MASSACHUSETTS WATER RESOURCES AUTHORITY

Charlestown Navy Yard
100 First Avenue, Building 39
Boston, MA 02129

Frederick A. Laskey
Executive Director

Telephone: (617) 242-6000
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November 14, 2016

Ms. Alice Ingerson
Community Preservation Program Manager
Planning and Development Department
Newton City Hall
1000 Commonwealth Avenue
Newton, MA 02459

RE: MWRA Pre-Proposal Submittal to Newton Community Preservation Committee for MWRA Railing Reconstruction Plan at Echo Bridge, Newton, MA.

Dear Ms. Ingerson:

In the spirit of working in good faith, the Massachusetts Water Resources Authority (MWRA) is coordinating with the ad-hoc Echo Bridge Railing Committee following the July, 2016 Newton Upper Falls Historic District Commission (NUFHDC) meeting regarding the historic railings at Echo Bridge. At that meeting, there was interest expressed by both the Commission members and local residents of Newton and Needham to have MWRA explore the possibility of obtaining Community Preservation Act (CPA) funding from both the City of Newton and the Town of Needham for a full reconstruction of the historic railings rather than the Option 4 proposal presented by MWRA for a new interior railing to replace the temporary chain link fence.

The project described in the attached pre-proposal calls for a $1.44 million full reconstruction plan for the historic railings at Echo Bridge. MWRA is seeking $500,000 from Newton and $250,000 from Needham which represents approximately 50% of the total project cost. This submittal includes the required pre-proposal form and other attachments that fully describe the project, historical significance, costs, timelines, and consistency with local historic preservation needs in both Newton and Needham.

MWRA requests to meet with the Newton Community Preservation Committee (CPC) at their December 8, 2016 meeting and intends to submit the remaining information required for a full Proposal as soon as possible after that meeting. MWRA will submit the pre-proposal to the Needham CPC by their December 1 deadline for "Initial Eligibility" applications.

Although the need for railing reconstruction has been discussed since the 2007 feasibility study was completed, only now with the infusion of community support has the MWRA had the opportunity to submit a CPC proposal. While we understand the priority of many projects already in the queue, the urgent need to improve the railings at the lowest possible cost drives the MWRA to respectfully asks the Newton Community Preservation Committee (CPC) for "off-cycle" consideration so we can coordinate Newton's schedule with the Town of Needham CPC application process that leads to a vote at Town Meeting in mid-May, 2017.

The MWRA is aware that the CPCs have the option to require a Preservation Restriction on funded historic preservation projects as a means to ensure their investment objectives are protected into the future. In this situation, however, the railings fall within the Newton Upper Falls Historic District boundaries and are visible from Ellis Street so the local historic district commission already holds review authority over all changes to the railings. In fact, they have exercised that authority by approving the railing reconstruction plan we are submitting at their November 10, 2016 meeting, and they will be following up with a letter of support for this application. The Massachusetts Historical Commission has also been exercising its review authority over the railings, based upon the listing of Echo Bridge in the State and National Registers of Historic Places. MWRA looks forward to receiving guidance from the Newton CPC on this matter.

In the event that MWRA is able to secure funding from both Newton and Needham Community Preservation Committees (CPC's) and other financial resources are identified, it is MWRA's intention to undertake this work in 2017. If CPA funding is not realized, it is MWRA intention to proceed with the installation of Option 4 (b) (also approved by the NUFHDC on November 10, 2016) which will consume some of the funds otherwise slated for the proper railing reconstruction desired in both communities, thus raising total costs. If you should need additional information or have any questions, please call me at (617) 788-1165.

Sincerely,

Marianne Connolly

Marianne Connolly
Senior Program Manager
Environmental Review and Compliance

Attachments
cc: Brona Simon, MHC
Patricia Carey, Town of Needham
Representative Ruth Balser
Patrice Kish, DCR
Paul Rullo, MWRA
Carmine DeMaria, MWRA
Lee Fisher, Echo Bridge Railing Committee

C:NewtonCPCSubmittalCover

Newton & Needham, Massachusetts
Community Preservation Programs
FUNDING REQUEST

(For staff use)
date rec'd:

14 Nov 2016,
Newton CPC

☑ **PRE-PROPOSAL** ☐ **PROPOSAL**

Please submit this completed file directly – do not convert to PDF or other formats, to:

Community Preservation Committee, c/o Park & Recreation Dept., Needham Town Hall, 500 Dedham Ave., Needham, MA 02492 (pcarey@needhamma.gov , 781.455.7550, **www.needhamma.gov/index.aspx?NID=425**) AND

Community Preservation Program Manager, Planning & Development Dept., Newton City Hall, 1000 Commonwealth Ave., Newton, MA 02459 (aingerson@newtonma.gov, 617.796.1144, **www.newtonma.gov/cpa**)

You may adjust the space for each question, but the combined answers to all questions on this page must fit on this page.

Project TITLE	**Echo Bridge Historic Railing Reconstruction**			
Project LOCATION	Echo Bridge, visible from Ellis Street in Newton, straddles the Charles River. It links the mill village of Newton Upper Falls to Needham (Reservoir Street) and links DCR parkland on both sides of the river (Hemlock Gorge).			
Project CONTACTS	Name & title or organization	Email	Phone	Mailing address
Project Manager	Marianne Connolly, Massachusetts Water Resources Authority	marianne.connolly@mwra.com	617-788-1165	100 First Ave Charlestown, MA 02129
Other Contacts	Lee Fisher, Echo Bridge Railing Committee	fishberg@rcn.com	617-527-0614	954 Chestnut Street Newton U Falls, MA 02464
Project FUNDING	**A. CPA funds requested:**	**B. Other funds to be used:**		**C. Total project cost (A+B):**
	$500,000 Newton/ $250,000 Needham	$690,000 (State, MWRA, Donations)		$1,440,000 estimate
Project SUMMARY	Explain how the project will use the requested CPA funds. You may provide more detail in attachments, but your PROJECT SUMMARY MUST FIT IN THE SPACE BELOW. Use a cover letter for general information about the sponsoring organization's accomplishments. **Word count for pre-proposal: 100.**			

Echo Bridge was built in 1876 to carry the Sudbury Aqueduct over the Charles River at Hemlock Gorge. Its top surface was designed as a pedestrian promenade with decorative cast iron railings on both sides. Over the course of 140 years these railings have severely deteriorated, exacerbated by poorly-executed repairs made decades ago. A temporary chain link fence was installed in 2008 for safety reasons.

A feasibility study of the railings was conducted in 2007 by McGinley Kalsow & Associates of Somerville. It described the conditions existing at that time and listed various material and method options for railing reconstruction. The MWRA, in collaboration with interested parties in Newton and Needham, has selected full in-kind replication of the railing posts and "BWW" rosettes with new ductile cast iron parts and reconstruction of the rails running between posts using color galvanized steel piping. A safety screen of 2"x2" steel mesh will be secured between the railing posts to meet current code requirements, as shown in the photo to the right. More details are available in the attached Reconstruction Plan.

The MWRA, as funding recipient, will provide the engineering, contracting, and project management expertise to conduct the reconstruction project. Ongoing maintenance of the railings will be performed with funds from MWRA's maintenance budget. Future changes to the railings, if needed, will continue to require review and approval from the Newton Upper Falls Historic District Commission and the Massachusetts Historical Commission.

You may adjust the space for each question, but the combined answers to all questions on this page must fit on this page.

Project TITLE	**Echo Bridge Historic Railing Reconstruction**
USE of CPA FUNDS	**HISTORIC RESOURCES**
Reconstruct/ rehabilitate	This project would use a combination of the "reconstruction" (for the cast iron railing) and "rehabilitation" (for additional screening to meet current safety codes) treatments in the *Secretary of the Interior's Standards.*

COMMUNITY NEEDS

Demonstrate how this project meets previously identified community needs by providing: for Newton, a brief quote from each of at least 2 plans linked to the *Guidelines & Forms* page of **www.newtonma.gov/cpa** (with plan title, year, and page number); for Needham, equivalent quotes from the "Factors for Consideration" in the Community Preservation Plan, at **http://ma-needham.civicplus.com/index.aspx?NID=440**

Echo Bridge is an iconic structure of local, metropolitan, and national significance. It is visited in all seasons by hikers, commuters, cyclists, friends & families, artists, nature lovers. Reconstruction of the historic railings will enhance the experience of those who visit and demonstrate a public/private commitment to preservation of historic landscapes.

1. Newton Comprehensive Plan (2007): www.newtonma.gov/civicax/filebank/documents/30752
p78 (p 4-10) "About twelve or more Village Centers in Newton are intended to be strongly pedestrian-oriented areas, including those listed below." Echo Bridge is listed, in addition to the village of Upper Falls, and the closing of Cooks Bridge in mid-2016 has underscored the key value of Echo Bridge to pedestrians and cyclists who depend upon it daily. The pedestrian experience over this Bridge will be greatly enhanced by reconstruction of the historic railings.

2. Newton's Heritage Landscapes (March, 2010): www.newtonma.gov/civicax/filebank/documents/30750
Cover page showcases Echo Bridge as a Heritage Landscape.
p 8 (p 5) "Along the riverfront, where recreation would eventually replace industry, the Metropolitan Park Commission created the Hemlock Gorge reservation with Echo Bridge as its focal point."
p 13 (p 10) Charles River Corridor – "Today the bridge has a pedestrian trail on top linking Newton and Needham."
p 50 (p 47) Heritage Landscapes Identified By Community: Echo Bridge "Current discussion re replacement railing."

3. City of Newton Open Space and Recreation Plan (3/14): www.newtonma.gov/civicax/filebank/documents/59645
P 59 (Sec 5, p8) "… the MWRA published a new policy which will make possible the opening up of MWRA aqueduct lands to the public for compatible use ... It is anticipated that this would bring considerable benefit to Newton… and should create opportunities for linkage with other open spaces and trails." *(e.g. Needham Aqueduct Trail)*

4. Town of Needham Community Preservation Plan (3/14): www.needhamma.gov/DocumentCenter/View/9621
p 18 (p 18) "A. Historic Preservation Resources and Needs - The 19 listed properties in Town are: Echo Bridge"

COMMUNITY CONTACTS

List at least 3 residents or organizations from Needham, and 3 from Newton, willing and able to comment on the project and its manager's qualifications. No more than 1 should be a supervisor, employee or current work colleague of the project manager or sponsor.

Name & title or organization	Email	Phone	Mailing address
Jack Cogswell, Needham Historical Society, Trustee	j.cogswell@verizon.net	781-444-0852	865 Central Ave., Apt 0-506 Needham, MA 02492
Jeff Heller, Needham Resident	jdheller@mindspring.com	781-888-2014	1092 Central Ave. Needham, MA 02492
Fred Moder, Needham Resident	fmoder@verizon.net	781-444-5061	42 Mayflower Road Needham, MA 02492
Brian Yates, Newton City Councilor & President of Friends of Hemlock Gorge	byates@newtonma.gov	617-244-2601	1094 Chestnut Street Newton U Falls, MA 02464
Jack Neville, President , Newton Upper Falls CDC	jjneville@comcast.net	617-332-3757	68 High Street Newton, MA 02464
Ruth Balser, State Representative (Newton)	ruth.balser@mahouse.gov	617-722-2396	Room 136, State House Boston, MA

You may adjust the space for each question, but the combined answers to all questions on this page must fit on this page.
Full proposals must include separate, detailed budgets in addition to this page.

Project TITLE	**Echo Bridge Historic Railing Reconstruction**

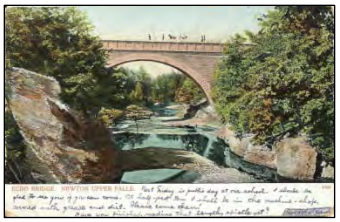
SUMMARY CAPITAL/DEVELOPMENT BUDGET		
Uses of Funds		
Design, permitting, bidding, project management, resident inspection (performed by MWRA staff)		$240,000
Direct Construction Costs (from 2007 study, uplifted to 2016 dollars)		$920,000
25% Contingency		$230,000
Bond		$50,000
D. TOTAL USES (should equal **C.** on page 1 and **E.** below)		**$1,440,000**
Sources of Funds	**Status** (requested, expected, confirmed) *filled in by Newton CPC staff – to be confirmed*	
CPA funding – Newton*	Request underway	$500,000
CPA funding – Needham*	Request underway	$250,000
MWRA ($250,000 Bond appropriation and $240,000 in-house services)	Committed	$490,000
Foundations & Agencies (incl. state Dept. of Conservation & Recreation, Massachusetts Historical Commission, etc.)	To be requested	$50,000
Community & Individual Donations	Partial commitment	$150,000
***NOTE: 2/3 of Echo Bridge is in Newton (320 feet) and 1/3 is in Needham (185 feet) including landings – See attached maps.**		
E. TOTAL SOURCES (should equal **C.** on page 1 and **D.** above)		**$1,440,000**

SUMMARY ANNUAL OPERATIONS & MAINTENANCE BUDGET (cannot use CPA funds)	
Uses of Funds	
Periodic inspection/maintenance	$5,000
F. TOTAL ANNUAL COST (should equal **G.** below)	**$5,000**
Sources of Funds	
MWRA Operating Budget	$5,000
G. TOTAL ANNUAL FUNDING (should equal **F.** above)	**$5,000**

Project TIMELINE	**Phase or Task**	**Est. Cost.**	**Season & Year**
Design, permitting, bidding, project management , resident inspection (10 months)		$228,000	June 2017 – March 2018
Construction Engineering Services during construction and Project Management		$1,212,000	March 2019 – November 2018
TOTAL		$1,440,000	

Project TITLE	Echo Bridge Historic Railing Reconstruction		
Check off submitted attachments here. ↓		Attachments in red below are required for a pre-proposal. All other attachments are required only for a full proposal.	
REQUIRED.	X	**PHOTOS**	of existing site conditions (2-3 photos may be enough for the pre-proposal)
	X	**MAPS**	USGS topographical map showing regional location of project; assessors map showing location of the project (in relation to nearest major roads)
REQUIRED for full proposal.		**NEEDHAM COMMUNITY PRESERVATION PLAN**	current listing/ranking & risk factors for this project
For pre-proposal, just use page 3 of form. **For full proposal a separate, detailed budget attachment is REQUIRED.**		**PROJECT FINANCES** printed and as computer spreadsheets, with both uses & sources of funds	
		development pro forma/capital budget: include total cost, hard vs. soft costs and contingencies, and project management – amount and cost of time from contractors or staff (in-kind contributions by existing staff must also be costed) **operating/maintenance budget, projected separately for each of the next 10 years** (CPA funds may not be used for operations or maintenance)	
		non-CPA funding: commitment letters, letters of inquiry to other funders, fundraising plans, etc., including both cash and est. dollar value of in-kind contributions	
		purchasing of goods & services: briefly summarize sponsor's understanding of applicable state statutes and City policies	
Recommended for pre-proposal. **REQUIRED for full proposal.**	X	**HISTORIC SIGNIFICANCE**	**See separate instructions for 3 attachments** required by Newton, analyzing historic significance and showing how project meets national preservation standards. Full proposal should include the National/State Register listing, in electronic form (omit from required printed copies).
REQUIRED for full proposal.		**SPONSOR FINANCES & QUALIFICATIONS, INSTITUTIONAL SUPPORT**	
		MWRA most recent annual operating budget (revenue & expenses) **& financial statement** (assets & liabilities); include both public and private resources ("friends" organizations, fundraising, etc.)	
		for project team & manager: relevant training & track record of managing similar projects	
		SITE CONTROL, PROJECT MANAGEMENT, RESTRICTION	
		COVER LETTER	from **MWRA** confirming commitment of staff time for project management and agreeing to any permanent deed restriction required by Newton & Needham CPCs as a condition of funding; if such a restriction will be held by the Massachusetts Historical Commission, please include a letter from MHC agreeing to hold the restriction.
		ZONING & PERMITTING	
		short email confirming review by Newton's **Development Review Team** (DRT)	
		brief property history: at least the last 30 years of ownership & use	
		environmental mitigation plans: incl. lead paint, asbestos, underground tanks	
		zoning relief and permits required: incl. parking waivers, demolition or building permits, comprehensive permit or special permit	
		other approvals required: Conservation Commissions, Historical Commissions, Massachusetts Architectural Access Board, etc.	
		DESIGN & CONSTRUCTION	
		professional design & cost estimates: include site plans & elevations	
		materials & finishes; highlight "green" or sustainable features & materials	
OPTIONAL.	X	**LETTERS or PETITIONS of SUPPORT**	Friends of Hemlock Gorge President, Brian Yates Feast of the Falls Organizing Committee

Echo Bridge Railing Reconstruction



Built in 1876, this national landmark is a metropolitan destination, as reflected in the postcards to the right. The historic railing design is integral to the landscape.

Echo Bridge Promenade - 1905

~2006

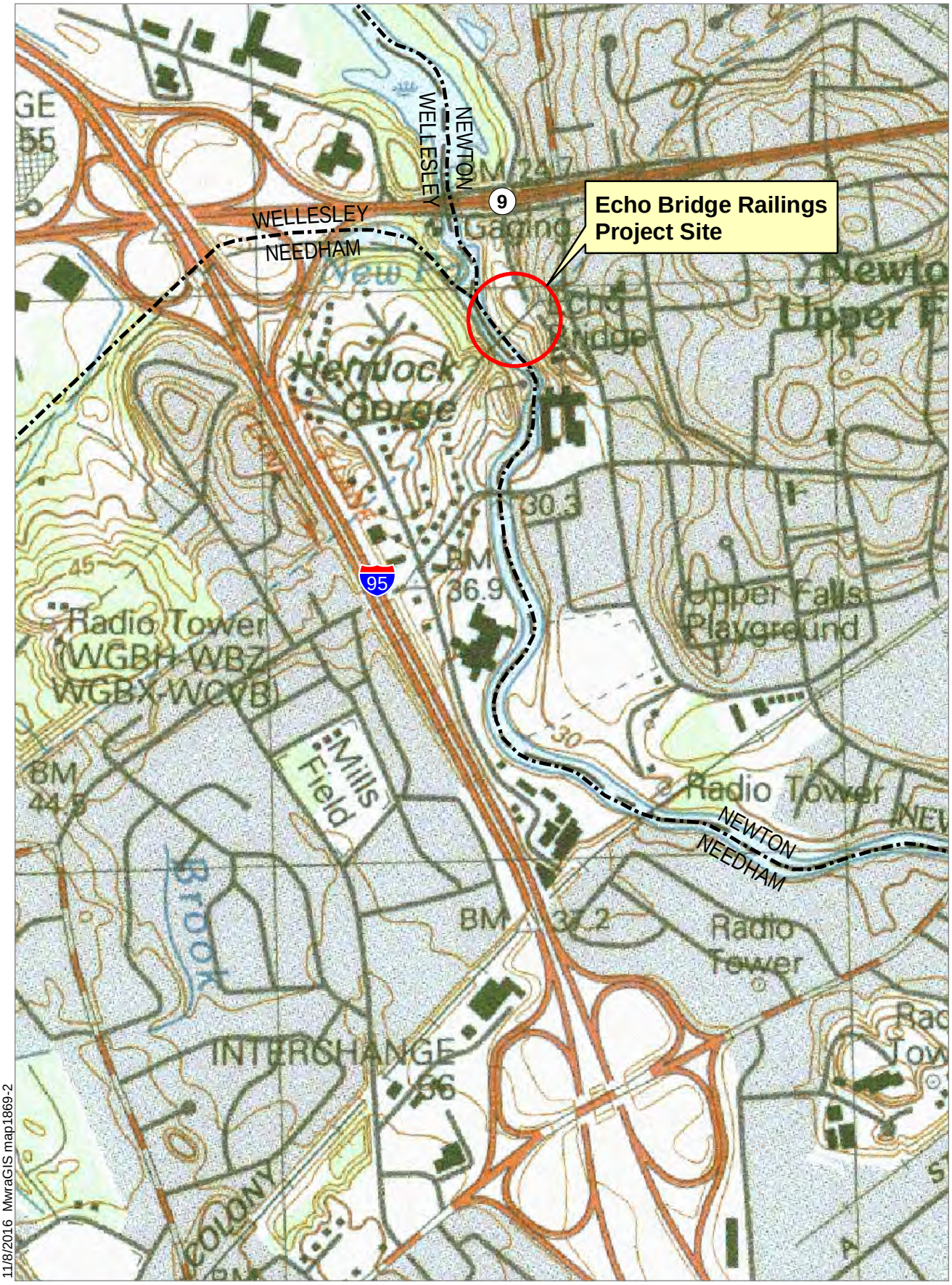
Current Railing Conditions:

Spalling cast iron at post base:

Inappropriate repairs & eroded paint:

Temporary chain link fence mounted on concrete pads & tied to historic railing:

USGS LOCUS PLAN



11/8/2016 MwraGIS map1869-2

1 inch = 800 feet

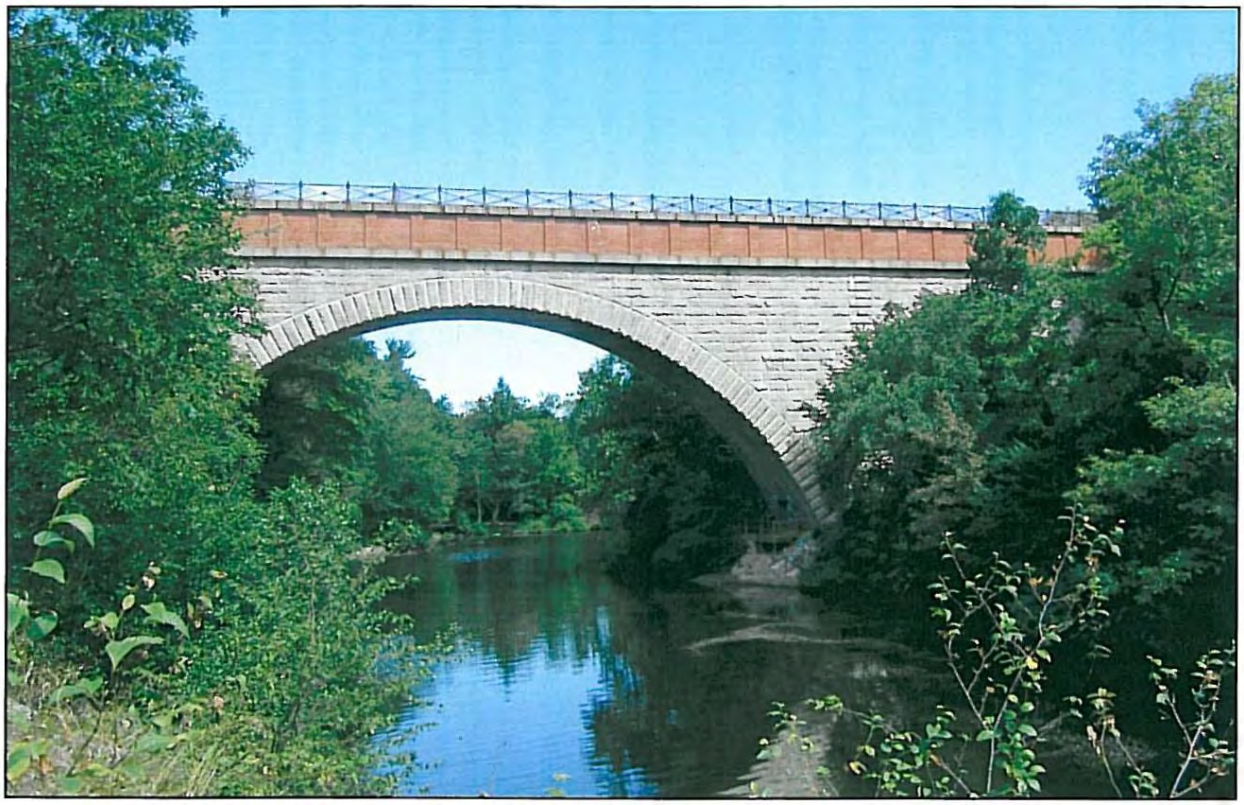
0 400 800 1,600 Feet

Municipal Lines

RAILINGS AT ECHO BRIDGE

(approximately 505 ft.)

Echo Bridge Railing Reconstruction Plan



November 14, 2016

Echo Bridge Background

Echo Bridge, officially known as the Charles River Aqueduct Bridge, spans the Charles River and connects the City of Newton and the Town of Needham. This pedestrian bridge serves as a conduit for the MWRA's Sudbury Aqueduct, and was constructed by the Boston Water Board in 1876. The Aqueduct still operates as an active emergency back-up water supply. The bridge is 475 feet long, 15 feet wide, and has seven arches, the longest spanning nearly 130 feet above the river. In 1980 Echo Bridge was included on the National Register of Historic Places designated by the Department of the Interior through the Massachusetts Historical Commission. The present original railings atop the bridge are made of cast iron and consist of decorative railing posts spaced 8 feet apart with pipe rails forming the top rail, bottom rail and crossing intermediate rails. There are decorative cast iron rosettes halfway between each post.

Present Conditions of Original Railings

The original railings have undergone severe deterioration from freeze-thaw actions and corrosion over the years. Efforts were undertaken to stabilize segments of the railings by partially filling the posts with a cementitious grout and then welding the cast iron ball tops to the post. This cementitious grout not only trapped moisture but also gave a surface for ice-jacking to take place. There is ample evidence of detached and missing railing components that further worsen their condition. The deterioration has advanced to a point where the reliability of the entire length of the original railings cannot be deemed adequate to maintain a contemporary standard of public safety.

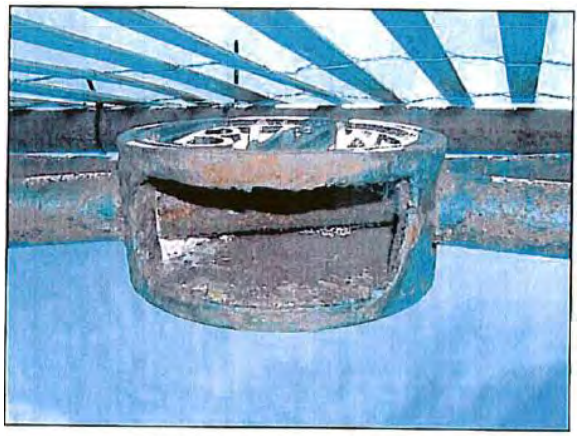
In January 2008, the deterioration of the railings prompted MWRA to install temporary chain link fencing as a backup measure for public safety. The 1-inch mesh black chain link fencing is tethered to the original railings by tubular members at regular intervals to provide lateral stability for the fence.

In 2007, MWRA funded an extensive study of the railings by McGinley Kalsow & Associates[1]. The Report found that more than 50% of the posts were severely damaged and because of the grout that was added and the severe rusting of the railings, half of the visually sound posts are likely to be damaged during a dismantling process.

Fractured Post

[1] "Echo Bridge Safety Improvement Program" McGinley Kalsow & Associates, September 2007.

The Study documents extensive corrosion inside the cast iron posts and estimates that 21% of the BWW rosettes have spalled at the bottom or rusted at the rail pipe joints beyond repair. This number will also significantly increase during any disassembly process. In addition, 5% to 23% of the railings have rust corrosion, reducing the mechanical strength of the rail and its connections. More importantly, the most severe corrosion is on the inside of the pipes where it is not visible. According to the Study, because of extensive corrosion where the rails are connected to the cast iron posts and rosettes, freeing these joints without damage to one part may be impossible in many cases.



Cast Iron Spalling at Rosette

MWRA Stewardship

MWRA's mission is to provide reliable, cost-effective, high-quality water and sewer services that protect public health, promote environmental stewardship, maintain customer confidence, and support a prosperous economy. MWRA was created by the legislature in 1984 and inherited operations and facilities beginning in 1985 from the Metropolitan District Commission, a century-old department of state government. MWRA's long-term business plan emphasizes improvements in service and systems and includes aggressive performance targets for operating "active" water and wastewater systems and maintaining new and existing facilities. Echo Bridge is considered an "emergency back-up" facility and therefore not considered a full active facility. Parallel to MWRA's goal of carrying out its capital projects and operating programs is its goal of limiting rate increases to its customer communities. The need to achieve and maintain a balance between these two goals is a critical issue facing MWRA and is reflected each year in its proposed budget. Therefore, MWRA is not in a position to dedicate MWRA ratepayer dollars to fund an historic railing project estimated to cost over $1.2 million.

In July 2016, recognizing this lack of financial resources, the MWRA proposed a new durable, self-supported interior galvanized steel railing system (Option 4) to the Newton Upper Falls Historic District Commission. During the July meeting the Commission directed the MWRA 1) to use good faith and best effort to work with the city of Newton and the Town of Needham to obtain a Memorandum of Understanding to restore the historic railings, and 2) that the Commission will review and approve the final details of the replacement railing Option 4, that has now become Option 4 b.

Formation of the Echo Bridge Railing Committee

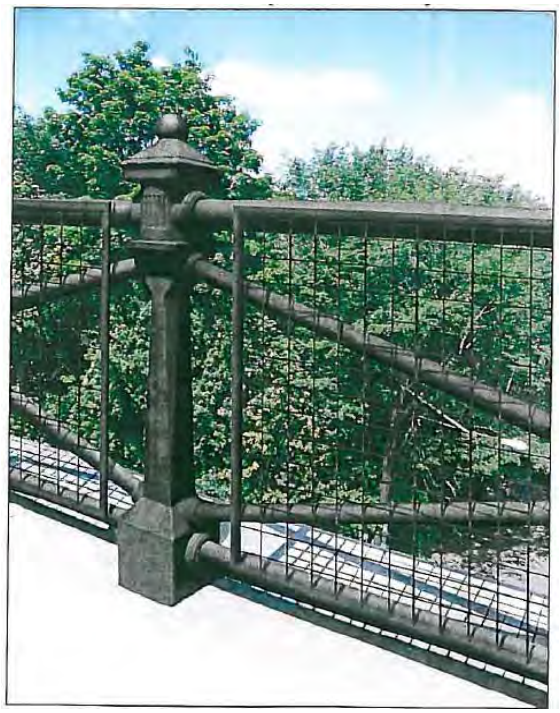
The ad-hoc Echo Bridge Railing Committee (the "Committee") formed to lead the effort to raise public attention and funds to replicate the historic railings. Based on the 2007 study and MWRA estimates, the Committee expects that $1,200,000 will be needed to reconstruct the bridge and landing railings (not including MWRA engineering services for project management and construction management costs estimated to be $240,000). Made up of residents from the City of Newton and the Town of Needham, the Committee refined the proposed project. The

Committee is made up of the following local residents: Lee Fisher, Andrea Downes, Karen Osborne and Brian Yates of Newton and Jeff Heller from Needham. MWRA assists the Committee in preparing materials necessary in preparation for the Community Preservation Act (CPA) applications and provides information as needed. As the Owner/Manager of Echo Bridge, MWRA is submitting this Proposal to the Newton Upper Falls Historic District Commission and Needham Historical Commission in November for approval so that CPA applications can be submitted to each municipality. The Committee will also be submitting this Plan to other potential community, agency, and foundation fundraising campaigns.

Construction Methodology for Reconstruction

Given that the railings have undergone so much deterioration, it is the conclusion of the MWRA and the Echo Bridge Railing Committee that based on the Secretary of Interior's Guidelines for historic properties[2], preserving, rehabilitating and/or restoring the railings is not feasible or recommended from cost and structural perspectives. Rather, the Committee's chosen solution for the railings at Echo Bridge is to accurately reconstruct the railing with new materials that replicate the historic design and have an expected useful life of up to 150 years.[3]

1. For the posts and rosettes, the Committee is choosing to stay with cast iron rather than use carbon steel, aluminum or fiberglass materials also listed as material options in the 2007 study (see Table 1). A modern ductile cast iron will be used rather than the original "gray" (ref. p22 and 30 of the 2007 Study) cast iron because ductile iron is superior in that it has high ductility (i.e. less brittle) as well as higher strength. The posts and rosettes will be cast from molds identically replicating the existing historic components.



2. The pipe railings and cross bars will be made out of color galvanized manufactured steel. The diameters of the existing pipe railings are standard manufactured steel pipe sizes, making this a cost effective solution (ref. page 27 of Study).

3. 2"x2" 10 gauge steel mesh panels will be attached to the new historic railing to bring the railing into state and local safety code compliance. The picture to the right provides a conceptual view.

4. All cast materials will have a black shop-applied industrial paint coating inside (ref. p14 of Study) and outside, providing a ~15 year life before needing painting. (ref. p24 of Study). All steel materials will be shop coated with a color galvanization process in a black color to match the historic color.

[2] 36 CFR Part 68 in the July 12, 1995 Federal Register (Volume 60, No.133) The Secretary of Interior's Standards for the Treatment of Historic Properties.

[3] "Echo Bridge Safety Improvement Program", Materials Comparison Table, page 29, McGinley Kalsow & Associates, September 2007.

The 2007 Study offered a more expensive alternative of salvaging an estimated 25% of the posts. The Committee rejected this option for the following reasons:

1. The additional decade of deterioration suggests that even fewer will be salvageable,

2. The non-uniform wall thickness of the old posts means "a marked reduction in their ability to adequately resist the forces of corrosion and ice jacking" than new ductile castings. (ref. p22of the Study),

3. The labor of sandblasting the interior and exterior of each old post, repairing minor cracks with welding, examining each post by an architectural conservator, and applying load testing acceptable to the structural engineer (ref. p14 of Study) adds approximately $200,000 more to the total project cost, whose funding is already far from assured, and

4. Mixing 140 year old posts with new posts reduces the expected life of the railing system, and the way it is constructed makes it impossible to swap one post for another without major disassembly. With CPA funding influenced by the long term viability of the project, such a mix would undermine any CPA proposals.

MWRA will be responsible for construction of the new railing in accordance with Massachusetts public construction bidding requirements and award the project to the lowest responsible bidder. MWRA will recommend including contractor qualifications within the specifications. Once awarded, the contract will follow the typical sequence of field verification of dimensions, shop drawing submittal and review, fabrication of materials, followed by installation. The specifications will limit the Contractor to work to one length of the rail, approximately 475 linear feet and to maintain pedestrian traffic on the other half. The total construction contract will be awarded for approximately 10 months with approximately 3 months of active construction on the Bridge.

The 2007 Report estimated the costs for reconstruction to be $892,288 including a 25% construction contingency. Inflated to 2016 dollars, the reconstruction cost is estimated to be approximately $1,200,000.00 (plus $240,000 for MWRA in-house engineering services including project management and construction management) not including inflation to the date of installation.

Table 1

Material Comparison Table

(Comparisons are to original cast iron material.)

Comparison Criteria	Cast & Ductile Iron	Carbon Steel	Aluminum	Reinforced Polyester (Fiberglass)
Historical	• Replicates original historic material + aesthetics. • Ductile iron is modern form of cast iron with improved ductility.	• Similar material to cast iron.	• Visually very similar to cast iron when painted (sharper corners and smoother surface).	• Not a good substitute for decorative cast iron.
Aesthetic	• Matches original material in weight, strength, texture and appearance. • Capable of being cast into highly complex geometries and details.	• Higher melting point makes it more difficult to cast intricate details. Not practical for detailed casting of historic posts. • Indistinguishable from original railings when painted.	• Castable - visually replicates molded architectural ornamental work.	• Castable - visually replicates molded architectural ornamental work. • Molds directly from historic features.
Structural + Physical Properties	• Good strength to weigh ratio. Good for posts and structurally meets codes. • Not good in tension. Rails tend to have hidden internal corrosion due to water infiltration at joints. For these reasons, not appropriate for handrails.	• Structurally good in tension. Appropriate for handrails + guardrails. • As post, good structurally. • Similar thermal expansion as cast iron. • Decreases in volume during solidification.	• Lower structural strength than cast iron, but structurally adequate for posts • Less brittle than cast iron • Not economical as structural rails • Difficult to prevent galvanic corrosion with other metals • Twice the thermal expansion of steel	• Non load bearing use.. Best suited as a façade ornament in non-structural applications. • Requires separate hidden structural post system. To with stand static forces as a rail system. • Cracks when impacted • Twice the thermal expansion of steel, Similar to aluminum
Design + Installation	• Posts anchorage location will match historical. • Patterns/molds need to consider shrinkage as iron cools during fabrication.	• 10% heavier than ductile iron. • Galvanizing gives complete coverage, coating steel internally, externally and at intricate details. • Factory applied zinc coating (galvanizing) provides greater quality control than field painting.	• Light weight material makes handling easier. than cast iron and lowers transportation costs • Easily assembled and good delivery time. • Greater expansion and contraction requires careful detailing and gaskets and/or caulked joints. • Patterns/molds need to consider shrinkage as iron cools during fabrication.	• Light weight material makes handling easier than cast iron and lowers transportation costs. • Internal structural support system requires longer installation time and greater complexity than cast iron. • Greater expansion and contraction requires careful detailing and gaskets and/or caulked joints. • Little shrinkage during fabrication.
Maintenance	• Relatively limited natural corrosion resistance. Regular preparation + painting required. • Difficult to weld due to high carbon content and may lead to brittleness.	• Zinc (Galvanizing) weathers at a very slow rate. Galvanizing produces a coating bonded metallurgically to steel. • Lower Maintenance when color galvanized	• Difficult to keep paint on aluminum • Regular preparation + painting required • Should not be used with cast iron rails due to galvanic action • Replacement of caulking and galvanic action barriers	• Ultraviolet sensitive unless surface is coated or pigments are in gel coat. • Regular Painting + Prep Required. • Lower Material Maintenance. • Good resistance to chemicals.
Useful Life Expectancy	• 100-150 years	• 20-50 (Not Galvanized) • 40-60 (Galvanized)	• Long life, durable Cast Alum: 100-125 years Tubing: 50-100 years	• 10-30 years • Vapor impermeable, will require ventilation detail to prevent rusting and short life expectancy of internal structural steel system.
Cost	• Similar in material cost to carbon steel. • Least expensive of materials for posts. • Due to necessity of creating molds and slow production rates, expensive for rails.	• Very cost effective for handrails. Pipe railing is manufactured in standard sizes.	• For similar size casting, aluminum is about 15-20% higher in material cost than cast iron	• Approximately 1/3 the cost to cast a fiberglass post vs. a ductile iron post. Cost of internal structural steel support posts not included. • Small cost saving compared to cast iron when used with concealed structural steel supports.

Option 4b Railing at Echo Bridge Description

If funding for full reconstruction is not realized, MWRA continues to believe that a new interior, self-supporting, code-compliant railing is the best alternative to adequately address future long-term safety concerns at the Bridge while not precluding future reconstruction of the historic railings. Referred to as Option 4b, the railing design is similar to the railings recently installed at the Massachusetts Department of Conservation and Recreation's historic Fort Warren on Georges Island. Like Echo Bridge in Newton and Needham, MA, Fort Warren is also a property listed on the State and National Registers of Historic Places. MWRA believes that the Option 4b design recognizes the historical significance of Echo Bridge while minimizing the structural and visual impacts to the historic railing. (See attachments included in this pre-proposal.)

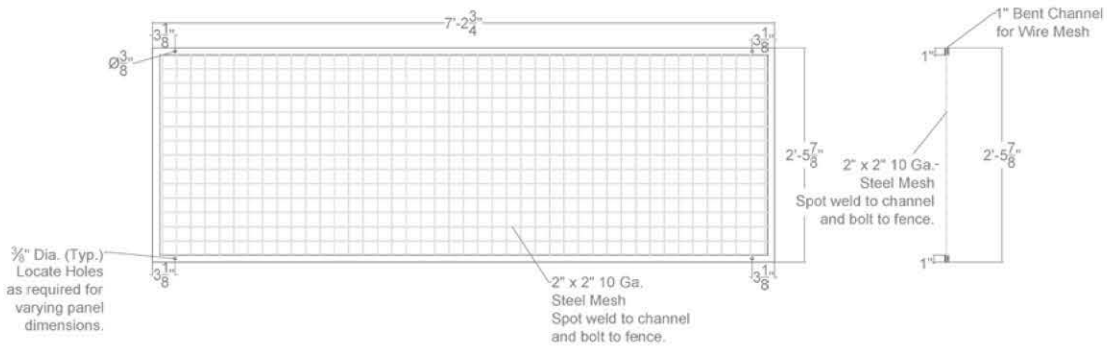
The Option 4b design would replace the temporary chain link fence with the installation of a more permanent architectural railing system on the inside of the existing historic railing in an attempt to preserve the historic railing and improve safety conditions and maintain pedestrian traffic at the Bridge. The 42" inch high black galvanized steel railing will be constructed in eight foot long panels to line up with the existing railing posts. The railing will have 1" by 2" flat bar posts with a continuous smooth handrail. Panels, required to meet the State Building Code, will be made of a 2" by 2" 10- gauge steel mesh and attached to the steel railing system. The new railing will be installed 12" from the existing historic railings and will be attached to the historic posts to better secure the historic railing. See Option 4b rendering and drawing on pages 8 and 9.

The proposed railing will require 5/8" diameter core holes to be drilled into the existing concrete walkway 8 inches deep attached with an anchoring system. Coring into the concrete walkway will not impact the walkway, the historical granite upon which the old railings are mounted, or the Sudbury Aqueduct's structural integrity. The cost of the railing and installation is estimated to be approximately $250,000 and will be funded from a previously approved line item in a State Transportation Bond Bill for Echo Bridge railing repair, sponsored by Representative Ruth Balser.

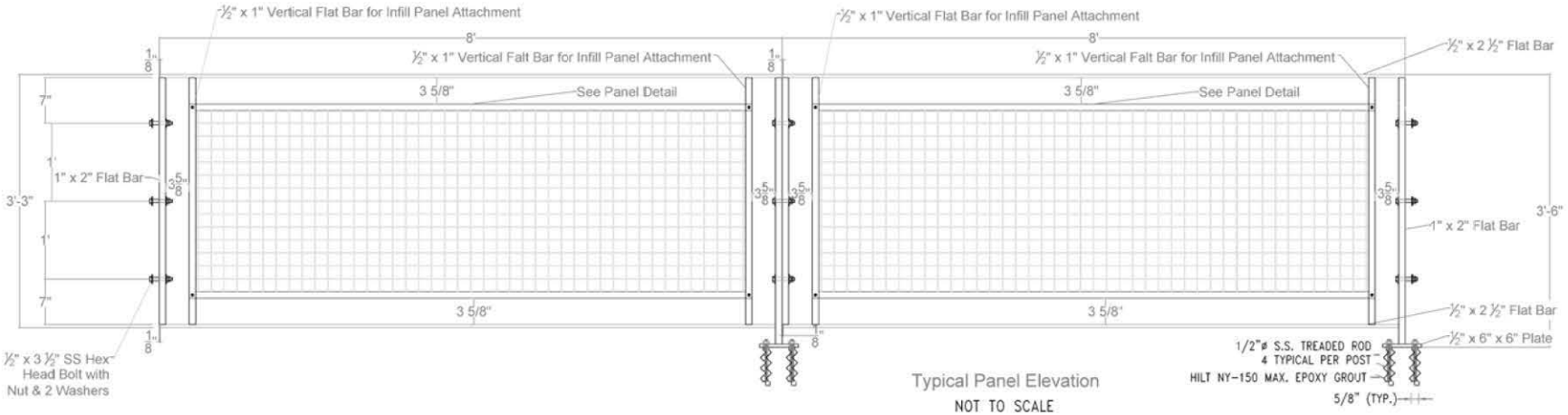
As stated above, it is not clear if and when MWRA will proceed with construction for Option 4b, (pending the resolution of CPA funding). MWRA has emphasized that the construction of 4b does not preclude future fundraising for the full reconstruction plan. In the eventuality of the construction of Option 4b, it is MWRA's intention to design the panels so that they can be re-used in a future construction of the historic railings.

If MWRA proceeds with Option 4b, pedestrian traffic across the bridge will be maintained during construction with temporary barriers installed to separate the work zone from foot traffic. Fabrication of materials will take approximately three months from approval of contractor shop drawings and the installation of the proposed rail will take an additional two to three months.

MWRA Railing Option 4B at Echo Bridge



Typical Wire Mesh Panel Detail
NOT TO SCALE



Typical Panel Elevation
NOT TO SCALE

DATE: 11/1/2016

MASSACHUSETTS WATER RESOURCES AUTHORITY
ECHO BRIDGE NEWTON - NEEDHAM

RAILING IMPROVEMENTS
OPTION 4B
DRAWING No.1

DWG. NO.
1

1 OF 1