



DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
696 VIRGINIA ROAD
CONCORD MA 01742-2751

November 05, 2018

Engineering Division

Lenny Laakso
Commissioner of Public Works
301 Broad Street
Fitchburg, MA 01420

Dear Mr. Laakso:

The most recent routine inspection (RI) of the federally constructed North Nashua River Flood Damage Reduction (FDR) System, in the city of Fitchburg, Massachusetts, was conducted on June 14, 2018. Enclosed is a detailed inspection report for the City's records.

The RI is an element of the U.S. Army Corps of Engineers (USACE) Inspection of Completed Works (ICW) Program, the primary objective of which is to assure that the FDR Systems are reliable and do not present unacceptable risks to the public, property, or the environment.

The FDR System was evaluated on the basis of several general criteria (e.g. flood damage reduction channels) and associated items (e.g. vegetation and obstructions). Each of these items is rated "acceptable", "minimally acceptable", or "unacceptable". The System rating is derived from the ratings of the individual System components.

The North Nashua River FDR System has an overall rating of Unacceptable. The unacceptable rating means that deficiencies were identified that require immediate attention and may prevent the System from performing as intended during the next significant flood event. This rating is reflective of longstanding problems identified at the System that have not been addressed within prior established timeframes not exceeding two years.

Please note that at this time the authority of the New England District to make PL-84-99 Rehabilitation and Inspection Program (RIP) eligibility decisions has been suspended by USACE Headquarters until further notice. Therefore, the North Nashua River FDR System will remain in an "Inactive" status. USACE will provide the Sponsor with status updates and further guidance once the PL-84-99 policy is finalized; please contact USACE if you have any questions regarding the PL-84-99 eligibility status.

The deficiencies that form the basis for the System rating are summarized below. The deficiencies need to be addressed in order for the System to be elevated to acceptable condition. The Sponsor must review the report in its entirety to gain a proper appreciation of the required work effort in order to formulate a realistic labor and cost schedule. Please note that the deficiencies reflect the condition of the System at the time of the inspection and may not reflect work that has been performed in the period between the inspection and the issue date of the report.

Items rated Unacceptable

- Flood Damage Reduction Channels: Significant vegetation, consisting of large brush and approximately 2- to 6-inch-diameter trees, was observed along the riprap slopes, adjacent to and within 15 feet of concrete walls, growing in and plucking stones from retaining walls, and in the river channels. Remove trees and saplings, spray the rip rap areas with an appropriate herbicide to control/eliminate woody vegetation and weed growth, and establish a routine program (i.e., annually) to prevent vegetation from reestablishing in these areas. Once the majority of vegetation is removed, the Sponsor should perform a thorough inspection of the concrete walls and project features. Shoaling with significant vegetation was present along the majority of the project limits. Shoaling should be removed and the original channel capacity restored. Spalling and efflorescence noted along many of the floodwalls should be repaired.
- Floodwalls: Gaps at the top of the floodwall system along Commercial Street and Putnam Street, where the top foot or more of the floodwall has been removed, should be repaired. Provide USACE with an update in the next semi-annual report.

a) Additional Concerns

- Minimally Acceptable Rated Items: Please refer to the inspection report for all "minimally acceptable" rated items. Please note that failure to correct the noted deficiencies in the inspection report could lead to the item being rated "unacceptable".
- Semi-Annual Reports: Start submitting semi-annual reports as required by the Operation and Maintenance manual. The reports should include a summary of work performed, significant flood events and any other information pertinent to the operation and maintenance of the System over the reporting period. Reports should be submitted every February and August.

- Emergency Action Plan: The Sponsor should prepare an Emergency Action Plan (EAP), which details responsibilities and procedures for actions to be taken in the event of an actual flood emergency. The EAP should be readily accessible and periodically reviewed and updated to avoid losing valuable information for new personnel and emergency responders. The Sponsor should provide USACE with a copy when complete.

It was noted in the pre-inspection form that the city of Fitchburg would like assistance in addressing the deficiencies identified. As discussed during the inspection, per the cooperation agreement the city of Fitchburg is responsible for the Operation and Maintenance of the North Nashua River FDR System. Unfortunately, USACE does not currently have the congressional authority or funding to perform the required deferred maintenance work on the North Nashua FDR System.

I wish to thank your staff for their cooperation during the inspection. If you have any questions concerning the inspection, or other matters pertaining to the North Nashua River FDR System, please feel free to contact Andrew Cattano at (978) 318-8329 or Kevin DiRocco, Levee Safety Program Manager, at (978) 318-8396.

Sincerely,



Michael Bachand, P.E.
Chief, Geotechnical / Water Resources Branch
Levee Safety Officer



Dave W. Schafer
Chief, Emergency Management

Enclosure

Copy Furnished (w/Encl):

Nickolas Erickson
Civil Engineer
301 Broad Street
Fitchburg, MA 01420

William C. Salomaa
Director, Office of Dam Safety
Department of Conservation and Recreation
251 Causeway Street
Boston, MA 02114

Mr. Stephen L. Dinatale
Mayor, City of Fitchburg
Suite 108
Fitchburg, MA 01420

Copy Furnished (wo/Encls):

Mr. Dean Savramis, P.E.
Director, Mitigation Division, FEMA Region 1
99 High Street, 6th Floor
Boston, MA 02110

Senator Elizabeth Warren, U.S. Senate
317 Hart Senate Office Building
Washington, DC 20510

Senator Edward Markey, U.S. Senate
218 Russell Senate Office Building
Washington, DC 20510

Representative Niki Tsongas, U.S. House of Representatives
1714 Longworth HOB
Washington, DC 20515



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Flood Damage Reduction Segment / System Inspection Report

Name of Segment / System: North Nashua River

Public Sponsor(s): City of Fitchburg, MA

Public Sponsor Representative: Lenny Laakso, Commissioner of Public Works

Sponsor Phone: (978) 829-1910

Sponsor Email: lilaakso@fitchburgma.gov

Corps of Engineers Inspector: Drew Clemens, Andrew Cattano

Inspection Start Date: 06/14/2018

Inspection End Date: 06/14/2018

Date Report Prepared: 07/13/2018

Date of ITR: 07/24/2018

Date Approved: 10/25/2018

Inspection Report Prepared By: Drew Clemens

Internal Technical Review (for Periodic Inspections) By: Andrew Cattano

Final Approved By: Kevin DiRocco, P.E.

Type of Inspection:

- Initial Eligibility Inspection
- Continuing Eligibility Inspection (Routine)
- Continuing Eligibility Inspection (Periodic)

Overall Segment / System Rating:

- Acceptable
- Minimally Acceptable
- Unacceptable

Contents of Report:

- Instructions
- Initial Eligibility Inspection
- General Items for All Flood Control Works
- Levee Embankment
- Concrete Floodwalls
- Sheet Pile and Concrete I-walls
- Interior Drainage System
- Pump Stations
- FDR System Channels

Note: In addition to the report contents indicated here, a plan view drawing of the system, with stationing, should be included with this report to reference locations of items rated less than acceptable. Photos of general system condition and any noted deficiencies should also be attached.

Note: This inspection rating represents the Corps evaluation of operations and maintenance of the flood damage reduction system and may be used in conjunction with other information for a levee certification determination for National Flood Insurance Program (NFIP) purposes if applicable. An Acceptable Corps inspection rating, alone, does not equate to a certifiable levee for the NFIP. It is recommended for levee systems currently accredited by the Federal Emergency Management Agency (FEMA) for NFIP purposes receiving a Corps Minimally Acceptable or Unacceptable rating, be evaluated by the levee owner to determine the potential impacts to the certification for FEMA.

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Flood Damage Reduction Segment / System Public Sponsor Pre-Inspection Form

The following information is to be provided by the levee district sponsor prior to an inspection. This information will be used to help evaluate the organizational capability of the levee district to manage the levee segment / system maintenance program.

1. Levee segment / system and district: (name of the segment / system and levee district) North Nashua River, Fitchburg, MA
2. Reporting period: (month/day/year to month/day/year) 01/01/2017 to 12/31/2017
3. Summary of maintenance required by last inspection report: Clear vegetation in channel and along embankments, excavate shoaling in channel, repair spalling along floodwalls.
4. Summary of maintenance performed this reporting period: None.
5. Summary of maintenance planned next reporting period: Attempt to clear vegetation in most critical areas in accordance with latest inspection report.
6. Summary of changes to segment / system since last inspection: None.
7. Problems/issues requiring the assistance of the US Army Corps of Engineers: The City does not have the financial resources or manpower to perform the required maintenance. Any assistance from the Army Corps is welcomed and encouraged.



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Flood Damage Reduction Segment / System
Inspection Report

Pre-Inspection Form
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Public Sponsor Pre-Inspection Report

The following information is to be provided by the levee district sponsor prior to an inspection

8. Levee district organization: (elected or appointed levee district officials and key employees)

Name	Position	Mailing Address	Phone Number	Email Address
Nick Erickson	Civil Engineer	301 Broad Street, Fitchburg, MA 01420	978-829-1905	nerickson@fitchburgma.gov
Lenny Laakso	DPW Commissioner	301 Broad Street, Fitchburg, MA 01420	978-829-1912	llaakso@fitchburgma.gov
Mike O'Hara	Conservation Agent	166 Boulder Drive, Suite 108, Fitchburg, MA 01420	978-829-1891	mohara@fitchburgma.gov
Stephen L. DiNatale	Mayor	166 Boulder Drive, Suite 108, Fitchburg, MA 01420	978-829-1801	sdinatale@fitchburgma.gov
«Name5»	«Pos5»	«Mail5»	«Phone5»	«Email5»
«Name6»	«Pos6»	«Mail6»	«Phone6»	«Email6»
«Name7»	«Pos7»	«Mail7»	«Phone7»	«Email7»
«Name8»	«Pos8»	«Mail8»	«Phone8»	«Email8»
«Name9»	«Pos9»	«Mail9»	«Phone9»	«Email9»
«Name10»	«Pos10»	«Mail10»	«Phone10»	«Email10»
«Name11»	«Pos11»	«Mail11»	«Phone11»	«Email11»
«Name12»	«Pos12»	«Mail12»	«Phone12»	«Email12»
«Name13»	«Pos13»	«Mail13»	«Phone13»	«Email13»
«Name14»	«Pos14»	«Mail14»	«Phone14»	«Email14»



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General Instructions for the Inspection of Flood Damage Reduction Segments / Systems

A. Purpose of USACE Inspections:

The primary purpose of these inspections is to prevent loss of life and catastrophic damages; preserve the value of Federal investments, and to encourage non-Federal sponsors to bear responsibility for their own protection. Inspections should assure that Flood Damage Reduction structures and facilities are continually maintained and operated as necessary to obtain the maximum benefits. Inspections are also conducted to determine eligibility for Rehabilitation Assistance under authority of PL 84-99 for Federal and non-Federal systems. (ER 1130-2-530, ER 500-1-1)

B. Types of Inspections:

The Corps conducts several types of inspections of Flood Damage Reduction systems, as outlined below:

Continuing Eligibility Inspections	
Initial Eligibility Inspections	Periodic Inspections
<p>Initial Eligibility Inspections</p> <p>IEIs are conducted to determine whether a non-Federally constructed Flood Damage Reduction system meets the minimum criteria and standards set forth by the Corps for initial inclusion into the Rehabilitation and Inspection Program.</p>	<p>Routine Inspections</p> <p>RIs are intended to verify proper maintenance, owner preparedness, and component operation.</p>
<p>Periodic Inspections</p> <p>PIs are intended to verify proper maintenance and component operation and to evaluate operational adequacy, structural stability, and safety of the system. Periodic Inspections evaluate the system's original design criteria vs. current design criteria to determine potential performance impacts, evaluate the current conditions, and compare the design loads and design analysis used against current design standards. This is to be done to identify components and features for the sponsor that need to be monitored more closely over time or corrected as needed. (Periodic Inspections are used as the basis of risk assessments.)</p>	

C. Inspection Boundaries:

Inspections should be conducted so as to rate each Flood Damage Reduction "Segment" of the system. The overall system rating will be the lowest segment rating in the system.

Project	System	Segment
<p>A flood damage reduction project is made up of one or more flood damage reduction systems which were under the same authorization.</p>	<p>A flood damage reduction system is made up of one or more flood damage reduction segments which collectively provide flood damage reduction to a defined area. Failure of one segment within a system constitutes failure of the entire system. Failure of one system does not affect another system.</p>	<p>A flood damage reduction segment is defined as a discrete portion of a flood damage reduction system that is operated and maintained by a single entity. A flood damage reduction segment can be made up of one or more features (levee, floodwall, pump stations, etc).</p>

D. Land Use Definitions:

The following three definitions are intended for use in determining minimum required inspection intervals and initial requirements for inclusion into the Rehabilitation and Inspection Program. Inspections should be considered for all systems that would result in significant environmental or economic impact upon failure regardless of specific land use.

Agricultural	Rural	Urban
<p>Protected population in the range of zero to 5 households per square mile protected.</p>	<p>Protected population in the range of 6 to 20 households per square mile protected.</p>	<p>Greater than 20 households per square mile; major industrial areas with significant infrastructure investment. Some protected urban areas have no permanent population but may be industrial areas with high value infrastructure with no overnight population.</p>



E. Use of the Inspection Report Template:

The report template is intended for use in all Army Corps of Engineers inspections of levee and floodwall systems and flood damage reduction channels. The section of the template labeled "Initial Eligibility" only needs to be completed during Initial Eligibility Inspections of Non-Federally constructed Flood Damage Reduction Systems. The section labeled "General Items" needs to be completed with every inspection, along with all other sections that correspond to features in the system. The section labeled "Public Sponsor Pre-Inspection Report" is intended for completion before the inspection, if possible.

F. Individual Item / Component Ratings:

Assessment of individual components rated during the inspection should be based on the criteria provided in the inspection report template, though inspectors may incorporate additional items into the report based on the characteristics of the system. The assessment of individual components should be based on the following definitions.

Acceptable Item	Minimally Acceptable Item	Unacceptable Item
The inspected item is in satisfactory condition, with no deficiencies, and will function as intended during the next flood event.	The inspected item has one or more minor deficiencies that need to be corrected. The minor deficiency or deficiencies will not seriously impair the functioning of the item as intended during the next flood event.	The inspected item has one or more serious deficiencies that need to be corrected. The serious deficiency or deficiencies will seriously impair the functioning of the item as intended during the next flood event.

G. Overall Segment / System Ratings:

Determination of the overall system rating is based on the definitions below. Note that an Unacceptable System Rating may be either based on an engineering determination that concluded that noted deficiencies would prevent the system from functioning as intended during the next flood event, or based on the sponsor's demonstrated lack of commitment or inability to correct serious deficiencies in a timely manner.

Acceptable System	Minimally Acceptable System	Unacceptable System
All items or components are rated as Acceptable.	One or more items are rated as Minimally Acceptable or one or more items are rated as Unacceptable and an engineering determination concludes that the Unacceptable items would not prevent the segment / system from performing as intended during the next flood event.	One or more items are rated as Unacceptable and would prevent the segment / system from performing as intended, or a serious deficiency noted in past inspections (which had previously resulted in a minimally acceptable system rating) has not been corrected within the established timeframe, not to exceed two years.

H. Eligibility for PL84-99 Rehabilitation Assistance:

Inspected systems that are not operated and maintained by the Federal government may be Active in the Corps' Rehabilitation and Inspection Program (RIP) and eligible for rehabilitation assistance from the Corps as defined below:

If the Overall System Rating is Acceptable	If the Overall System Rating is Minimally Acceptable	If the Overall System Rating is Unacceptable
The system is active in the RIP and eligible for PL84-99 rehabilitation assistance.	The system is Active in the RIP during the time that it takes to make needed corrections. Active systems are eligible for rehabilitation assistance. However, if the sponsor does not present USACE with proof that serious deficiencies (which had previously resulted in a minimally acceptable system rating) were corrected within the established timeframe, then the system will become Inactive in the RIP.	The system is Inactive in the RIP, and the status will remain Inactive until the sponsor presents USACE with proof that all items rated Unacceptable have been corrected. Inactive systems are ineligible for rehabilitation assistance.



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L. Reporting:

After the inspection, the Corps is responsible for assembling an inspection report (or a summary report if it was a Periodic Inspection) including the following information:

- a. All sections of the report template used during the inspection, including the cover and pre-inspection materials. (Supplemental data collected, and any sections of the template that weren't used during the inspection do not need to be included with the report.)
- b. Photos of the general system condition and noted deficiencies.
- c. A plan view drawing of the system, with stationing, to reference locations of items rated less than acceptable.
- d. The relative importance of the identified maintenance issues should be specified in the transmittal letter.
- e. If the Overall System Rating is Minimally Acceptable, the report needs to establish a timeframe for correction of serious deficiencies noted (not to exceed two years) and indicate that if these items are not corrected within the required timeframe, the system will be rated as Unacceptable and made inactive in the Rehabilitation Inspection Program.

J. Notification:

Reports are to be disseminated as follows within 30 days of the inspection date.

If the Overall System Rating is Acceptable	If the Overall System Rating is Minimally Acceptable	If the Overall System Rating is Unacceptable
Reports need to be provided to the local sponsor and the county emergency management agency.	Reports need to be provided to the local sponsor, state emergency management agency, county emergency management agency, and to the FEMA region.	Reports need to be provided to the local sponsor, state emergency management agency, county emergency management agency, FEMA region, and to the Congressional delegation within 30 days of the inspection.



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General Items for All Flood Damage Reduction Segments / Systems

For use during all inspections of all Flood Damage Reduction Segments / Systems

Rated Item	Rating	Rating Guidelines		Location/Remarks/Recommendations
		Rating	Rating Guidelines	
1. Operations and Maintenance Manuals	A	A	Levee Owner's Manual, O&M Manuals, and/or manufacturer's operating instructions are present.	Sponsor maintains a copy of the Operation and Maintenance Manual. (A)
		M	Sponsor manuals are lost or missing or out of date; however, sponsor will obtain manuals prior to next scheduled inspection.	
		U	Sponsor has not obtained lost or missing manuals identified during previous inspection.	
2. Emergency Supplies and Equipment (A or M only)	M	A	The sponsor maintains a stockpile of sandbags, shovels, and other flood fight supplies which will adequately supply all needs for the initial days of a flood fight. Sponsor determines required quantity of supplies after consulting with inspector.	Sponsor needs to verify that an adequate supply of flood fighting materials is available. Provide USACE with an update in the next semi-annual report. (M)
		M	The sponsor does not maintain an adequate supply of flood fighting materials as part of their preparedness activities.	
3. Flood Preparedness and Training (A or M only)	M	A	Sponsor has a written system-specific flood response plan and a solid understanding of how to operate, maintain, and staff the FDR system during a flood. Sponsor maintains a list of emergency contact information for appropriate personnel and other emergency response agencies.	No Emergency Action Plan (EAP) has been provided to USACE. Provide USACE with a copy of an EAP in the next semi-annual report. (M)
		M	The sponsor maintains a good working knowledge of flood response activities, but documentation of system-specific emergency procedures and emergency contact personnel is insufficient or out of date.	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. FDR = Flood Damage Reduction



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Flood Damage Reduction Segment / System
Inspection Report

General Items for All Flood Damage Reduction
Segments / Systems
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Flood Damage Reduction Channels

For use during Initial and Continuing Eligibility Inspections of flood damage reduction channels

Rated Item	Rating	Rating Guidelines	Location/Remarks/Recommendations
1. Vegetation and Obstructions	A	No obstructions, vegetation, debris, or sediment accumulation within the channel. Concrete channel joints and weep holes are free of grass and weeds.	Significant vegetation consisting of large brush and trees greater than 2-inch diameter along the channel slopes of the entire project, with greater than 6-inch diameter present at each inspected segment. Vegetation needs to be cleared to prevent any reduction in flow during a flood event in accordance with Engineering Technical Letter 1110-2-583. Refer to photos 1-56. (U) Ornamental trees planted adjacent to the floodwall within the shopping complex by the Water Street bridge. Refer to photo 10. Remove trees. (M) A three story brick building wall on the Circle Street, upstream left bank is failing, with debris falling into the channel. The wall is bowed vertically, and may be also bowed toward the channel. If the wall collapses, it could block the channel. Work with the building owner to stabilize the wall or monitor the building and remove debris from the channel. Refer to photo 24. (U)
	M	Obstructions (including log jams), vegetation, debris, or sediment are minor and have not impaired channel flow capacity, but should be removed. Sediment shoals have not developed to the extent that they can support vegetation other than non-aquatic grasses. A limited volume of grass and weeds may be present in concrete channel joints and weep holes.	
	U	Obstructions (including log jams), vegetation, debris or sediment have impaired the channel flow capacity. Sediment shoals are well established and support woody and/or brushy vegetation. Sediment and debris removal required to re-establish flow capacity.	
2. Shoaling ¹ (sediment deposition)	U	No shoaling or minor, non-vegetated shoaling is present.	Shoaling with significant vegetation present along entire project. Remove vegetation and excavate shoaling to restore original capacity. Provide USACE with an update in the next semi-annual report. Refer to photos 1 through 8, 10, 19, 21, 22, 38-39, 49, 50, and 52. (U)
	M	More widespread vegetated and non-vegetated shoaling is present. Non-aquatic grasses are present on shoal. No trees or brush is present on shoal, and channel flow is not significantly reduced. Sediment and debris removal recommended.	
	U	Shoaling is well established, stabilized by saplings, brush, or other vegetation. Shoals are diverting flow to channel walls. Channel flow capacity is reduced and maintenance is required.	
3. Encroachments	A	No trash, debris, unauthorized structures, excavations, or other obstructions present within the easement area. Encroachments have been previously reviewed by the Corps, and it was determined that they do not diminish proper functioning of the channel.	No issues noted. (A)
	M	Trash, debris, unauthorized structures, excavations, or other obstructions present, or inappropriate activities noted that should be corrected but will not inhibit operations and maintenance or emergency operations. Encroachments have not been reviewed by the Corps.	
	U	Unauthorized encroachments or inappropriate activities noted are likely to inhibit operations and maintenance, emergency operations, or negatively impact the integrity of the channel.	
4. Erosion	U	No head cutting or horizontal deviation observed.	Channel embankments could not be inspected due to high vegetation. Trees on the downstream left bank of the Circle Street bridge are displacing stone blocks out of the retaining
	M	Head cutting and horizontal deviation evident, but is less than 1 foot from the designed grade or cross section.	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. FDR = Flood Damage Reduction



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Flood Damage Reduction Channels

For use during Initial and Continuing Eligibility Inspections of flood damage reduction channels

Rated Item	Rating	Rating Guidelines	Location/Remarks/Recommendations
5. Concrete Surfaces	U	Head cutting and horizontal deviation of more than 1 foot from the designed grade or cross section. Corrective actions required to stop or slow erosion.	wall near the bridge (Photo 28). Clear vegetation and provide USACE with an update in the next semi-annual report. (U)
	U	A	Most of the floodwalls could not be inspected due to high vegetation. Clear vegetation and provide USACE with an update in the next semi-annual report. (U)
		M	Negligible spalling, scaling or cracking. If the concrete surface is weathered or holds moisture, it is still satisfactory but should be seal coated to prevent freeze/ thaw damage.
		U	Spalling, scaling, and open cracking present, but the immediate integrity or performance of the structure is not threatened. Reinforcing steel may be exposed. Repairs/ sealing is necessary to prevent additional damage during periods of thawing and freezing.
		N/A	Surface deterioration or deep cracks present that may result in an unreliable structure. Any surface deterioration that exposes the sheet piling or lies adjacent to monolith joints may indicate underlying reinforcement corrosion and is unacceptable. There are no concrete items in the channel.
6. Tilting, Sliding or Settlement of Concrete Structures ²	U	There are no significant areas of tilting, sliding, or settlement that would endanger the integrity of the structure.	Based on the 2017 routine inspection, gaps appear to have been created in the floodwall where the top foot or more of the floodwall appears to have been removed from several locations along Putnam Street and Commercial Street. Due to heavy vegetation, these areas were not visible for inspection in 2018, but there is no indication these areas have been repaired. Repair and provide USACE with an update in the next semi-annual report. (U)
	A	M	Most of the floodwalls could not be inspected due to high vegetation. Clear vegetation and provide USACE with an update in the next semi-annual report. (U)
		U	There are areas of tilting, sliding, or settlement (either active or inactive) that need to be repaired. The maximum offset, either laterally or vertically, does not exceed 2 inches unless the movement can be shown to be no longer actively occurring. The integrity of the structure is not in danger.
		N/A	There are areas of tilting, sliding, or settlement (either active or inactive) that threaten the structure's integrity and performance. Any movement that has resulted in failure of the waterstop (possibly identified by daylight visible through the joint) is unacceptable. Differential movement of greater than 2 inches between any two adjacent monoliths, either laterally or vertically, is unacceptable unless it can be shown that the movement is no longer active. Also, if the floodwall is of I-wall construction, then any visible or measurable tilting of the wall toward the protected side that has created an open horizontal crack on the riverside base of a monolith is unacceptable.
		A	There are no concrete items in the channel.
		No active erosion, scouring, or bank caving that might endanger the structure's stability.	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. FDR = Flood Damage Reduction



Flood Damage Reduction Channels

For use during Initial and Continuing Eligibility Inspections of flood damage reduction channels

Rated Item	Rating	Rating Guidelines	Location/Remarks/Recommendations
7. Foundation of Concrete Structures ³	U	M There are areas where the ground is eroding towards the base of the structure. Efforts need to be taken to slow and repair this erosion, but it is not judged to be close enough to the structure or to be progressing rapidly enough to affect structural stability before the next inspection. For the purposes of inspection, the erosion or scour is not closer to the riverside face of the wall than twice the floodwall's underground base width if the wall is of L-wall or T-wall construction; or if the wall is of sheetpile or I-wall construction, the erosion is not closer than twice the wall's visible height. Additionally, rate of erosion is such that the wall is expected to remain stable until the next inspection.	Most of the floodwalls could not be inspected due to high vegetation. Clear vegetation and provide USACE with an update in the next semi-annual report. (U)
		U Erosion or bank caving observed that is closer to the wall than the limits described above, or is outside these limits but may lead to structural instabilities before the next inspection. Additionally, if the floodwall is of I-wall or sheetpile construction, the foundation is unacceptable if any turf, soil or pavement material got washed away from the landside of the I-wall as the result of a previous overtopping event.	
		N/A There are no concrete items in the channel.	
8. Slab and Monolith Joints	U	A The joint material is in good condition. The exterior joint sealant is intact and cracking/desiccation is minimal. Joint filler material and/or waterstop is not visible at any point.	Most of the floodwalls could not be inspected due to high vegetation. Clear vegetation and provide USACE with an update in the next semi-annual report. (U)
		M The joint material has appreciable deterioration to the point where joint filler material and/or waterstop is visible in some locations. This needs to be repaired or replaced to prevent spalling and cracking during freeze/ thaw cycles, and to ensure water tightness of the joint.	
		U The joint material is severely deteriorated or the concrete adjacent to the monolith joints has spalled and cracked, damaging the waterstop; in either case damage has occurred to the point where it is apparent that the joint is no longer watertight and will not provide the intended level of protection during a flood.	
9. Flap Gates/ Flap Valves/ Pinch Valves ⁴	N/A	N/A There are no concrete items in the channel.	Not applicable.
		A Gates/ valves open and close easily with minimal leakage, have no corrosion damage, and have been exercised and lubricated as required.	
		M Gates/ valves will not fully open or close because of obstructions that can be easily removed, or have minor corrosion damage that requires maintenance.	
		U Gates/ valves are missing, have been damaged, or have deteriorated to the point that they need to be replaced.	
		N/A There are no flap gates.	
10. Riprap Revetments & Banks	U	A No riprap displacement or stone degradation that could pose an immediate threat to the integrity of channel bank. Riprap intact with no woody vegetation present.	Riprap slopes could not be inspected due to high vegetation. Clear vegetation and provide USACE with an update in the next semi-annual report. (U)
		M Minor riprap displacement or stone degradation that could pose an immediate threat to the integrity of the channel bank. Unwanted vegetation must be cleared or sprayed with an appropriate herbicide.	

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Flood Damage Reduction Channels

For use during Initial and Continuing Eligibility Inspections of flood damage reduction channels

Rated Item	Rating	Rating Guidelines	Location/Remarks/Recommendations	
11. Revetments other than Riprap		U	Significant riprap displacement, exposure of bedding, or stone degradation observed. Scour activity is undercutting banks, eroding embankments, or impairing channel flows by causing turbulence or shoaling. Rock protection is hidden by dense brush, trees, or grasses.	
		N/A	There is no riprap protecting this feature of the segment / system, or riprap is discussed in another section.	
	N/A	A	Existing revetment protection is properly maintained, undamaged, and clearly visible.	Not applicable.
		M	Minor revetment displacement or deterioration that does not pose an immediate threat to the integrity of the levee. Unwanted vegetation must be cleared or sprayed with an appropriate herbicide.	
		U	Significant revetment displacement, deterioration, or exposure of bedding observed. Scour activity is undercutting banks, eroding embankments, or impairing channel flows by causing turbulence or shoaling. Revetment protection is hidden by dense brush and trees.	
	N/A	There are no such revetments protecting this feature of the segment / system.		

¹ If weather and flow conditions allow, inspectors should walk in the channel and probe shoal areas in order to estimate extent of blockage of the cross-sectional area where shoaling is present.

² The sponsor should be monitoring any observed movement to verify whether the movement is active or inactive.

³ Inspectors must have as-built drawings available during the inspection so that the lateral distance to the heel and toe of the floodwalls can be determined in the field.

⁴ Proper operation of this item must be demonstrated during the inspection.

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. FDR = Flood Damage Reduction



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Photo 1: Bemis Road: View of vegetation and shoaling downstream.



Photo 2: Bemis Road: View of heavy vegetation and shoaling.



Photo 3: Bemis Road: View of heavy vegetation along the upstream left bank.

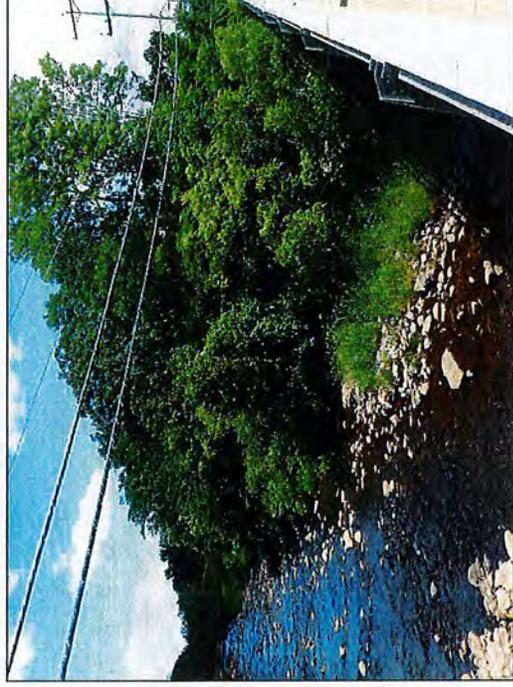


Photo 4: Bemis Road: View of heavy vegetation and shoaling.



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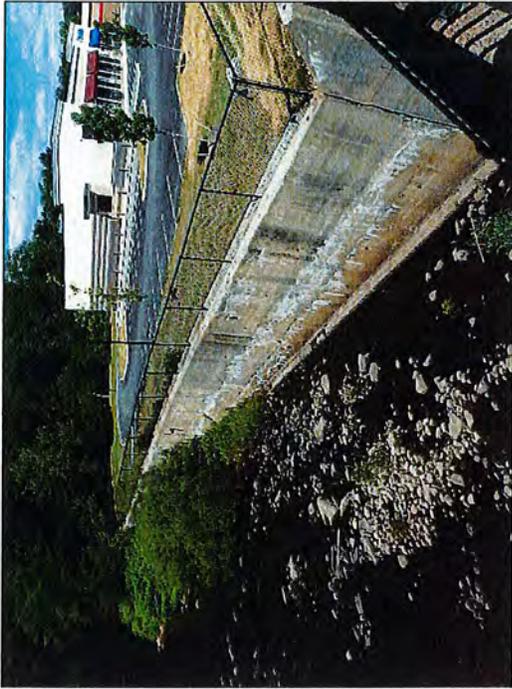


Photo 5: Water Street: View of vegetation and shoaling.



Photo 6: Water Street: View of efflorescence and shoaling along the upstream left bank.

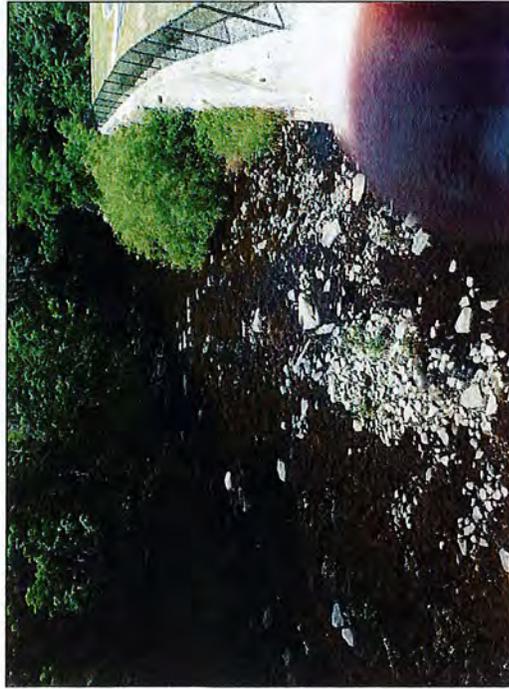


Photo 7: Water Street: View of heavy vegetation along the upstream left bank, below the fence.



Photo 8: Water Street: View of vegetation along the upstream right bank.



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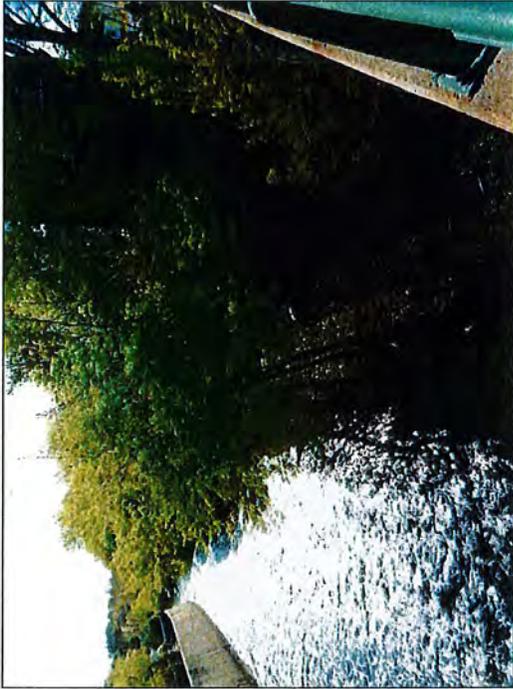


Photo 9: Water Street: Heavy vegetation and shoaling on the downstream right bank.

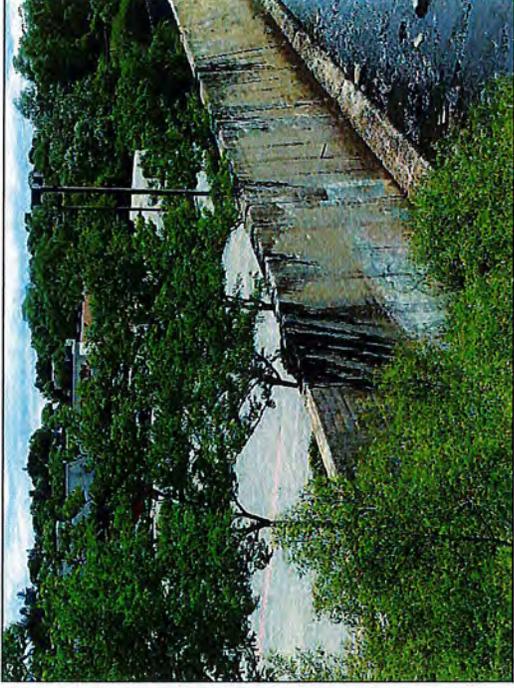


Photo 10: Water Street: View of floodwall cracks, trees on upper and lower flat spaces, and shoaling along the downstream right bank.



Photo 11: Commercial Street: Heavy vegetation along the upstream left bank.

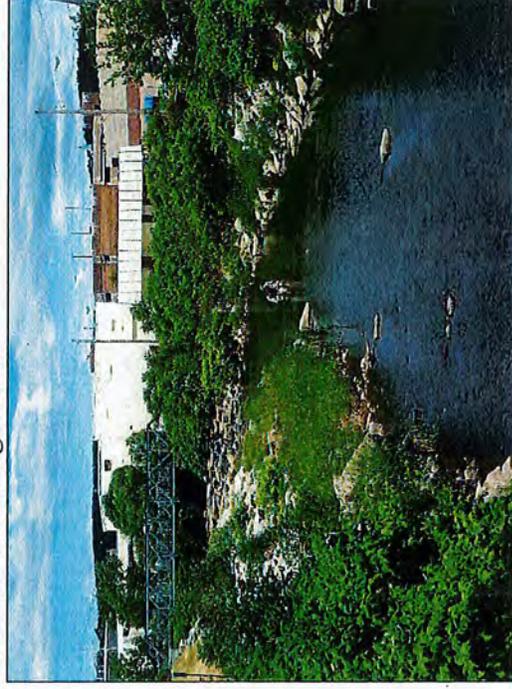


Photo 12: Commercial Street: Vegetation along the upstream right bank.



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Photo 13: Commercial Street: Heavy vegetation on left bank looking downstream.



Photo 15: Commercial Street: Heavy vegetation on right bank looking downstream.



Photo 14: Commercial Street: Heavy vegetation on left bank looking downstream.



Photo 16: Commercial Street: Close-up of heavy vegetation on right bank looking downstream.

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Photo 17: Commercial - Putnam Street: View of heavy vegetation downstream on the right bank.



Photo 19: Commercial-Putnam Street: Heavy vegetation and shoaling looking downstream.



Photo 18: Commercial – Putnam Street: View of heavy vegetation downstream on the left bank.



Photo 20: Putnam Street: Heavy vegetation upstream on the left bank.



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Photo 21. Putnam Street: Heavy vegetation and shoaling on upstream left bank.

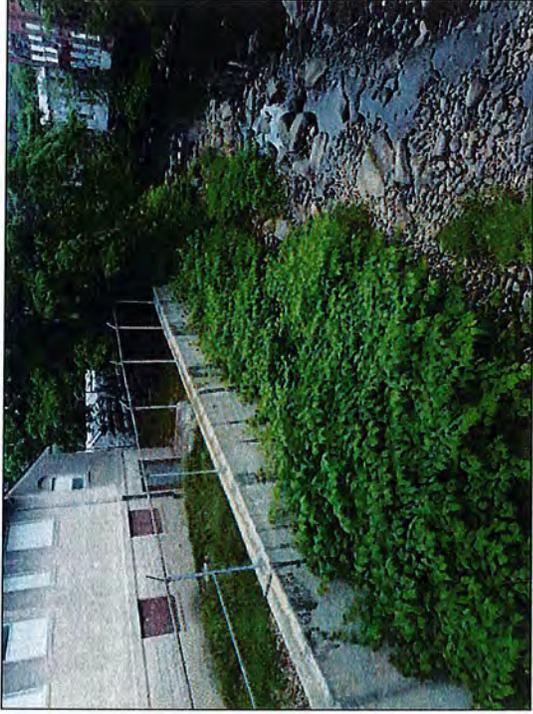


Photo 22: Circle Street: Heavy vegetation and shoaling upstream right bank.



Photo 23: Circle Street: Heavy vegetation and shoaling upstream left bank.



Photo 24. Circle Street: Failing 3-story building wall overhanging upstream, left bank.

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Photo 25: Circle Street: Looking downstream.



Photo 26: Circle Street: Heavy vegetation and shoaling on downstream right bank.



Photo 27: Circle Street: Vegetation growing out of masonry and rock joints, downstream, right bank.



Photo 28: Circle Street: Trees up to 6 inch diameter growing out of block joints downstream, left bank.



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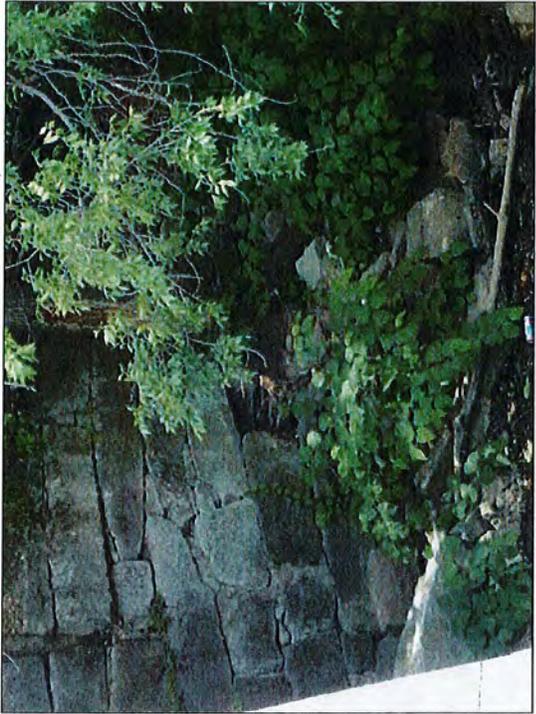


Photo 29: Circle Street: 6 inch diameter tree displacing blocks out of stone wall, downstream, left bank.



Photo 31: River/Main Street: Heavy vegetation and shoaling upstream left bank.



Photo 30: River/Main Street: Heavy vegetation and shoaling upstream right bank.



Photo 32: River/Main Street: Heavy vegetation on and within stone block joints, upstream left bank.



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Photo 33: Sheldon Street: View looking upstream.

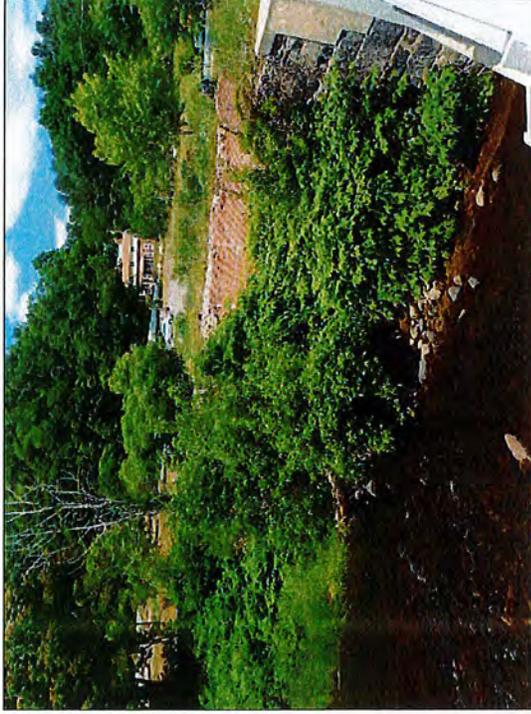


Photo 34: Sheldon Street: Deteriorated brick outfall (flowing), vegetation, upstream left bank.



Photo 35: Sheldon Street: Heavy vegetation, upstream left bank.



Photo 36: Sheldon Street: Heavy vegetation, upstream left bank.



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Photo 37: Sheldon Street: Heavy vegetation at brick outfall (flowing), upstream left bank.

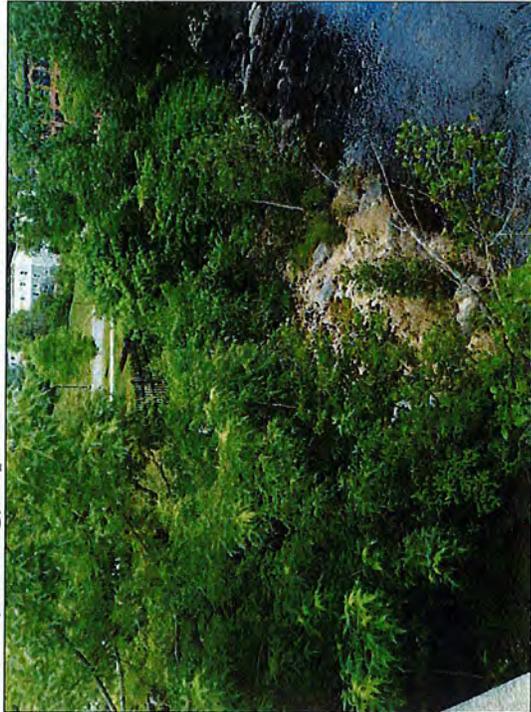


Photo 39: Sheldon Street: Heavy vegetation and shoaling downstream left bank.



Photo 38: Sheldon Street: Heavy vegetation and shoaling downstream right bank.

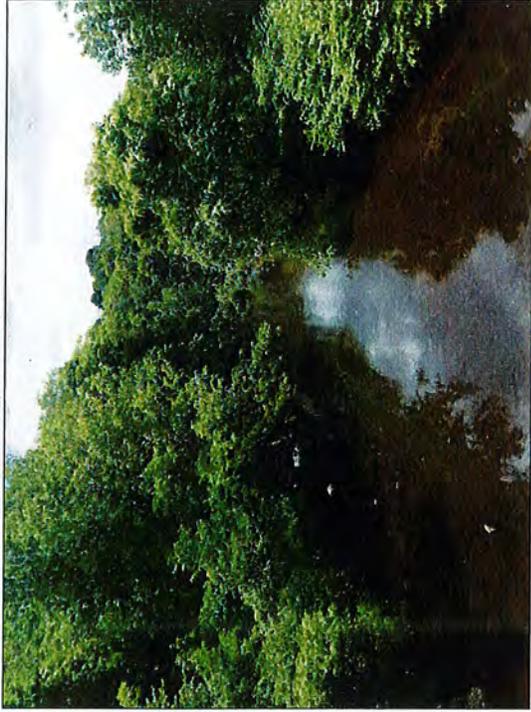


Photo 40: Kimball Street: Heaving vegetation upstream on left and right banks.



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Photo 41: Kimball Street: Heaving vegetation upstream on right bank.

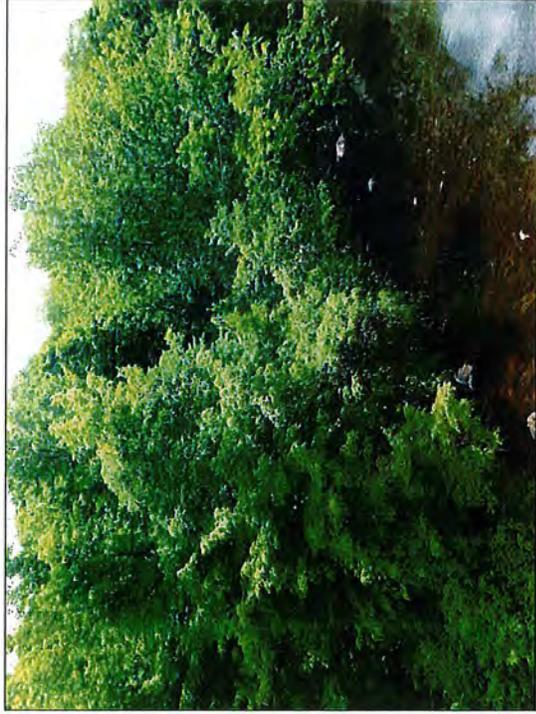


Photo 42: Kimball Street: Heaving vegetation upstream on left bank.

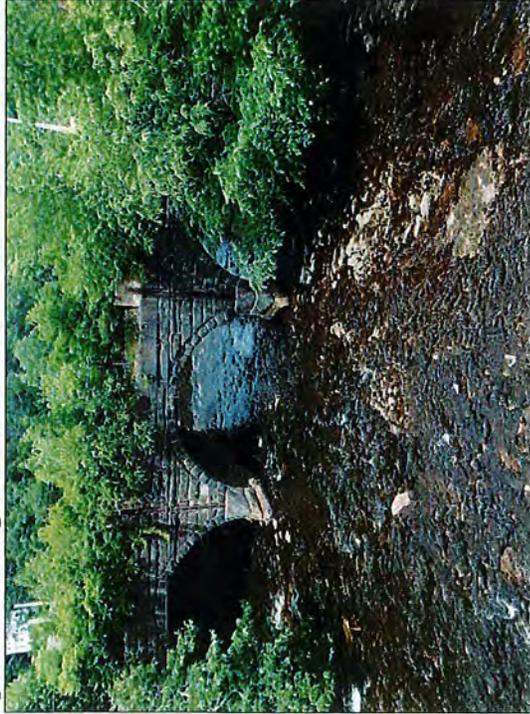


Photo 43: Kimball Street: Looking downstream to overgrown railroad bridge.

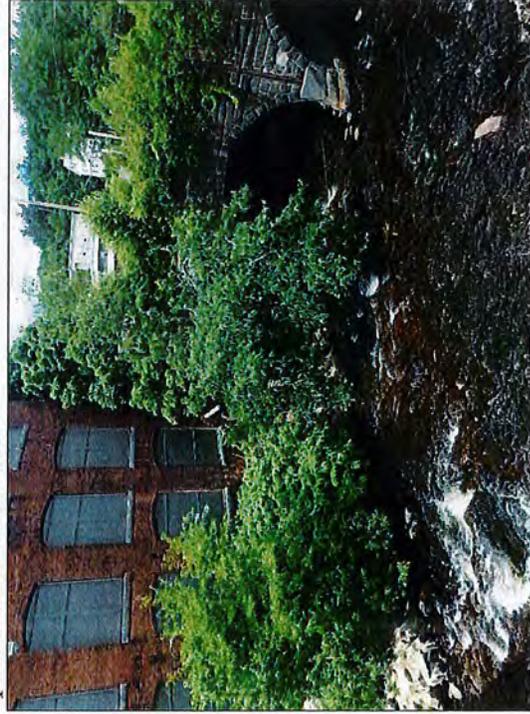


Photo 44: Kimball Street: Heaving vegetation on downstream left bank and railroad bridge.



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Photo 45: Kimball Street: Heaving vegetation on downstream right bank and railroad bridge.



Photo 47: Daniels Street: Efflorescence at concrete-stone wall interface on upstream right bank.



Photo 46: Daniels Street: Heavy vegetation and trees on upstream right bank.

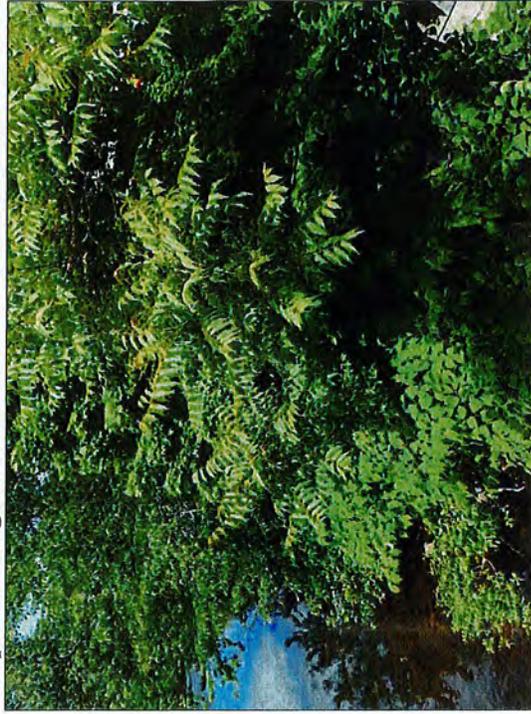


Photo 48: Daniels Street: Heavy vegetation on upstream left bank.

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Photo 49: Daniels Street: Looking downstream.



Photo 50: Daniels Street: Vegetation & trees bordering construction site, downstream left bank.



Photo 51: Daniels Street: Close-up of construction site bordering downstream left bank.

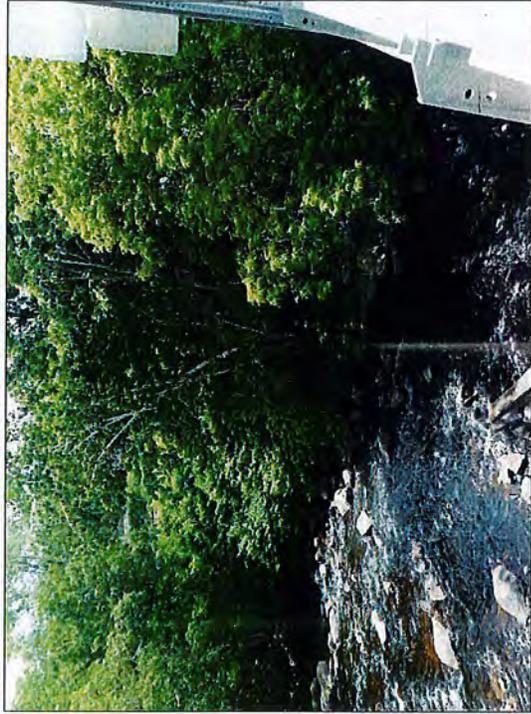


Photo 52: Daniels Street: Vegetation & trees bordering construction site, downstream right bank.



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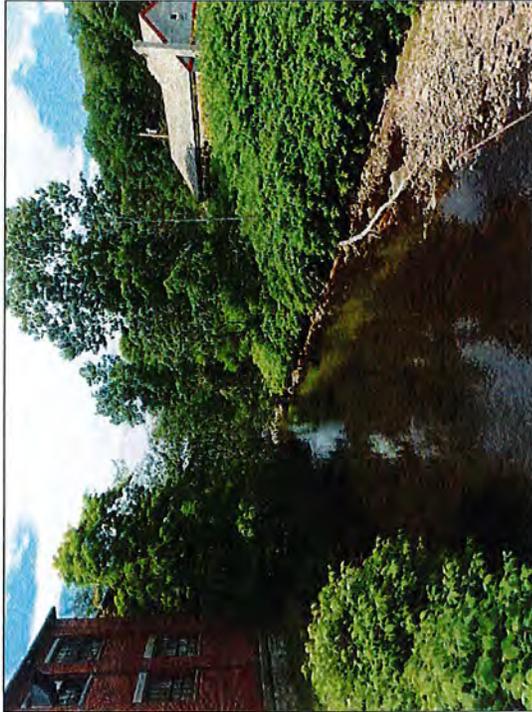


Photo 53: Oakhill Road: Looking upstream.



Photo 54: Oakhill Road: Heavy vegetation and leaning trees on upstream left bank.

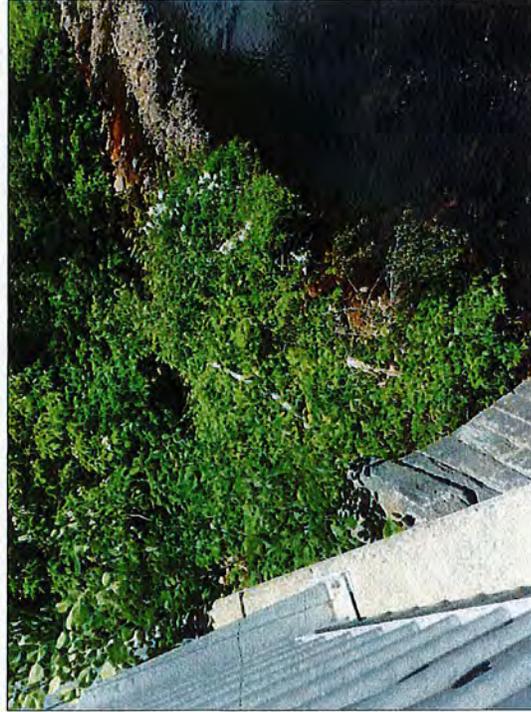


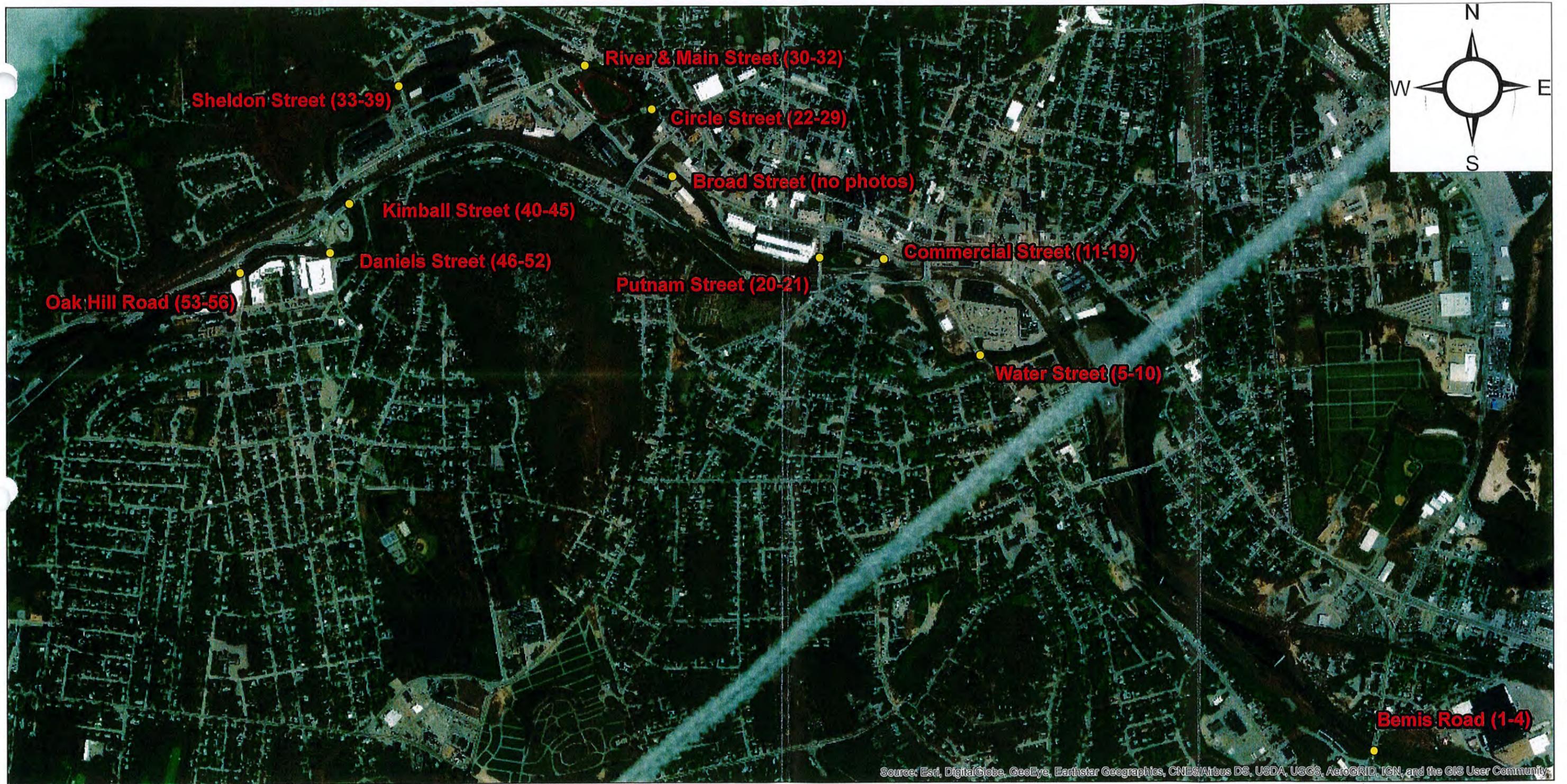
Photo 55: Oakhill Road: Heavy vegetation and shoaling on upstream right bank.



Photo 56: Oakhill Road: Heavy vegetation and shoaling on upstream left bank.



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**North Nashua River
Flood Damage Reduction System
Fitchburg, MA
Routine Inspection
June 14, 2018**

