Project Final Report

Stormwater Management and Stream Restoration for Water Quality in Lower Abbey Brook, Chicopee, MA

#19-01/319
2019-2022

September 30, 2022

Prepared by City of Chicopee,
Pioneer Valley Planning Commission, and Tighe & Bond

For Massachusetts Department of Environmental Protection,
Bureau of Water Resources
and
U.S. Environmental Protection Agency, Region 1

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Stormwater Management and Stream Restoration for Water Quality in Lower Abbey Brook
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City of Chicopee

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PREPARED FOR:

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER RESOURCES

AND

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 1

MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
Bethany A. Card, Secretary

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Martin Suuberg, Commissioner

BUREAU OF WATER RESOURCES
Kathleen Baskin, Assistant Commissioner

WATERSHED PLANNING PROGRAM
Richard O. Carey, Director

Cover photo: City of Chicopee's Earth Day Outreach at Szot Park's Lower Bemis Pond, April 2021.

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A. Project Snapshot

Project number and title: Stormwater Management and Stream Restoration for Water Quality in Lower Abbey Brook; #19-01/319

A1. Project start date: March 6, 2019

A2. Date closed: September 30, 2022

A3. Basin and HUC 12 subwatershed: Chicopee River Basin
Twelvemile Brook to Mouth 010802040402

A4. Segment and/or waterbody number(s): Abbey Brook MA36-40

A5. **Status of waterbody (Category 5, etc.):** Category 5 for *Escherichia Coli* (*E. Coli*), and Total Suspended Solids (TSS)

A6. Priority Pollutant(s) targeted: The pollutants of concern include *Escherichia Coli* (*E. Coli*), and Total Suspended Solids (TSS) which impact the target waterbody, Abbey Brook, a tributary to the Chicopee River which, in turn, feeds into the Connecticut River.

A7. Estimated Annual Pollutant removal (quantity, not percentage)

Pollutant	**Estimated removal in original 319 grant request to MassDEP**	**Calculated removal with 90-percent design of BMPs September 2022**
E. Coli	15.5 billion Colony Forming Units	21 billion Colony Forming Units
TSS	1,180 lbs.	2,810 lbs.
TP	0 lbs.	3.5 lbs.
TN	0 lbs.	10.6 lbs.

Method of Determination and calculations: Simple method for TSS, TP, and TN; in addition to geese average waste calculations for *E. Coli*.

A8. BMPs planned for installation, number and type:

Type of BMP installed	**Number**
Offline Lined Bioretention	1
Deep Sump Manholes	3
Conversion of Turf Grass to Wet Meadow, including Boulder Cascade Outflow with two culverts	1
Dam conversion to bridge (reduce geese habitat) and plantings of trees and brush	1

B. Descriptive Project Summary

Massachusetts Department of Environmental Protection

Section 319 NPS Project #19-01/319

Project Title: Stormwater Management and Stream Restoration for Water Quality in Lower Abbey Brook
NPS Category: Resource Restoration
Investigator: City of Chicopee
Location: Chicopee River Watershed

Description:

Abbey Brook is shown on the Integrated List of Waters as impaired, Category 5, waters requiring a TMDL for *E. coli* and total suspended solids (TSS). Abbey Brook drains a small but highly urbanized watershed in Springfield and Chicopee and flows 1.5 miles to join the Chicopee River. Sampling done under a successful 2016 604b grant study found high *E. coli* levels in lower Abbey Brook attributable to the Canada geese that congregate at Lower and Upper Bemis Ponds in Szot Park.

This project entailed design for an ambitious initiative to improve water quality in Abbey Brook and provide important climate change resilience benefits. The project's design includes transformation of the Szot Park landscape with removal of the Lower Bemis Pond Dam and installation of shoreline stormwater BMPs designed to address the identified bacteria issues and discourage year-round geese that are habituated to using the slopes of the Lower Pond. Match to the 319 grant included a feasibility study for removal of the Upper Bemis Pond Dam. That study revealed the need for a much more extensive downstream effort to accommodate flows that will result with removal of the Upper Dam, including upgrading the culvert at Front Street and daylighting Lower Abbey Brook between Front Street and its confluence with the Chicopee River. State and federal agencies required permitting of the work in Lower Abbey Brook as a whole, rather than segmented parts. This has extended both the scope of work overall and the timeline beyond the 319 grant period such that construction has not yet occurred. Final permitting from MassDEP, the U.S. Army Corps of Engineers (USACE), and the Department of Conservation and Recreation (DCR) Office of Dam Safety (ODS) is expected within the next three (3) months. The project is scheduled to be bid for construction during winter 2023.

Project Goals:

The primary goal of this project is to reduce runoff in order to improve the water quality of Abbey Brook and remove it from the impairment list. This will be accomplished primarily through:

- Installing BMPs to discourage congregation of geese, providing for decentralized treatment of stormwater runoff impacts, reducing sediment loading from the nearby roadway, and slowing flows along the slopes that drain to Abbey Brook.
- Reducing stormwater flow volumes to make the areas around Abbey Brook more resilient to

climate change.
- Advancing full restoration of Abbey Brook with an investigation at the Upper Dam, a downstream culvert, and a downstream storm drainpipe.
- Supporting public understanding of what Szot Park could look like with restoration of Abbey Brook.

Project Tasks:

1: Quality Assurance and Project Evaluation

The contracting engineer used the Simple Method and geese waste calculations to model results of anticipated pollutant load reductions achieved by BMPs designed under the project. Description of BMP type, estimated date of installation, targeted pollutant(s), and size of targeted treatment area(s) are provided for in Section D below with detail in Attachment A.

2: Survey, Design, Permit, and Construct Stormwater Management BMPs

The contracting engineer designed and permitted the following stormwater BMP facilities:

- Three (3) deep sump manholes and an offline lined bioretention diversion to improve the existing storm drain system, including capture of total suspended solids (TSS).
- Wet meadow to improve and augment existing bordering vegetated wetlands, including groundwater conveyance and boulder cascade overflow.
- Two (2) open bottom box culverts for boulder cascade that will also support groundwater discharge from the wet meadow.
- Vegetated areas with persistent emergent wetland vegetation along the east and west banks of Abbey Brook to discourage geese from use of these areas and to provide source control.

Permitting completed to date for the overall project includes: Massachusetts Environmental Protection Act (MEPA) approval, submission of a MassDEP Water Quality Certificate (WQC) Application, USACE Project Pre-Construction Notification (PCN), and Notice of Intent (NOI) to the Chicopee Conservation Commission. The Chapter 253 permit for DCR ODS is in draft form and will be submitted in October 2023. As noted above, final permitting from agencies is expected within the next three (3) months (see Construction Permits and Approvals to Date in Attachment B). Given the extended scope of work and permitting noted above, construction and implementation work has not yet occurred. The City is scheduled to issue the bid for construction work in winter 2023.

3: BMP Operation and Maintenance Plan

The contract engineer has prepared a long-term operation and maintenance plan that the City will use in caring for the BMP facilities (see Long Term Operation and Maintenance Plan in Attachment C). This Plan includes the following elements:

- Identification of owners of the BMPs.
- Identification of the party or parties responsible for operation and maintenance of the BMPs.
- Schedule for inspection and maintenance.
- List of routine and non-routine maintenance tasks to be performed.

- A map showing the locations of the BMPs.

Note funding for long term operation and maintenance of the BMPs will be through the City of Chicopee Department of Parks & Recreation with support provided by the City's Department of Public Works (DPW).

Task 4: Feasibility Study for Removal of Upper Bemis Pond Dam and Restoration of Lower Abbey Brook; Removal of Lower Bemis Pond Dam

The engineering contractor has completed the feasibility analysis for removal of the Upper Bemis Pond Dam, upsizing the culvert at Front Street, and daylighting a storm drain pipe that outfalls to the Chicopee River (see Abbey Brook Restoration Basis of Design Memorandum summarizing the feasibility analysis in Attachment D). This work was completed in conjunction with other dam removal design and permitting work the City was already doing at the Lower Bemis Pond Dam. Given the extended scope of work and permitting noted above, the construction and implementation work of removing the Lower Bemis Pond Dam has not yet occurred.

Task 5: Presentation Size Renderings from Different Vantage Points Illustrating Before and After Conditions and Potential Benefits of Dam Removal

The consulting landscape architect has prepared a preliminary design of a stream channel alignment for the restoration of Abbey Brook through the Lower Bemis Pond basin with the dam removed. The design is informed by hydrologic and hydraulic modeling through the corridor so that the landscape renderings can provide as accurate a depiction as possible, incorporating stream channel, wetlands, flood plain features, and upland areas along with amenities for park patrons such as boardwalks and foot bridges (see hydrologic and hydraulic modeling results within the Basis of Design Memorandum in Attachment D and Renderings that Illustrate Before and After Conditions in Attachment E).

Task 6: Outreach and Education

The Hitchcock Center for the Environment worked with local teachers in producing and delivering a three-part module to 5th graders from the Bowe, Belcher, and Barry Elementary Schools to explore the story of Abbey Brook and aquatic species typical of healthy stream systems. The work resulted in a poster showcasing student drawings of dragonflies, a water filtering experiment by students, and a YouTube video summarizing the purpose of the project relative to stormwater and water quality. See: Hitchcock Center | Stormwater Management and Stream Restoration in Lower Abbey Brook – YouTube. The module aligns with Massachusetts teaching standards on watershed and engineering design solutions (5th grade Earth and Human Activity standards). Local considerations on the specifics at Szot Park— particularly the problem with geese, stormwater, and water quality, and the nature of the two existing dams, history and benefits of removal— were included. A poster highlights some of the students' final work. (See the Hitchcock Center for the Environment's Final Report and Final Poster in Attachments F and G.)

As part of this task, PVPC also met with City staff and provided a Memorandum on Recommended Public Engagement Approach. (See Attachment H.)

Other public engagement activities around the Abbey Brook Restoration Project have occurred primarily via conversations with the City Council, around permitting processes, and in coordinating with Chicopee Electric Light (CEL), which is housed on property downstream of Szot Park. These activities include:

- The local Ward Councilor started outreach with community residents when the project was introduced to City Council:
    - Academy Street residents are interested in participating in project discussions
        - Would like opportunities to review plans, provide input;
        - Concerns: public safety (sightlines, homeless encampments) related to 2017 incident in Szot Park, access for police and emergency responders.
    - Councilor has indicated that the ponds have sentimental value from childhood experiences, but he still supports the project.
- City Planning Staff presented to the CEL Board on February 15, 2022; previous project discussion between the City and CEL occurred via a site walk in 2020. CEL had been concerned about laydown area and ability to use their facility, but now have much better understanding and are fully supportive.
- City Planning Staff presented the project to City Council on February 22, 2022 for authorization of additional funding provided by DER, was unanimously approved and reported on in newspaper article
- City Planning Staff periodically receive phone calls from interested residents; to date, those phone calls have primarily been in the form of positive feedback on the project plan, with the exception of one resident concerned about the future of the geese population.
- An Earth Day event was held at Szot Park with the Division for Ecological Restoration (DER) on April 21, 2021. See coverage at:
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    - https://www.wwlp.com/news/local-news/hampden-county/abbey-brook-at-szot-park-in-chicopee-restoration-project/
    - https://www.youtube.com/watch?v=nHUKdi-Jv4M
    - https://www.masslive.com/galleries/5G6BHDXSW5BFPI2QGYKZ7GSUMU/

Task 7: Reporting and Project Oversight

The City with assistance from the Pioneer Valley Planning Commission (PVPC) and consulting engineers Tighe & Bond prepared 14 quarterly reports and the project final report.

C. Financial Summary

Final Project Cost: $327,037

Funding:	$116,172	Section 319 Grant
	$210,865	City of Chicopee – Match

Note that based on total related project costs and grants funds spent, the City exceeded its 40% match obligation.

% of City match = 64%

Project Duration: 2019 – 2022

Attachment B
Project Budget – Amended April 21, 2021
Stormwater Management and Stream Restoration for Water Quality in Lower Abbey Brook
19-01/319

Expense Item	Original 319 Amount	New 319 Amount	Original Non-Federal Match	New Non-Federal Match	Original Total Project Cost	New Total Project Cost
Salaries						
Planning Director ($60-$65/hour)			$4,500		$4,500	
City Engineer ($70-$75/hour)			$5,900		$5,900	
Public Works Laborer ($25-$30/hour)			$9,000		$9,000	
Subtotal Salaries			**$19,400**	**$19,400**	**$19,400**	**$19,400**
Subcontractual						
Project Administration and Assistance	$11,500	$19,500			$11,500	$19,500
Engineering	$54,800	$84,800	$50,000	$50,000	$104,800	$134,800
Construction – Labor		$80,250		$67,000		$147,250
Education and Outreach	$ 5,000	$ 6,500			$ 5,000	$ 6,500
Subtotal Subcontractual	**$71,300**	**$191,050**	**$50,000**	**$117,000**	**$121,300**	**$308,050**
Materials and Supplies						
Construction Materials	$50,700	$130,950		$67,000	$50,700	$197,950
Equipment Rental			$11,000	$11,000	$11,000	$11,000
Subtotal Materials and Supplies	**$50,700**	**$130,950**	**$11,000**	**$78,000**	**$61,700**	**$208,950**
Travel (for auto mileage only @ $.45 /mile)			$1,000	$1,000	$1,000	$1,000
Totals	**$122,000 60%**	**$322,000**	**$81,400 40%**	**$215,400**	**$203,400 100%**	**$537,400**

The Disadvantaged Business Enterprise, (DBE) Program "Fair Share" goals for the project are: $22,571 for D/MBE (4.2%) and for $24,183 D/WBE (4.5%). Firms utilized in Federally Assisted Projects must be certified as either an MBE or WBE *and* a DBE.
The Department will retain 10% of the total maximum obligation of the s. 319 grant funds or the final invoice submitted by the Grantee, whichever is greater, until all contract provisions are satisfied and final reports and other products are delivered and accepted. This 10% retainage shall be reflected on each invoice submitted by the Grantee and will be cumulative in the amount of $32,200 (10% of the contract amount).

D. BMPs

1. Type of BMP:
Offline lined bioretention facility

2. Date of implementation:
Implementation anticipated 2023

3. Size of treatment area:
10.51 acres (~15% of runoff assumed to be diverted into the bioretention facility via the proposed diversion structure)

4. Area land use:
Recreational

5. Pollutant load removed:
TSS = 1,370 lbs. removed annually
TP = 3.3 lbs. removed annually
TN = 9.7 lbs. removed annually

6. Method of pollutant load removal determination and calculations:
Simple Method

7. Signed statement: See attachments.

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1. Type of BMP:
Deep Sump Manholes

2. Date of implementation:
Implementation anticipated 2023

3. Size of treatment area:
10.59 acres

4. Area land use:
Recreational

5. Pollutant load removed:
TSS = 1,380 lbs. removed annually

6. Method of pollutant load removal determination and calculations:
Simple Method

7. Signed statement: See attachments.

1. Type of BMP:
Conversion of Turf Grass to Wet Meadow including boulder cascade outflow through two culverts

2. Date of implementation:
Implementation anticipated 2023

3. Size of treatment area:
0.45 Acres

4. Area land use:
Maintained lawn to wetland

5. Pollutant load removed:
TSS = 63 lbs. removed annually
TP = 0.2 lbs. removed annually
TN = 0.9 lbs. removed annually

6. Method of pollutant load removal determination and calculations:
Simple Method

7. Signed statement: See attachments.

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1. Type of BMP:
Dam conversion to bridge (reduce geese habitat) and plantings of trees and brush

2. Date of implementation:
Implementation anticipated 2023

3. Size of treatment area:
Not applicable - removal of pollutant source

4. Area land use:
Recreational

5. Pollutant load removed:
21 billion Colony Forming Units *E. coli*

6. Method of pollutant load removal determination and calculations:
Geese average waste calculations.

7. Signed statement: See attachments.

E. Lessons Learned

Expanded scope of work and extended permitting timelines

Having to "leave on the table" more than $200,000 in budgeted construction labor and materials from the awarded 319 grant has been a painful part of this project given the need within the City to defray Abbey Brook construction costs. There are several lessons to be pulled from this.

The initial 319 grant proposal included stormwater improvements to be designed, permitted, and implemented in association with removal of the Lower Bemis Pond Dam. It was difficult to foresee how additional efforts to understand the feasibility of removing the Upper Bemis Pond Dam would open up a much wider discussion about Abbey Brook. That feasibility analysis showed that removal of the Upper Dam could only occur with downstream upgrades, including a larger culvert at Front Street and daylighting of Abbey Brook between Front Street and the Chicopee River. These were added elements needed to accommodate projected stream flows. Together, these elements expanded the scope of work for design and increased the permitting burden. MEPA has specific non-segmentation requirements; therefore, the entire restoration project had to be included in the MEPA EENF. After the MEPA EENF was received, the City of Chicopee, Department of Ecological Restoration (DER), Tighe & Bond, and PVPC held a meeting on July 23, 2021 to discuss a path forward including an approach for permits required for MassDEP (for the 401 water quality certification) and the U.S. Army Corps of Engineers (USACE) (404 PNF). It was agreed during the meeting that the project should be submitted as a single application to encompass all potential impacts and mitigation.

The City and engineering consultant worked diligently in the period following this meeting to move forward with this revised, but appropriate holistic approach. The proposed additional scope of work was funded through grants that required time to fully contract. Despite best efforts, however, there was little control over permitting timelines. A summary of required permits and status is provided below:

- MEPA EENF
    - Submitted: 05/17/21
    - Permit Issuance: 07/02/21

- Request for Determination of Applicability (RDA)
    - Submitted: 4/20/22
    - Permit Issuance: 5/4/22
- MassDEP 401 WQC
    - Submitted: 3/21/22
    - Status: Under review

- USACE 404 PNF
    - Submitted: 6/30/22
    - Status: Under review

- Chicopee Conservation Commission Notice of Intent (NOI)
    - Submitted: 9/21/22
    - Hearing Date: 10/5/22

- Chapter 253 Application
    - Target Submittal: 10/20/22
    - Anticipated Review: Less than 2 months

The lesson on the permitting side is that the required permitting for resiliency, dam removal, and stream restoration projects tends to be more substantial (and require more time for agency review) than those for typical stormwater improvement projects due to substantial work within resource areas. Projects large enough to trigger a MEPA review are particularly complicated as going through MEPA becomes the first step, and due to non-segmentation requirements the EENF was required to include the comprehensive Abbey Brook Restoration project. Since this was the first required permit other permits were pushed back accordingly.

The lesson on the grants side is an awareness now of just how constraining it is to try to pack in design, permitting, and construction under one grant (even if the grant period is extended). Since the aim of the 319 grant program is construction/implementation for water quality improvements, MassDEP might also consider a conversation with EPA to develop a more generous (> $50,000) and flexible 604b program and offer possibility for sequential grants under that program where the 1st grant enables analysis of water quality issues, then a 2nd grant enables design and permitting. Municipalities and their teams could then use 319 grants for construction and construction oversight while not having to risk losing grant funds due to permitting timelines.

It should also be noted that most of the planned scope of services anticipated under this grant were completed during the COVID-19 pandemic. The pandemic has impacted all levels of government, agency workflows, staffing levels, and workflows. While the project team associated with this project is satisfied with the work that has been completed under these unprecedented circumstances, the reality that 319 grant funds are being returned to the EPA on this project reveals a regulatory framework with the 319 Program that is not resilient nor capable of responding to such significant impacts. Review of the Program's framework as noted above and in this paragraph would be beneficial to ensuring 319 funds results in stormwater improvement projects being constructed to realize benefits.

Combining projects for water quality improvements and climate resilience

Abbey Brook presents an outstanding opportunity to address water quality improvements while also tackling other detrimental issues impacting streams in the urban environment, including flashy and contaminated storm flows, higher than normal temperatures, dams and impoundments that no longer serve any purpose and pose threats to public safety, and other infrastructure impacting flow regime and stream ecology. Learning how to combine funding sources to best effect such large-scale, multi-phased restoration projects is a work in progress.

The comprehensive Abbey Brook Restoration project will involved the removal of two (2) deteriorating dams, the replacement of an undersized culvert at Front Street with a culvert that meeting Massachusetts Stream Crossing Standards, daylighting of Abbey Brook from Front Street to the Chicopee River, and restoration of Abbey Brook through its current impoundments. This is a consequential project for an urbanized waterway that has been impacted by human interventions for well over a century. This project is a significant effort to address failing infrastructure, protect adjacent critical infrastructural assets, while restoring ecological attributes to Abbey Brook and considering long-term resiliency needs. The City intends for this project to serve as a case study for future projects that are similar in nature.

F. Attachments

Deliverables

Task 1: Quality Assurance and Project Evaluation
Attachment A: Annual Pollutant Load Reduction Calculations Summary for the Lower Bemis Pond Dam Removal and Szot Park Stormwater Improvements Project

Task 2: Design Stormwater BMPs
Attachment B: Construction Permits and Approvals to Date

Task 3: BMP Operation and Maintenance Plan
Attachment C: Long-term Operation and Maintenance Plan

Task 4: Feasibility Study for Removal of Upper Bemis Pond Dam and Restoration of Lower Abbey Brook; Removal of Lower Bemis Pond Dam

Attachment D: Abbey Brook Restoration Basis of Design Memorandum (*including feasibility analysis of Upper Bemis Pond Dam Removal*)

Task 5: Presentation Size Renderings from Different Vantage Points Illustrating Before and After Conditions and Potential Benefits of Dam Removal

Attachment D: Abbey Brook Restoration Basis of Design Memorandum (*including hydrologic and hydraulic modeling results*)
Attachment E: Renderings that Illustrate Before and After Conditions

Task 6: Outreach and Education

Attachment F: Hitchcock Center for the Environment Final Report
Attachment G: Final Poster
Attachment H: PVPC Memorandum on Recommended Public Engagement Approach