution systems were developed as private business ventures by individuals or by corporations chartered for that purpose. In 1652, the Water Works Company was organized to collect spring water in a "conduit," actually a small covered reservoir near the present site of Faneuil Hall, from which

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residents drew their own supply in buckets for domestic use or fire fighting. This venture was short-lived, and no other attempt to create a water supply in Boston was made until 1795-1796, when the Boston Aqueduct Company was chartered to distribute spring water from Jamaica Pond in Roxbury. This venture proved quite successful, and by 1825 the system had grown to serve some 1,500 households through 15-18 miles of mains (Primack 1981:5-6; Baker 1889:28; LaNier 1976:174-175).

Although convenient for its subscribers, the Jamaica Pond supply was neither large enough to provide water throughout Boston, nor fully in an emergency.

In April 1825, a major conflagration brought the water supply issue to the forefront of public thinking. In response, the city appointed a committee to look into the matter, thereby embarking upon a decade of investigation and debate (Primack 1981:6).

The first study, conducted in 1825 by Dr. Daniel Treadwell at the behest of the committee, proposed development of Spot Pond in Stoneham and also utilization of the Charles River above Watertown to create a new water supply for the city (Treadwell 1825). Treadwell's recommendations, however, were soon lost in debates over a related issue, that of who--the city or private enterprise--was best qualified to supply water from any source.

In 1834, the water question remaining unresolved, the city began a second investigation, turning to Loammi Baldwin, a noted civil engineer from Charlestown, for advice. Selecting aqueducts and pumping systems as most feasible for Boston, Baldwin examined sources from 5 to 15 miles outside the city, and ultimately settled on Long Pond in Natick as the only source meeting the twin criteria of water quality and elevation sufficient for delivery of the supply by means of a gravity aqueduct (Baldwin 1834: 10-44, 58-59).

Although Baldwin's recommendations generated much interest among Boston residents and in the city council, the projected cost of his proposed system was of no little concern. As a result, the city commissioned yet another study, from civil engineer R. H. Eddy (Eddy 1836). Eddy, in reviewing past studies, decided in favor of Mystic Lake and Spot Pond, their water to be conveyed to a reservoir on Beacon Hill by steam pumps.

Eddy's proposals fared no better than had previous recommendations. In 1837, a commission consisting of Daniel Treadwell, James Baldwin (brother of Loammi), and Boston publisher Nathan Hale reviewed all

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three studies. Treadwell and Hale recommended utilization of dual sources (Spot Pond and Mystic Lake) and a pumping system, while Baldwin, not surprisingly, favored his brother's proposed aqueduct from Long Pond (Report of the Commissioners... 1837:35, 48-51). As a result of this disagreement among experts, no decisions were reached on any of the issues.

Public interest, however, gradually came round to the support of Loammi Baldwin's Long Pond proposal, a support vindicated by yet another commission which in 1844 recommended development of Long Pond after visiting New York's Croton system, then under construction (Report of the Commissioners... 1844). Resistance from private water companies and from those who preferred development of Spot Pond, however, remained strong. Ultimately, the whole issue was brought before the state legislature, which commissioned still another investigation, this time by "unbiased" experts, Croton's Chief Engineer John B. Jervis and Professor Walter Johnson, a Philadelphia chemist.

The Jervis-Johnson report strongly supported Loammi Baldwin's proposals for development of Long Pond (Report of the Commissioners...1845). The document became the basis for legislation in 1846 authorizing the City of Boston to "take, hold and convey into and through the said City the water of Long Pond, so called...." To design and build the new system, the City of Boston called upon Jervis's services as a consultant, with E. Sylvester Chesebrough and William S. Whitwell as Division Engineers.

Work was begun in 1846 and completed, with the due public rejoicing, in 1848 (Celebration of the Introduction of the Water...1848). The centerpiece of the new system was the 14.5-mile brick Cochituate Aqueduct between Long Pond (renamed Lake Cochituate) and Brookline Reservoir, with handsome gray granite chambers in the then-still fashionable Greek Revival style (Area A).

Despite the success of the new public water supply, within six years the Cochituate Water Board began to foresee an increasing demand for water which Lake Cochituate would, in the not-so-distant future, be unable to meet. Indeed, by 1869, the Board was forced to contract with the City of Charlestown for additional water from the latter's Mystic Lakes supply, developed in 1864. (15-2; 15-3; 15-4) The inadequacy of this measure, however, was demonstrated in 1870-1871, when a drought resulted in an "unusual drawing down" of Lake Cochituate. Exacerbating the situation was a devastating fire in 1872, which destroyed 63 acres of Boston, including the city's downtown (King 1878).

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In 1871, the Cochituate Water Board retained Joseph P. Davis, a civil engineer who had worked on designs for Boston's sewer system, to investigate potential sources of an additional supply within a 50-mile radius of the city. Davis recommended development on the Sudbury River due to its quantity and consistency of supply. Although he felt that the Sudbury water was not always of the highest quality, Davis believed this could be ameliorated with a series of large settling and storage reservoirs that would allow natural cleansing of the water by pooling it and letting heavier foreign material fall to the bottom (Boston Water Works 1882:7) (Areas B, E).

In April 1872, the Sudbury River Act, authorizing use of the river as a water source for Boston, was signed into law, and Davis was appointed City Engineer. Under Davis as Chief Engineer, and Alphonse Fteley as Resident Engineer, the city constructed an aqueduct from Farm Pond in Framingham to <u>Chestnut Hill Reservoir</u> (Area E) in Brighton, three settling and storage reservoirs on the north branch of the Sudbury in Framingham (3-2, 3-3, 3-4), and a conduit from the dam at <u>Framingham Reservoir No. 1</u> to Farm Pond. A fourth reservoir was added in 1885, a fifth in 1894, and a sixth begun in 1895. In addition, the <u>Sudbury Aqueduct</u> (Area B; 5-1) was extended in 1886 from its original beginning at Farm Pond, to <u>Framingham Reservoir No. 1</u> (Fitzgerald 1898:1).

Initiation of this second cycle in the early 1870s coincided with the emergence of issues that were to have a significant bearing on the third cycle in the history of the Boston area's water supply system. One issue was the physical growth of Boston and its consequent impact on neighboring communities; the other was its public health.

Until the late 18th century, the city of Boston was largely able to accommodate development and population growth within the confines of the Shawmut Peninsula. From about 1790 to 1860, however, the city's population grew from 18,320 to 177,840 (Wakstein 1972:286). Intensive development and redevelopment within Boston's existing boundaries proved only a temporary solution to ever-increasing demands for housing, commercial space, and industrial facilities (Potter 1873:15). In the face of a growing need for more land, the city began a program of reclamation, but this proved insufficient to meet local pressures (Wakstein 1972:287).

The failure of reclamation to solve Boston's long-term land problems led to proposals for the annexation of adjacent, less-populated communities--a precedent established in 1804 with the annexation of

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South Boston. During the early 1870s, a variety of annexation schemes were advanced; although none came to fruition, between 1867 and 1874 Roxbury, Dorchester, Charlestown (along with its Mystic Water Works; 15-2, 15-3, 15-4), Brighton, and West Roxbury were brought within the Boston city limits by legislative fiat (Beale 1932:118).

A major interest of the annexationists was provision of public services. Boston's growth between 1790 and 1860 had been paralleled by population increases, although on a smaller scale, in neighboring communities (Wakstein 1972:276). Among the results of these increases was escalating competition for the means to provide public services, particularly water supply and sewage disposal.

In the early 1870s, when the issue of an additional water supply for Boston from either the Sudbury or Charles River was raised in the legislature, communities bordering these watercourses registered strong objections. In addition to debating Boston's needs, legislators in the 1872 session confronted petitions from no fewer than 27 other cities and towns for authority to take water from rivers and ponds, often from the same sources (Boston Daily Advertiser, 7 March 1872). Such controversy appeared, to some, to justify annexation, which it was believed would end competition among communities and permit economies of scale to provide quality public services at minimal cost to the users. Others, however, saw an equally effective solution in the creation of special agencies, operating on the metropolitan scale, to develop and maintain particular services for communities that would retain their corporate identities. With regard to water supply, however, the metropolitan approach at the time found few advocates. From 1873 to 1876, at least eight communities around Boston built their own water systems, and two more purchased existing systems from private corporations (Baker 1889).

The appearance of water supply and sewerage as major issues in the annexation debate paralleled a rising concern for public health at the state level. In 1869, the legislature created a State Board charged with taking "cognizance of the interests of health and life among the citizens of this Commonwealth" (Mass. Board of Health Annual Report 1871). Three years later, in 1873, the Board of Health conducted an investigation of "the questions of sewage, sewerage, and water supply," and in particular the "increasing joint use of water courses for sewers and as a source of supply for domestic use" (Mass. Board of Health Annual Report 1874:63).

The special report issued by the Board of Health in January 1873

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found that only Boston and Worcester had "anything like a comprehensive sewerage system" and that most cities and towns (other than those on the coast) discharged sewerage directly into the nearest river, stream, or pond. Lack of proper sewerage also contributed to pollution of waters set aside for consumption. As a general conclusion, the Board predicted that unless legislation against the pollution of watercourses was more effectively enforced, "the spoiling of our rivers as sources of water supply is a question of time, of destiny of population, and of their size" (Ibid.:100).

Not until the 1880s, however, were public health issues and the metropolitan concept directly connected. In 1886, the Board of Health was reorganized to include an engineering division, headed by former Water Board engineer Frederic Stearns. That same year, the state legislature published a "Report of a Commission Appointed to Consider a General System of Drainage for the Valleys of the Mystic, Blackstone and Charles Rivers." The study, in which the Board of Health played a prominent role, proposed construction of two main sewers, for the Charles and Mystic valleys, to be operated by "a central agency and authority, which can for this special purpose override town boundaries and disregard local susceptibilities." Establishment of such an agency was crucial to the success of the projects, which "are neither of them of local or municipal character. They partake, on the contrary, preeminently of the nature of great arterial channels for the benefit of wide metropolitan districts" (Report...1886:liv).

A second study completed by the Board of Health in 1889, focused particularly on the specific programs and construction needed for sewage disposal in the Charles and Mystic river valleys (Mass. Board of Health 1889). This document became the basis for legislation enacted in June of that year establishing a Metropolitan Sewerage Board authorized to "construct, maintain and operate...such main sewers and other works as shall be required for a system of sewage disposal" for eight cities and ten towns, and to contract with other towns to supply sewerage services in the future (Acts of 1889, Chapter 439).

With creation of the Metropolitan Sewerage Board and a solution to the Boston area's sewage problems in hand, the third cycle in the development of Boston's water supply began. Chapter 495 of the Legislative Acts for 1893 ordered the Board of Health to conduct an inquiry into the matter. With the assistance of Chief Engineer Frederic Stearns, Joseph P. Davis (Former City Engineer and Architect of the Sudbury System), Dexter Brackett (of the Water Board's Distribution Department), and Desmond Fitzgerald

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(Superintendent of the Sudbury System), the Board of Health in 1895 issued a landmark report that in effect became the blueprint for development of a metropolitan water supply system.

In the opening sections of the report, the Board forthrightly stated that it was guided in the study by justifications it had developed in support of a metropolitan sewerage system (Massachusetts Board of Health 1895:ix). Having established the need for pure water, not only in Boston, but in many neighboring communities, the Board went on to consider a wide range of possible solutions, among them filtration of existing supplies. In the end, however, the Board rejected a large-scale filtration program in favor of the procurement of a new, clean source of supply from the south branch of the Nashua directly above the city of Clinton. The Board proposed construction of a very large reservoir above Clinton (Area G), connected to Sudbury Reservoir #5, then under construction by the City of Boston, by a twelve-mile aqueduct (Area C). From there, water could be conveyed through the Sudbury Aqueduct (Area B) to the main distribution facilities at Chestnut Hill (Area E) in Brookline. Anticipating a rising demand for water in communities north of Boston, the Board also found that another aqueduct, directly from Sudbury Reservoir, would be required within a decade, and to that end outlined the specifics of a thirteen-mile conduit from the reservoir to the town of Weston (Mass. Board of Health 1895:xvi-xviii) (Area D).

The program thus outlined was expected to provide a sufficient supply of pure water to the Boston metropolitan area for about twenty years. Assuming continued increases in population and in demand during that time, the Board outlined possibilities for future expansion of the water supply system. "The very great merit of the plan now submitted is to be found in the fact that this extension of the chain of the metropolitan water supplies to the valley of the Nashua will settle forever the future water policy of the district, for a comparatively inexpensive conduit can be constructed through to the Valley of the Ware River, and beyond the Ware River lies the Valley of the Swift; and in a future so far distant that we do not venture to give a date to it, are portions of the Westfield and Deerfield Rivers, capable, when united, of furnishing a supply of the best water for a municipality larger than any now found in the world" (Mass. Board of Health 1895: xvi-xvii).

The Metropolitan Water Act was passed in 1895 (Acts of 1895, Ch. 488). The Metropolitan Water Board, "acting for the Commonwealth, shall construct, maintain, and operate a system of metropolitan water works substantially in accordance with the plans and

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recommendations of the State Board of Health..." for seven cities and six towns in the Boston metropolitan area, to be called the Metropolitan Water District (the number to be increased as other communities within a ten-mile radius of the statehouse wished to join). The Metropolitan Water Board was authorized to take, on or before January 1, 1898, "all lands and all the ponds, basins, reservoirs, filter beds, dams, aqueducts, conduits, pumping stations, pipes, pumps and other property held by the City of Boston" for water supply and distribution west of, and including, Chestnut Hill Reservoir (Area E), and also Spot Pond (Area H), originally developed by the communities of Malden, Melrose, and Medford. In addition to acquisition of these existing facilities and systems, the Water Board was authorized to complete Sudbury Reservoir (see Area F) and, its largest task, to take "by purchase or otherwise" the waters of the south branch of the Nashua River through construction of a reservoir and the appropriate systems for conveying the water to the metropolitan area.

The Metropolitan Water Board, consisting of Henry R. Sprague, Wilmot R. Evans, and John R. Freeman, selected Frederic Stearns as chief engineer, to be assisted by Dexter Brackett (Distribution) and Thomas F. Richardson (Aqueduct Department). Within six months, the Board embarked upon a twenty-year-long program of construction and improvements in five general categories: supply, relocation of existing transportation routes, distribution, water quality, and hydropower.

Largest and most costly of these efforts was the tapping of new water supplies from the north branch of the Sudbury and south branch of the Nashua through construction of reservoirs and dams, and the building of aqueducts to carry the increased supply to distribution. The Metropolitan Water Board's first task in this program was completion, in 1898, of Sudbury Reservoir, which had been initiated by the City of Boston and was underway at the time the Board took over in 1896 (see Area F). Simultaneously, the Wachusett Aqueduct (Area C) was built east from Clinton to Sudbury Reservoir, and its completion in March 1898 marked the first taking of water from the Nashua River. In 1897 construction of two huge earthen dikes at Wachusett Reservoir was begun, to be completed in 1905. Wachusett Dam (Area G), begun in 1900, was finished in 1906, and the reservoir raised to full level in May 1908. In the meantime (1901-1903), the Weston Aqueduct (Area D), like the Wachusett having a capacity of 300 million gallons/day (mgd), was completed to augment the old Sudbury conduit in the conveyance of water from the Sudbury watershed to the Boston metropolitan area.

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The creation of additional water supplies necessarily required both renovation of existing facilities and construction of new works at the distribution end of the system. At Chestnut Hill in Brighton, the high-service pumping station was enlarged and equipped with another engine; and a new low-service station was added to the complex (Area E). A new pumping station was built at Spot Pond, in Stoneham; the existing reservoir was enlarged and two built in Middlesex Fells (Area H). New pumping stations were also constructed in Arlington and Hyde Park. In addition, existing standpipes were replaced on Bellevue Hill (16-1), Forbes Hill (16-4), and in Arlington (16-3). The distribution system was also expanded with miles of new mains throughout the Metropolitan Water District.

Several water quality projects involved construction and improvements of systems to filter sewage and other impurities from streams flowing into the reservoirs. The Pegan Brook Filter Beds, constructed by the City of Boston in 1893 to filter water from Pegan Brook before it reached Lake Cochituate, were considerably upgraded in 1901. On the northwest side of Sudbury Reservoir, water from Marlborough and Walker Brooks was collected in a settling reservoir, from which it was channeled into a series of filter beds before passing into the reservoir (6-2). In 1907, a series of filter beds were constructed near Sterling, to cleanse water flowing through that town into Wachusett Reservoir. The Metropolitan Water Board also built intercepting sewers, a covered reservoir, filter beds, and a pumping station to process sewage from the city of Clinton. The Marlboro Filter Beds are the only ones to retain sufficient integrity to warrant nomination.

The 1895 Metropolitan Water Act authorized the Water Board to exploit the hydropower potential at any of the facilities under its control. Between 1910 and 1916, this potential was realized through installation of hydroelectric power-generating equipment at both Wachusett (Area G) and Sudbury Dams (Area F). Transmission of electricity from Wachusett in August 1911 marked the first known instance of hydroelectric power generation from a domestic water supply (Thayer and Allardice 1914). The Sudbury plant was put in operation in early 1916, and the following year a transmission line was completed along the Wachusett Aqueduct right-of-way to connect the two facilities.

In the decade following completion of Wachusett Reservoir and Dam, construction of new works tapered off, and activity gradually centered on operation and maintenance of the existing water supply system. Continuing the trend toward centralization of metropolitan

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administrative functions, which began in 1901 with creation of the Metropolitan Water and Sewerage Board, the legislature in 1919 established the Metropolitan District Commission, which took over not only the water supply and sewerage systems, but also the Metropolitan Parks Commission. Also that year, mindful of the twenty-year timetable projected in the Board of Health's 1895 report, the Legislature initiated the fourth cycle in the development of the water supply system by ordering a joint board, with members from the Board of Health and the Water Division of the MDC, to review the system as it then stood and to develop recommendations for the future (Resolves of 1919, Ch. 49).

In its report issued in 1922, the Board found that not only was the population of metropolitan Boston steadily increasing, but that rising living standards, plus business and industrial growth, fostered an increase in per capita consumption as well. It was therefore estimated that by 1930 the demand for water would exceed the safe yield of existing sources of supply by nearly 10 mgd (Goodnough 1922:189,206).

Having concluded that the existing system would prove inadequate within a decade, the Joint Board referred to the 1895 report, which had guided development of the Metropolitan Water System for more than twenty-five years. The Board recommended first the diversion of water from the Ware River through a tunnel to Wachusett Reservoir. It also recommended development of an enormous reservoir on the Swift River, with a capacity of 400 billion gallons. Construction of this reservoir would require removal and/or relocation of a significant number of homes and families, with the towns of Enfield, Dana, and Greenwich subject to the greatest impact. In connection with this reservoir, the Ware-Wachusett Tunnel would be extended to the Swift. This portion of the conduit could then convey water either west from the Ware to the Swift Reservoir, or east from the Swift to Wachusett Reservoir (Report of the Joint Board 1922:16,18,20).

The report of the Joint Board was not entirely well-received either in the Legislature or, most certainly, in towns facing possible inundation by the proposed Swift River development. Two years after publication of the Joint Board's report, the Legislature called a new committee to "study further" the question of metropolitan Boston's water supply (Acts of 1924, Ch. 491). The report of the Metropolitan Water System Investigating Committee was issued in December 1925, with major contributions from New York engineer Allen Hazen and Boston engineer Leonard Metcalf. The document rejected the proposed Swift and Ware River diversions, in favor of

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development on the upper Ware with a dam and reservoir at Barre Falls, chiefly to supply the city of Worcester, with the remaining water being available for metropolitan Boston. For additional supply, the Committee recommended diversion of branches of the Assabet River into Wachusett Aqueduct, and eventual utilization of the Ipswich River and Hobbs Brook Reservoir in Cambridge. Water from these sources, however, would require filtration before it could be available as a supply.

Despite the efforts expended in the "further study," the state legislature in the end adopted the recommendations presented by the joint board in 1922. One recommendation from the 1925 report that was adopted, however, was the creation of a new agency, headed by the Commissioner of the MDC, to oversee construction of the new works. The Metropolitan District Water Supply Commission was thus established by the legislature in 1926, with David B. Keniston as chairman, Frank E. Winsor as Chief Engineer, and Karl Kennison as Designing Engineer (Acts of 1926, Ch. 375; Metropolitan District Water Supply Commission 1926:2,3). The Commission immediately began work on the Ware-Wachusett Tunnel, and in the following year (1927) on surveys and plans for the reservoir on the Swift River. The tunnel was completed in 1931, the Quabbin-Ware extension in 1935. Construction at Quabbin Reservoir, begun in 1931, was completed in 1940.

Ten years into this new program, the state legislature once again called upon a Joint Board, comprising members of the Metropolitan District Water Supply Commission and the Department of Public Health (formerly the Board of Health), to examine issues of qualitative improvement and prevention of pollution in the water supply system. The recommendations of this Joint Board, presented in 1938, were duly incorporated into the metropolitan water supply program (Report of the Joint Board 1938). The Sudbury and Cochituate supplies, and also the <u>Sudbury Aqueduct</u> (Area B), were discontinued once Quabbin Reservoir was completed and the expanded distribution system put in service. The Sudbury supply was maintained, but only for emergency purposes, while <u>Lake Cochituate</u> (see Area A) was removed entirely from service. The Joint Board's final recommendation was that in all subsequent aqueduct construction east of the <u>Wachusett Aqueduct</u> (Area C) terminal chamber, pressure conduits be utilized to avoid pollution of water as it passed through the heavily developed regions of central and eastern Massachusetts en route to Boston. This recommendation was followed in construction of Hultman Aqueduct (1940), Wachusett-Marlborough Tunnel (1966-1967), City Tunnel (from the Weston terminal chamber to Chestnut Hill) and the latter's extension to Malden (1950, 1962).

The Metropolitan District Water Supply System Commission, its original mandate to construct an additional supply fulfilled with the raising of Quabbin Reservoir to full level in 1945, was abolished in 1947. Its works were turned over to the MDC, thereby completing the fourth cycle in the development of the system (Acts of 1947, Ch. 583). Quabbin Reservoir became the principal source of supply for metropolitan Boston, and older portions of the system were gradually bypassed and taken out of service. Today, a section of Cochituate Aqueduct in Newton serves as a utilidor, and another carries sewage for the town of Wellesley, while the Sudbury and Wachusett aqueducts lie completely unused. The Weston, now supplied from the Hultman Aqueduct, is presently the only one of the early gravity conduits still in operation.

These post-1926 changes and additions to the Metropolitan Boston Water Supply System will be considered more fully in a proposed amendment to this Thematic Resource Area.

Engineers, Architects, and Designers

The following selected biographical sketches acknowledge some of the many people who worked on the Metropolitan Water Supply System. Since it would be impossible to include every engineer and architect involved, biographies focus on those who were most instrumental in conceptualization, design, and implementation. The absence of anyone in no way reflects their merit as designers nor does it reflect any bias on the part of the authors.

Spanning a period of just over one hundred years, the wealth of creative talent brought to the system by engineers and architects is impressive. These professionals worked together to create technologically innovative and aesthetically pleasing water systems that fit so well into the physical landscape as to be almost invisible amidst more obvious civic, commercial, and residential projects.

While the engineers were producing "state of the art" technology such as the filter beds at Pegan Brook and Marlborough; large reservoirs such as the Wachusett and Quabbin; and complex systems such as Shaft 8 on the Quabbin Aqueduct the architects tended to be, if not restrained, carefully within the bounds of their stylistic time periods. The entire system, from Cochituate in 1845 to Quabbin in 1947, represents periods of architecture in a neat chronological sequence: Cochituate, Greek Revival; Sudbury, Victorian Eclectic; Weston and Wachusett, Classical Revival; and Quabbin, Colonial Revival.

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The 19th and early 20th centuries were a time of rapid urban and industrial expansion which is clearly evidenced by the career routes of these civil and hydraulic engineers. What becomes readily apparent after studying the individuals who worked on the systems is how closely defined was the world in which they worked. Almost all of those in the Boston system worked in the public sector and moved easily from other water supply systems in New York City (John Jervis, Aphonse Fteley, and J. Waldo Smith), Newark, New Jersey (Smith and Thaddeus Merriman), Providence (Frank Winsor), and on to Boston. Some moved west to work in Chicago (E. S. Chesbrough) and California (Thaddeus Merriman). Inevitably after a long public career, most retired and then went on to consult in the private sector.

Water supply was what these engineers were known for, unlike the architects who worked on the systems. Almost never, in an architect's biography, obituary, or in articles about an individual architect or architectural firm is there mention of any water system structures. The reason for this remains unknown, although architects, unlike engineers, did not specialize in water supply structures. George Clough, Arthur Vinal and Edmund Wheelwright were all, at varying times, Boston's official city architect, and therefore designed a variety of municipal structures (in addition to water supply buildings) such as schools and courthouses.

Under the influence of Frederick Stearns, landscape architecture played a prominent role in the aesthetic development of the metropolitan system. Stearns, who believed that technology and nature could live and thrive together, was responsible for initiating the participation of the Olmsted Associates, and subsequently Arthur Shurcliff, in the landscape design of several major components of the system, most notably Middlesex Fells and Weston reservoirs, the Wachusett Dam Complex, and Quabbin Reservoir. It is interesting to note that the professional relationship originally established by Henry Hobson Richardson and Frederick Law Olmsted was perpetuated by their sucessor firms (Shepley, Rutan & Coolidge, and Olmsted Associates, respectively) in their projects for the Metropolitan Water Supply System.

Insight into the engineers and architects who designed and built Boston's Water Supply System provides a more fully humanistic view of the system. Often undocumented, but readily observed, is the close working relationship of these architects and engineers and their sensitivity to people and the environment.

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Perhaps due to an unspoken but underlying philosophy, the systems these professionals designed together provide not only water for the people, but also handsome architecture and literally thousands of acres of lush forests, lakes, scenic vistas, and abundant wildlife habitats, all in the context of the ultimate goal of pure water.

Ellis Sylvester Chesbrough

E. S. Chesbrough (1813-1886) began his career as an engineer on the construction of the Boston & Providence Railroad. In 1846, he was hired by the city of Boston as Chief Engineer for the Western Division of the Cochituate Aqueduct, becoming Water Commissioner of Boston in 1849, and the first City Engineer of Boston, from 1850 to 1855. Chesbrough left Boston in 1855 for Chicago, where he remained for the duration of his career first as an engineer in Chicago's Sewerage Commission, and then as commissioner of Public Works and City Engineer, a position he held until 1879 when he retired. From 1879-1881 he was a planning consultant for the New Croton Aqueduct (National Cyclopaedia of American Biography 1899: 35).

George A. Clough

George A. Clough (1843-ca. 1916) established an architectural practice in Boston in 1869. He was appointed Boston's first City Architect, a position he held from 1873 to 1883. During this time he designed the Prince School, on Newbury St. (1875); and English High School and Latin High (1877). In 1882, he restored Boston's first statehouse. Clough also designed the Suffolk County Courthouse (1889) and with a partner, designed the Soldiers' Home and St. Patrick's Church, both in Chelsea (Withey 1970: 127; Lyndon 1982: 4,39; Southworth 1984: 99, 285).

Structures Designed for the Boston Water Board:

Sudbury System:

Farm Pond Gatehouse
Framingham Reservoir & Gatehouses #1, 2, & 3.
4 Waste Weirs
2 Siphon Chambers
Terminal Chamber

Joseph Phineas Davis

Joseph P. Davis (1837-1917) began his career as an engineer on the

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construction of the Brooklyn, New York, Water Works, with which he was involved from 1856 to 1861. From 1861 until 1865, he was employed by the Peruvian government as a topographical engineer and worked on railroad, bridge, and sewer projects. Davis returned to Brooklyn and in 1865 was Assistant Engineer for the Ridgewood Reservoir. From 1866 to 1867, he served as Chief Engineer for construction of Prospect Park, designed by Frederick Law Olmsted.

Davis moved to St. Louis, Mo., where from 1867 to 1870, he was Principal Assistant Engineer for the St. Louis Water Works. Returning east, Davis was Chief Engineer of the Lowell, Mass., Water Works from 1870-1871. In 1870 he was commissioned by the City of Boston to investigate possible sources for an additional supply of water. His report became the basis for construction of the Sudbury System. From 1872 until 1880, Davis, as Boston City Engineer, supervised all city engineering work including construction of the Sudbury Aqueduct and three storage reservoirs on the Sudbury River in Framingham. He also "... designed and constructed a system of main drainage for the city (of Boston) which was at its completion one of the most elaborate municipal sewers in the United States."

Davis left Boston in 1880 to become a consulting engineer for the American Bell Telephone and Telegraph Company and stayed with the firm until his retirement in 1908 (National Cyclopaedia of American Biography 1936:5).

Densmore, LeClear & Robbins

Densmore, LeClear & Robbins, a Boston architectural firm, designed a number of well-known structures in that city including the Salada Tea Company building of 1919, which has elaborate cast bronze doors that won a silver medal at the Paris Salon of 1927. The Park Square Building, which housed the firm's offices for a number of years, was completed in 1923. This building has a concourse down the middle of the main floor with shops on either side in addition to a lobby and elevators to the floors above. The firm also designed the Art Deco-style New England Telephone and Telegraph Company building (1930), as well as a variety of buildings and structures for the Metropolitan District Commission and the Metropolitan District Water Supply Commission. Edward Dana Densmore (1871-1925), senior partner in the firm, was from Somerville, Massachusetts,and educated at Harvard and M.I.T. (Withey 1970: 170; Boston Public Library, Architectural File, Densmore, LeClear & Robbins; Southworth 1984: 140; Lyndon 1982: 41, 191).

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Structures Designed for the Water Supply System:

MDC Administration Building
Quabbin Administration Buildings
Quabbin Lookout Tower
Quabbin Aqueduct Shaft 1,4,8,9, and 12 Headhouses and Shaft 1,8, and 12 Service Buildings
Winsor Dam Outlet Works Powerhouse
Hultman Aqueduct Shaft 4 Headhouse
Norumbega Reservoir Gatehouse

Desmond Fitzgerald

Desmond Fitzgerald (1846-1926) was born in the Bahamas. At an early age Fitzgerald displayed the talent and inquisitiveness that would be the hallmark of his successful life and career. At the age of twelve, after going to school in Providence, R.I., he studied art in Paris. He then attended Phillips Academy in Andover, Mass., and graduated in 1864, at which time he studied engineering at Cushing & Dewitt, an engineering firm in Providence, R.I. In 1866, at only 20 years of age he became Deputy Secretary of Rhode Island and private secretary to General Burnside, Governor of Rhode Island.

Fitzgerald's first engineering job was in the midwest; this led to his appointment as Chief Engineer, in 1871, of the Boston & Albany Railroad, a position Fitzgerald held until 1873 when he became superintendent of the Western Division of the Sudbury Aqueduct for the City of Boston. In this capacity, he designed Framingham reservoirs #1, #2, #3, and Ashland and Hopkinton Reservoirs. Fitzgerald remained with the Boston Water Works for thirty years, a time which proved to be the most productive period of his life. He was a pioneer in the sanitary protection of water supplies, and extensively studied the causes, formation and control of algae and bacteria in drinking water. He also was one of the first hydraulic engineers involved in the study of water color and swamp drainage. In connection with this work, he established one of the first biological laboratories. Fitzgerald published a number of articles, including "Evaporation" (Transactions of the American Society of Civil Engineers, 1886) and "Rainfall, Flows of Streams and Storage" (Ibid., 1892). He also wrote The History of the Boston Water Works, a book that was published in 1876.

In addition to his scientific activities, Fitzgerald was an avid art collector, an avocation he began in 1871. In 1913 he built an art gallery, open to the public, near his home in Brookline, to house a

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collection of Korean and Chinese pottery and porcelains, his own travel photographs, and works of Monet, Manet, and Pissaro.

After his retirement from the Boston Water Works, Fitzgerald was a consultant on water supply to the cities of Chicago, Washington, San Francisco, and Manila. In 1892, he was elected president of the American Society of Civil Engineers (Dictionary of American Biography 1959: Vol. III: 434-435; Boston Evening Globe, 22 September 1926:16).

Alphonse Fteley

Alphonse Fteley (1837-1903) was born in France and came to the United States in 1865. From 1865 to 1870, he worked for William E. Worthern, primarily on hydraulic projects. In 1870 he began his own practice as a civil engineer, and three years later became resident engineer of construction of the Sudbury Aqueduct. From 1873 to 1880, Fteley was City Engineer of Boston, which included duties as Superintendent of the water supply. Fteley left Boston in 1884 to become principal assistant engineer of the New Croton Aqueduct Commission in New York City. Two years later he became consulting engineer for the commission, and in 1898 Fteley was appointed Chief Engineer of the New Croton Aqueduct. One of his major contributions in this post was the design of the New Croton Dam at Cornell.

During his career, Fteley also served as a Consulting Engineer to the Metropolitan Water Board, and as Boston's first Rapid Transit Commissioner. During the construction of the Panama Canal, he was a consultant for the Panama Canal Company. Poor health forced him to retire in 1900 and he died in 1903 (National Cyclopaedia of American Biography 1906:561).

Xanthus Henry Goodnough

X.H. Goodnough (1860-1935) was born in Brookline, Mass. He attended Harvard University, from which he graduated in 1882. A sanitary engineer, Goodnough worked for the Commonwealth of Massachusetts from 1886 until 1930, a period of 44 years. He began his career in the State Board of Health's Engineering Division as Assistant to Frederic Stearns. Upon Stearns' appointment as Chief Engineer of the Metropolitan Water Board in 1895, Goodnough was appointed Chief Engineer of the Board of Health, a position he held until 1914. In this capacity he acted as Chief Engineer for the Joint Board created to investigate water supply needs, investigations which eventually led to construction of Quabbin Reservoir and Aqueduct. Other Board

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of Health projects included improvements of the Sudbury, Concord, and Neponset Rivers and expansion of the southern metropolitan sewerage system. A reorganization of the Board of Health resulted in Goodnough's promotion to Chief Engineer and Director of the Division of Sanitary Engineering of the Department of Public Health. During this time, he also served as an advisor to the Metropolitan District Water Supply Commission. In 1930, Goodnough retired from public service and formed a private practice with Bayard F. Snow. Upon his death, in Waterford, Maine, the Water Supply Commission, in its Annual Report of 1935, noted: "By the death of Mr. Goodnough the commission lost the services of one who was particularly well fitted to advise them on this [Quabbin Reservoir] project" (Metropolitan District Water Supply Commission 1935:1). In his honor the Commission named the Quabbin Reservoir dike, Goodnough Dike (Metropolitan District Water Supply Commission 1935:1; Dictionary of American Biography, Vol. XI: 325).

John Bloomfield Jervis

John B. Jervis (1795-1885) a civil engineer, began his career as a rodman on the Erie Canal, but soon became Engineer in Charge of canal construction from Albany to Amsterdam, New York. In 1825 he became an Assistant Engineer on the Delaware and Hudson Canal and advanced to Chief Engineer in 1827. Jervis was then Chief Engineer of the first railroad constructed in New York State, the Albany and Schenectady, completed in 1830. As was typical of the beginning years of major railroad construction and before the days of "specialization," civil engineers such as Jervis moved easily between a variety of water, rail, and transportation projects. In 1833 Jervis, in his capacity as Chief Engineer, completed the Chenago Canal, which was 100 miles long and had 98 locks. Jervis devised an artificial storage reservoir for this project that was used to maintain the water level of the canal. In 1836, Jervis became Chief Engineer of the Croton Aqueduct, the project that made him one of the leading and best-known civil engineers of the 19th century. The 41-mile-long aqueduct was essentially completed in 1842. While still Chief Engineer of Croton, a position he held until 1849, Jervis served as Consulting Engineer for Boston's Cochituate Aqueduct (1846-1848) and also as the Chief Engineer of the Hudson River Railroad, which ran from Albany to New York City. From 1851 until 1854, he was Engineer and President of the Chicago and Rock Island Railroad. Jervis retired in 1858, but three years later became Superintendent and Engineer of the Pittsburgh and Ft. Wayne Railroad. In 1868 he organized the Merchant Iron Mill in his hometown, Rome, New York, where he died in 1885 (National Cyclopaedia of American Biography, 1907:35; FitzSimons 1971).

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Karl Kennison

Karl Kennison (1886-1977) a graduate of Colby College and M.I.T., had a long career in water-related construction projects. Before joining the Metropolitan District Water Supply Commission in 1926, he had been involved with the planning of the San Francisco and Providence water supplies, and also designed some of the first dams for the Mississippi River Power Development. He was also an advisor on a number of shipyard construction projects.

Kennison joined the Water Supply Commission as Designing Engineer; in 1934 he was promoted to Assistant Chief Engineer and upon the death of Frank Winsor in 1939, became Chief Engineer on the Quabbin project. Kennison remained with the Water Supply Commission after it merged in 1947 with the Metropolitan District Commission and was renamed the Construction Division. He left the MDC in the 1950s and moved to New York City, where he headed the city's Board of Water Supply from 1952 until his retirement in 1962.

Kennison was a past president of a number of professional organizations including the New England Water Works Association and the Boston Society of Civil Engineers. He also served as director of the Municipal Engineers of New York City and of the American Water Works Association. Kennison wrote numerous articles on the Quabbin construction and on sewage treatment in the Boston area. Upon his death he was buried in the Quabbin Park Cemetery. (Boston Globe, 3 May 1977: 12; Metropolitan District Water Supply Commission Annual Reports, 1932:4; 1939:4)

Thaddeus Merriman

Thaddeus Merriman (1876-1939) was, like his father, a hydraulic engineer. Born in New Haven, Connecticut, he was educated at Lehigh University in Pennsylvania. After school he worked on the construction of waterworks for New Boston, Connecticut. From 1898-1900, Merriman was an assistant engineer for a survey team in Nicaragua that was trying to build a canal. Returning to the United States, he worked with Jonas Waldo Smith, on the Little Falls, New Jersey, filtration plant. Continuing in New Jersey, Merriman was Assistant and Division Engineer on the dam at Boonton for the Jersey City Water Supply Company, which was the first cyclopean dam, consisting of large stones imbedded in concrete rather than set in mortar.

In 1905, Merriman began "a long and distinguished" association with the New York City Water Supply Board, first working as an Assistant

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to J. Waldo Smith in preparing general plans and estimates for the Catskill Water Supply. Succeeding Smith (who retired) as Chief Engineer in 1922, Merriman stayed with the New York City Water Board until 1933 when he retired from public service. He began a busy private practice in which, among other activities, he served as Consulting Engineer for Quabbin Reservoir, as consulting engineer from 1933 to 1939 to the City of New York's Delaware River Project Dam in Lackawanna, New York; and as Chief of the Engineer Board of Review for the Metropolitan Water District of Southern California.

Merriman maintained an active academic life, lecturing on hydraulics at Yale, M.I.T., Harvard, Princeton, and at Lehigh University, where he was awarded an honorary Ph.D in 1903. He also spent more than 25 years researching the properties and uses of Portland cement and published a number of articles on the subject. In his honor, upon his death in 1939, the Delaware River Project Dam at Lackawanna, N.Y. was renamed the Merriman Dam (National Cyclopaedia of American Biography Vol. 29:95-96).

Frederick Olmsted and Associates

The Olmsted architectural landscaping firm was founded by Frederick Law Olmsted (1822-1903), who began his landscaping career when he and Calvert Vaux submitted a winning design for New York City's Central Park. Prior to this Olmsted traveled throughout China, Europe, and the United States and was a farmer, writer, and dry goods clerk. After the completion of his work on Central Park in 1857, Olmsted moved to California where he managed gold mines. He remained in California to design a campus and village for the College of California at Berkeley, the Mountain View Cemetery, and a park and parkway plan for San Francisco. During the mid-1860s while in California, Olmsted wrote a report advocating the Yosemite Valley and Mariposa Big Tree Grove as scenic reservations.

Olmsted returned to New York in the fall of 1865 and immediately began, with Vaux, his design for Brooklyn's Prospect Park. Throughout the 1860s and 1870s Olmsted worked in theory and practice on his design for urban parks and parkways; it was during this period that his philosophy became clearly defined. His theories of parks within urban landscaping linking different areas of cities through waterways and landscaped parkways and boulevards was to have an impact on major cities throughout North America including New York City, Boston, Buffalo, Riverside, Illinois, Newark, Chicago, Montreal, Detroit, Milwaukee, Rochester, and Louisville.

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Vaux and Olmsted's partnership was dissolved in 1872. In 1877, after becoming increasingly disenchanted with New York City, Olmsted moved to Brookline, Mass. where he remained for the rest of his life. He was encouraged in this move by the architect, H. H. Richardson, who also lived in Brookline. He and Olmsted collaborated on a number of projects including the Ames estate in North Easton, Mass. (1881), and the Crane Memorial Library, Quincy, Mass. (1883), as well as several railroad stations for the Boston and Albany Railroad.

It was in Boston that Olmsted was able to fully realize his vision of an interconnected park system with continuously green open space throughout an urban area. In 1878 he began his work for the Boston Park System, which resulted in the "Emerald Necklace," a string of parks and parkways which included the Fenway, the Jamaicaway, and Arborway. These were linked with Commonwealth Avenue, the Arnold Arboretum, and Franklin Park. In conjunction with Shepley, Rutan and Coolidge, successor firm to Richardson, Olmsted designed the Stanford University (California) campus and the Middlesex Fells in Boston. He also designed a number of private estates, including the 2,000-acre Biltmore (1888) and the Vanderbilt home in Asheville, N.C. Working with the landscape, Olmsted maximized natural formations of an area with a result that looks amazingly natural and untouched, although the effect was often achieved through massive earth-moving projects.

Olmsted's last major design was the 1893 site plan for the World's Columbian Exposition in Chicago. By 1895 he had retired from the firm and much of the day-to-day operation was taken over by his stepson, John C. Olmsted, who had joined the firm in 1879 and became a partner in 1884. In addition to his stepson, Olmsted had a number of other partners including Codman from 1889 to 1893 and Charles Eliot from 1893 to 1897. Arthur Shurcliff, active in the Boston Park System, was also a partner in the firm but left in 1907 to begin his own practice. Olmsted's son, Frederick Law Olmsted, Jr., joined the firm after 1895 and with John C. Olmsted developed "...a practice many times larger than before."

Tragically, Frederick Law Olmsted died, ill and senile, after a creative and productive life, in McLean's Hospital, outside of Boston, for which he had designed the grounds (Placzek 1982: Vol. 3: 319-324-Southworth 1984:X, 435, 442-445).

<u>Landscape Projects for the Metropolitan Water Supply System</u>:

Spot Pond

(continued)

Middlesex Fells Reservoir
Bear Hill Reservoir
Weston Reservoir

Shepley, Rutan & Coolidge

George Foster Shepley (1860-1903), Charles Hercules Rutan (1851-1914), and Charles Allerton Coolidge (1858-1936) were all members of H. H. Richardson's firm. Upon his death in 1886, they formed a partnership, completed Richardson's unfinished projects, and went on to become one of the most successful architectural firms in America.

In 1892 the firm completed the Ames building, then the tallest (13 stories) structure in Boston and today still the second highest masonry wall-bearing building in the Untied States. They designed the campus of Stanford University, Palo Alto, Calif. (1892), Chicago Art Institute (1897) and the John Hay Library at Brown University (1907). In the Boston area, in addition to the Ames Building, the firm also designed the Grain and Flour Exchange (1889-1892), the Chamber of Commerce (1892), the Trinity Church Porch (1897), South Station (1900), and the Harvard University Medical School (1907).

Working in conjunction with the Olmsted firm, Shepley, Rutan & Coolidge designed structures for the Metropolitan Water Supply System at the three reservoirs in the Middlesex Fells (an Olmsted-designed park). They also designed the Chestnut Hill Low Service Pumping Station, all the structures on the Weston Aqueduct, and the lower gatehouse at Wachusett Dam.

Shepley and Coolidge both studied at M.I.T. This and their subsequent relationship with Richardson may well account for the firm's strong grasp of a number of styles including Richardsonian Romanesque, Classical Revival, and the Beaux Arts. In 1886, Shepley married Richardson's daughter; the couple's son, Henry R. Shepley, became a partner in the firm, then named Coolidge, Shepley, Bulfinch and Abbott. The partnership continues today in Boston, with offices in the 1892 Ames Building, as Shepley, Bulfinch, Richardson and Abbott (Placzek 1982: Vol. 4: 51-51; Withey 1970: 136-137, 534; 550-551 Southworth 1984:78, 90, 109; Lyndon 1982:13, 163, 274).

Structures Designed for the Metropolitan Water Supply System:

Spot Pond Pumping Station
Spot Pond Southern Gatehouse

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Low Service Pumping Station, Chestnut Hill
Weston Aqueduct Structures:
- Head chambers
- 2 gaging chambers
- 4 siphon chambers
- Channel chamber
- Screen chamber
- Terminal chamber
- Wachusett Dam lower Gatehouse/powerhouse
- Middlesex Fells Reservoir Gatehouse
- Bear Hill Reservoir Gatehouse

<u>Arthur Shurcliff</u>

Arthur Shurcliff (1870-1939) was a landscape architect and planner who through good design and a forceful personality had a powerful impact on all his projects. Shurcliff, a graduate of both M.I.T. and Harvard University, began his career in the office of Frederic Law Olmsted. He soon left, however, to form his own practice and eventually founded the firm of Shurcliff, Shurcliff and Merrill. Nationally known for recreating the gardens and grounds of Williamsburg, Va,. in the 1930s, Shurcliff was best known in his home town of Boston for redesigning Boston Common in 1918, in which he cleared the area of unneccessary structures, realigned walks to better focus on the State House and advocated removing some of the paving from Tremont Street and returning it to green land.

Shurcliff was for many years a consultant to the MDC water and parks division, and in this capacity was involved in the Charles River Basin/Storrow Drive design in the 1940s, in addition to his work at Wachusett and Quabbin reservoirs. He was also one of the founders of the Harvard School of Landscape Architecture and was a member and secretary of the Massachusetts State Art Commission for 27 years. In addition to his landscape work, Shurcliff designed town plans for more than 37 cities in New Englnad and for Fort Worth, Indiana, and Fort Worth, Texas.

During the late 1940s Shurcliff wrote his autobiography (published privately by his family in 1981) in which he carefully detailed the projects he had worked on and his role in each. The book conveys a man of enormous energy and talent with a strong-willed character. Today, his grandson, Charles Shurcliff, works at the MDC Parks Division as a landscape architect. (New York <u>Times</u>, Nov. 13, 1957: 35; Wouthworth 1984: 438; Shurcliff 1981).

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Landscape Projects for the Metropolitan Water Supply System

Quabbin Administration (Administration and Winsor Dam areas)
Wachusett Dam Area
Quabbin Park Cemetery

Jonas Waldo Smith

J. Waldo Smith (1891-1933) was born in Lincoln, Mass., where he obtained his first engineering job, at the age of 16, in the town waterworks. He left to go to school at Phillips Academy, and in 1881 continued his education at M.I.T., where he graduated in 1887 with a degree in civil engineering. Between his stays at Phillips and M.I.T., Smith was Assistant Engineer with the Essex Water Power Company, Lawrence, Mass. He continued his career in the water field, working for two years at the Holyoke Water Power Company. From 1890 to 1897, Smith worked for the East Jersey Water Company, where he was First Resident Engineer and then Principal Assistant Engineer. Upon completion of a design of the Newark water supply system, Smith designed the first modern mechanical filtration plant in the United States, at Little Falls, New Jersey, in 1902.

Like many of his colleagues, Smith worked on New York City's Croton System. In 1903 he was Chief Engineer in charge of all construction on the New Croton Supply including the New Croton Dam, then the world's largest masonry dam. In 1905, New York City's additional supply from the Catskills was begun, work that was finally completed in 1922. Smith, who planned and engineered the project, considered this his triumph. The 92-mile-long Catskill Aqueduct was finished under budget and one year ahead of schedule. He retired from public service soon after the completion of the Catskill Project and then consulted on a number of projects, including the Quabbin Aqueduct and Reservoir studies, until his death in 1933 (National Cyclopaedia of American Biography Vol. 24: 108; Metropolitan District Water Supply commission annual report 1933: 1).

Frederic P. Stearns

Frederic Pike Stearns was born in Calais, Maine, on November 11, 1851. At the age of 18, he went to Boston and obtained a position in the office of the city surveyor. Three years later, in 1872, Stearns joined the "engineering corps" of Boston's Cochituate Water Board, then under the administration of Joseph P. Davis, and the following year conducted surveys for the Sudbury aqueduct and reservoir project as an Assistant Engineer. When construction began

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on that system, Stearns was put in charge of completion of a segment of the aqueduct. From 1877 to 1879, Stearns and Alphonse Fteley conducted a series of hydraulic experiments through the Sudbury Aqueduct. Publication of their work in 1883 earned Stearns and Fteley a Norman Medal from the American Society of Civil Engineers (National Cyclopaedia of American Biography 1967, Vol. 14:306).

From 1880 to 1886, Stearns was employed in the construction of the Boston Main Drainage Works, with particular responsibility for the tunnel under Dorchester Bay and the reservoir and outlet works at Squantum and Moon Island. In 1886, with the creation of an engineering department in the Massachusetts State Board of Health, Stearns was appointed Chief Engineer for that department. In this capacity, he conducted studies and developed plans for main sewers in the Charles and Mystic River valleys, which became the basis for creation of the Metropolitan Sewerage Board in 1889. In addition, Stearns served as engineer to a joint board examining improvements to the Charles River and developed plans for creation of a fresh water basin by construction of a dam with a tidal lock. Between 1893 and 1895, Stearns played a pivotal role in the Board of Health's study for a metropolitan water supply system (published in 1895), which resulted in the establishment of the Metropolitan Water Board.

With Stearns as Chief Engineer, the Water Board's engineering department oversaw construction of Sudbury and Wachusett Reservoirs, Wachusett and Weston Aqueducts, and also numerous improvements to the distribution facilities, most notably at Chestnut Hill and Spot Pond. With completion of Wachusett Reservoir and Dam, Stearns retired from public service, but until his death in 1919 maintained an active career as a private consultant.

Frederic Stearns may in many respects be considered the architect of the Metropolitan Water Supply System. The 1895 Board of Health study, to which he contributed extensively, became in effect the blueprint for development of the system through construction of Quabbin Reservoir, the completion of which marked the realization of ideas Stearns had developed forty years before. Stearns' reputation as an engineer was perhaps most prominently highlighted in his selection to a 13-member international commission of engineers for the Panama Canal, which functioned in an advisory capacity on that project. The north dike at Wachusett Reservoir, designed by Hiram Miller under Stearns' guidance, was of particular interest to the commission, which made a special trip to the reservoir in November 1905 to discuss its unusual construction

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methods and to view the results thereof.

A hallmark of Stearns' work in Massachusetts was his concern for the aesthetics as well as the technology of the Metropolitan Water Supply System. The Boston Evening Transcript noted this characteristic by saying Stearns "combined in rare degree both scientific attainment and a love of the beautiful, as the result of which his achievements adorned as well as served in a utilitarian sense the communities for which he worked" (Transcript, 2 December 1919:4). Having worked with Charles Eliot, of the firm Olmsted, Olmsted & Eliot, on the Charles River improvement studies in the 1880s, Stearns remembered that experience and built upon it as Chief Engineer for the Metropolitan Water Board (Journal of the New England Water Works Assn. 34 [1920] :30). As a result, landscaping was a prominent feature of reservoirs built under Stearns, in particular Weston Reservoir and Spot Pond, and of the complex of structures at Wachusett Dam. Stearns' contributions were eloquently summarized by the American Society of Civil Engineers, of which he was at one time president, as "at . . . their construction probably the most noteworthy series of waterworks structures in the United States; foremost not altogether in size, but in perfection of detail and the embodiment of the best practice in hydraulic engineering . . .from reservoir to pumping station" (ASCE Transactions 83 [1919-20] :2135).

Arthur Vinal

Arthur H. Vinal (1855-1924) was born in Quincy, Massachusetts. He apprenticed in the architectural firm of Peabody and Stearns before beginning his own practice, in Boston, in the 1870s. During his career, Vinal designed a number of single-family dwellings in and around Boston, including houses for family members on Bay State Road. As Boston City Architect, a position Vinal held from 1884 to 1888, Mr. Vinal designed schools, and police and fire stations, including Engine and Hose Houses No. 33 and the adjacent Police Station, now the Institute of Contemporary Art. As City Architect, Vinal designed what is perhaps his-best known work, the Chestnut Hill High Service Pumping Station, a carefully massed and detailed Richardsonian Romanesque structure. Vinal also designed the Robert B. Brigham Hospital and subsequently did work on the Brigham family estate. He also designed the lodge at the base of the Bunker Hill Monument and was the architect for the Bangor and Augusta, Maine opera houses. Vinal died suddenly, in West Harpsell, Maine (Boston Transcript, August 25, 1924:5; Boston Public Library, Architectural File, Arthur Vinal; Southworth 1984: 10, 292; Lyndon 1982: 180, 211, 300).

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Structures Designed for the Water Supply System:

Fisher Hill Reservoir and Gatehouse
Chestnut Hill High Service Pumping Station

Wheelwright & Haven

Edmund March Wheelwright (1854-1912), a Boston architect, was educated at Harvard, M.I.T. and the Ecole des Beaux Arts, Paris. Before beginning his own practice, he worked in the offices of Peabody and Stearns and McKim, Mead, and White. After five years of private practice, Wheelwright in 1889 formed a partnership with Parkman B. Haven (1858-1943). During his practice with Haven, Wheelwright (from 1891 to 1895) was also Boston City Architect and designed a number of municipal buildings including the subway entrance on Boston Common at Park Street (1897), several of the buildings at Boston City Hospital, the Fine Department Headquarters (now the Pine Street Inn), which was based on the Palazzo Vecchio in Florence (1894), and the Massachusetts Historical Society (1899). It was in this capacity that Wheelwright designed some of the structures for the Metropolitan Water Supply System. In 1895, the City Architect position was abolished and Wheelwright resumed his partnership with Haven. The firm designed several notable buildings in Boston including Horticultural Hall (1900); New England Conservatory of Music (1903), Longfellow Bridge (inspired by a bridge in St. Petersburg, Russia) (1907), and the New Opera House (1908) (Placzek 1982: Vol. 4; 389; Withey 1970: 273, 648-649; Lyndon 1982:108, 203, 296, 300; Southworth 1984: 191, 297, 310).

Structures Designed for the Boston Water Board:

Extension of Chestnut Hill High Service Pumping Station
Gatehouse at Chestnut Hill
Glenwood Pipe Yards
Sudbury Dam Gate Chamber

Frank E. Winsor

Frank E. Winsor (1870-1939), born in Providence, Rhode Island, graduated from Boston University with a civil engineering degree. For his entire career, Winsor was involved with water-related projects. From 1881 to 1895, he worked on the construction of the Boston metropolitan sewerage system. In 1895 he moved to the Metropolitan Water Board, where for five years he was an assistant in the Wachusett Dam and Reservoir and Aqueduct Departments. He was then promoted to Assistant Engineer in charge of the Weston Aqueduct

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department, and from there moved up to Division Engineer for part of the Wachusett Aqueduct.

From 1903 to 1906, Winsor served as Designing and Deputy Chief Engineer for Boston's Charles River Basin Commission. He left this position to work in New York City for the next nine years, where he was an engineer on the Catskill Water Supply. In this capacity, he was in charge of construction of the Kensico and Hillview Reservoirs and 32 miles (out of a total of 92) of the Catskill Aqueduct. Later, he served as consulting engineer to the New York

City Board Water Supply. Returning to New England, Winsor was Chief Engineer of the Metropolitan Supply of Providence. In 1926, he was appointed Chief Engineer for the Metropolitan District Water Supply Commission in Boston. In this capacity, Winsor was in charge of construction of the Quabbin Aqueduct and Quabbin Reservoir, one of the largest construction projects ever undertaken in the United States at that time. He was also the highest paid state official in Massachusetts, earning $3,500 more a year than the governor of the state. In the most ironic of circumstances for a career public servant, Winsor died while testifying in Boston Muncipal Court, in a contractor's suit against the Water Supply Commission. Upon his death the main dam at Quabbin Reservoir was renamed Winsor Dam; a memorial, co-sponsored by the Boston Society of Engineers and the Northeastern Section of the American Society of Civil Engineers, was erected on a hill overlooking the reservoir. As recorded in the Water Supply Commission Annual Report for 1939, "He died at the height of a distinguished career and his loss was very keenly felt." (Metropolitan District Water Supply Commission 1939:4-5, New York Times, February 1, 1939).

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Archaeological Significance

Since patterns of prehistoric occupation in many of the towns listed in this nomination are poorly understood, any surviving sites would be significant. Sites in the nomination area offer the potential for an analysis of riverine sites in both the interior uplands and coastal locales. More importantly, however, surviving sites in the nomination area offer the potential for an analysis of the relationships between interior uplands and coastal sites. The past and present environmental diversity of the nomination area offers the potential for a detailed analysis of prehistoric settlement and subsistence through time with particular emphasis on change when it occured and why the numerous riverine drainages included in the area may also allow an analysis of such topics as trade, territoriality and a material use and procurement.

Historic archaeological remains described above have the potential for providing detailed information on the evolution of water supply for Boston and the metropolitan area from 1825 to the 20th century. Archaeological survivals can document sequences of construction and temporary facilities used during construction for which no records exist, archaeological survivals also document changes in various facilities through time, particularly with older facilities. Similar survivals can also provide details of engineering features no longer extant or for which surface examples and records no longer survive. In general, archaeology may offer a valuable approach for the analysis of the evolution of water supply from its inception to the present.

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Previously Listed on the National Register of Historic Places

Echo Bridge - Form #5-3 - 1980;
Spot Pond Reservoir Pumping Station - Form #14-3 - 1985;
Bottume House - Form #14-8 - 1985;
Roxbury Standpipe - Form #16-2 - 1973;
Arlington Standpipe - Form #16-3 - 1984.

National Historic Mechanical Engineering Landmark

Leavitt Pumping Engine - Chestnut Hill Reservoir.

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section number COVER Page ____

SUPPLEMENTARY RECORD

NRIS Reference Number: N/A Date Listed: N/A

N/A	Middlesex, et al.	MA
Property Name	County	State

Water Supply System of Metropolitan Boston MPS
Multiple Name

This property is listed in the National Register of Historic Places in accordance with the attached nomination documentation subject to the following exceptions, exclusions, or amendments, notwithstanding the National Park Service certification included in the nomination documentation.

for [signature] Signature of the Keeper

01-18-90 Date of Action

Amended Items in Nomination:

COVER FORM: Section #8--Statement of Significance

Typographical errors:

The continuation sheet labelled 8/11 is really 8/1; all others then follow in chronological order with the exclusion of 8/11.

The birth date for engineer Jonas Waldo Smith (page 8/24) is actually 1861, not 1891 as indicated.

This information was confirmed with Betsy Friedberg, National Register Director, MASHPO by telephone.

DISTRIBUTION:
National Register property file
Nominating Authority (without nomination attachment)