TOWN OF MEDFIELD, MASSACHUSETTS

PHOSPHORUS CONTROL PLAN (PCP)

June 30, 2023

~~REVISION: December 26, 2023~~

REVISION: January 20, 2026

Prepared By:

The Ginivan Group LLC
17 Summer Path Way
Pembroke, Massachusetts 02359

Table of Contents

LIST OF ATTACHMENTS

EXECUTIVE SUMMARY

On behalf of the Town of Medfield, this Phosphorous Control Plan (PCP) was prepared by the Ginivan Group LLC to provide the town with a framework to comply with the nutrient reduction requirements of the Small Municipal Separate Storm Sewer Systems (MS4) permit that took effect on July 1, 2018. The plan is in part based on the Charles River Watershed Association PCP template that was funded by a Massachusetts Department of Environmental Protection (MassDEP) grant and drafted by Kleinfelder in June 2021 for use by watershed communities. Input to the template was provided by the Environmental Protection Agency Region 1 and MassDEP. Upon completion this PCP will be added to the Medfield Stormwater Management Plan (SWMP) by amendment.

This document has been developed to serve the following purposes:

- Provide an overview of the town-specific impacts of the requirements of the PCP outlined in the MS4 Permit, particularly Appendix F;
- Assist the Town of Medfield to meet the planning and documentation requirements of the PCP outlined in the MS4 Permit, particularly Appendix F;
- Provide step-by-step guidance and calculation support for establishing baseline conditions and accounting for retrospective 2005 – present development credits/impacts;
- Provide guidance on identifying potential strategies to meet the implementation schedule milestones;
- Provide references and resource materials for planning, and prospective tracking of structural and non-structural best management practice reductions; and
- Maintain a centralized record of activities and tasks undertaken in performance of the PCP objectives.

The Charles is an urban river and is impaired for multiple pollutants that have altered and degraded habitat in many areas. The river has borne the brunt of much of the development in the greater Boston area through damming, pollution, and traditional development practices. A nearly five-decade cleanup effort has resulted in water quality improvements, primarily from elimination of industrial discharges and a significant reduction in untreated sewage flowing into the river. The primary challenge facing the river today is stormwater runoff and a total of three TMDLs have been developed: two for nutrients and one for bacteria. Phosphorus loading in stormwater runoff is a particular challenge to the river, leading to summertime cyanobacteria blooms and overgrowth of invasive aquatic plants in many areas of the watershed.

Medfield's PCP must be fully implemented within 20 years of the Permit effective date (i.e., by 2038), as illustrated in **Table E-1**. The targeted phosphorus reductions are broken out into interim mandatory milestones, culminating in achievement of the allowable TMDL phosphorus loads for each municipality at the end of the 20-year schedule.

Table E-1: Charles River Watershed Communities PCP Implementation Timeline

Permit Years 1-5 (2018-2023)	Permit Years 5-10 (2023-2028)	Permit Years 10-15 (2028-2033)	Permit Years 15-20 (2033-2038)
Create Phase 1 Plan	Implement Phase 1		
	Create Phase 2 Plan	Implement Phase 2	
		Create Phase 3 Plan	Implement Phase 3

In 2023, the Town of Medfield was a "decision community" and was allowed to choose one of the following options to define its PCP Area:

(1) the entire area within its jurisdiction (for municipalities this would be the municipal boundary) within the Charles River Watershed; or

(2) only the urbanized area portion of the permittee's jurisdiction within the Charles River Watershed.

As a result, in its initial PCP, the town opted to implement the PCP within the MS4-regulated (urbanized) area because it is a smaller load and a smaller, more manageable area. However, the pending 2024 Draft MS4 General Permit revises the "decision community" standard and requires all municipalities in the Charles River watershed to use the entire municipal boundary. Therefore, the Town of Medfield has revised its PCP to align with the 2024 Draft General and From the MS4 General Permit and our allowable phosphorous load reduction will be based on the Full Watershed (General Permit Table F-2).

The town anticipated having the available space within the urbanized area to meet the MS4 Permit phosphorus reduction requirements. The town also anticipated that there would be improvements to stormwater management practices outside of the designated urbanized area due to the adoption of new stormwater policies and requirements that will be implemented on a municipal scale. We understand that these improvements will now count towards Medfield's phosphorus reduction requirement.

The Baseline Phosphorus Load and Allowable Phosphorus Load will correspond to the urbanized areas within the Charles River. This decisions results in the corresponding Stormwater Phosphorous Load Reduction requirement with the PCP Area and the targeted milestones for the current Phase 1 (through 2028) and future Phase 2 and Phase 3 terms.

Medfield will be held responsible for the Allowable Phosphorus Load reported in Appendix F of the MS4 General Permit. For the entire area of the Town, the Allowable Phosphorus Load is reported in Table F-2 of Appendix F, as shown in **Table E-2** relative to the full watershed loads.

Table E-2. Allowable Phosphorus Load Reduction

Condition	From the MS4 General Permit Full Watershed Table F-2	From the MS4 General Permit Urbanized Area Table F-3
Baseline P-Load, lbs/yr	2,105.4	**1,823.2**
Allowable P-Load, lbs/yr	1,347.0	**1,084.7**
Stormwater P-Load Reduction Requirement, lbs/yr	760.6	**738.5**
Phase 1 Requirements		
Year 8 (2026) Milestone: 20% of Reduction, in lbs/yr	152.1	**147.7**
Year 10 (2028) Milestone: 25% of Reduction, in lbs/yr	190.1	**184.6**

To achieve the target of reducing phosphorus loads by 190.1 lbs/yr by 2028, Medfield will take credit for its' existing non-structural and structural BMPs, and plans to implement a series of structural and non-structural BMPs, updating regulatory mechanisms as necessary to aid with achieving these goals, evaluating funding mechanisms and costs, and developing its O&M and recordkeeping programs to ensure continued compliance and functionality of all installed BMPs.

Since the Town has opted to comply with the Draft 2024 General Permit revisions, all of the town-wide enhanced non-structural BMPs qualify for phosphorus reduction credits in the Charles River Watershed in accordance with the Draft 2024 Permit Appendix F, Attachment 2, and will count towards the required phosphorus reduction outlined in **Table 1-5**. As a result, the Town will at least maintain 54.9 lbs/year of P-Load reduction for the non-structural BMPs that are presently enacted.

1 INTRODUCTION

The 2016 National Pollutant Discharge Elimination System General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) in Massachusetts ("MS4 Permit" or "the Permit") took effect on July 1, 2018. The Permit was subsequently modified on December 7, 2020. The MS4 Permit conditions the operation, regulation, and management of MS4s in subject Massachusetts municipalities. The Town of Medfield submitted its Notice of Intent to the Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (DEP) on September 28, 2018, and it was accepted on April 12, 2019. The town updated its Stormwater Management Plan on June 24, 2019, and has also made it a priority to work closely with the local watershed associations. The Town of Medfield is a founding member of the Neponset River Stormwater Partnership and has received guidance from the Charles River Watershed Association's Draft Template[1] for developing this Phosphorous Control Plan (PCP).

The permit requires terms and conditions across six Minimum Control Measures (also referred to as Maximum Extent Practicable or MEP provisions), and water quality-based effluent limitations (WQBEL). These include requirements for waterbodies with approved Total Maximum Daily Loads (TMDLs) and other waterbodies with quality limits. Specifically, to nutrients and the Town of Medfield, there are two approved nutrient TMDLs: one for the Lower Charles River Basin, published in 2007[2], and one for the Upper/Middle Charles River Basin, published in 2011[3].

As an element of the Permit's WQBEL provisions, communities within the Charles River watershed are obligated to address phosphorus impairments through the development and implementation of a PCP. Appendix F of the MS4 Permit describes specific requirements of the PCP, implementation of which is anticipated to achieve the TMDL- established targeted phosphorus reductions over a 20-year timeframe. PCP implementation includes structural and non-structural best management practices (BMPs) executed through programs, projects, and policies. The PCP must be fully implemented within 20 years of the Permit effective date (i.e., by 2038), as illustrated in **Table 1-1**. The targeted phosphorus reductions are broken out into interim mandatory milestones, culminating in achievement of the allowable TMDL phosphorus loads for each municipality at the end of the 20-year schedule.

Table 1-1: Charles River Watershed Communities PCP Implementation Timeline

Permit Years 1-5 (2018-2023)	Permit Years 5-10 (2023-2028)	Permit Years 10-15 (2028-2033)	Permit Years 15-20 (2033-2038)
Create Phase 1 Plan	Implement Phase 1		
	Create Phase 2 Plan	Implement Phase 2	
		Create Phase 3 Plan	Implement Phase 3

[1] *Phosphorous Control Plan Draft Template, Charles River Watershed Association*, Kleinfelder, June 2021.

[2] *Massachusetts Department of Environmental Protection. 2007. Final TMDL for Nutrients in the Lower Charles River Basin. CN 301.1*

[3] *Massachusetts Department of Environmental Protection. 2011. Total Maximum Daily Load for Nutrients in the Upper/Middle Charles River Basin, Massachusetts. CN 272.0*

1.1 OVERVIEW OF PCP PHASE 1 MILESTONES

Phase 1 of the PCP must achieve the first 25% of the town's phosphorus load reduction requirement within 10 years (i.e., by June 30, 2028) of the permit start, with an interim milestone of achieving the first 20% of phosphorus load reduction by Year 8 (i.e., by June 30, 2026). The detailed components of the PCP due within Phase 1 are outlined in **Table 1-2**.

Table 1-2: Phase 1 Component Deadlines

Permit Year #	Year-End (June 30th)	PCP Component(s) Due	Status
Year 1	2019	N/A	N/A
Year 2	2020	Legal Analysis	Completed
Year 3	2021	Funding Source Assessment	Completed
Year 4	2022	PCP Scope	Completed
Year 5	2023	Descriptions of the following Phase 1 items: - Nonstructural controls - Structural controls - O&M program for structural controls - Implementation schedule - Phase 1 cost estimate - Written Phase 1 PCP - Full implementation of nonstructural controls	Completed
Year 6	2024	Performance Evaluation	Planned
Year 7	2025	Performance Evaluation	Planned
Year 8	2026	Performance Evaluation & Implementation of structural controls to achieve 20% of target phosphorus reduction	Planned
Year 9	2027	Performance Evaluation	Planned
Year 10	2028	Performance Evaluation & Implementation of structural controls to achieve 25% of target phosphorus reduction	Planned

Medfield acknowledges that to meet the phosphorus reduction deadlines set forth in the MS4 Permit, significant preparation is required. In order to plan for, to allocate funds for, design, and construct structural controls to meet the Year 8 and Year 10 reduction deadlines, there is significant work to be completed during the initial years of PCP implementation. Some controls that rely on local bylaws or regulatory updates, or engaging landowners directly through incentives, may take even longer to implement. This is taken into account as much as possible in the Phase 1 implementation schedule.

1.2 COMMUNITY CHARACTERIZATION AND WATERSHED

1.2.1 Town Description

The Town of Medfield is situated in Norfolk County and is approximately 18 miles northwest of Brockton and 19 miles southwest of Boston. Medfield has a total land area of approximately 14.6 square miles and a population of 12,273 (2000 census). The Town is bordered by Millis on the west; Sherborn on the northwest; Dover on the north and northwest; Walpole on the east and southeast; and Norfolk to the south. The Town of Medfield Locus Map is provided as **Figure 1**.

The Town of Medfield owns 201 distinct parcels, of which 172 parcels are entirely open space with no impervious area and 29 parcels contain structures and impervious surfaces. The town owns a total of 1,727.4 acres, including 64.9 acres of impervious area (only 3.8% of the town land). The town owned land includes the following:

- 1,662.5 acres of open space (96.2%);
- 21.9 acres of building area; and
- 43.0 acres of impervious ground surface.

Three of the publicly owned facilities are covered under the Phase 2NPDES industrial permitting and are operated by the Medfield DPW. These include the Transfer Station, Highway Garage and Wastewater Treatment Plant. In addition, the DPW maintains 75 miles of additional paved roadways (230-acres). The paved roads include former Massachusetts Highway Department Route 27 and Route 109. To better manage these assets, the DPW and PeopleGIS have developed a Geographic Information System (GIS) platform. The GIS base map is based on a flyover of the Town conducted on April 15, 2001 and field reconnaissance of drainage structures. The GIS platform indicates that there are 2,331 catch basins; 1,295 drain manholes; 361 outfalls (17 private) and 133 "culverts" (21 of which are private). The GIS data is posted to the local website: https://www.town.medfield.net/1793/Storm-Water-Information.

1.2.2 Local Watersheds

The town is located on a rugged upland area of both the Charles River and Neponset River watersheds. Much of the town is located northeast of the confluence of the Charles River and the Stop River. About 11.3 square miles (77.4%) percent of the town drains westerly to the Charles River through a number of brooks, including the Stop River. The remaining 3.3 square miles (22.6%) drain easterly toward the Neponset River. The largest watershed to the Neponset River is located at the southeastern corner of the town and conveys a majority of runoff to Neponset River in Walpole through the Mine Brook. About 8.8 square miles, or 77.9%, of the Charles River watershed and all of the Neponset River watershed is located in the 2010 Census urbanized area. The Summary of Key MS4 Watershed Areas is provided in **Table 1-3.**

Table 1-3: Summary of MS4 Watershed Areas

Area Description	Area (Square Miles)	Percentage
Town of Medfield	14.6	100% of Town
Charles River Watershed (CRW)	11.3	77.4% of Town
Neponset River Watershed (NRW)	3.3	22.6% of Town
Charles River Watershed Urbanized Area	8.8	60.3% of Town 77.9% of CRW
Charles River Water Non-Urbanized Area	2.5	17.1% of Town 22.1% of CRW
Neponset River Watershed Urbanized Area	3.3	22.6% of Town 100% of NRW

The Town of Medfield has been working with the Neponset Stormwater Partnership (NSP) on the priority ranking of sub-watersheds and assessment of site suitability for potential phosphorus control measures based on soil types and other factors. The Priority Watershed Sub-catchment Areas are shown on **Figure 1.2** and the Urbanized Area Map is provided as **Figure 1.3**. The NSP Nutrient Source Identification Report is provided in **Attachment One**.

1.2.3 Phosphorous Concerns in the Charles River Watershed

The Charles River watershed is home to over a million residents and collects water from a total land area of 308 square miles. The river twists and turns on an 80-mile route from Hopkinton to Boston Harbor. The river flows through 23 communities and the total watershed encompasses 35 communities, adding many political complexities to watershed management. Some 80 brooks and streams, and several major aquifers, feed the Charles River. The watershed contains many lakes and ponds, most of them manmade, many through the construction of dams. The river drops about 350 feet in its unhurried journey to the sea. Lacking speed and force, the slow-moving Charles River is naturally brownish in color, because the water seeps like tea through the abundant wetlands along its path.

The Division of Water Pollution Control has rated the Charles River in Medfield, as a Class B water body with warm water restrictions on dissolved oxygen, temperature, pH, Fecal Coliform Bacteria, solids, color and turbidity, oil and grease, taste and odor. Class B water bodies are suitable for use as a public water supply with appropriate treatment; for fish habitat and other aquatic life; for primary and secondary recreation; for irrigation and other agricultural uses; and for compatible industrial cooling and process uses. The upstream, non-tidal portion of the Neponset River (beyond mile marker 29.5) is also a Class B and a High-Quality Water Body with the same warm water restrictions.

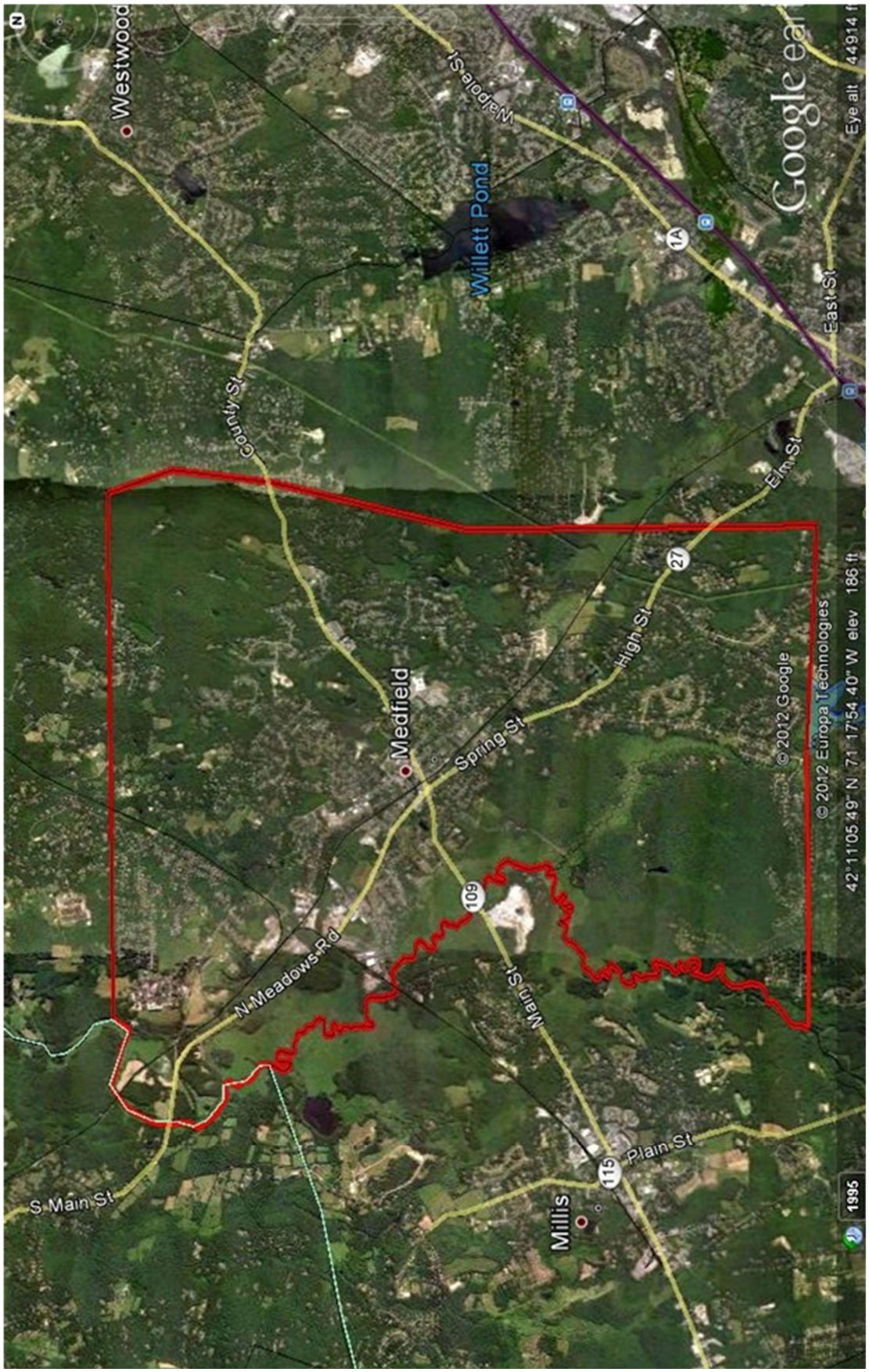


FIGURE 1.1
MEDFIELD LOCUS MAP

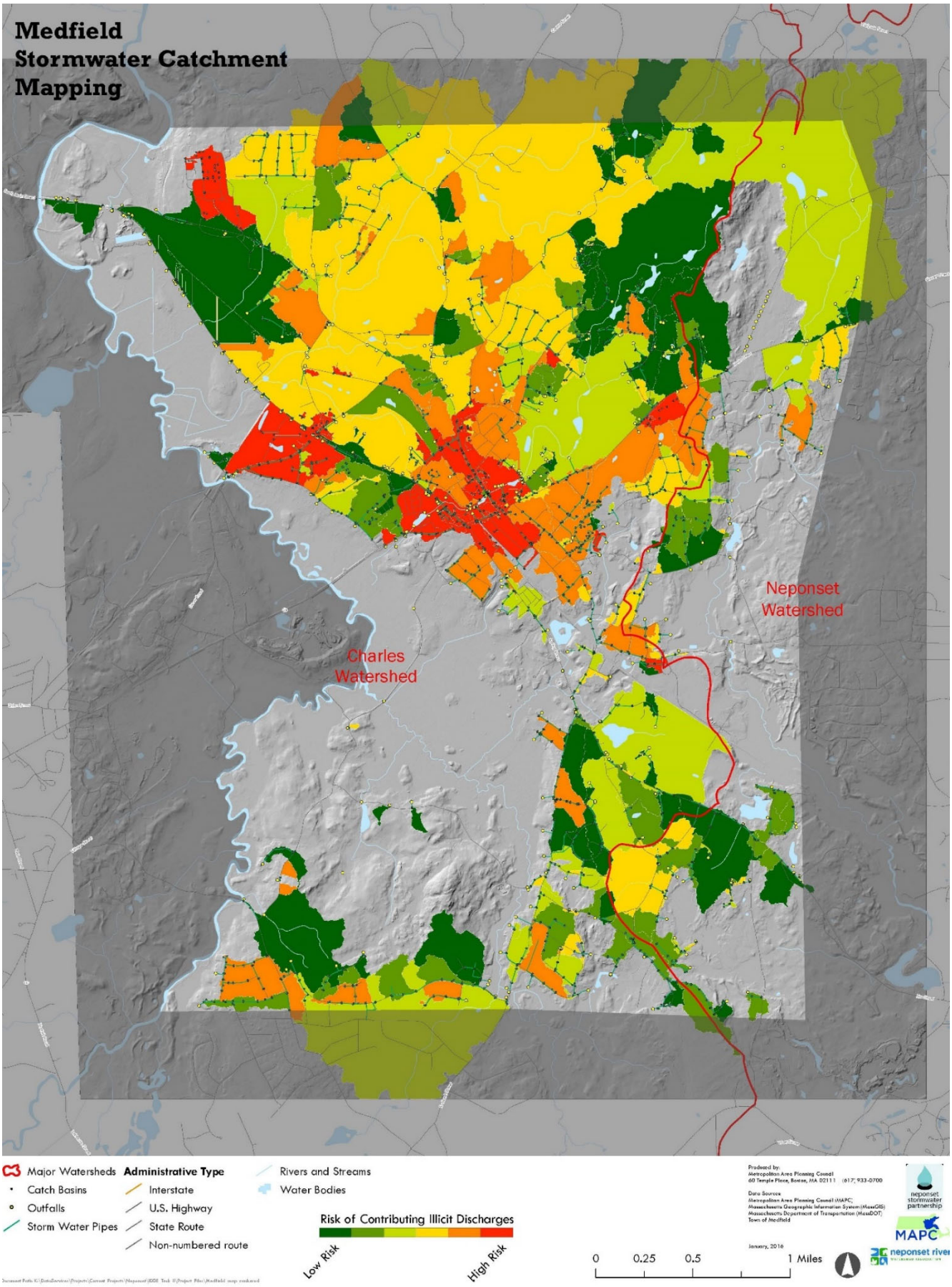
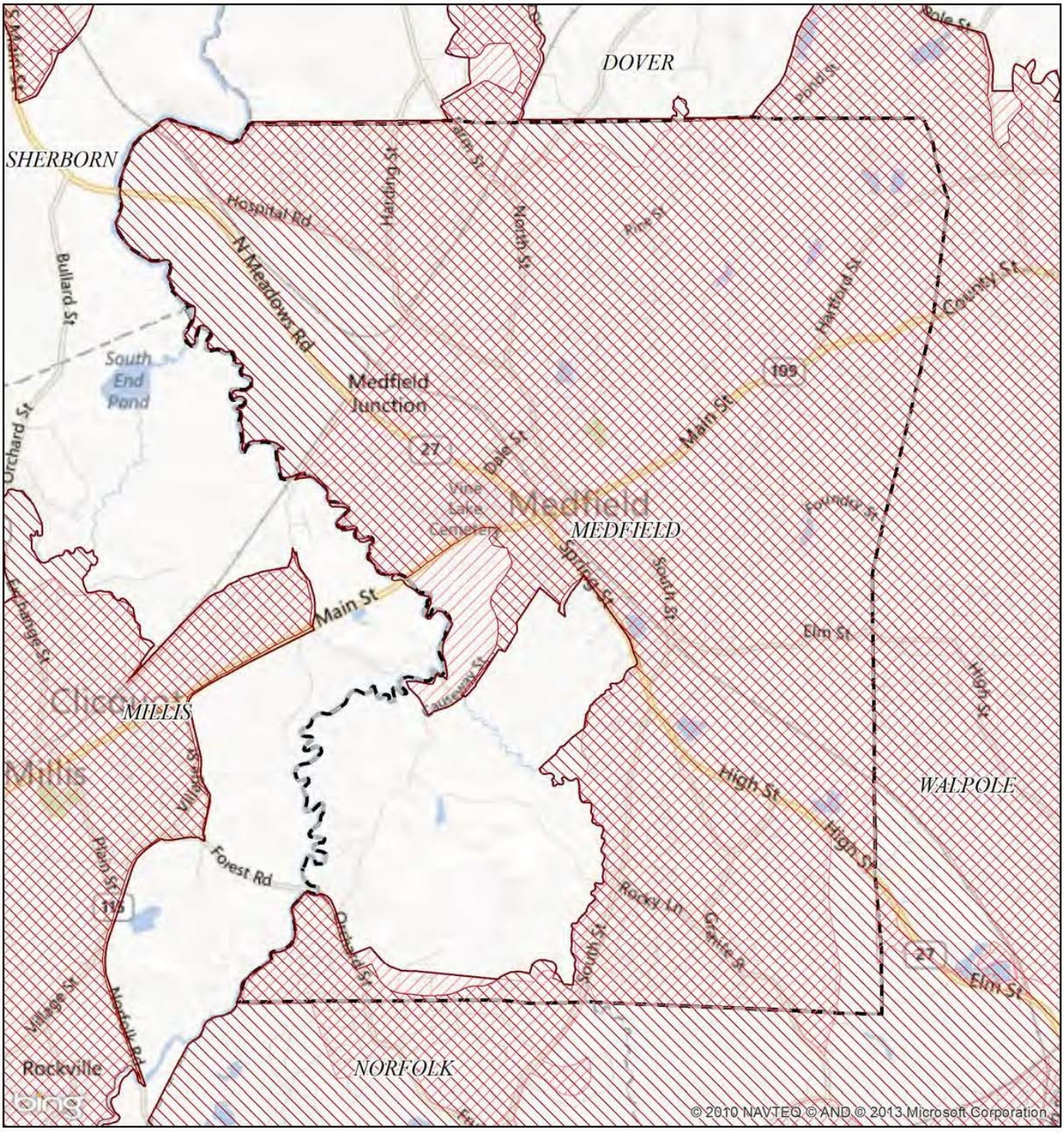
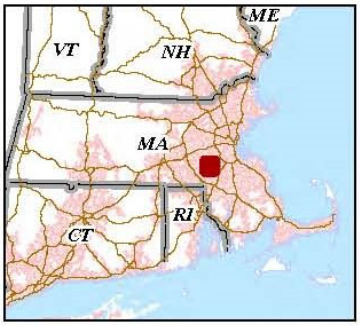


FIGURE 1.2
PRIORITY WATERSHED SUB-CATCHMENT AREAS





NPDES Phase II Stormwater Program
Automatically Designated MS4 Areas

Medfield MA

Regulated Area:

UA Based on 2000 Census	UA Based on 2010 Census

0 1 2 3 Kilometers

0 1 2 Miles

Town Population: **12024**

Regulated Population: **11520**

(Populations estimated from 2010 Census)

EPA

Urbanized Areas, Town Boundaries:
US Census (2000, 2010)
Base map © 2013 Microsoft Corporation

FIGURE 1.3
URBANIZED AREA MAP

The Charles is an urban river and is impaired for multiple pollutants that have altered and degraded habitat in many areas. The river has borne the brunt of much of the development in the greater Boston area through damming, pollution, and traditional development practices. A nearly five-decade cleanup effort has resulted in water quality improvements, primarily from elimination of industrial discharges and a significant reduction in untreated sewage flowing into the river. The primary challenge facing the river today is stormwater runoff and a total of three TMDLs have been developed: two for nutrients and one for bacteria. Phosphorus loading in stormwater runoff is a particular challenge to the river, leading to summertime cyanobacteria blooms and overgrowth of invasive aquatic plants in many areas of the watershed.

1.3 PCP AREA SELECTION

In 2023, the Town of Medfield was a "decision community" and was allowed to choose one of the following options to define its PCP Area:

(1) the entire area within its jurisdiction (for municipalities this would be the municipal boundary) within the Charles River Watershed; or

(2) only the urbanized area portion of the permittee's jurisdiction within the Charles River Watershed.

As a result, in its initial PCP, the town opted to implement the PCP within the MS4-regulated (urbanized) area because it is a smaller load and a smaller, more manageable area. However, the pending 2024 Draft MS4 General Permit revises the "decision community" standard and requires all municipalities in the Charles River watershed to use the entire municipal boundary. Therefore, the Town of Medfield has revised its PCP to align with the 2024 Draft General and From the MS4 General Permit and our allowable phosphorous load reduction will be based on the Full Watershed (General Permit Table F-2).

1.4 BASELINE AND ALLOWABLE P-LOADS, P-REDUCTION REQUIREMENTS

1.4.1 Targeted Baseline and Allowable P-Loads, and P-Reduction Requirements

The Baseline Phosphorus Load and Allowable Phosphorus Load will now correspond to the entire area within the Town's jurisdiction (the municipal boundary). This decision results in the corresponding Stormwater Phosphorous Load Reduction requirement with the PCP Area and the targeted milestones for the current Phase 1 (through 2028) and future Phase 2 and Phase 3 terms.

Medfield will be held responsible for the Allowable Phosphorus Load reported in Appendix F of the MS4 General Permit. For the entire municipal boundary, the Allowable Phosphorus Load is reported in Table F-2 of Appendix F, as shown in **Table 1-4** relative to the full watershed loads.

Table 1-4. Allowable Phosphorus Load Requirement

Condition	From the MS4 General Permit Full Watershed Table F-2	From the MS4 General Permit Urbanized Area Table F-3
Baseline P-Load, lbs/yr	2,105.4	**1,823.2**
Allowable P-Load, lbs/yr	1,347.0	**1,084.7**
Stormwater P-Load Reduction Requirement, lbs/yr	760.6	**738.5**
Phase 1 Requirements		
Year 8 (2026) Milestone: 20% of Reduction, in lbs/yr	152.1	**147.7**
Year 10 (2028) Milestone: 25% of Reduction, in lbs/yr	190.1	**184.6**

To achieve the target of reducing phosphorus load of 190.1 lbs/yr by 2028, Medfield will be planning and implementing a series of structural and non-structural BMPs, updating regulatory mechanisms as necessary to aid with achieving these goals, evaluating funding mechanisms and costs, and developing its O&M and recordkeeping programs to ensure continued compliance and functionality of all installed BMPs.

1.4.2 Adjusted Phosphorus Load Since 2005

The Baseline Load displayed in **Table 1-4** was calculated using land use data from 2005. Due to the limited development in Medfield, the anticipated phosphorus load has not changed significantly. As land use, development, and impervious cover changes, this information will be updated, ensuring that Medfield is on track to still achieve the required 20% and 25% reduction milestones by Years 8 and 10.

Table 1-5: Updated Phosphorus Load Characteristics is through Permit Year 5 (June 30, 2023) and accounted for the changes in the Town since 2005 and calculates the adjusted load reduction requirement using the existing non-structural and structural BMPs. As shown in the table, the 20% and 25% milestones are applied to this new reduction value to show how the load reduction requirements have evolved when the town accounts for current conditions. This effort will be replicated during the Performance Evaluations, which track not only the progress of implemented BMPs, but any changes to the annual export load.

Table 1-5. Updated Phosphorus Load Characteristics (thru June 30, 2023)

Condition	Value
Baseline P-Load, lbs/yr	2,105.4
Allowable P-Load, lbs/yr	1,347.0
Stormwater P-Load Reduction Requirement, lbs/yr	758.4
Current P-Load Reduction (from currently maintained BMPs) Non-Structural BMPs, lbs/yr = 54.9 Structural BMPs, lbs/yr = 197.23	252.1
Current Stormwater P-Load Reduction Requirement, lbs/yr	506.3
Year 8 Milestone: 20% of Reduction, in lbs/yr	151.7
Year 10 Milestone: 25% of Reduction, in lbs/yr	189.6

1.4 FUNDING SOURCE ASSESSMENT

The Town of Medfield has completed the Funding Source Assessment that is required under Appendix F of the MS4 Permit. The MS4 Permit requires that the Town describe known and anticipated funding mechanisms (e.g., general funding, enterprise funding, stormwater utilities, permit fees or penalties, user fees, grant funding, etc.) that will be used to fund PCP implementation as well as the steps it will take to implement its funding plan. The funding source assessment should include preferred funding sources, why they are appropriate and sufficient to fund PCP implementation, and a timeline to establish those funding sources. If a stormwater utility is being considered, you must account for a substantial public outreach and education campaign to garner support. The Funding Source Assessment is provided in **Attachment Two**.

Updates to the attached Funding Source Assessment will be made on a regular basis as the permit periods progress and the actual phosphorous load reductions are compared to the targeted goals. The assessment will consider planned non-structural and structural controls and associated estimates of probable cost over each phase of work. This assessment requires some iteration with other parts of the PCP not due until end of Permit Year 5.

2. PCP CONTROLS

In order to achieve the targeted phosphorous reduction milestones presented in **Table 1-5**, the Town of Medfield has and will implement several best management practices.

2.1 REGULATORY ENFORCEMENT

Since 2000, the Town of Medfield has identified existing regulatory mechanisms available to the MS4 (such as bylaws and ordinances) and has adopted several revisions that will be effective in implementing the PCP.

In the early years of the program, the changes were implemented by the town's Stormwater Management Committee that represented the various town departments, local regulators and the town's legal counsel. The work began with an extensive review of all local, state and federal requirements and adoption of a consistent streamlined set of requirements that met the MS4 Permit needs. Over the years, with the assistance of the local watershed associations, the Town has adopted new stormwater regulations as was required to be developed by end of MS4 Permit Year 2, Parts 2.3.6.b and 2.3.6.c.

A thorough legal analysis ensures that current rules and regulations meet Permit requirements and absolutely do not restrict or prohibit the implementation of BMPs. The town has enhanced its post-construction stormwater regulations through local stormwater bylaws and other mechanisms that impact development projects. The town also considered the legal avenues that can facilitate implementation of the PCP such as establishment of a Stormwater Utility and has not opted for a Stormwater Utility at this time.

The Neponset River Watershed Association (NRWA) and the Charles River Watershed Association (CRWA) have both reviewed Medfield's stormwater regulations and bylaws and to facilitate compliance with the phosphorus reduction requirements of Appendix F of the MS4 Permit. The adopted language allows the town to gather necessary stormwater management data (e.g., pre-development phosphorus load, post-development phosphorus load, load reductions associated with each structural BMP, operation and maintenance plan including responsible party) during project review processes and enables ongoing tracking of operation and maintenance of BMPs.

The regulatory review process has also allowed for an opportunity to engage the private sector in phosphorus reduction calculations and documentation of BMP maintenance by requiring submission of such calculations in permitted formats and regular maintenance reports. The regulatory changes are not required to be implemented until the end of the Permit term and have been generally made. The Town is using Microsoft Excel spreadsheets for existing and proposed BMP tracking and nutrient reduction tracking. In the future, the Town plans to use an EPA spreadsheet-based tool (BATT) that facilitates watershed and municipal based nutrient accounting, tracking and reporting associated with nutrient load reduction. The BATT tool simply requires Microsoft Excel 2013, Microsoft Word 2013, Security settings that 'enable macros' and an enabled MS Work 15.0 Object Library. The existing data is easily transferable to the BATT system.

2.2 NON-STRUCTURAL CONTROLS

This section describes the non-structural stormwater control measures necessary to support achievement of the phosphorus export milestones in **Table 1-5**. The description of non-structural controls includes the planned measures, the areas where the measures will be implemented, and the annual phosphorus reductions that are expected to result from their implementation in units of pounds per year (lbs/yr). Annual phosphorus reduction from non-structural BMPs shall be calculated consistent with Attachment 2 to Appendix F.

2.2.1 Current Non-Structural BMPs

Current non-structural BMPs are those that are anticipated to continue at current resource levels, or "business as usual." The enhanced non-structural BMPs are the same for both the entire Town of Medfield and the urbanized area. These include:

- ✓ twice per year street sweeping of 75 miles of roadway (230-acres), over 150 miles per year, with high efficiency equipment over 9 months/year,
- ✓ annual cleaning of 2,331 catch basins, and
- ✓ a DEP-approved leaf and litter collection program.

The credit information presented in **Table 2-1** is based on the Non-Structural Calculations provided in **Attachment Three**.

Table 2-1. Existing Non-Structural BMP Credits

Existing Non-Structural BMP	Implementation Levels	Average Annual Townwide P-Reduction (lbs/yr)	Average Annual Charles River Watershed P- Reduction (lbs/yr)
Street Sweeping	Town-wide	27.0	20.9
Catch Basin Cleaning	Town-wide	7.2	5.6
Leaf Litter Program	Town-wide	20.7	16.0
Total Existing Non-Structural Credit =		54.9	42.5

To comply with the 2024 Draft MS4 Permit revisions, all town-wide enhanced non-structural BMPs qualify for phosphorus reduction credits in the Charles River Watershed in accordance with Permit Appendix F, Attachment 2, and will count towards the required phosphorus reduction outlined in **Table 1-5**.

2.2.2 Proposed Non-Structural BMPs

The Town of Medfield did not make changes to its non-structural BMP controls in Permit Year 8, the year starting July 1, 2025 and ending June 30, 2026. Therefore, the following was conducted in Permit Year 8:

- ✓ Street Sweeping: twice per year street sweeping of 75 miles of roadway;

- ✓ CB Cleaning: annual cleaning of 2,331 catch basins; and
- ✓ Leaf Litter Program: DEP-approved leaf and litter collection program.

The phosphorus reduction associated with the proposed Year 8 changes are presented in **Table 2-2** and is based on the Non-Structural Calculations provided in **Attachment Four**.

Table 2-2. Planned Year 8 Non-Structural Control Summary

Planned Non-Structural BMP	Average Annual Acres Managed	Average Annual P-Reduction (lbs/yr)	Anticipated Urban Area P-Reduction (lbs/yr)
Street Sweeping	Town-wide	27.0	20.9
Catch Basin Cleaning	Town-wide	7.2	5.6
Leaf Litter Program	Town-wide	20.7	16.0
Total Existing Non-Structural Credit =		54.9	42.5

2.3 STRUCTURAL CONTROLS

The Town of Medfield developed a priority ranking system of areas and infrastructure for potential implementation of structural phosphorus controls during Phase 1. The ranking has been conducted with the assistance of the NSP and under a Section 604B grant. The work included the use of available screening and monitoring results collected during the permit term by the town and the NRWA pursuant to part 2.3.4.6 of the Permit. The 604B Grant List of Priority Structural BMP Sites in provided in **Attachment Five**.

This section describes the structural stormwater control measures necessary to support achievement of the phosphorus export milestones in Table 1-5. The description of structural controls includes the existing and planned existing measures, the areas where the measures will be implemented or are currently implemented, and the annual phosphorus reductions in units of pounds/year that are expected to result from their implementation. Structural measures to be implemented by a third party may be included in a municipal PCP. Annual phosphorus reductions from structural BMPs shall be calculated consistent with Permit Appendix F, Attachment 3.

Medfield will employ structural BMPs to detain, treat, and better manage runoff from well-defined areas of impervious surface, such as roads, parking lots, or rooftops. Semi-structural BMPs are more passive stormwater management approaches that can still produce excellent water quality benefits such as rainwater harvesting, impervious area disconnection, conversion of impervious area to pervious, and enhancement of pervious areas. For the purposes of this document, the term structural control refers to both structural and semi-structural BMPs.

Structural BMPs historically have been incorporated into Medfield via stormwater compliance projects (for public and private development projects), using various sources of grant funding, or as part of our capital infrastructure program. The Town has historically and plans to continue address structural BMPs on private properties by obtaining calculations from private developers

through the existing provisions in the local regulations to enable this. Structural BMPs that have already been implemented are evaluated in Section 2.3.1.

Our planning in support of PCP development determined that a significant investment in structural BMPs will be required to achieve the required target phosphorus reductions. Structural BMP opportunities were evaluated to allow for adaptive management during the development and execution of the PCP, that is presented below.

The following sections describe the assessment, performance and implementation of Planned Structural BMPs (those that were built, or designed and are planned for implementation prior to development of this PCP) and Proposed Structural BMPs (those that were newly identified for PCP compliance or will be implemented after this written PCP is submitted).

2.3.1 Current Structural BMPs

This section summarizes the local implementation mechanisms (regulatory, capital improvements, grant funding, repaving programs, etc.) that have resulted in the implementation of existing structural BMPs and quantifies the phosphorus reductions with the associated current structural BMPs. This section reports the results of the structural BMP accounting from Calculation Support Worksheet No. 2, Part (2c) in Appendix R.2, that have been updated through the Permit Year 8 deadline (June 30, 2026). Planned structural BMPs beyond Permit Year 8 are provided in Section 2.3.2.

The Town of Medfield currently employs a mix of regulatory, incentive programs and capital improvement programs to implement structural BMPs. To date, the DPW has inventoried eighty-two known structural BMPs within the PCP Area. Of these BMPs, the Town has assessed the P-Load reduction associated with all eighty-two. Additional structural BMPs may also be evaluated for P-Load reduction potential when and if they are located.

The eighty-two constructed structural BMPs have resulted in phosphorus reductions outlined in **Table 2-3** and further detailed in **Attachment Five**. The reductions in the table are presented on a high-level for summary, and all of the calculations were performed following the equations and requirements in Attachment 3 to Appendix F of the Permit. Through Permit Year 8 (June 30, 2026), it is estimated that seventy-eight known structural BMPs in the Town contributed to an annual P-load reduction of 234.01 lbs/yr. This is up from the estimated 197.2 lbs/yr in 2023. This is due to the following newer structural BMPs:

- In 2024, installed swBMP-21B (OF-222) at 55 North Meadows Road for 23.22 lbs/yr.
- In 2025, installed swBMP-80 (OF-191) at South Street and Wilson Street for 10.71 lbs/yr.
- In 2025, installed swBMP-81 (OF144) at the Montrose School for 2.85 lbs/yr.

Table 2-3. Summary of Current Structural Controls

BMP ID	LOCATED	WATERSHED	LOCATION	P-LOAD REDUCTION
swBMP-1	x	OF-558 TO OF-240	55 North Meadows Road	12.18
swBMP-2	x	OF-512	Ice House Road	1.67
swBMP-3	x	OF-374	Memorial School at North Street	2.60
swBMP-4	x	OF-377	Memorial School, 56 Adams Street School	0.54
swBMP-5	x	OF-555 UPSTREAM SWBMP-3	Memorial School at North Street	-
swBMP-6	x	OF-556 UPSTREAM SWBMP-3	Memorial School at North Street	-
swBMP-7	x	OF-557 OF-425	Janes Ave. Outfall	4.87
swBMP-8	x	OF-394	44 Hospital Road	1.73
swBMP-9	x	UPSTREAM OF SWBMP-21B	Public Safety Building, 112 North Street	-
swBMP-10	x	UPSTREAM OF SWBMP-21B	Public Safety Building, 112 North Street	-
swBMP-11	x	UPSTREAM OF SWBMP-21B	Public Safety Building, 112 North Street	-
swBMP-12	x	UPSTREAM OF SWBMP-21B	Public Safety Building, 112 North Street	-
swBMP-13	x	OF-222	Dale street school parking lot	0.74
swBMP-14	x	OF-554 (OF-75)	45 Green Street Swim Pond	18.13
swBMP-15	x	OF-7	7 Frairy Street Derby House	0.06
swBMP-16	x	OF-558 TO OF-240	55 North Meadows Road	3.86
swBMP-17	x	OF-558 TO OF-240	55 North Meadows Road	3.22
swBMP-18	x	OF-558 TO OF-240	55 North Meadows Road	0.05
swBMP-19	x	OF-558 TO OF-240	55 North Meadows Road	0.62
swBMP-20	x	OF-558 TO OF-240	55 North Meadows Road	0.62
swBMP-21A	x	OF-223	55 North Meadows Road, Behind fuel tank	3.01
swBMP-21B	2024	OF-222	55 North Meadows Road, Forebay Connect	23.22
swBMP-22	x	OF-393 OF-386 OF-545	Birch Lane	11.06
swBMP-23	x	OF-490	10 Earle Kerr Road	3.20
swBMP-24	x	OF-488	Ledgetree Road	7.53
swBMP-25	x	OF-559 CB-355	10 Cole Drive	0.76
swBMP-26	x	OF-172 OF-469	7 Kettle Pond Way	0.39
swBMP-27	x	OF-529 TO OF-530 OF-531	High School at 88R South Street Parking Lot	15.38
swBMP-28	x	OF-529 TO OF-530 OF-531	High School at 88R South Street Parking Lot	12.88
swBMP-29	x	OF-529 TO OF-530 OF-531	High School at 88R South Street Parking Lot	12.88
swBMP-30	x	OF-536	High School at 88R South Street	0.48
swBMP-31	x	OF-560 UPSTREAM OF-244	2 Ice House Road	0.00

BMP ID	LOCATED	WATERSHED	LOCATION	P-LOAD REDUCTION
swBMP-32	x	OF-562 UPSTREAM OF-244	2 Ice House Road	0.00
swBMP-33	x	OF-174	245 South Street	9.20
swBMP-34	x	OF-169 OF-167	10 Loeffler Lane	8.97
swBMP-35	x	OF-536	Middle School at 24 Pound Street	0.57
swBMP-36	x	OF-503 OF-502	Quarry Road	13.30
swBMP-37	x	OF-270	15 Boyden Road	0.28
swBMP-38	x	OF-271	17 Boyden Road	0.47
swBMP-39	x	OF-563 UPSTREAM OF-273	Vine Brook Road at 22 Boyden Road Yard	0.00
swBMP-40	x	OF-272	Vine Brook Road at 22 Boyden Road	1.77
swBMP-41	x	OF-573 UPSTREAM OF-273	Vine Brook Road	0.32
swBMP-42	x	OF-573 UPSTREAM OF-273	Vine Brook Road	0.32
swBMP-43	x	OF-499	39 Vine Brook Road	-
swBMP-44	x	OF-566 UPSTREAM OF-149	22 Minuteman Road	0.66
swBMP-45	x	OF-501	22 Minuteman Road	3.11
swBMP-46	x	OF-317	11 Jade Walk	3.95
swBMP-47	x	OF-508 OF-509 OF-510	Walden Court	1.51
swBMP-48	x	OF-403 OF-404	17 Hawthorne Drive	2.15
swBMP-49	x	OF-506	78 Flint Locke Lane	4.23
swBMP-50	x	OF-229	4 Grist Mill Road	1.63
swBMP-51	x	OF-336	Robinson Road	2.31
swBMP-52	x	OF-336 UPSTREAM SWBMP-51	Robinson Road	-
swBMP-53	x	OF-354	Baker Road	4.99
swBMP-54	x	OF-500 OF-574	39 Vine Brook Road	2.53
swBMP-55	x	OF-401 OF-402	Walden Court	1.56
swBMP-56	x	OF-505	Erik Road	0.01
swBMP-57	x	OF-504 UPSTREAM OF-149	25 Erik Road	0.00
swBMP-58	x	OF-503 DOWNSTREAM SWBMP-36	Quarry Road	0.00
swBMP-59	x	OF-230	Haven Road	1.33
swBMP-60	x	OF-168	Wild Holly Lane	1.90
swBMP-61		UNKNOWN		
swBMP-62	x	OF-227	Powder House Road	0.61
swBMP-63	x	OF-227	Powder House Road	0.61
swBMP-64	x	OF-227	Powder House Road	0.61
swBMP-65	x	OF-227	Powder House Road	0.61

BMP ID	LOCATED	WATERSHED	LOCATION	P-LOAD REDUCTION
swBMP-66	x	OF-355 OF-546	1 Rockwood Lane	0.34
swBMP-67	x	OF-355 OF-546	3 Rockwood Lane	0.87
swBMP-68	x	OF-355 OF-546	3 Rockwood Lane	0.87
swBMP-69	x	OF-355 OF-546	1 Rockwood Lane	0.15
swBMP-70	x	OF-516	Ice House Road	0.15
swBMP-71	x	UNDEFINED	Prentiss Place	0.65
swBMP-72	x	UNDEFINED	11 Prentiss Place, Unit 11	0.65
swBMP-73	x	CB-2306	Prentiss Place	0.31
swBMP-74	x	CB-2306	Prentiss Place	0.31
swBMP-75	x	CB-2306	Prentiss Place	0.31
swBMP-76	x	OF-511	Ice House Road	2.60
swBMP-77	x	OF-507 OF-575 UPSTREAM OF-390	Green Street and 57 Flint Locke Lane	1.45
swBMP-78	x	OF-390 DOWNSTREAM SWBMP-77	Green Street and 57 Flint Locke Lane	0.00
swBMP-79	x	OF-536	Middle School at 24 Pound Street	0.57
swBMP-80	2025	OF-191	South Street and Wilson Street	10.71
swBMP-81	2025	OF-144	Montrose School, 29 North Street Field	2.85
			ESTIMATED TOAL (LBS/YR) =	**234.01**

2.3.2 Planned Structural BMPs

The Town of Medfield has used the following to build its PCP approach:

- EPA's recommended PCP Guidance Tools;
- NSP nutrient loading reports and subwatershed mapping; and
- PeopleGIS mapping tolls.

Favorable locations for BMPs were based on suitability and need as well as additional social considerations such as Environmental Justice Communities and Greenspace Deserts. Maps display areas considered a priority for upland restoration based on a conservation and restoration tool developed by CRWA and The Nature Conservancy (TNC), this tool is also available online at:

https://maps.coastalresilience.org/massachusetts

The Town's prioritization considered the largest (>5 acre) continuous impervious areas that are publicly owned (based on available data in MassGIS and the Medfield GIS). Highly impervious publicly owned sites are often good sites to implement town-controlled projects and can be opportunities to receive a large amount of pollutant removal. Many of these sites are schools and municipal buildings and can therefore offer considerable public education opportunities.

Working with the NSP, the town first identified areas (including municipal properties with significant impervious cover (including parking lots, buildings, and maintenance yards) and infrastructure (e.g., drainage systems, roadway projects, etc.) where BMP implementation may be easiest and provide the most pollution reduction benefits (a.k.a. "priority ranking"). The following was used to identify and rank priority areas and infrastructure:

- Available screening and monitoring results collected during the permit term either by the municipality (e.g., IDDE dry and/or wet weather outfall screening) or another entity (watershed organization, public health agency, state agency, etc.). The intent of using these data is to help communities identify catchments with higher phosphorus loading and plan to address those areas with phosphorus BMPs through the PCP as soon as possible.
- The MS4 mapping (Phase 1 and Phase 1I), including any of the recommended elements (e.g., sanitary sewer, septic systems, topo, private drainage, etc.) included in the mapping per Part 2.3.4.5 of the Permit. The intent of this is to support the suitability assessment, and ultimately site selection. Opportunities sites located at the downstream end of large drainage areas map provide considerable pollution reduction opportunities through the implementation of a single BMP.
- Site suitability based on soil types and other factors including access for maintenance purposes; subsurface geology; depth to water table; proximity to aquifers and subsurface infrastructure including sanitary sewers and septic systems; opportunities for public use and education.
- Capital plans for facilities, utility including sewer and drainage work, roadway programs including paving.
- Current storm sewer level of service.
- Discharges to water quality limited waters, first or second order streams, public swimming beaches, drinking water supply sources, and shellfish growing areas may be appropriate to

target first because of the additional public health benefits improved water quality can provide.

The following was used to identify and rank priority areas and infrastructure:

- ✓ Previously developed watershed management plans and results from watershed planning tools (i.e. EPA's Opti Tool).
- ✓ Development/redevelopment permits, as any site undergoing new or redevelopment poses an opportunity to install structural BMPs.
- ✓ Anticipated private projects.
- ✓ Results from the Charles River Flood Model (anticipated to be available online in summer 2021).
- ✓ MVP, Open Space, Local Hazard Mitigation, Master and other local plans.
- ✓ Green infrastructure co-benefits, community wants and needs, as well as political climate.
- ✓ Implementation mechanisms that suit the political and physical constraints.

The Town of Medfield's BMP priority ranking was intentionally kept simple because the guiding parameters and impacts can change frequently. The Tow's ranking system was:

- ➢ High = planned public or private projects which will incorporate BMPs, likely to be constructed before year 8.
- ➢ Medium = favorable site conditions on municipally controlled parcels and roadways and/or "pollutant hotspot" based on screening and monitoring, opportunity site based on community values such as equity, habitat restoration, climate adaptation, education, or other; likely to be constructed before year 10. This can also include private sites likely to be redeveloped during Phase 1I.
- ➢ Low = least favorable site conditions based on site suitability, sites unlikely to undergo redevelopment in the near term, sites not likely to be implemented during Phase 1.

The planned structural BMPs are listed in **Attachment Five** and are summarized in **Table 2-4**.

Table 2-4. Planned Structural Control Summary

Planned Structural BMP Site Locations	Outfall #	BMP Type	Acres Managed (Impervious and Pervious Area)	Potential Est. Annual P-Reduction (lbs/yr)
~~Medfield Highway Department~~	~~OF-222~~	~~DMH diversion to forebay upstream of detention area~~	~~21.32~~	~~23.22 (2024)~~
~~South Street & Wilson Street~~	~~OF-191~~	~~Earthen Dry Infiltration Basin & Rip-rap Outlet~~	~~22.67~~	~~13.39 (2025)~~
West Street	OF-353	Rip-rap Dry Infiltration Basin	36.87	21.03
West Street	OF-464	Rip-rap Dry Infiltration Basin and Galleys	40.13	29.72
Wheelock School	OF-475	Infiltration Galleys & Rain Garden	3.80	2.08
Medfield High School	OF-529	Infiltration galleys/basin	104.74	57.67
Medfield High School & Medfield Middle School	OF-536	Infiltration galleys/basin	1.59	2.14
Medfield Middle School	OF-538	Infiltration galleys/basin	0.59	0.32
Metacomet Park	(OF-227)	Surface feature such as infiltration cell	-	-
North Street at Harding/Winter	OF-113	Infiltration basin, bio retention basin, swale	27.38	6.68
Medfield WWTP	OF-532	Large infiltration basin or bioretention cell	2.09	0.62
Medfield WWTP	OF-533	Large infiltration basin or bioretention cell	2.18	1.33
Memorial School	OF-377	Rain gardens	14.16	6.06
Parking Lot on Janes Avenue	OF-425	Infiltration basin	3.48	3.26
Vine Lake Cemetery	OF-344	Rain garden or small bioretention	27.87	7.43
Senior Center (Kensington Club)	OF-511	Reroute water to existing infiltration basin	39.92	7.01
Estimated Totals			304.80	145.35

2.4 OPERATION AND MAINTENANCE (O&M) PROGRAM FOR EXISTING AND PLANNED STRUCTURAL BMPS

The Town of Medfield has established an Operation and Maintenance (O&M) Program for all existing structural BMPs being claimed for phosphorus reduction credit as part of Phase 1 of the PCP. The town will also do the same for all proposed BMPs. This includes BMPs implemented to date as well as BMPs to be implemented during Phase 1 of the PCP. The O&M Program shall become part of the PCP and include:

- ✓ inspection and maintenance schedule for each BMP according to BMP design or manufacturer specification and

- ✓ the public department or private entity responsible for BMP maintenance.

The Town of Medfield BMP O&M Program is documented in **Attachment Six**. The maintenance programs span many tools and departments, including conservation, planning, stormwater regulations/ ordinances /bylaws, other local code, good housekeeping practices, etc. The attached clearly outlines who will be conducting BMP maintenance (i.e. private developers, municipal staff or contractors, or NGOs/private landowners) for each BMP being credited under the PCP. At the present time the Town does not anticipate an increase in the O&M needs. However, in time many of the watershed planning tools provide maintenance requirement guidelines to anticipate increased FTEs, equipment, and labor hours as BMPs increase over time.

It will be the responsibility of the Medfield Department of Public Works Director to communicate to responsible parties and to set maintenance standard for all BMP responsible parties. In the future, the town will consider self-certification programs as one means of meeting requirements for certifying maintenance of privately owned BMPs for which reductions are claimed on an annual basis.

For municipally owned structural BMPs, the O&M program will be defined by and/or modify the written plan prepared under this report and/or by O&M Plans prepared and approved under local permitting processes including Conservation, Planning, Stormwater, etc.. The goal will be to create consistency as appropriate. In accordance with MS4 Permit Part 2.3.7.a. iii, at a minimum, "all permittee-owned stormwater treatment structures (excluding catch basins) shall be inspected annually at a minimum."

2.5 PHASE 1 IMPLEMENTATION SCHEDULE

This section outlines the implementation schedules determined for each BMP type (structural, non-structural, non-traditional) and the corresponding implementation of the O&M program (e.g. by when will new staff need to be hired). The schedule has been developed with a goal of meeting the Year 8 and Year 10 phosphorus load milestones identified in **Table 1-5**.

As required by the Permit, the schedule for implementation of all planned Phase 1 BMPs, shall including, as appropriate: obtaining funding, training, purchasing, construction, inspections, monitoring, operation and maintenance activities, and other assessment and evaluation components of implementation. Implementation of planned BMPs must begin upon completion of the Phase 1 Plan, and all non-structural BMPs shall be fully implemented within six years of the permit effective date. Structural BMPs shall be designed and constructed to ensure the permittee will comply with the 8 and 10 year phosphorus load milestones established in Table F-1 [of Appendix F of the MS4 Permit]. The Phase 1 plan shall be fully implemented as soon as possible, but no later than 10 years after the effective date of permit.

Medfield has prepared an implementation schedule for Phase 1 of the PCP. This schedule is included in **Attachment Seven**. Additional detail is available from the Medfield DPW. In the future, the Town of Medfield may use CMMS programs, Microsoft Project, Asset Management Software, etc., to track the overall PCP schedule instead. In any event, the proposed schedule will align with other planned projects (public and private), such as roadway, utility, and/or facility upgrades and improvements.

In preparing the initial schedule below in 2023, the town considered how to fully implement non-structural BMPs in Permit Year 6 (June 30, 2024) while also effectively working backwards from Permit Year 10 for the overall planning effort. To date, in Permit Year 8, the non-structural BMPs are anticipated to reduce a total of 54.9 lbs/yr of phosphorus in Phase 1 of the PCP. The structural and semi-structural BMPs are anticipated to reduce a total of 234.0 lbs/yr of phosphorus in Phase 1 of the PCP. The combined non-structural and structural BMPs through Permit Year 8 totals 288.9 lbs/yr, or 189% of the target phosphorus reduction of 152.1 lbs/yr. The implementation schedule in Appendix F further details the schedule for BMP implementation.

2.6 ESTIMATED COST FOR IMPLEMENTING PHASE 1 OF THE PCP

In 2023, the Town of Medfield has estimated the cost of implementing the Phase 1 non-structural and structural controls and associated Operation and Maintenance Program. This cost estimate shall be used to assess the validity of the funding source assessment completed by year 3 after the permit effective date and to update funding sources as necessary to complete Phase 1. This cost estimate is included in **Attachment Eight**. Additional detail is available from the Medfield DPW.

The Town recognizes that developing accurate cost estimates is a very community-specific tasks. Construction costs; including labor, materials, police detail, equipment rental, etc.; vary considerably across communities and will even vary within a community between projects. Additionally, construction costs are only one element of the life cycle cost of new infrastructure that the community should consider. The Town of Medfield DPW is also more that capable of constructing the BMPs in-house. For these reasons the Town of Medfield communities that wish to perform the cost estimates on its own.

2.7 PERFORMANCE EVALUATIONS

The town has evaluated the effectiveness of the PCP by tracking the phosphorus reductions achieved through implementation of structural and non-structural BMPs and tracking increases resulting from development. Phosphorus reductions shall be calculated consistent with Attachment 2 to Appendix F (non-structural BMP performance) and Attachment 3 to Appendix F (structural BMP performance) for all BMPs implemented to date. Phosphorus export increases since 2005 due to development shall be calculated consistent with Attachment 1 to Appendix F. Phosphorus loading increases and reductions in unit of lbs/yr shall be added or subtracted from the applicable Baseline Phosphorus Load given in Table F-2 or Table F-3 [of Appendix F of the MS4 Permit] depending on the Scope of PCP chosen to estimate the yearly phosphorous export rate from the PCP Area. The permittee shall also include all information required in part I.2 of this Appendix in each performance evaluation. Performance evaluations will be included as part of each permittee's annual report as required by part 4.4 of the Permit.

2.7.1 Performance Evaluation for Year 6

Medfield completed the required Performance Evaluation that assesses our PCP progress in Year 6 (through June 30, 2024). A summary of the Town of Medfield's performance in Year 6 is included in **Table 2-5**.

Table 2-5. Year 6 Performance Evaluation Summary

Parameter	Value (lbs/yr)
Baseline Load	2,105.4
Allowable Load	1,347.0
Calculations to Update to Current Conditions	
Changes in P-Load Since 2005	0.0
Current Phosphorus Load = Baseline +/- Impacts	2,105.4
Updated Phosphorus Reduction Required to Meet Allowable Load (Allowable Load)	758.4
Year 8 Milestone, 20% of Reduction (lbs/yr)	152.1
Year 10 Milestone, 25% of Reduction (lbs/yr)	190.1
Phosphorus Credits for Year 6	
Total P-Reduction from Non-Structural BMPs (lbs/yr)	54.9
Total P-Reduction from Existing Structural BMPs (lbs/yr)	220.4
TOTAL P-REDUCTION (lbs/yr)	275.3
Evaluation	
Remaining Phosphorus Reduction Requirement (Updated Phosphorus Reduction Requirement to Meet Allowable Load – Total Reductions)	483.1

Based on the Year 6 evaluation, Medfield successfully reduced phosphorus by 275.3 lbs/yr, and 483.1 lbs/yr is required to meet the Phase 1 milestone reduction of 758.4 lbs/yr.

Based on this evaluation, the Town of Medfield has exceeded the Year 8 milestone of 20% progress toward meeting our required reduction. We continue to implement BMPs to achieve credits and based on our implementation schedule outlined in Section 9.

2.7.2 Performance Evaluation for Year 7

Medfield has completed the required Performance Evaluation that assesses our PCP progress through Year 7 (through June 30. 2025). A summary of Medfield's performance through Year 7 is included in **Table 2-6**.

Table 2-6. Year 7 Performance Evaluation Summary

Parameter	Value (lbs/yr)
Baseline Load	2,105.4
Allowable Load	1,347.0
Calculations to Update to Current Conditions	
Changes in P-Load Since 2005	0.0
Current Phosphorus Load = Baseline +/- Impacts	2,105.4
Updated Phosphorus Reduction Required to Meet Allowable Load (Allowable Load)	758.4
Year 8 Milestone, 20% of Reduction (lbs/yr)	152.1
Year 10 Milestone, 25% of Reduction (lbs/yr)	190.1
Phosphorus Credits for Year 6	
Total P-Reduction from Non-Structural BMPs (lbs/yr)	54.9
Total P-Reduction from Existing Structural BMPs (lbs/yr)	234.0
TOTAL P-REDUCTION (lbs/yr)	288.9
Evaluation	
Remaining Phosphorus Reduction Requirement (Updated Phosphorus Reduction Requirement to Meet Allowable Load – Total Reductions)	469.5

Based on this year's evaluation, Medfield has successfully reduced phosphorus by 288.9 lbs/yr, and 469.5 lbs/yr is required to meet the Phase 1 milestone reduction of 758.4 lb/yr.

Based on this evaluation, the Town of Medfield has exceeded its Year 8 milestone of 20% reduction (152.1 lbs/yr). We continue to implement BMPs to achieve credits, based on our implementation schedule outlined in Section 9, we are on track to meet our implementation rate.

2.7.3 Performance Evaluation for Year 8

Medfield has completed the required Performance Evaluation that assesses our PCP progress through Year 8 (through June 30, 2026). A summary of Medfield's performance through Year 8 is included in **Table 2-7**.

Table 2-7. Year 8 Performance Evaluation Summary

Parameter	Value (lbs/yr)
Baseline Load	2,105.4
Allowable Load	1,347.0
Calculations to Update to Current Conditions	
Changes in P-Load Since 2005	0.0
Current Phosphorus Load = Baseline +/- Impacts	2,105.4
Updated Phosphorus Reduction Required to Meet Allowable Load (Allowable Load)	758.4
Year 8 Milestone, 20% of Reduction (lbs/yr)	152.1
Year 10 Milestone, 25% of Reduction (lbs/yr)	190.1
Phosphorus Credits for Year 6	
Total P-Reduction from Non-Structural BMPs (lbs/yr)	54.9
Total P-Reduction from Existing Structural BMPs (lbs/yr)	**T.B.D.**
TOTAL P-REDUCTION (lbs/yr)	**T.B.D.**
Evaluation	
Remaining Phosphorus Reduction Requirement (Updated Phosphorus Reduction Requirement to Meet Allowable Load – Total Reductions)	**T.B.D.**

Based on this year's evaluation, Medfield has successfully reduced phosphorus by ##AMOUNT## lbs/yr, and ##HAS OR HAS NOT## met the Phase 1 milestone reduction of ##PHASE 1 MILESTONE##.

2.7.4 Performance evaluation for Year 9

Medfield has completed the required Performance Evaluation that assesses our PCP progress through Year 9. Documentation of the Land Development Impacts and Phosphorus Credits for this effort is included in ##LOCATION##.

A summary of Medfield's performance through Year 9 is included in **Table 2-8**.

Table 2-8. Year 9 Performance Evaluation Summary

Parameter	Value (lbs/yr)
Baseline Load	2,105.4
Allowable Load	1,347.0
Calculations to Update to Current Conditions	
Changes in P-Load Since 2005	0.0
Current Phosphorus Load = Baseline +/- Impacts	2,105.4
Updated Phosphorus Reduction Required to Meet Allowable Load (Allowable Load)	758.4
Year 8 Milestone, 20% of Reduction (lbs/yr)	152.1
Year 10 Milestone, 25% of Reduction (lbs/yr)	190.1
Phosphorus Credits for Year 9	
Total P-Reduction from Non-Structural BMPs (lbs/yr)	54.9
Total P-Reduction from Existing Structural BMPs (lbs/yr)	**T.B.D.**
TOTAL P-REDUCTION (lbs/yr)	**T.B.D.**
Evaluation	
Remaining Phosphorus Reduction Requirement (Updated Phosphorus Reduction Requirement to Meet Allowable Load – Total Reductions)	**T.B.D.**

Instructions: Divide the remaining requirement into the number of years to your first deadline to estimate an average yearly requirement to build reductions. Compare this to your planned BMPs, and comment on if this indicates that you are on track or not.

Tip/Trick: You can estimate if the Town of Medfield is on track by looking at how many lbs/yr you will have to remove each year over two additional years to achieve the Year 8 Milestone, and then comparing that to your planned nonstructural and structural BMPs. For Example, if you have 20 lbs/yr left to reach your Year 10 Milestone, but your planned BMPs only total 15 lbs/yr, you are not currently on track to meet your Year 10 Milestone.

Note: If the Town of Medfield is not on track to meet the Year 10 milestone of 20% reduction, the Performance Evaluation should include a plan for Year 9 and Year 10 to increase non-structural and/or structural BMP implementation, improve identification and maintenance of previously installed BMPs, changes to Legal Analysis, and increases/changes to Funding Source Assessment.

Based on this year's evaluation, Medfield has successfully reduced phosphorus by ##AMOUNT## lbs/yr, and ##REMAINING## lbs/yr is required to meet the Phase 1 milestone reduction of ##PHASE 1 MILESTONE##.

Based on this evaluation, the Town of Medfield ##IS OR IS NOT## on track to meet the Year 10 milestone of ##PERCENT## reduction. To meet this milestone, we have to continue to implement BMPs to achieve credits at a rate of ##LBS/YR## lbs/yr, and based on our implementation schedule outlined in Section 9, we are on track to meet this implementation rate.

2.7.5 Performance evaluation for Year 10

Note: Be sure to compare this evaluation to the Year 10 milestone of 25% reduction.

Medfield has completed the required Performance Evaluation that assesses our PCP progress through Year 10. Documentation of the Land Development Impacts and Phosphorus Credits for this effort is included in ##LOCATION##.

A summary of Medfield's performance through Year 10 is included in **Table 2-9**.

Table 2-9. Year 10 Performance Evaluation Summary

Parameter	Value (lbs/yr)
Baseline Load	2,105.4
Allowable Load	1,347.0
Calculations to Update to Current Conditions	
Changes in P-Load Since 2005	0.0
Current Phosphorus Load = Baseline +/- Impacts	2,105.4
Updated Phosphorus Reduction Required to Meet Allowable Load (Allowable Load)	758.4
Year 8 Milestone, 20% of Reduction (lbs/yr)	152.1
Year 10 Milestone, 25% of Reduction (lbs/yr)	190.1
Phosphorus Credits for Year 9	
Total P-Reduction from Non-Structural BMPs (lbs/yr)	54.9
Total P-Reduction from Existing Structural BMPs (lbs/yr)	**T.B.D.**
TOTAL P-REDUCTION (lbs/yr)	**T.B.D.**
Evaluation	
Remaining Phosphorus Reduction Requirement (Updated Phosphorus Reduction Requirement to Meet Allowable Load – Total Reductions)	**T.B.D.**

Based on this year's evaluation, Medfield has successfully reduced phosphorus by ##AMOUNT## lbs/yr, and ##HAS OR HAS NOT## met the Phase 1 milestone reduction of ##PHASE 1 MILESTONE##.

2.8 PHASE 1 PUBLIC COMMENT

The Town of Medfield is required to make the Phase 1 Plan available to the public for comment during Phase 1 Plan development. EPA has encouraged the town to post the Phase 1 Plan online to facilitate public involvement at: https://www.town.medfield.net/1793/Storm-Water-Information.

Instructions: Any public engagement activities – including compliance with state public notice requirements per Part 2.3.3. of the MS4 Permit, public comments received, responses, copy of / link to website with PCP posting, etc., should be included in the appendix noted above and updated as the PCP evolves.

Tip/Trick: If the Town of Medfield has an Environmental Justice Population and or known Climate Impacted Population, this effort includes an opportunity to reach out directly to those groups for input on this process. You may wish to provide information in predominant non-English languages.

In conformance with the Permit's requirements for each Phase of the PCP, Medfield made the draft written Phase 1 PCP available for public comment. Appendix G provides documentation of public engagement, including:

- Public Meeting/Public Hearing at ____(Board/Commission/etc.) on ____(date).
- Website
- Social media posts
- Etc.

Here is a summary of the comments received:

##insert summary of comments received in bulleted or paragraph form##

3 PHASE 2 AND PHASE 3

The PCP described above, while formulated for Phase 1 of the PCP, can be replicated for Phases 2 and 3. Many of the requirements are the same but will require updating as the Town of Medfield progresses toward its Allowable P-Load. **Table 3-1** is included to illustrate the comparative timelines for both Phases 2 and 3. This is a replication of Table 1-2, and the values here can be replaced in Table 1-2 when you start your written Phase 2 and Phase 3 documents.

Note: The starting requirements for each phase overlaps the prior phase. For example the Town must create a written Phase 2 PCP in Year 10, as it is completing the final Phase 1 Performance Evaluation.

Table 3-1. Year 10 Performance Evaluation Summary

Phase 2 Permit Year (year)	Phase 3 Permit Year (year)	PCP Component(s) Due
As necessary	As necessary	Legal Analysis
N/A	N/A	Funding Source Assessment
N/A	N/A	PCP Scope
10 (2028)	15 (2033)	Descriptions of the following Phase 2 and Phase 3 items: - Nonstructural controls - Structural controls - O&M program for structural controls - Implementation schedule - Phase 2 and Phase 3 cost estimate - Written Phase 2 and Phase 3 PCP - Full implementation of nonstructural Controls
11 (2029)	16 (2034)	Performance Evaluation
12 (2030)	17 (2035)	Performance Evaluation
13 (2031)	18 (2036)	Performance Evaluation & Implementation of structural controls to achieve XX% of target phosphorus reduction[1]
14 (2032)	19 (2037)	Performance Evaluation
15 (2033)	20 (2038)	Performance Evaluation & Implementation of structural controls to achieve XX% of target phosphorus reduction[2]

[1]Interim target of 35% for Phase 2; 70% for Phase 3

[2]Final Phase target of 50% for Phase 2; 100% for Phase 3

ATTACHMENT ONE

NSP NUTRIENT SOURCE IDENTIFICATION REPORT

Nutrient Source Identification Report
Town of Medfield

Prepared By: Neponset River Watershed Association
June 14, 2021

Acknowledgements

This is one among twenty Nutrient Source Identification Reports prepared by the Neponset River Watershed Association (NepRWA) and the Pioneer Valley Planning Commission (PVPC). These reports are meant to provide MS4 permitted municipalities with documents they can finalize and submit to U.S. EPA as part of their Year 4 reporting requirements.

This work is made possible through a grant from the MassDEP Municipal Assistance Program. Project staff from NepRWA and PVPC appreciate the conversation and feedback provided by MassDEP and U.S. EPA staff in working through methodology to prepare these reports. Aside from producing nutrient source identification reports for 20 communities, this project also resulted in the following: lake-pond phosphorous control plan Year 4 submission requirements for two communities; documentation of approach and methods for use by other MS4 permittees across MA in meeting these Year 4 requirements; and setting of the stage for upgrading existing stormwater infrastructure in key high pollutant loading catchments.

NepRWA and PVPC staff are grateful also to the partner communities who joined them in this pilot project. Following is a list of cities and towns who participated in this project:

Agawam
Canton
Dedham
Foxborough
Granby
Longmeadow
Ludlow
Medfield
Milton
Northampton
Quincy
Randolph
Sharon
South Hadley
Southampton
Southwick
Stoughton
Westfield
Westwood
Wilbraham

Background: The Nutrient Pollution Problem

Nitrogen and phosphorous are naturally occurring plant fertilizers or "nutrients." When land is developed, and storm drain systems are installed, the amount of nitrogen and phosphorous discharged to local streams, ponds and wetlands increases significantly relative to natural stream conditions. In the urban environment, nitrogen and phosphorous come from a variety of sources including organic debris such as fallen leaves, animal and pet waste, lawn and agricultural fertilizers, malfunctioning sewers and septic systems, and atmospheric deposition from car exhaust, among other sources.

Some of these sources also occur in the natural environment. However, in the urban environment the prevalence of paved and impervious areas coupled with the availability of storm drain collection systems allows street runoff containing excess nutrient pollution to be very quickly collected and conveyed to the nearest waterbody, generally with little or no treatment—bypassing the natural processes such as soil filtration and infiltration that would capture and recycle nutrients before they reached waterways in an undeveloped landscape.

As a result, nutrient pollution from polluted stormwater runoff has become a major source of pollution across the country. Nutrient pollution increases undesirable plant and algae growth in waterways, which can be highly toxic to humans and wildlife and reduce oxygen levels in the water. This, in turn, impedes recreation and creates chronic challenges for aquatic life, sometimes leading to fish kills. In freshwater waterways phosphorous is generally the primary pollutant of concern, while nitrogen becomes the primary concern once freshwater rivers flow into saltwater estuaries and bays.

Background: Regulatory Context

Under the federal and state clean water acts, the Massachusetts Department of Environmental Protection (MassDEP) is charged with establishing water quality standards and determining whether waterways meet these designated standards. MassDEP publishes its Integrated List of Waters, also referred to at the 303d Impaired Waters List, identifying waters that do not meet standards. These waterways are referred to as being "impaired" or "water quality limited" based on one or more causes which may include nitrogen, phosphorous, "nutrient/eutrophication biological indicators" or in some cases turbidity or transparency. MassDEP is also charged with preparing waterbody-specific cleanup plans for nutrient pollution known as Total Maximum Daily Loads or TMDLs, though these are yet to be prepared for many impaired waterways.

The Town of Medfield ("the Town") is subject to the requirements of US Environmental Protection Agency's (EPA's) 2016 Massachusetts Small MS4 General Permit. One of the requirements of this permit is that communities discharging stormwater to waterways that are listed by MassDEP as impaired for phosphorous or nitrogen, or that flow into impaired waterways, and for which a total maximum daily load does not exist, shall prepare a Nutrient Source Identification Report as detailed in Appendix H of the permit. This report has been developed to satisfy this requirement of the permit.

The nutrient source identification report must be submitted with the permit year 4 annual report (year ending June 30, 2022 and report due late September 2022). The requirements include (excerpt from EPA 2016 MS4 Permit Appendix H):

1. Calculation of total MS4 area draining to the water quality limited water segments or their tributaries, incorporating updated mapping of the MS4 and catchment delineations produced pursuant to part 2.3.4.6;
2. All screening and monitoring results pursuant to part 2.3.4.7.b., targeting the receiving water segment(s);
3. Impervious area and DCIA for the target catchment;
4. Identification, delineation and prioritization of potential catchments with high [*nitrogen and/or phosphorous*] loading;
5. Identification of potential retrofit opportunities or opportunities for the installation of structural BMPs during redevelopment.

MS4 Permit Appendix H Applicability

Portions of the Town lie both within the Neponset River Watershed and the Charles River Watershed. Of the six receiving waters identified in the Town's Notice of Intent, two have been identified as specifically impaired for phosphorus. In some cases, the Town's receiving waters also flow into another water body that is impaired for phosphorous, or waters that are listed as impaired for a cause in which phosphorous pollution is a factor such as dissolved oxygen, or eutrophication biological indicators.

The saltwater portion of the Neponset River, known as the Neponset River Estuary, is not specifically listed as impaired for nitrogen by MassDEP, but is listed as impaired for several other factors for which nitrogen pollution is a contributing factor. Furthermore, EPA has directed the City of Quincy to prepare a nutrient source identification report for nitrogen based on its stormwater discharges to the Neponset River. While EPA has not provided any clear direction to other communities in the Neponset River Watershed that are upstream of the Neponset Estuary regarding the need for a nitrogen source identification report, the possibility exists that EPA may issue such a requirement in the future. In the interest of efficiency of analysis, this report also includes an analysis of nitrogen pollution loading for all communities in the Neponset River Watershed.

Therefore, this report has been prepared in accordance with the guidelines in sections I.1.b and II.1.b of Appendix H of the 2016 Massachusetts Small MS4 General Permit.

The status of receiving waters in the Town is summarized in Table 1 below.

Table 1. Receiving Waters for the Town of Medfield

Receiving Water	Number of Outfalls	Impaired for P?	Impaired for N?	Other Impairments
Charles River (MA72-05)	207	Yes	No	Dissolved Oxygen, TSS, Chlorodane, DDT, Mercury in Fish Tissue, Nutrient/Eutrophication
Stop River (MA72-10)	86	Yes	No	E. Coli, Organic Enrichment (Sewage), Biological Indicators

Mill Brook (MA73-08)	99	No	No	Dissolved Oxygen
Mine Brook (MA73-09)	29	No	No	Dissolved Oxygen, Fecal Coliform
Flynns Pond (MA73019)	3	No	No	
Jewells Pond (MA73026)	0	No	No	

Data Sources and Analytical Methods

Several existing datasets were used to complete this work. Table 2 below lists the utilized data sets and their origin.

Table 2. Data Sources

Existing Data Set	Origin	Date Published/Updated	Link
2016 Land Cover/Land Use	MassGIS	May 2019	https://docs.digital.mass.gov/dataset/massgis-data-2016-land-coverland-use
Soil Survey Geographic (SSURGO) Database for Norfolk and Suffolk Counties, Massachusetts	USDA	June 2020	Downloaded through Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm). Hydrologic soil groups extracted using Soil Data Viewer Version 6.1 (https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/geo/?cid=nrcs142p2_053619)
Town Catchments	Town GIS Files	Current as of the publishing of this report	N/A
Massachusetts Land Parcel Database (Metro Boston Region)	MAPC	May 2019	Used to locate SCM opportunities, this shapefile contains the "Parloc_ID" field used to identify parcels. https://datacommon.mapc.org/browser/datasets/360

Impervious area is the portion of the Town that is paved, covered by buildings, or otherwise rendered unable to absorb water naturally due to development. Impervious area for the town was calculated using the MassGIS 2016 Land Cover/Land Use data layer which was published in 2019. This data layer maps impervious and pervious land cover by land use type based on aerial photography and other data sources. This was overlaid with the Town's data layer for outfall catchment areas (the area draining to each town-owned stormwater discharge point) to estimate total areas and total impervious area discharging to or upstream of nutrient-impaired waterways, as well as to estimate impervious area for each stormwater outfall catchment.

Directly connected impervious area (DCIA), also referred to as "effective impervious cover," is the amount of impervious area that is directly connected to the storm drain system. Most land in the Town was developed before the creation of modern requirements to capture, clean, slow down, and recharge stormwater runoff using stormwater control measures (SCMs). However, many new development and redevelopment projects constructed in recent years have required the installation or upgrade of SCMs, such that today some properties have no SCMs, some have SCMs that meet some modern standards, and some have SCMs that are fully compliant with modern standards. Because site-specific information about the existence of specific SCMs is not available at the parcel level, an estimate of DCIA or effective impervious cover is used to approximate the average level of SCMs installed across the watershed. Estimating DCIA can yield a more specific pollutant loading estimate for a given area. DCIA was estimated based on land use categories following EPA guidance.

To estimate the pollutant loads for nitrogen and/or phosphorous in each catchment, estimated pollutant loading rates for different combinations of land use type, land cover type, and soil type were applied in accordance with guidance in the EPA 2016 MS4 Permit. The individual loading rates for these unique subsections were summed based on catchment, which produced an overall estimated catchment pollutant loading rate.

For a more detailed description of the analytical methods used for this project, please refer to the supplement to this report, entitled "Nutrient Source Identification Report Addendum: Methods."

Note that one catchment in the Town's data set was had no entry in the identifier field. This was assumed to be a collective entry for catchments with no definitive outfall. While this catchment was included in analysis, it was removed from any rankings.

Total Area Draining to Water Quality Limited Segments (or Tributaries)

The total area of the Town is approximately 9,376 acres. Since all areas of the Town are located either in the Neponset River Watershed or the Charles River Watershed and drainage flows either directly to waters that are impaired for phosphorus or waters that are listed as impaired for a cause in which phosphorous pollution is a factor, this report included all areas of the town in the phosphorus loading evaluation. Table 3 below shows how much of the Town is located in each watershed.

Similarly, portions of the town are upstream of the Neponset Estuary and therefore drain to a segment that EPA may consider impaired for nitrogen. While EPA has not provided clear guidance indicating that the Town is subject to the requirements of Appendix H of the 2016

MS4 permit for nitrogen, this report includes the analysis for nitrogen so that the relevant data is available should EPA make such a determination in the future. Therefore, catchments located in the Neponset River Watershed were included in the nitrogen loading analysis sections of this report. Catchments located in the Charles River Watershed were not ranked with regards to nitrogen loading, but nitrogen loading estimates were made for these catchments in the process of analysis and the results are included in Table C-1 in Appendix C for reference.

Table 3. Summary of Area Draining to Water Quality Limited Segments

Receiving Water Impaired for Phosphorus	Neponset Watershed	Charles Watershed	Total
Total Area of Town (Acres)	2,127	7,249	9,376
Area Draining to Phosphorous Impaired Waters or Potentially Impaired Waters (Acres)	2,127	7,249	9,376
Area Draining to Nitrogen Impaired or Potentially Impaired Waters (Acres)	2,127	0	2,127

22.68% 77.31%

Impervious Area and Directly Connected Impervious Area

Table 4 below summarizes the total impervious area (IA) and estimated DCIA in the Town. It is also important to note that most of the impervious area in the Town is not owned or maintained by the Town, but by private parties or other public agencies.

Table 4. Summary of Impervious Area and DCIA

	Neponset Watershed	Charles Watershed	Total	
Impervious Area (Acres)	155	786	941	10.03%
Estimated DCIA (Acres)	1.4	22	23.4	0.25%

Table A-1 and A-2 in Appendix A of this report provides impervious area and estimates of DCIA for the Town's catchments in the Charles and Neponset River Watersheds, respectively. Table 5 and 6 below show the same information for the ten catchments with the most impervious area in each watershed. The catchments are labeled using the Town's identifier for the outfall to which they drain. The table is sorted in descending order of total impervious area.

Table 5. Total Impervious Area and DCIA for the Ten Most Impervious Town Catchments in the Charles River Watershed

Catchment Identifier	Impervious Area (Acres)	Percent Impervious	DCIA (Acres)	Percent DCIA
OF-240	89.70	8.09 %	2.86	0.26 %
OF-201	28.03	10.16 %	1.11	0.40 %
OF-529	26.35	25.16 %	4.47	4.27 %
OF-464	15.76	39.27 %	4.12	10.27 %
OF-423	14.81	21.18 %	1.57	2.25 %
OF-265	13.61	19.09 %	1.57	2.20 %
OF-222	11.74	55.10 %	4.07	19.09 %
OF-463	11.40	44.29 %	2.39	9.29 %
OF-528	11.09	6.39 %	0.50	0.29 %
OF-146	11.02	7.30 %	0.50	0.33 %
Top 10 Catchments as a % of Town Watershed Total	31.98 %		16.99 %	

Table 6. Total Impervious Area and DCIA for the Ten Most Impervious Town Catchments in the Neponset River Watershed

Catchment Identifier	Impervious Area (Acres)	Percent Impervious	DCIA (Acres)	Percent DCIA
OF-102	31.46	6.04 %	1.02	0.20 %
OF-85	10.95	22.47 %	1.06	2.17 %
OF-470	8.16	10.34 %	0.62	0.79 %
OF-351	4.80	27.15 %	0.72	4.10 %
OF-393	4.72	21.69 %	0.98	4.52 %
OF-170	4.15	15.74 %	0.48	1.82 %
OF-300	4.00	24.65 %	0.54	3.30 %
OF-456	3.80	21.24 %	0.78	4.37 %
OF-488	3.32	25.38 %	0.44	3.37 %
OF-482	3.24	13.13 %	0.26	1.06 %
Top 10 Catchments as a % of Town Watershed Total	68.36 %		47.32 %	

MILL BK.

PHOS. ND

Estimated Nutrient Loading from Catchments

Using the methods described in the addendum to this report, estimates of phosphorus and nitrogen loading potential were created for each of the Town's storm drain outfall catchments.

Tables B-1 and B-2 in Appendix B and C-1 and C-2 in Appendix C of this report show calculated phosphorus and nitrogen loading estimates, respectively, for all catchments in the Town. Tables 7-9 below show the five catchments with the highest estimated phosphorus and nitrogen loading, respectively. Note that, as stated earlier in this report, catchments in the Charles River Watershed were not ranked for estimated nitrogen load, but the analysis was completed in the

interest of efficiency. Results for estimated nitrogen load for Charles River Watershed catchments are available in Table C-1 in Appendix C.

Table 7. Estimated Phosphorus Loading for Five Highest-Load Town Catchments in the Charles River Watershed

Catchment Identifier	Estimated P Load (Lbs/Yr)
OF-240	328.39
OF-201	100.52
OF-529	57.67
OF-104	48.59
OF-528	45.16
Top 5 as a % of Total Town Watershed Load	28.64 %

Table 8. Estimated Phosphorus Loading for Five Highest-Load Town Catchments in the Neponset River Watershed

Catchment Identifier	Estimated P Load (Lbs/Yr)
OF-102	126.85
OF-85	28.18
OF-470	22.70
OF-351	12.96
OF-455	12.94
Top 5 as a % of Total Town Watershed Load	58.07 %

Table 9. Estimated Nitrogen Loading for Five Highest-Load Town Catchments in the Neponset River Watershed

Catchment Identifier	Estimated N Load (Lbs/Yr)
OF-102	1217.96
OF-85	225.08
OF-470	157.45
OF-517	106.69
OF-170	106.01
Top 5 as a % of Total Town Watershed Load	60.86 %

Note these are estimated loadings based on soil type, land use and estimated DCIA (e.g. typical level of SCMs in town). Actual loading may vary considerably from site to site depending on what SCMs are actually present, and regional studies such as the Charles River Phosphorous TMDL have indicated that the default DCIA assumptions used by EPA are somewhat optimistic, such that actual loading rates may be higher. However, these estimates provide a valuable guide to help identify those areas of the Town that should be the highest priorities for interventions to begin reducing pollutant loading.

Outfall Screening Monitoring Results

As of the writing of this report, outfall screening results did not identify any outfalls with significantly elevated nutrient concentrations, using the guidelines in the Center for Watershed Protection's Illicit Discharge Detection and Elimination Manual (published in October 2004) as a reference. One manhole screening found a phosphorus concentration of 0.46 mg/L, which is slightly above the Manual's suggested threshold of 0.4 mg/L. That manhole is identified as DMH-273 and is located in catchment OF-85. Up-to-date outfall screening data are included in Appendix F. As more outfall screening is completed and more data become available, they will

be included in this report and pertinent findings shall be incorporated into the determination of the highest priority catchments with respect to phosphorus and nitrogen loading.

Catchment Prioritization

As of the writing of this report, one screening at a manhole found elevated phosphorus concentrations. The catchment in which that manhole is located (OF-85) shall be added to the catchments that are suspected of high nutrients loads based on this desktop analysis. Aside from OF-85, catchments are prioritized in the order shown in Tables B-1 and B-2 (phosphorus) and C-1 and C-2 (nitrogen). When more outfall screening data become available, the list of catchments should be re-examined and the "Top 5" list should be updated based on these real-world data.

Potential Retrofit Opportunities

Town parcels were examined for potential BMP retrofit opportunities using the Neponset Stormwater Partnership's BMP Tool (NSP BMP Tool). This tool analyzes soil data, estimated pollutant loading, and various limitations of each parcel in Town to determine the locations most suitable for further field assessment of SCM opportunities to reduce chosen pollutants.

The NSP BMP Tool uses slightly different methods to estimate pollutant loading than are utilized in this report so estimated loading rates will differ. However, this does not diminish the utility of the NSP BMP Tool as a means to help identify potential retrofit sites, especially given additional features that are incorporated into the Tool.

After assessing the data, each high-loading catchment was reviewed for potential SCM sites. Five parcels were chosen and are listed in Tables 10-12 below. All parcels in these lists are Town-owned, as town-owned properties often present the fewest barriers to SCM development. These sites should be visited first when performing reconnaissance work to locate SCMs that will reduce nutrient loading in the town. Additionally, it should be noted that the NSP BMP Tool does not rank rights-of-way as Town-owned, but they are often highly desirable sites for SCMs. All rights-of-way, particularly in the high-loading catchments, should be considered in addition to individual parcels. Note that "Parloc_ID" is an attribute from the MAPC parcel data set that may be helpful in identifying the indicated parcels.

More extensive lists of Town-owned properties to be considered for SCM development is included in Appendix D and E. In these lists, they are ranked by the BMP Tool's priority score, which projects each parcel's pollutant load and considers how suited that parcel is for SCM's designed to remove the targeted pollutant. Appendix D ranks parcels for phosphorus removal and Appendix E ranks them for nitrogen removal. The larger lists in these appendices should be considered a more comprehensive collection of the parcels that should be considered first for SCM development. As Town-owned parcels are evaluated, the Town should begin considering privately-owned parcels, as well, using the NSP BMP Tool as a guide.

Table 10. High-Priority Parcels in the Charles Watershed to be Considered for SCM Development for Phosphorus Pollution

Address	Parloc_ID	Catchment	Notes
North St & 329R	F_709446_2903186	OF-240	Undeveloped parcel

What Town Department?

Rear Deerfield Dr	F_708241_2900694	OF-240	Undeveloped parcel in residential area CONSERVATION COMMISSION
Rear Hawthorne Dr	F_710005_2899063	OF-240	Large undeveloped parcel in residential area CON COMM
15 Cedar Ln	F_707878_2898743	OF-240	Undeveloped parcel in residential area CON COMM
3 Hawthorne Dr	F_710797_2900362	OF-240	Undeveloped parcel in residential area WATER AND SEWER PARCEL

Table 11. High-Priority Parcels in the Neponset River Watershed to be Considered for SCM Development for Phosphorus Pollution

Address	Parloc_ID	Catchment	Notes
Rear Plain St	F_714753_2880611	OF-470	Very large undeveloped parcel accessible by several neighborhoods CON COMM
115 High St	F_715254_2883614	OF-470	Undeveloped parcel in residential area CON COMM
149 High St	F_716095_2883099	OF-161	Undeveloped parcel in residential area UNKNOWN
High St	F_716694_2882435	OF-161	Large undeveloped parcel in residential area CON COMM
Rear Eastmount Rd	F_713205_2892864	OF-351	Large undeveloped parcel in residential area WATER & SEWER

*Very few Town-owned parcels were found in the Neponset River Watershed. The listed parcels represent some of the best opportunities, but they are not located in high-loading catchments. It is recommended that roadways in the high-load catchments be considered for SCM retrofit suitability.

Table 12. High-Priority Parcels in the Neponset River Watershed to be Considered for SCM Development for Nitrogen Pollution

Address	Parloc_ID	Catchment	Notes
Rear Plain St	F_714753_2880611	OF-470	Very large undeveloped parcel accessible by several neighborhoods CON COMM
115 High St	F_715254_2883614	OF-470	Undeveloped parcel in residential area CON COMM
149 High St	F_716095_2883099	OF-161	Undeveloped parcel in residential area UNKNOWN
High St	F_716694_2882435	OF-161	Large undeveloped parcel in residential area CON COMM
Rear Eastmount Rd	F_713205_2892864	OF-351	Large undeveloped parcel in residential area WATER & SEWER

*Very few Town-owned parcels were found in the Neponset River Watershed. The listed parcels represent some of the best opportunities, but they are not located in high-loading catchments. It is recommended that roadways in the high-load catchments be considered for SCM retrofit suitability.

These results provide a valuable starting point for the next phase of requirements in Appendix H of the 2016 MS4 Permit which are due by the end of permit year 5 (6/30/2023), which include:

- “Evaluate all permittee-owned properties identified as presenting retrofit opportunities”,
- “Provide a listing of planned structural BMPs and a plan and schedule for implementation”, and
- “Any structural BMPs installed…by the permittee…shall be tracked and the permittee shall estimate the phosphorus removal by the BMP.”

Appendix A: Impervious/DCIA Summary by Catchment

Table A-1. Impervious and DCIA Amounts for All Town Catchments in the Charles River Watershed, Sorted by Impervious Area

Catchment Identifier	Impervious Area (Acres)	Percent Impervious	DCIA (Acres)	Percent DCIA
OF-240	89.70	8.09	2.86	0.26
	34.26	43.10	8.67	10.91
OF-201	28.03	10.16	1.11	0.40
OF-529	26.35	25.16	4.47	4.27
OF-464	15.76	39.27	4.12	10.27
OF-423	14.81	21.18	1.57	2.25
OF-265	13.61	19.09	1.57	2.20
OF-222	11.74	55.10	4.07	19.09
OF-463	11.40	44.29	2.39	9.29
OF-528	11.09	6.39	0.50	0.29
OF-146	11.02	7.30	0.50	0.33
OF-353	10.88	29.50	2.30	6.24
OF-144	10.27	45.50	3.14	13.89
OF-104	10.12	5.44	0.87	0.47
OF-244	9.91	6.80	1.12	0.77
OF-75	9.08	33.60	1.79	6.63
OF-301	9.05	28.46	1.14	3.60
OF-208	8.90	22.98	1.27	3.29
OF-157	7.87	13.55	0.62	1.06
OF-312	7.77	18.03	0.75	1.74
OF-227	7.67	30.87	1.65	6.63
OF-345	7.30	28.28	1.66	6.42
OF-537	6.55	29.97	1.32	6.02
OF-148	6.42	15.01	0.60	1.41
OF-424	6.34	30.35	1.19	5.69
OF-388	6.14	18.88	0.54	1.65
OF-356	6.01	35.44	1.82	10.73
OF-149	5.65	2.91	0.16	0.08
OF-142	5.49	47.34	2.88	24.82

OF-355	5.44	19.51	0.69	2.49
OF-273	5.10	12.81	0.47	1.18
OF-377	4.82	34.02	1.74	12.29
OF-390	4.57	27.19	0.60	3.59
OF-283	4.51	16.66	0.46	1.69
OF-315	4.44	4.53	0.18	0.18
OF-344	4.28	15.37	0.68	2.43
OF-191	3.99	17.60	0.43	1.90
OF-167	3.93	24.25	0.61	3.73
OF-38	3.92	52.50	1.26	16.94
OF-373	3.90	28.06	0.92	6.62
OF-209	3.86	25.91	0.73	4.88
OF-199	3.82	16.46	0.34	1.47
OF-212	3.77	5.76	0.17	0.26
OF-116	3.77	13.05	0.44	1.53
OF-409	3.70	11.19	0.39	1.17
OF-400	3.69	9.90	0.25	0.66
OF-511	3.67	9.20	0.40	0.99
OF-346	3.59	43.89	0.98	11.93
OF-339	3.51	28.21	0.72	5.82
OF-368	3.40	26.32	0.82	6.33
DMH-58	3.40	23.45	0.67	4.64
OF-359	3.36	34.28	1.19	12.17
OF-323	3.29	7.28	0.16	0.35
OF-259	3.28	14.03	0.37	1.59
OF-113	3.23	11.70	0.41	1.48
OF-174	3.13	18.30	0.39	2.28
OF-202	3.10	9.83	0.47	1.49
OF-48	3.09	12.97	0.28	1.15
OF-288	2.91	33.39	0.68	7.85
OF-125	2.90	5.32	0.16	0.29
OF-502	2.84	21.53	0.50	3.76

OF-198	2.81	21.07	0.45	3.34
OF-109	2.80	33.28	0.71	8.43
OF-16	2.79	25.10	0.57	5.12
OF-305	2.78	37.66	0.79	10.64
OF-9	2.78	21.39	0.41	3.12
OF-280	2.77	26.86	0.50	4.86
OF-408	2.76	20.16	0.32	2.33
OF-184	2.66	19.18	0.38	2.75
OF-105	2.64	36.31	0.76	10.51
OF-389	2.59	34.19	0.77	10.10
OF-372	2.59	8.66	0.21	0.71
OF-425	2.54	72.94	1.01	28.97
OF-354	2.51	23.83	0.40	3.78
OF-503	2.50	46.27	0.49	9.14
OF-179	2.47	23.67	0.50	4.77
OF-302	2.43	79.68	1.42	46.56
OF-193	2.35	22.66	0.35	3.35
OF-156	2.34	31.36	0.47	6.35
OF-132	2.30	55.37	1.07	25.72
OF-204	2.29	21.34	0.38	3.50
OF-182	2.22	30.27	0.44	6.02
OF-414	2.17	15.32	0.27	1.87
OF-6	2.12	19.68	0.42	3.88
OF-365	2.11	33.89	0.80	12.87
OF-513	2.11	83.34	1.84	72.78
OF-203	2.11	4.52	0.12	0.25
OF-205	2.10	21.93	0.28	2.93
OF-486	2.04	42.97	0.58	12.24
OF-40	1.98	9.33	0.25	1.18
OF-289	1.95	23.18	0.72	8.52
OF-331	1.94	17.20	0.29	2.59
OF-108	1.92	10.15	0.16	0.84

OF-333	1.87	31.03	0.41	6.84
OF-13	1.85	20.99	0.34	3.88
OF-190	1.83	26.72	0.36	5.28
OF-207	1.83	15.79	0.19	1.65
OF-461	1.73	9.94	0.15	0.87
OF-489	1.68	31.69	0.38	7.13
OF-287	1.68	79.45	0.95	45.07
OF-526	1.68	31.76	0.43	8.11
OF-165	1.62	18.94	0.24	2.78
OF-106	1.61	61.02	0.51	19.43
OF-223	1.57	48.42	0.51	15.55
OF-490	1.57	18.73	0.23	2.69
OF-493	1.54	26.42	0.28	4.77
OF-347	1.51	18.60	0.43	5.23
OF-147	1.50	15.34	0.22	2.24
CB-2098	1.49	62.63	1.18	49.57
OF-371	1.42	49.90	0.63	21.94
OF-189	1.42	25.26	0.24	4.25
OF-396	1.41	26.13	0.31	5.69
OF-445	1.41	71.02	1.15	58.04
OF-475	1.39	41.87	0.76	22.75
OF-374	1.39	37.43	0.55	14.95
OF-506	1.38	18.52	0.25	3.29
OF-47	1.38	29.89	0.37	7.94
OF-317	1.37	15.50	0.22	2.44
OF-303	1.37	19.26	0.50	7.05
OF-444	1.36	58.69	0.62	26.84
OF-416	1.34	13.26	0.19	1.89
OF-521	1.32	46.16	0.54	18.89
OF-12	1.26	8.82	0.13	0.91
OF-229	1.26	32.25	0.37	9.43
OF-501	1.24	30.87	0.33	8.31

OF-446	1.22	87.56	0.62	44.38
OF-206	1.20	34.32	0.48	13.83
OF-536	1.20	75.54	1.04	65.65
OF-406	1.18	13.51	0.24	2.79
OF-336	1.17	31.65	0.25	6.83
OF-67	1.17	12.78	0.11	1.23
OF-294	1.12	51.78	0.50	23.30
OF-484	1.09	20.28	0.24	4.53
OF-533	1.09	49.82	0.65	29.96
OF-261	1.07	15.77	0.23	3.41
OF-340	1.02	25.95	0.20	5.07
OF-500	1.02	28.76	0.24	6.87
OF-274	1.02	31.02	0.35	10.61
OF-376	1.01	66.68	0.67	44.47
OF-399	0.98	49.62	0.41	20.50
OF-286	0.98	19.38	0.25	4.97
OF-410	0.98	21.52	0.17	3.83
OF-477	0.97	47.16	0.56	27.18
OF-492	0.94	22.76	0.19	4.62
OF-81	0.93	44.92	0.53	25.59
OF-100	0.92	89.15	0.85	82.58
OF-512	0.91	42.89	0.49	23.09
OF-168	0.87	23.52	0.16	4.39
OF-404	0.85	34.61	0.23	9.41
OF-324	0.84	11.01	0.12	1.58
OF-210	0.84	7.07	0.11	0.93
OF-375	0.82	36.87	0.27	11.98
OF-285	0.82	31.39	0.22	8.39
OF-224	0.82	30.82	0.24	9.03
OF-540	0.81	5.24	0.08	0.50
OF-278	0.78	7.35	0.11	1.02
OF-22	0.78	24.91	0.25	7.98

OF-394	0.78	11.00	0.18	2.55
OF-272	0.77	37.99	0.19	9.57
OF-523	0.77	22.93	0.20	5.89
OF-367	0.77	39.10	0.32	16.48
OF-152	0.76	35.23	0.27	12.67
OF-49	0.76	38.92	0.21	10.77
OF-304	0.75	44.86	0.34	20.46
OF-263	0.73	41.72	0.19	10.98
OF-69	0.71	24.29	0.20	6.96
CB-1791	0.71	24.87	0.17	5.84
OF-214	0.71	15.01	0.19	4.06
OF-337	0.69	37.23	0.26	14.04
OF-234	0.69	42.65	0.24	14.86
OF-195	0.68	19.61	0.17	5.01
OF-230	0.66	19.71	0.16	4.71
OF-58	0.66	10.28	0.07	1.12
OF-397	0.66	43.67	0.38	25.35
OF-153	0.66	26.51	0.24	9.84
OF-66	0.65	37.64	0.18	10.54
OF-84	0.64	29.59	0.25	11.53
CB-353	0.62	69.66	0.31	35.30
OF-200	0.62	25.53	0.21	8.49
OF-211	0.61	31.61	0.20	10.31
OF-7	0.61	57.47	0.32	30.42
OF-342	0.59	22.92	0.14	5.53
OF-178	0.58	38.74	0.17	11.18
OF-192	0.58	31.79	0.22	11.95
OF-357	0.58	39.71	0.26	17.80
OF-417	0.58	26.90	0.22	10.45
OF-279	0.57	6.26	0.10	1.07
OF-514	0.56	50.95	0.25	22.75
CB-2306	0.52	48.16	0.32	29.88

OF-343	0.51	36.70	0.17	12.20
OF-481	0.50	45.44	0.23	20.90
OF-379	0.50	60.18	0.30	35.96
OF-318	0.49	9.11	0.06	1.07
OF-522	0.49	35.85	0.19	13.68
CB-2063	0.49	35.03	0.13	9.61
OF-497	0.47	38.97	0.16	13.32
OF-532	0.46	21.83	0.21	9.94
OF-341	0.45	13.33	0.07	2.01
OF-330	0.45	37.52	0.27	22.97
DMH-55	0.44	82.95	0.40	75.55
OF-260	0.43	42.36	0.27	26.89
OF-413	0.43	23.83	0.10	5.61
OF-218	0.42	7.97	0.06	1.06
CB-808	0.41	24.70	0.21	12.27
OF-366	0.40	64.16	0.23	36.70
OF-252	0.39	27.59	0.19	13.57
OF-449	0.39	72.15	0.30	55.02
OF-402	0.38	33.09	0.09	7.78
OF-254	0.36	3.90	0.07	0.77
OF-25	0.35	43.55	0.23	28.74
CB-736	0.35	29.96	0.13	11.23
OF-237	0.35	3.83	0.05	0.53
OF-14	0.35	88.57	0.20	51.71
OF-487	0.34	20.05	0.06	3.71
OF-313	0.33	5.24	0.03	0.46
OF-245	0.32	8.53	0.07	1.94
OF-472	0.32	25.28	0.11	8.50
CB-878	0.31	5.06	0.03	0.48
OF-94	0.31	85.07	0.21	57.25
OF-360	0.28	53.49	0.13	25.04
OF-236	0.28	3.83	0.05	0.75

OF-308	0.28	53.29	0.20	38.91
OF-476	0.27	32.74	0.08	9.56
OF-412	0.27	38.82	0.11	15.99
OF-181	0.25	35.54	0.10	14.63
CB-1404	0.25	64.96	0.19	50.56
OF-215	0.24	56.50	0.18	41.73
OF-271	0.24	42.96	0.11	20.58
OF-411	0.23	20.32	0.06	5.57
CB-935	0.23	7.83	0.05	1.57
OF-524	0.23	19.45	0.06	5.14
OF-401	0.23	37.85	0.13	21.52
OF-509	0.22	22.41	0.07	6.88
OF-216	0.22	34.30	0.12	19.18
OF-485	0.21	23.04	0.10	11.06
OF-527	0.20	40.85	0.07	14.61
OF-319	0.20	15.78	0.04	3.11
CB-2180	0.19	10.42	0.04	2.10
OF-298	0.18	93.48	0.17	90.39
CB-282	0.18	15.65	0.05	4.10
OF-329	0.17	41.93	0.08	20.38
OF-538	0.17	29.46	0.08	12.86
OF-494	0.17	37.94	0.06	14.01
OF-295	0.16	98.40	0.16	97.61
CB-84	0.15	37.74	0.09	23.13
OF-491	0.15	48.42	0.06	18.90
OF-258	0.15	100.00	0.15	99.97
OF-510	0.15	9.89	0.03	1.91
OF-221	0.14	25.49	0.07	12.87
OF-534	0.14	93.74	0.14	90.75
OF-42	0.14	93.72	0.13	90.73
OF-270	0.14	46.96	0.06	19.49
OF-450	0.13	49.14	0.08	28.64

OF-256	0.13	97.27	0.13	95.94
CB-1400	0.13	91.81	0.12	87.26
CB-354	0.12	55.53	0.08	38.46
OF-281	0.12	70.19	0.10	57.96
OF-131	0.12	96.32	0.09	77.14
CB-901	0.11	35.77	0.07	20.39
OF-235	0.11	3.61	0.02	0.66
OF-508	0.11	27.94	0.04	9.06
OF-249	0.11	6.63	0.03	1.69
OF-480	0.11	29.13	0.08	21.53
OF-217	0.11	11.41	0.02	2.04
OF-525	0.10	56.93	0.08	42.03
OF-432	0.10	86.98	0.10	81.12
OF-246	0.10	4.08	0.02	0.82
OF-233	0.10	14.83	0.03	4.97
OF-483	0.09	75.64	0.08	65.41
CB-2147	0.09	91.32	0.07	71.82
OF-169	0.09	53.32	0.06	35.55
OF-435	0.09	97.59	0.09	96.41
OF-177	0.09	99.86	0.09	98.05
OF-448	0.09	95.38	0.09	93.15
CB-102	0.09	24.68	0.03	9.43
OF-516	0.08	45.27	0.04	21.79
OF-452	0.08	42.69	0.04	18.59
CB-1401	0.08	31.08	0.04	14.42
CB-545	0.08	27.03	0.03	9.74
OF-282	0.08	37.88	0.04	21.65
OF-253	0.08	1.96	0.01	0.28
CB-2217	0.08	31.91	0.03	14.45
OF-243	0.08	63.20	0.06	50.25
OF-451	0.07	23.48	0.02	7.45
OF-479	0.07	98.81	0.07	99.05

CB-1199	0.06	99.93	0.06	99.89
OF-430	0.06	5.22	0.01	0.94
OF-307	0.06	90.11	0.06	85.54
OF-443	0.05	100.00	0.05	100.00
CB-1403	0.05	100.00	0.05	99.85
CB-104	0.05	7.26	0.01	1.39
CB-1852	0.05	44.03	0.03	26.23
OF-242	0.05	91.61	0.04	87.68
OF-361	0.05	60.38	0.04	46.91
CB-737	0.04	43.17	0.02	20.16
OF-231	0.04	1.25	0.00	0.09
OF-447	0.04	88.40	0.04	86.01
OF-299	0.04	95.87	0.04	93.87
CB-2303	0.04	17.60	0.02	7.38
OF-441	0.03	61.99	0.03	48.81
OF-241	0.03	90.75	0.03	86.45
OF-403	0.03	32.11	0.01	12.38
CB-1964	0.03	60.09	0.02	42.22
OF-297	0.02	99.05	0.02	98.58
OF-478	0.02	46.11	0.02	39.69
OF-238	0.02	0.11	0.00	0.00
OF-296	0.02	93.91	0.02	91.01
CB-1872	0.02	67.76	0.02	55.78
OF-141	0.02	49.10	0.01	34.41
OF-427	0.02	98.14	0.02	97.22
OF-251	0.02	99.22	0.02	98.83
OF-306	0.02	73.27	0.01	38.54
OF-292	0.01	94.32	0.01	91.60
OF-496	0.01	25.17	0.01	11.13
OF-293	0.01	92.49	0.01	88.95
CB-103	0.01	74.92	0.01	64.85
OF-139	0.01	45.13	0.01	28.95

CB-1871	0.01	100.00	0.01	100.00
CB-352	0.01	15.55	0.00	6.10
OF-255	0.01	93.71	0.01	90.72
CB-2146	0.01	29.22	0.00	14.11
OF-247	0.01	1.44	0.00	0.12
OF-250	0.01	68.76	0.00	57.01
OF-88	0.00	42.20	0.00	27.12
OF-239	0.00	0.33	0.00	0.02
OF-442	0.00	94.18	0.00	91.40
CB-2064	0.00	72.03	0.00	61.14
OF-248	0.00	0.98	0.00	0.10
CB-1861	0.00	17.34	0.00	7.22
OF-505	0.00	16.18	0.00	5.40
CB-840	0.00	2.39	0.00	0.37
CB-2097	0.00	100.00	0.00	100.00
CB-1402	0.00	0.00	0.00	0.00
CB-2258	0.00	0.00	0.00	0.00
OF-232	0.00	0.00	0.00	0.00
OF-291	0.00	0.00	0.00	0.00
OF-499	0.00	0.00	0.00	0.00
OF-535	0.00	0.00	0.00	0.00

Table A-2. Impervious and DCIA Amounts for All Town Catchments in the Neponset River Watershed, Sorted by Impervious Area

Catchment Identifier	Impervious Area (Acres)	Percent Impervious	DCIA (Acres)	Percent DCIA
OF-102	31.46	6.04	1.02	0.20
OF-85	10.95	22.47	1.06	2.17
OF-470	8.16	10.34	0.62	0.79
OF-351	4.80	27.15	0.72	4.10
OF-393	4.72	21.69	0.98	4.52
OF-170	4.15	15.74	0.48	1.82

OF-300	4.00	24.65	0.54	3.30
OF-456	3.80	21.24	0.78	4.37
OF-488	3.32	25.38	0.44	3.37
OF-482	3.24	13.13	0.26	1.06
OF-455	3.24	7.52	0.21	0.48
OF-185	2.81	26.12	0.63	5.88
OF-392	2.18	18.36	0.46	3.87
OF-348	2.00	23.40	0.34	4.04
OF-176	1.96	24.38	0.45	5.57
OF-175	1.81	25.20	0.49	6.90
OF-268	1.62	17.48	0.29	3.19
OF-269	1.59	19.83	0.30	3.68
OF-173	1.51	25.22	0.27	4.60
OF-32	1.34	29.63	0.40	8.76
OF-519	1.22	28.83	0.26	6.23
OF-350	1.17	42.29	0.39	13.99
OF-188	1.12	13.51	0.10	1.26
OF-309	1.06	15.14	0.16	2.31
OF-517	1.04	1.99	0.04	0.08
OF-369	1.03	9.71	0.12	1.09
OF-161	1.03	5.42	0.11	0.57
OF-338	1.00	34.52	0.28	9.63
OF-311	0.88	20.72	0.18	4.24
OF-380	0.87	19.48	0.16	3.58
OF-405	0.83	35.14	0.19	8.27
OF-322	0.80	15.14	0.22	4.09
OF-186	0.77	42.48	0.24	13.07
OF-267	0.49	11.50	0.12	2.83
OF-382	0.42	18.60	0.11	4.83
CB 355	0.38	43.77	0.11	12.97
OF-220	0.37	42.40	0.17	20.09
OF-370	0.32	24.83	0.09	6.86

OF-219	0.26	40.91	0.15	22.62
OF-171	0.25	35.91	0.12	16.90
OF-172	0.18	35.29	0.08	15.09
OF-187	0.17	52.39	0.10	32.12
OF-386	0.17	68.47	0.14	54.86
OF-515	0.16	50.69	0.08	24.81
CB-207	0.15	22.75	0.05	7.26
OF-128	0.12	57.01	0.06	30.38
CB-208	0.07	14.67	0.03	5.24
OF-469	0.01	3.74	0.00	0.44
CB-1073	0.00	0.00	0.00	0.00
CB-355	0.00	0.00	0.00	0.00

Appendix B: Estimated Phosphorus Loading Summary by Catchment

Table B-1. Estimated Phosphorus Loading for All Town Catchments in the Charles River Watershed

Catchment Identifier	Estimated P Load (Lbs/Yr)
OF-240	328.39
OF-201	100.52
	71.87
OF-529	57.67
OF-104	48.59
OF-528	45.16
OF-146	44.73
OF-244	42.14
OF-149	39.67
OF-265	36.18
OF-423	32.96
OF-464	29.72
OF-157	25.86
OF-208	24.49
OF-315	23.43
OF-312	23.36
OF-222	23.22
OF-463	22.58
OF-301	22.11
OF-353	21.03
OF-125	20.19
OF-144	19.41
OF-148	18.57
OF-75	18.13
OF-227	16.13
OF-212	15.87
OF-388	15.58
OF-409	15.03
OF-345	14.42
OF-273	14.33
OF-191	13.39
OF-323	12.82
OF-537	12.81
OF-356	12.61
OF-424	12.46
OF-199	12.19
OF-400	12.14
OF-142	11.99
OF-283	11.87
OF-116	11.39
OF-355	11.24
OF-344	11.09
OF-259	11.02
OF-203	10.51
OF-511	10.47
OF-202	10.25
OF-390	10.09
OF-113	9.97
OF-48	9.91
OF-209	9.84
OF-174	9.20
OF-377	9.06
OF-167	8.79
OF-502	7.99
OF-372	7.96
DMH-58	7.94
OF-408	7.88
OF-9	7.71
OF-414	7.68
OF-198	7.66

OF-184	7.63
OF-373	7.60
OF-368	7.58
OF-38	7.57
OF-108	7.46
OF-40	7.15
OF-339	6.97
OF-346	6.85
OF-359	6.47
OF-207	6.31
OF-179	6.29
OF-16	6.17
OF-6	5.73
OF-13	5.69
OF-461	5.67
OF-288	5.65
OF-331	5.60
OF-193	5.55
OF-280	5.54
OF-305	5.46
OF-109	5.41
OF-204	5.35
OF-503	5.31
OF-147	5.24
OF-105	5.08
OF-205	5.04
OF-354	4.99
OF-389	4.98
OF-425	4.87
OF-182	4.86
OF-132	4.65
OF-156	4.65

OF-365	4.64
OF-333	4.38
OF-302	4.36
OF-190	4.33
OF-506	4.23
OF-406	4.15
OF-486	4.11
OF-317	3.95
OF-189	3.91
OF-513	3.77
OF-289	3.73
OF-416	3.59
OF-526	3.48
OF-540	3.48
OF-347	3.34
OF-165	3.32
OF-396	3.31
OF-489	3.29
OF-490	3.20
OF-12	3.17
OF-501	3.11
OF-493	3.08
OF-287	3.07
OF-303	3.06
OF-223	3.01
OF-484	2.99
OF-324	2.93
OF-254	2.91
OF-58	2.91
OF-410	2.86
OF-106	2.84
OF-210	2.82

OF-47	2.80
OF-444	2.73
CB-2098	2.69
OF-261	2.68
OF-206	2.66
OF-371	2.63
OF-374	2.60
OF-394	2.59
OF-475	2.57
OF-521	2.56
OF-500	2.53
OF-445	2.53
OF-67	2.48
OF-238	2.47
OF-229	2.44
OF-313	2.43
OF-523	2.37
OF-336	2.31
OF-318	2.29
OF-340	2.29
OF-286	2.26
OF-446	2.16
OF-274	2.16
OF-536	2.14
OF-477	2.14
OF-237	2.08
OF-404	2.07
OF-81	2.06
OF-294	2.04
OF-22	2.00
OF-533	1.98
OF-278	1.96

OF-218	1.95
OF-279	1.95
OF-168	1.90
OF-492	1.88
OF-399	1.86
OF-376	1.82
OF-214	1.78
OF-285	1.77
OF-272	1.77
OF-236	1.75
OF-69	1.74
OF-512	1.67
OF-100	1.64
OF-367	1.63
OF-195	1.62
OF-152	1.62
OF-375	1.60
OF-224	1.57
OF-49	1.53
CB-878	1.52
OF-192	1.51
OF-263	1.43
OF-304	1.43
CB-1791	1.42
OF-234	1.37
OF-200	1.35
OF-337	1.33
OF-230	1.33
OF-341	1.32
OF-153	1.26
OF-397	1.24
OF-417	1.24

OF-84	1.23
OF-66	1.20
OF-211	1.19
OF-342	1.18
CB-2306	1.17
OF-178	1.17
OF-357	1.14
OF-7	1.12
OF-514	1.12
OF-522	1.11
CB-353	1.09
OF-497	1.07
OF-402	1.02
OF-343	1.00
OF-487	1.00
OF-245	0.98
OF-379	0.95
OF-481	0.94
OF-532	0.92
CB-2063	0.91
CB-935	0.90
OF-413	0.89
OF-366	0.88
OF-449	0.85
OF-330	0.84
OF-260	0.84
OF-252	0.82
CB-808	0.81
DMH-55	0.79
OF-472	0.78
OF-524	0.78
OF-319	0.71

OF-411	0.71
CB-736	0.69
OF-235	0.65
OF-25	0.64
OF-253	0.64
OF-509	0.63
OF-14	0.62
CB-2180	0.59
OF-510	0.58
OF-94	0.57
OF-181	0.55
OF-401	0.54
OF-231	0.54
OF-360	0.53
OF-476	0.53
OF-216	0.52
OF-412	0.52
OF-308	0.51
OF-271	0.47
OF-246	0.47
OF-215	0.46
CB-1404	0.45
OF-217	0.42
OF-485	0.42
OF-527	0.41
OF-249	0.39
CB-282	0.38
OF-329	0.34
CB-84	0.33
OF-494	0.32
OF-538	0.32
OF-298	0.32

OF-221	0.30
OF-508	0.30
OF-232	0.30
CB-901	0.30
OF-491	0.29
OF-295	0.28
OF-270	0.28
OF-430	0.27
OF-258	0.26
OF-480	0.26
OF-534	0.25
OF-450	0.25
OF-233	0.25
OF-42	0.25
CB-354	0.23
OF-256	0.23
CB-1400	0.23
OF-281	0.22
OF-131	0.21
OF-525	0.20
OF-451	0.20
OF-499	0.19
OF-452	0.19
OF-432	0.18
OF-169	0.18
CB-545	0.17
OF-483	0.17
CB-102	0.17
CB-2147	0.17
OF-435	0.16
OF-177	0.16
OF-448	0.16

OF-479	0.16
CB-2217	0.16
OF-516	0.15
CB-1401	0.15
OF-282	0.15
OF-239	0.14
OF-243	0.14
CB-2303	0.13
CB-104	0.12
CB-1199	0.11
OF-307	0.10
OF-443	0.10
CB-1403	0.10
CB-1852	0.09
OF-447	0.09
CB-737	0.09
OF-242	0.08
OF-361	0.08
OF-403	0.08
OF-291	0.07
OF-299	0.07
OF-247	0.06
OF-441	0.06
OF-241	0.06
CB-1964	0.06
OF-248	0.06
OF-478	0.05
OF-297	0.04
OF-296	0.04
CB-1872	0.04
OF-141	0.04
OF-427	0.03

OF-251	0.03
OF-496	0.03
OF-306	0.03
OF-292	0.03
CB-1871	0.02
OF-293	0.02
CB-103	0.02
OF-139	0.02
CB-352	0.02
CB-2146	0.02
OF-255	0.02

OF-535	0.02
OF-250	0.01
OF-88	0.01
CB-1861	0.01
OF-442	0.01
CB-2064	0.01
OF-505	0.01
CB-840	0.00
CB-1402	0.00
CB-2097	0.00
CB-2258	0.00

Table B-2. Estimated Phosphorus Loading for All Town Catchments in the Neponset River Watershed

Catchment Identifier	Estimated P Load (Lbs/Yr)
OF-102	126.85
OF-85	28.18
OF-470	22.70
OF-351	12.96
OF-455	12.94
OF-170	12.76
OF-517	11.00
OF-300	10.79
OF-393	10.75
OF-456	8.95
OF-482	8.54
OF-488	7.53
OF-185	5.97
OF-392	5.32
OF-269	4.66
OF-369	4.59
OF-348	4.56
OF-268	4.18
OF-176	4.12
OF-161	4.09
OF-188	3.71
OF-175	3.64
OF-173	3.25
OF-350	2.71
OF-309	2.66
OF-32	2.63
OF-519	2.56
OF-380	1.97
OF-311	1.96
OF-338	1.94
OF-405	1.78
OF-322	1.69
OF-186	1.48
OF-267	1.35
OF-382	0.86
CB 355	0.76
OF-220	0.70
OF-370	0.64
OF-219	0.49
OF-171	0.48
OF-172	0.35
OF-187	0.31
OF-386	0.31
CB-207	0.30
OF-515	0.29
OF-128	0.22
CB-208	0.16
OF-469	0.04
CB-1073	0.00
CB-355	0.00

Appendix C: Estimated Nitrogen Loading Summary by Catchment

Table C-1. Estimated Nitrogen Loading for All Catchments in the Charles River Watershed

Catchment Identifier	Estimated N Load (Lbs/Yr)
OF-240	2522.48
OF-201	872.01
	580.91
OF-149	521.19
OF-528	474.96
OF-529	443.71
OF-104	347.92
OF-244	321.18
OF-265	320.16
OF-146	301.54
OF-315	292.91
OF-423	270.25
OF-464	237.30
OF-157	230.70
OF-208	209.78
OF-312	202.68
OF-125	187.85
OF-212	180.57
OF-222	168.47
OF-301	166.18
OF-463	164.97
OF-353	161.19
OF-203	160.40
OF-144	149.48
OF-409	138.45
OF-273	134.05
OF-75	133.45
OF-148	131.96
OF-388	130.55
OF-227	117.11
OF-191	116.94
OF-202	113.71
OF-345	108.52
OF-259	105.90
OF-323	105.01
OF-537	96.99
OF-400	96.69
OF-199	95.24
OF-424	93.78
OF-283	92.69
OF-356	88.08
OF-209	84.00
OF-355	83.45
OF-142	80.66
OF-390	79.95
OF-48	79.53
OF-174	79.32
OF-511	76.58
OF-40	74.12
OF-344	72.79
OF-167	71.80
OF-377	70.72
OF-116	69.30
OF-9	67.43
OF-408	66.78
OF-414	66.27
DMH-58	65.24
OF-113	65.17

OF-198	64.14
OF-502	62.90
OF-184	62.48
OF-108	61.22
OF-373	57.96
OF-207	56.78
OF-38	56.32
OF-368	54.24
OF-179	53.60
OF-372	53.41
OF-339	53.24
OF-346	51.99
OF-13	49.76
OF-461	49.35
OF-359	49.28
OF-16	48.63
OF-6	47.44
OF-331	47.00
OF-503	44.13
OF-193	43.01
OF-288	42.71
OF-204	42.39
OF-280	41.60
OF-109	41.20
OF-147	41.18
OF-205	40.70
OF-305	40.57
OF-182	39.23
OF-105	38.56
OF-317	38.27
OF-389	38.08
OF-354	37.73

OF-425	36.04
OF-333	35.68
OF-406	34.98
OF-190	34.95
OF-156	34.47
OF-302	34.43
OF-189	34.19
OF-506	34.16
OF-132	32.94
OF-540	31.88
OF-210	31.87
OF-365	31.01
OF-513	29.87
OF-486	29.61
OF-416	29.53
OF-289	29.41
OF-484	28.35
OF-324	28.26
OF-238	27.58
OF-526	27.00
OF-396	26.42
OF-394	26.09
OF-165	24.95
OF-489	24.83
OF-287	24.54
OF-501	24.47
OF-12	24.39
OF-490	24.17
OF-58	23.64
OF-410	23.45
OF-347	23.29
OF-493	23.06

OF-106	22.98
OF-223	22.69
OF-206	22.60
OF-261	21.95
OF-318	21.58
CB-2098	21.27
OF-303	21.00
OF-313	20.97
OF-371	20.51
OF-47	20.39
OF-374	20.23
OF-475	20.19
OF-445	20.02
OF-521	19.91
OF-500	19.74
OF-444	19.47
OF-67	18.91
OF-286	18.79
OF-229	18.63
OF-523	18.60
OF-340	17.85
OF-404	17.63
OF-336	17.29
OF-446	17.25
OF-274	17.14
OF-536	17.01
OF-22	16.63
OF-218	16.58
OF-294	16.13
OF-533	15.68
OF-168	15.13
OF-285	15.08

OF-278	15.02
OF-237	14.78
OF-214	14.76
OF-399	14.68
OF-376	14.38
OF-69	14.36
OF-492	14.25
OF-477	14.06
OF-152	14.00
OF-272	13.81
OF-81	13.49
CB-878	13.22
OF-512	13.20
OF-195	13.18
OF-100	12.98
OF-236	12.29
OF-375	12.05
OF-224	12.05
OF-192	11.94
OF-49	11.83
OF-367	11.43
OF-263	11.27
OF-66	11.23
OF-234	11.12
OF-341	11.03
OF-304	10.91
OF-200	10.87
CB-1791	10.67
OF-279	10.59
OF-230	10.18
OF-337	10.10
OF-417	10.04

OF-153	9.84
OF-397	9.57
OF-84	9.51
OF-178	9.13
OF-211	9.04
OF-342	8.99
CB-353	8.82
OF-7	8.81
OF-522	8.67
OF-357	8.46
OF-497	8.19
OF-514	8.06
OF-402	7.97
OF-487	7.80
OF-254	7.77
CB-2306	7.49
OF-343	7.47
OF-481	7.28
CB-2063	7.19
CB-935	7.15
OF-379	7.11
OF-413	7.04
OF-510	6.98
OF-532	6.91
OF-472	6.80
OF-260	6.78
OF-319	6.61
CB-2180	6.58
OF-330	6.50
DMH-55	6.29
CB-808	6.23
OF-524	6.15

OF-411	6.08
OF-509	6.05
OF-252	5.78
OF-366	5.65
OF-245	5.57
OF-449	5.51
OF-235	5.17
CB-736	5.16
OF-25	5.10
OF-14	4.93
OF-231	4.86
OF-216	4.72
OF-401	4.66
OF-181	4.64
OF-94	4.51
OF-217	4.34
OF-499	4.24
OF-360	4.05
OF-476	4.01
OF-308	3.97
OF-412	3.91
OF-271	3.71
OF-215	3.66
CB-1404	3.56
OF-527	3.15
OF-485	3.13
OF-249	2.90
CB-282	2.77
OF-232	2.74
OF-329	2.72
OF-508	2.59
OF-538	2.56

OF-298	2.52
CB-84	2.48
OF-494	2.42
OF-253	2.26
OF-295	2.24
CB-901	2.23
OF-270	2.21
OF-246	2.17
OF-491	2.16
OF-221	2.15
OF-258	2.08
OF-534	2.01
OF-233	2.00
OF-42	1.96
OF-430	1.92
OF-450	1.86
OF-256	1.82
CB-1400	1.80
OF-451	1.79
CB-354	1.76
OF-281	1.70
OF-525	1.69
OF-131	1.66
OF-480	1.61
OF-239	1.58
OF-452	1.56
OF-169	1.48
OF-432	1.46
CB-545	1.40
OF-483	1.34
CB-2147	1.32
CB-102	1.29

OF-435	1.28
OF-177	1.27
OF-448	1.25
OF-516	1.22
CB-1401	1.20
CB-2303	1.16
OF-282	1.14
CB-2217	1.14
OF-243	1.09
OF-479	0.96
CB-104	0.95
CB-1199	0.88
OF-307	0.83
OF-443	0.76
CB-1403	0.76
CB-1852	0.70
OF-242	0.66
OF-361	0.66
CB-737	0.65
OF-403	0.61
OF-447	0.54
OF-299	0.54
OF-441	0.50
OF-241	0.45
CB-1964	0.41
OF-297	0.35
OF-478	0.32
OF-141	0.30
OF-296	0.29
OF-291	0.26
CB-1872	0.26
OF-427	0.24

OF-251	0.24
OF-306	0.23
OF-247	0.22
OF-496	0.21
OF-292	0.20
OF-248	0.20
OF-293	0.17
OF-139	0.17
CB-352	0.17
CB-103	0.16
CB-1871	0.16
CB-2146	0.15

OF-255	0.14
OF-535	0.13
OF-250	0.07
OF-88	0.07
OF-442	0.06
CB-2064	0.06
CB-1861	0.05
OF-505	0.04
CB-840	0.03
CB-1402	0.01
CB-2258	0.00
CB-2097	0.00

Table C-213. Estimated Nitrogen Loading for All Catchments in the Neponset River Watershed

Catchment Identifier	Estimated N Load (Lbs/Yr)
OF-102	1217.96
OF-85	225.08
OF-470	157.45
OF-517	106.69
OF-170	106.01
OF-455	104.63
OF-351	101.38
OF-393	85.82
OF-300	84.40
OF-482	65.81
OF-456	64.91
OF-488	58.53
OF-185	46.36
OF-392	43.18
OF-269	37.68
OF-348	36.06
OF-369	36.05
OF-268	33.42
OF-176	32.00
OF-188	31.04
OF-161	30.72
OF-175	28.22
OF-173	25.96
OF-350	21.37
OF-519	20.06
OF-32	19.80
OF-309	18.75
OF-311	16.28
OF-380	15.39
OF-338	14.70
OF-405	13.95
OF-322	13.25
OF-186	11.66
OF-267	9.46
OF-382	6.42
CB 355	5.88
OF-220	5.36
OF-370	4.84
OF-219	3.82
OF-171	3.68
OF-172	2.67
OF-386	2.47
OF-187	2.44
CB-207	2.27
OF-515	2.27
OF-128	1.76
CB-208	1.17
OF-469	0.31
CB-1073	0.01
CB-355	0.00

Appendix D: Town-Owned Parcels Sorted by the NSP BMP Tool's Phosphorus Priority Ranking

Table D-1. Town-Owned Parcels Sorted by BMP Tool Priority Score for Phosphorus Removal

Address	Parloc_ID	Use Description	BMP Tool Priority Score (Max Score = 1)
HIGH ST	F_713664_2887021		1
0 HIGH ST	F_714303_2886555		1
NOON HILL RD	F_707558_2884747		1
REAR ORCHARD ST	F_701967_2882985		1
84 R HARDING ST	F_703237_2898667	Municipal, Federal, or State	0.994696795
NOON HILL ST	F_708669_2883256		0.992391054
115 HIGH ST	F_715254_2883614		0.987548997
REAR PLAIN ST	F_715348_2881796		0.987548997
SCHOOL ST	F_706892_2898006		0.987548997
1 ICE HOUSE RD.	F_703417_2898120		0.987548997
CAUSEWAY ST	F_704503_2885480		0.98270694
REAR HAWTHORNE DR	F_710005_2899063		0.98270694
KENNEY RD	F_709148_2896852		0.98270694
2 ICE HOUSE RD.	F_702608_2898113	Commercial	0.98270694
39 SPRING ST	F_708401_2891890		0.98270694
NOON HILL ST	F_708814_2882219		0.944431635
ELM ST	F_716734_2887274		0.944431635
PLAIN ST	F_716720_2881595		0.944431635
3 ICE HOUSE RD.	F_701962_2898645		0.944431635
REAR PLAIN ST	F_714753_2880611		0.932672354
NOON HILL ST	F_709590_2882330		0.932672354
PLAIN ST	F_716747_2879421		0.922065944
HIGH ST	F_716694_2882435		0.922065944
3 HAWTHORNE DR	F_710797_2900362		0.922065944
ELM ST	F_715302_2887388		0.916762739

NORTH ST & 329R	F_709446_2903186		0.916762739
COLE DR	F_715652_2880947		0.914456998
OFF HIGH ST	F_716820_2880841		0.914456998
SOUTH ST	F_708350_2884456		0.914456998
REAR HIGH ST	F_715119_2886232		0.914456998
13 SURREY RUN	F_704681_2899383		0.914456998
NOON HILL RD	F_708875_2885248	Municipal, Federal, or State	0.905925755
CHARLES RIVER	F_700139_2879928		0.905925755
BRIDGE ST	F_701104_2895725		0.90454231
MILLBROOK RD	F_715715_2895157		0.90454231
REAR ELM ST	F_715802_2888323		0.90454231
149 HIGH ST	F_716095_2883099		0.896241642
REAR PHILIP ST	F_716631_2890609		0.845054185
ORCHARD ST	F_703691_2882134		0.845054185
NOON HILL	F_705383_2880456		0.845054185
REAR DEERFIELD DR	F_708241_2900694		0.845054185
NOON HILL	F_707414_2882235		0.845054185
REAR HIGH ST	F_717076_2882041		0.845054185
NOON HILL	F_704392_2882095		0.845054185
STOP RIVER	F_705345_2882404		0.845054185
REAR WALDEN CT	F_711727_2900209		0.845054185
EASTMOUNT RD	F_713383_2892739	Industrial	0.845054185
NOON HILL	F_704221_2880903		0.80401199
10 RIDGE RD	F_710555_2881238		0.80401199
CAUSEWAY ST	F_704605_2883005		0.80401199
NOON HILL	F_705403_2881544		0.80401199
17 ELM ST	F_713738_2888271		0.798708785
21 RIDGE RD	F_711424_2881157		0.796633618

ELM ST	F_714889_2889774		0.796633618
34 COLONIAL RD	F_705938_2901075		0.796633618
15 CEDAR LN	F_707878_2898743		0.774729075
NORTH ST & 329R	F_708965_2902741		0.76942587
NORTH ST & 329R	F_709114_2902843		0.76942587
17 SURREY RUN	F_704755_2899492		0.76942587
OFF FLINT LOCKE LN	F_712319_2900082		0.756974867
625 MAIN ST	F_706129_2893345		0.753977404
ROCKY LN	F_711523_2881572		0.74821305
OFF SOUTH ST	F_709168_2879829		0.739220659
ROCKY LN	F_710900_2882474		0.739220659
9 INDIAN HILL RD	F_708352_2880015		0.701637076
E SPRING ST	F_710471_2889757		0.701637076
REAR EASTMOUNT RD	F_713205_2892864		0.694950427
2 R LAKEWOOD TERR	F_711538_2880858		0.631542541
HILLTOP CIR	F_711514_2882870		0.631542541
REAR PHILIP ST	F_716568_2890938		0.631542541
JUNIPER LN	F_710606_2887061		0.631542541
HIGH ST	F_711305_2887141		0.631542541
CAUSEWAY ST	F_704291_2883135		0.631542541
REAR PHILIP ST	F_716374_2891236		0.631542541
WOOD END LN	F_717280_2896473		0.631542541
MAIN ST	F_707229_2891236		0.631542541
20 RIDGE RD	F_711417_2880903		0.59349781
OFF ROLLING LN	F_713000_2894856		0.59349781

3 INDIAN HILL RD	F_708752_2879679		0.580355084
REAR WEST & ADAMS STS	F_705506_2895165		0.580355084
83 BLACKSMITH DR	F_704537_2900085		0.580355084
HARDING ST	F_705898_2900601		0.580355084
OFF PLAIN ST	F_714203_2881926		0.559372838
HIGH ST	F_714845_2885818		0.559372838
107 R ELM ST	F_716708_2888676		0.556836523
5 INDIAN HILL RD	F_708580_2879821		0.556836523
7 INDIAN HILL RD	F_708469_2879934		0.556836523
2 INDIAN HILL RD	F_709002_2879914		0.556836523
REAR PLAIN ST	F_717128_2879933		0.556836523
	LOCmapc_392516		0.556836523
REAR HIGH ST	F_712011_2887009		0.556836523
REAR LAND	F_716656_2886099		0.556836523
DEERFIELD DR	F_708255_2899874		0.556836523
0 UNKNOWN	F_708174_2892620		0.556836523
54 HATTERS HILL RD	F_712037_2897339		0.556836523
PHEASANT RD	F_704589_2901181		0.556836523
DALE ST	F_705058_2893003		0.556836523
84 BLACKSMITH DR	F_704602_2899877		0.556836523
LAUREL DR	F_707553_2891328		0.556836523
GROVE ST	F_704573_2894926		0.556836523
GROVE ST	F_704762_2894787		0.556836523
WEST MILL ST	F_702922_2896899		0.51925294

GRANITE ST	F_714492_2881602		0.516716624
END SAW MILL LN	F_716414_2894967		0.516716624
42 HATTERS HILL RD	F_712202_2897018		0.516716624
NORTH ST	F_707241_2896856		0.516716624
REAR GREEN ST	F_710227_2895358		0.516716624
NORTH ST & 329R	F_709364_2902859		0.516716624
HATTERS HILL RD	F_711988_2897432		0.516716624
85 COLONIAL RD	F_704696_2899708		0.516716624
44 HOSPITAL RD	F_701817_2899713		0.510260549
DALE ST	F_706841_2895889		0.505187918
REAR ELM ST	F_715075_2889736		0.505187918
POUND ST	F_711887_2892836		0.505187918
COLONIAL RD	F_705072_2899751		0.505187918
9 SURREY RUN	F_704480_2899177		0.505187918
55 NO MEADOWS RD	F_706171_2894527		0.505187918
REAR HARDING ST	F_704457_2898840		0.505187918
BRIDGE ST	F_700967_2894235		0.505187918
HIGH ST	F_715155_2886542		0.480055338
50 HATTERS HILL RD	F_712092_2897231		0.424948121
3 BRIAR HILL RD	F_715694_2880028	Single family residence	0.370071478
8 INDIAN HILL RD	F_708598_2880179		0.368457459
END SAW MILL LN	F_716584_2894878		0.368457459

UPHAM RD	F_708285_2893241		0.368457459
55-59 GREEN ST	F_709504_2894871		0.361540235
6 INDIAN HILL RD	F_708700_2880077		0.343324879
PLEASANT CT	F_709444_2891549		0.34171086
4 INDIAN HILL RD	F_708868_2879959		0.303666129
7 SURREY RUN	F_704354_2899294		0.303666129
NORTH ST	F_707107_2897139		0.303666129
46 HATTERS HILL RD	F_712147_2897124		0.296748905
93 PLEASANT ST	F_710306_2891063		0.293520867
ELM ST	F_715751_2888058		0.216970256
100 BIRCH RD	F_717930_2896669		0.201060641
NORTH ST	F_707552_2896592		0.144800553
BRIDGE ST	F_701393_2894103		0.132810699
NORTH ST	F_707551_2894808		0.114825917
135 NO MEADOWS RD	F_702412_2897022		0.112750749
OFF WEST ST	F_702651_2895849		0.112750749
124 NORTH ST	F_707623_2895185		0.112750749
7 FRAIRY ST	F_708241_2893413		0.112750749
30 POUND ST	F_710887_2892850		0.112750749
459 MAIN ST	F_708981_2893302		0.112750749
15 JANES AVE	F_709078_2893482		0.112750749
NORTH ST	F_708847_2893304		0.112750749
458 - 460 MAIN ST	F_709108_2893052		0.112750749
CAUSEWAY ST	F_705563_2887608		0.022826839
NOON HILL	F_708213_2885972		0.022365691
REAR LAND	F_716663_2886401		0.020521098
REAR LAND	F_716456_2886728		0.019368227

STOP RIVER AREA	F_708919_2886712		0.018676504
STOP RIVER	F_707279_2886428		0.018676504
REAR CAUSEWAY ST	F_706094_2887105		0.018676504
OFF ELM ST	F_716997_2886546		0.018676504
ELM ST	F_715853_2887170		0.018676504
MAIN ST	F_704757_2891063		0.018676504
0 UNKNOWN	F_705210_2891507		0.018676504
45 HATTERS HILL RD	F_712316_2897286		0.00391976
49 HATTERS HILL RD	F_712210_2897405		0.00391976
18 SURREY RUN	F_704606_2899659		0.00391976
14 SURREY RUN	F_704518_2899610		0.00391976
MAIN ST	F_704522_2891585		0.001383445
REAR ELM ST	F_715667_2886649		0.000461148
ELM ST	F_715796_2887705		0.000461148

Appendix E: Town-Owned Parcels Sorted by the NSP BMP Tool's Nitrogen Priority Ranking

Table E-1. Town-Owned Parcels Sorted by BMP Tool Priority Score for Nitrogen Removal

Address	Parloc_ID	Use Description	BMP Tool Priority Score (Max Score = 1)
8 INDIAN HILL RD	F_708598_2880179		1
3 INDIAN HILL RD	F_708752_2879679		0.999077703
5 INDIAN HILL RD	F_708580_2879821		0.999077703
7 INDIAN HILL RD	F_708469_2879934		0.999077703
ROCKY LN	F_710900_2882474		0.999077703
REAR LAND	F_716656_2886099		0.995157943
9 INDIAN HILL RD	F_708352_2880015		0.994927369
NOON HILL	F_704221_2880903		0.990315887
CAUSEWAY ST	F_704605_2883005		0.990315887
ORCHARD ST	F_703691_2882134		0.985243256
	LOCmapc_392516		0.985243256
149 HIGH ST	F_716095_2883099		0.985243256
SOUTH ST	F_708350_2884456		0.982245792
GRANITE ST	F_714492_2881602		0.98155407
REAR HIGH ST	F_712011_2887009		0.98155407
NORTH ST	F_707241_2896856		0.98155407
9 SURREY RUN	F_704480_2899177		0.98155407
7 SURREY RUN	F_704354_2899294		0.98155407
NORTH ST	F_707107_2897139		0.98155407
CHARLES RIVER	F_700139_2879928		0.977864884
NORTH ST & 329R	F_709114_2902843		0.976942587
44 HOSPITAL RD	F_701817_2899713		0.975789716
BRIDGE ST	F_701104_2895725		0.974406272
REAR ELM ST	F_715802_2888323		0.974406272
REAR HIGH ST	F_717076_2882041		0.974406272
E SPRING ST	F_710471_2889757		0.974406272
REAR ELM ST	F_715075_2889736		0.974406272
REAR HARDING ST	F_704457_2898840		0.974406272

BRIDGE ST	F_700967_2894235		0.974406272
NOON HILL ST	F_708814_2882219		0.965644455
OFF ROLLING LN	F_713000_2894856		0.965644455
PLAIN ST	F_716720_2881595		0.965644455
OFF FLINT LOCKE LN	F_712319_2900082		0.965644455
NORTH ST & 329R	F_709446_2903186		0.965644455
NORTH ST & 329R	F_708965_2902741		0.962416417
POUND ST	F_711887_2892836		0.962416417
115 HIGH ST	F_715254_2883614		0.959418953
21 RIDGE RD	F_711424_2881157		0.958496657
55-59 GREEN ST	F_709504_2894871		0.958496657
REAR PLAIN ST	F_714753_2880611		0.958496657
COLE DR	F_715652_2880947		0.958496657
OFF HIGH ST	F_716820_2880841		0.958496657
NOON HILL ST	F_709590_2882330		0.958496657
REAR WEST & ADAMS STS	F_705506_2895165		0.958496657
HARDING ST	F_705898_2900601		0.958496657
ELM ST	F_716734_2887274		0.940050726
3 BRIAR HILL RD	F_715694_2880028	Single family residence	0.940050726
10 RIDGE RD	F_710555_2881238		0.940050726
HIGH ST	F_715155_2886542		0.940050726
NOON HILL	F_705403_2881544		0.940050726
84 R HARDING ST	F_703237_2898667	Municipal, Federal, or State	0.940050726
CAUSEWAY ST	F_704503_2885480		0.921604796
REAR HAWTHORNE DR	F_710005_2899063		0.921604796
REAR PHILIP ST	F_716631_2890609		0.921604796

NOON HILL	F_705383_2880456		0.921604796
REAR DEERFIELD DR	F_708241_2900694		0.921604796
NOON HILL	F_707414_2882235		0.921604796
HIGH ST	F_713664_2887021		0.921604796
NOON HILL	F_704392_2882095		0.921604796
STOP RIVER	F_705345_2882404		0.921604796
REAR WALDEN CT	F_711727_2900209		0.921604796
REAR EASTMOUNT RD	F_713205_2892864		0.921604796
EASTMOUNT RD	F_713383_2892739	Industrial	0.921604796
6 INDIAN HILL RD	F_708700_2880077		0.751671662
REAR GREEN ST	F_710227_2895358		0.751671662
NOON HILL ST	F_708669_2883256		0.750057644
15 CEDAR LN	F_707878_2898743		0.737606641
0 HIGH ST	F_714303_2886555		0.716854969
NOON HILL RD	F_707558_2884747		0.716854969
REAR ORCHARD ST	F_701967_2882985		0.716854969
625 MAIN ST	F_706129_2893345		0.716854969
2 INDIAN HILL RD	F_709002_2879914		0.655061102
46 HATTERS HILL RD	F_712147_2897124		0.655061102
NOON HILL RD	F_708875_2885248	Municipal, Federal, or State	0.65436938
ROCKY LN	F_711523_2881572		0.649296749
OFF SOUTH ST	F_709168_2879829		0.581507955
MILLBROOK RD	F_715715_2895157		0.581507955
50 HATTERS HILL RD	F_712092_2897231		0.581507955
HIGH ST	F_716694_2882435		0.578279917

83 BLACKSMITH DR	F_704537_2900085		0.578279917
17 ELM ST	F_713738_2888271		0.57620475
REAR PLAIN ST	F_715348_2881796		0.57620475
SCHOOL ST	F_706892_2898006		0.57620475
1 ICE HOUSE RD.	F_703417_2898120		0.57620475
54 HATTERS HILL RD	F_712037_2897339		0.565828914
13 SURREY RUN	F_704681_2899383		0.565828914
84 BLACKSMITH DR	F_704602_2899877		0.565828914
OFF PLAIN ST	F_714203_2881926		0.55891169
3 ICE HOUSE RD.	F_701962_2898645		0.55891169
PLAIN ST	F_716747_2879421		0.547613558
KENNEY RD	F_709148_2896852		0.547613558
2 ICE HOUSE RD.	F_702608_2898113	Commercial	0.547613558
39 SPRING ST	F_708401_2891890		0.547613558
DALE ST	F_706841_2895889		0.547613558
3 HAWTHORNE DR	F_710797_2900362		0.547613558
55 NO MEADOWS RD	F_706171_2894527		0.547613558
4 INDIAN HILL RD	F_708868_2879959		0.421489509
MAIN ST	F_707229_2891236		0.417569749
ELM ST	F_715302_2887388		0.416647452
93 PLEASANT ST	F_710306_2891063		0.415725156
20 RIDGE RD	F_711417_2880903		0.385289371
2 R LAKEWOOD TERR	F_711538_2880858		0.383214203
HILLTOP CIR	F_711514_2882870		0.383214203
REAR PHILIP ST	F_716568_2890938		0.383214203
JUNIPER LN	F_710606_2887061		0.383214203

HIGH ST	F_711305_2887141		0.383214203
ELM ST	F_714889_2889774		0.383214203
REAR PHILIP ST	F_716374_2891236		0.383214203
WOOD END LN	F_717280_2896473		0.383214203
BRIDGE ST	F_701393_2894103		0.383214203
17 SURREY RUN	F_704755_2899492		0.383214203
34 COLONIAL RD	F_705938_2901075		0.383214203
END SAW MILL LN	F_716584_2894878		0.240488817
UPHAM RD	F_708285_2893241		0.240488817
HIGH ST	F_714845_2885818		0.239566521
NORTH ST	F_707551_2894808		0.239566521
END SAW MILL LN	F_716414_2894967		0.233110445
42 HATTERS HILL RD	F_712202_2897018		0.233110445
NORTH ST & 329R	F_709364_2902859		0.233110445
HATTERS HILL RD	F_711988_2897432		0.233110445
85 COLONIAL RD	F_704696_2899708		0.233110445
WEST MILL ST	F_702922_2896899		0.229882407
107 R ELM ST	F_716708_2888676		0.227576666
REAR PLAIN ST	F_717128_2879933		0.227576666
135 NO MEADOWS RD	F_702412_2897022		0.227576666
OFF WEST ST	F_702651_2895849		0.227576666
DEERFIELD DR	F_708255_2899874		0.227576666
PLEASANT CT	F_709444_2891549		0.227576666
124 NORTH ST	F_707623_2895185		0.227576666
0 UNKNOWN	F_708174_2892620		0.227576666
7 FRAIRY ST	F_708241_2893413		0.227576666
100 BIRCH RD	F_717930_2896669		0.227576666
PHEASANT RD	F_704589_2901181		0.227576666
30 POUND ST	F_710887_2892850		0.227576666
459 MAIN ST	F_708981_2893302		0.227576666

DALE ST	F_705058_2893003		0.227576666
LAUREL DR	F_707553_2891328		0.227576666
15 JANES AVE	F_709078_2893482		0.227576666
NORTH ST	F_708847_2893304		0.227576666
458 - 460 MAIN ST	F_709108_2893052		0.227576666
GROVE ST	F_704573_2894926		0.227576666
GROVE ST	F_704762_2894787		0.227576666
ELM ST	F_715751_2888058		0.086465299
REAR HIGH ST	F_715119_2886232		0.085773576
REAR LAND	F_716663_2886401		0.083928983
COLONIAL RD	F_705072_2899751		0.083928983
CAUSEWAY ST	F_705563_2887608		0.083237261
REAR LAND	F_716456_2886728		0.083237261
NOON HILL	F_708213_2885972		0.079086926
STOP RIVER AREA	F_708919_2886712		0.079086926
STOP RIVER	F_707279_2886428		0.079086926
REAR CAUSEWAY ST	F_706094_2887105		0.079086926
OFF ELM ST	F_716997_2886546		0.079086926
ELM ST	F_715853_2887170		0.079086926
NORTH ST	F_707552_2896592		0.079086926
MAIN ST	F_704757_2891063		0.079086926
0 UNKNOWN	F_705210_2891507		0.079086926
45 HATTERS HILL RD	F_712316_2897286		0.039428176
49 HATTERS HILL RD	F_712210_2897405		0.039428176
18 SURREY RUN	F_704606_2899659		0.039428176
14 SURREY RUN	F_704518_2899610		0.039428176
MAIN ST	F_704522_2891585		0.032741526
REAR ELM ST	F_715667_2886649		0.019137653
ELM ST	F_715796_2887705		0.019137653

CAUSEWAY ST	F_704291_2883135		0.01729306

Appendix F: Town Outfall Screening Data

Table W-1
Outfall Dry Weather Sampling
Surface Water Results Summary
9/25/2019

Sample Identification: / Receiving Waterbody / Watershed / Date Sampled:	UNITS	IDDE PRIORITY SOURCE	IDDE PRIORITY STANDARD	Outfall Number					
				OF-28	OF-42	OF-73	OF-85	OF-484	OF-541
				Stop River	Vine Brook	Stop River	Mill Brook	T.B.D.	T.B.D.
				Charles	Charles	Charles	Neponset		
				9/25/2019	9/25/2019	9/25/2019	9/25/2019	9/25/2019	9/25/2019
FIELD SCREENING									
Field pH	su units	Center for Watershed Protection	> 5	6.89	6.78	7.10	7.25	7.10	6.72
Field pH	su units	Charles River TMDL	6.5 - 8.3	6.89	6.78	7.10	7.25	7.10	6.72
Temperature	°C	314 CMR 4.00 for Class B Warm Water	< 28.3	18.21	18.11	17.46	18.56	15.71	15.64
Field Specific Conductance	µs/cm °C	Center for Watershed Protection	< 2000	12.4	14.8	15.10	-5.7	-2.4	31.0
Dissolved Oxygen	%	314 CMR 4.00 for Class B Warm Water	> 43.22%	54.3%	90.30%	**40.00%**	71.00%	91.00%	**24.00%**
Dissolved Oxygen	mg/L	314 CMR 4.00 for Class B Warm Water	> 5	-	-	-	-	-	-
Turbidity	NTU			15.62	15.67	28.45	38.77	29.42	27.45
Salinity	ppt			343.0	301.0	215.0	204.0	1324.0	13.0
LABORATORY TESTING									
Ammonia as N (SM19-22 4500 NH3 C)	mg/L	EPA New England Bacterial Source Tracking Protocol	< 0.5	ND	ND	0.53	0.53	ND	ND
Chlorine, Free (SM21-22 4500 CL G)	mg/L	EPA 2018 General Permit	< 0.02	ND	ND	0.041	ND	ND	0.83
Chlorine, Residual (SM21-22 4500 CL G)	mg/L	EPA 2018 General Permit	< 0.02	ND	0.036	0.087	0.024	ND	0.59
Coliform, Fecal (SM 9223B - COLILERT)	MPN/100 mL	Neponset River TMDL	≤ 200	7.5	7.4	100	**370**	86	140
Coliform, Total (SM 9223B - COLILERT)	MPN/100 mL			>2419.6	2400	>2419.6	>2419.6	>2419.6	4900
Phosphorus, Total (SM 21-22 4500 P E)	mg/L			ND	ND	.11	ND	ND	0.22
Total Suspended Solids (SM21-22 2540D)	mg/L			ND	2.6	27	2.4	ND	240
E. Coli (SM 9223B - COLILERT)	MPN/100 mL		< 235	14	11	140	2400	91	180
Enterococci (ENTEROLERT)	present/absent			Present	Present	Absent	Present	Absent	Present
Surfactants - Methylene blue active substances (SM5540 C-1)	mg/L	EPA New England Bacterial Source Tracking Protocol	< 0.25	0.06	0.06	0.10	0.06	0.12	0.07

Notes:

Any outfalls that are found during screening to contain one or more of the following signs of sewage contamination will automatically be re-prioritized to the top of the high priority outfalls for catchment investigation:

√ Olfactory or visual evidence of sewage;

√ Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, AND bacteria levels greater than the applicable water quality criteria for receiving water (235 CFU or MPN for E. coli or 61 CFU or MPN for Enterococcus); or

√ Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L AND detectable levels of chlorine.

Table W-1
Outfall/DMH Dry Weather Sampling
Surface Water Results Summary
6/26/2020

				Outfall Number			IDDE Drainage Manholes					
Sample Identification:		**IDDE PRIORITY**	**IDDE PRIORITY**	OF-85	OF-265	OF-526	DMH-266	DMH-267	DMH-273	DMH-274	DMH-927	DMH-938
Receiving Waterbody	**UNITS**	**SOURCE**	**STANDARD**	Mill Brook								
Watershed				Neponset	Charles	Charles						
Date Sampled:				6/26/2020	6/26/2020	9/25/2019	6/26/2020	6/26/2020	6/26/2020	6/26/2020	9/25/2019	6/26/2020
FIELD SCREENING												
Field pH	su units	Center for Watershed Protection	> 5	6.57	7.49	7.66	6.61	Dry	6.06	5.70	6.59	Dry
Field pH	su units	Charles River TMDL	6.5 - 8.3	6.57	7.49	7.66	6.61	Dry	6.06	**5.70**	6.59	Dry
Temperature	°C	314 CMR 4.00 for Class B Warm Water	< 28.3	16.83	18.73	11.92	19.21	Dry	18.48	17.62	16.12	Dry
Field Specific Conductance	µs/cm °C	Center for Watershed Protection	< 2,000	194	258	271	215	Dry	153	151	180	Dry
Dissolved Oxygen	%	314 CMR 4.00 for Class B Warm Water	> 43.22%	74.2%	97.90%	99.20%	**13.40%**	Dry	51.40%	**12.40%**	93.20%	Dry
Dissolved Oxygen	mg/L	314 CMR 4.00 for Class B Warm Water	> 5	7.18	9.16	10.69	**1.23**	Dry	**4.77**	**1.18**	9.16	Dry
Turbidity	NTU			Below	Below	Below	Below	Dry	Below	Below	Below	Dry
Salinity	ppt			Below	Below	Below	Below	Dry	Below	Below	Below	Dry
LABORATORY TESTING												
Ammonia as N (SM19-22 4500 NH3 C)	mg/L	EPA New England Bacterial Source Tracking Protocol	< 0.5	0.40	ND	ND	**2.10**	Dry	0.40	ND	**0.53**	Dry
Chlorine, Free (SM21-22 4500 CL G)	mg/L	EPA 2018 General Permit	< 0.02	**0.021**	**0.040**	ND	**0.400**	Dry	ND	**0.044**	**0.400**	Dry
Chlorine, Residual (SM21-22 4500 CL G)	mg/L	EPA 2018 General Permit	< 0.02	**0.027**	**0.030**	ND	**0.340**	Dry	**0.370**	**0.045**	**0.450**	Dry
Coliform, Fecal (SM 9223B - COLILERT)	MPN/100 mL	Neponset River TMDL	≤ 200	15	28	ND	**2,000**	Dry	20	1	13	Dry
Coliform, Total (SM 9223B - COLILERT)	MPN/100 mL			2000	>2419.6	870	>2419.6	Dry	1400	1600	>2419.6	Dry
Phosphorus, Total (SM 21-22 4500 P E)	mg/L			ND	0.17	ND	ND	Dry	0.46	ND	ND	Dry
Total Suspended Solids (SM21-22 2540D)	mg/L			4	ND	ND	220	Dry	360	ND	100	Dry
Turbidity (EPA 180.1)	NTU			31	1.5	ND	36	Dry	580	ND	270	Dry
E. Coli (SM 9223B - COLILERT)	MPN/100 mL		< 235	3.1	22	1.0	67	Dry	13	ND	5.1	Dry
Enterococci (ENTEROLERT)	Present/Absent			Absent	Absent	Absent	Present	Dry	Present	Absent	Absent	Dry
Salinity (SM2520B)				ND	ND	ND	ND	Dry	ND	ND	ND	Dry
Surfactants - Methylene blue active substances (SM5540 C-1)	mg/L	EPA New England Bacterial Source Tracking Protocol	< 0.25	0.09	0.05	<0.05	**1.79**	Dry	0.11	<0.05	0.08	Dry

Notes:

Any outfalls that are found during screening to contain one or more of the following signs of sewage contamination will automatically be re-prioritized to the top of the high priority outfalls for catchment investigation:

√ Olfactory or visual evidence of sewage;

√ Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, AND bacteria levels greater than the applicable water quality criteria for receiving water (200 CFU or MPN for E. coli or 61 CFU or MPN for Enterococcus); or

√ Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L AND detectable levels of chlorine.

ATTACHMENT TWO

FUNDING SOURCE ASSESSMENT

Estimated Annual MS4 Program Management Cost

Program Element	Entity	Permit Section Reference	Town's Monetary Resources
Permit Management with NSP Participation	DPW	1	$7,500
Public Education and Outreach,	DPW, NSP, NRWA, CRWA	2.3.2	$4,000
Public Meeting	DPW	2.3.3	$3,000
Illicit Discharge Detection and Elimination	DPW	2.3.3	$50,000
Sewer System Overflow Management	DPW	2.3.4	$2,000
General GIS Maintenance	IT Department	2.3.4	$5,000
Catchment Re-assessment and Priority Re-evaluation of Outfall Priority (Data Evaluation)	DPW	2.3.4	$2,000
Outfall Pipe Inspections (142/year)	DPW	2.3.4	$15,000
Field Screening and Monitoring Program	DPW	2.3.4	$4,000
Annual Employee Training	DPW	2.3.4	$3,000
Regulatory Review and Updates	DPW	2.3.5/2.3.6	$0
Amendments to Written Procedures	DPW	2.3.5/2.3.6	$0
Construction Site Stormwater Runoff Control	Planning and ConComm	2.3.5	To be determined
Post Construction Stormwater Management	Planning and ConComm	2.3.6	To be determined
Retrofit Inventory	DPW	2.3.6	NSP 604B Grant
Inventory Town owned Facilities	DPW	2.3.7	$10,000
Stormwater Pollution Prevention Planning (SWPPP) at Public Facilities	DPW	2.3.7	$4,000
Catch Basin Cleaning	DPW	2.3.7	$53,000
Street Sweeping	DPW	2.3.7	$15,000
Winter Road Maintenance	DPW	2.3.7	120,000
Storm Drain System Inspections	DPW	2.3.7	$7,500
Annual Reporting	DPW	4	$3,500

Estimated Program Management Cost (Excluding Structural BMPs, see attached) = $308,500

Town of Medfield
604B Grant Best Management Practice Installations
West Street Cost Estimate

Unit No.	Description	Units	Quantity	Unit Price [(1)]	Subtotal
120	EARTH EXCAVATION	CY	1,152	$ 41.36	$ 47,655.91
156	CRUSHED STONE	TON	114	$ 60.00	$ 6,834.38
181.11	DISPOSAL OF UNREGULATED SOIL	TON	1,152	$ 10.00	$ 11,522.22
698.1	GEOTEXTILE FABRIC FOR STABILIZATION	SY	761	$ 10.00	$ 7,606.78
748	MOBILIZATION/DEMOBILIZATION	5%	1	$ 8,421.52	$ 8,421.52
751.1	LOAM FOR LAWNS (6-INCHES)	CY	42.0	$ 97.43	$ 4,092.06
751.2	PLANTING BED FOR LANDSCAPING (12-INCHES)	CY	137.0	$ 40.00	$ 5,480.00
765	SEEDING	SY	183	$ 2.50	$ 458.33
767.121	SEDIMENT CONTROL BARRIER	FT	128	$ 7.50	$ 960.00
775	LANDSCAPING	LS	1	$ 5,188.50	$ 5,188.50
983.1	RIPRAP	TON	412	$ 89.75	$ 36,995.62
999.01	STORMTECH DRAINAGE SYSTEM (1 HOUR PEAK @ 671 GPM)	GAL	40,260	$ 0.91	$ 36,636.60
999.02	SURVEYING	LS	1	$ 5,000.00	$ 5,000.00
	ENGINEERING	10%	1	$ 17,685.19	$ 17,685.19
	PERMITTING	5%	1	$ 8,842.60	$ 8,842.60
	CONTINGENCY	20%	20%	$ 40,675.94	$ 8,135.19
	ESTIMATED TOTAL CONCEPTUAL COST (PV 2023)				$ 211,514.90

O&M	ESTIMATED ANNUAL MAINTENANCE COST	LS/YEAR	1	$ 2,115.15	$ 2,115.15

Notes: (1) The unit cost are based on the highest of MassHighway District 1 Mean and Median unit prices, dated 2/1/2023.
(2) The Cultec Stormtech unit cost is based on a 2.0 multiplier on the MC-4500 (4,500 gal) at $2,050 per unit.

Town of Medfield
604B Grant Best Management Practice Installations
Wheelock School Cost Estimate

Unit No.	Description	Units	Quantity	Unit Price [(1)]	Subtotal
120	EARTH EXCAVATION	CY	1,180	$ 41.36	$ 48,824.71
129.2	OLD PAVEMENT EXCAVATION	SY	2,265	$ 15.00	$ 33,975.00
146	DRAINAGE STRUCTURE REMOVED	EA	3	$ 924.18	$ 2,772.54
151	GRAVEL BORROW	CY	410	$ 64.86	$ 26,587.80
156	CRUSHED STONE	TON	75	$ 60.00	$ 4,522.50
181.11	DISPOSAL OF UNREGULATED SOIL (COMMON FILL)	CY	1,180	$ 10.00	$ 11,804.81
201	CATCH BASIN	EA	2	$ 5,000.00	$ 10,000.00
222.3	FRAME AND GRATE (OR COVER) MUNICIPAL STANDARD	EA	3	$ 1,200.00	$ 3,600.00
402	DENSE GRADED CRUSHED STONE FOR SUB-BASE	CY	63	$ 85.00	$ 5,347.92
450.23	SUPERPAVE SURFACE COURSE (2")	TON	29	$ 275.00	$ 7,941.66
450.42	SUPERPAVE BASE COURSE (2")	TON	29	$ 309.00	$ 8,923.53
698.1	GEOTEXTILE FABRIC FOR STABILIZATION	SY	110	$ 10.00	$ 1,096.11
748	MOBILIZATION/DEMOBILIZATION	5%	1	$ 12,778.78	$ 12,778.78
751.1	LOAM FOR LAWNS (6-INCHES)	CY	62	$ 97.43	$ 6,040.66
751.2	PLANTING BED FOR LANDSCAPING (12-INCHES)	CY	233.0	$ 40.00	$ 9,320.00
765	SEEDING	SY	247	$ 2.50	$ 616.67
767.4	WOOD CHIP MULCH	CY	26	$ 115.40	$ 2,956.59
775	LANDSCAPING	LS	1	$ 7,125.00	$ 7,125.00
999.01	STORMTECH DRAINAGE SYSTEM (1 HOUR PEAK @ 1,037 GPM)	GAL	62,220	$ 0.91	$ 56,620.20
999.02	SURVEYING	LS	1	$ 7,500.00	$ 7,500.00
	ENGINEERING	10%	1	$ 26,835.45	$ 26,835.45
	PERMITTING	0%	1	$ -	$ -
	CONTINGENCY	20%	20%	$ 59,037.99	$ 11,807.60
	ESTIMATED TOTAL CONCEPTUAL COST (PV 2023)				$ 306,997.53

O&M	ESTIMATED ANNUAL MAINTENANCE COST	LS/YEAR	1	$ 3,069.98	$ 3,069.98

Notes: (1) The unit cost are based on the highest of MassHighway District 1 Mean and Median unit prices, dated 2/1/2023.
(2) The Cultec Stormtech unit cost is based on a 2.0 multiplier on the MC-4500 (4,500 gal) at $2,050 per unit.

Town of Medfield
604B Grant Best Management Practice Installations
South Street at Wilson Street Cost Estimate

Unit No.	Description	Units	Quantity	Unit Price [(1)]	Subtotal
120	EARTH EXCAVATION	CY	1,612	$ 41.36	$ 66,666.19
181.11	DISPOSAL OF UNREGULATED SOIL (COMMON FILL)	CY	1,612	$ 10.00	$ 16,118.52
202	MANHOLE	EA	1	$ 5,092.42	$ 5,092.42
242.24	24 INCH REINFORCED CONCRETE PIPE FLARED END	EA	1	$ 2,435.55	$ 2,435.55
244.24	24 INCH REINFORCED CONCRETE PIPE CLASS V	FT	52	$ 210.67	$ 10,954.67
748	MOBILIZATION/DEMOBILIZATION	5%	1	$ 7,195.41	$ 7,195.41
751.1	LOAM FOR LAWNS (6-INCHES)	CY	80	$ 97.43	$ 7,794.40
751.2	PLANTING BED FOR LANDSCAPING (12-INCHES)	CY	326.0	$ 40.00	$ 13,040.00
765	SEEDING	SY	1,256	$ 2.50	$ 3,140.00
775	LANDSCAPING	LS	1	$ 13,229.00	$ 13,229.00
983.1	RIPRAP	TON	5	$ 89.75	$ 437.53
999.02	SURVEYING	LS	1	$ 5,000.00	$ 5,000.00
	ENGINEERING	10%	1	$ 15,110.37	$ 15,110.37
	PERMITTING	0%	1	$ -	$ -
	CONTINGENCY	20%	20%	$ 33,242.81	$ 6,648.56
	ESTIMATED TOTAL CONCEPTUAL COST (PV 2023)				$ 172,862.62

O&M	ESTIMATED ANNUAL MAINTENANCE COST	LS/YEAR	1	$ 1,728.63	$ 1,728.63

Notes: (1) The unit cost are based on the highest of MassHighway District 1 Mean and Median unit prices, dated 2/1/2023.
(2) The Cultec Stormtech unit cost is based on a 2.0 multiplier on the MC-4500 (4,500 gal) at $2,050 per unit.

Town of Medfield
604B Grant Best Management Practice Installations
Medfield Highway Garage Cost Estimate

Unit No.	Description	Units	Quantity	Unit Price [(1)]	Subtotal
120	EARTH EXCAVATION	CY	32	$ 41.36	$ 1,323.52
151	GRAVEL BORROW	CY	10	$ 64.86	$ 648.60
181.11	DISPOSAL OF UNREGULATED SOIL (COMMON FILL)	CY	32	$ 10.00	$ 320.00
202	MANHOLE	EA	1	$ 5,092.42	$ 5,092.42
242.24	24 INCH REINFORCED CONCRETE PIPE FLARED END	EA	1	$ 2,435.55	$ 2,435.55
244.24	24 INCH REINFORCED CONCRETE PIPE CLASS V	FT	35	$ 210.67	$ 7,373.33
748	MOBILIZATION/DEMOBILIZATION	5%	1	$ 968.76	$ 968.76
983.1	RIPRAP	TON	2	$ 89.75	$ 181.74
999.02	SURVEYING	LS	1	$ 2,000.00	$ 2,000.00
	ENGINEERING	10%	1	$ 2,034.39	$ 2,034.39
	PERMITTING	0%	1	$ -	$ -
	CONTINGENCY	20%	20%	$ 4,475.66	$ 895.13
	ESTIMATED TOTAL CONCEPTUAL COST (PV 2023)				$ 23,273.45
O&M	ESTIMATED ANNUAL MAINTENANCE COST	LS/YEAR	1	$ 232.73	$ 232.73

Notes: (1) The unit cost are based on the highest of MassHighway District 1 Mean and Median unit prices, dated 2/1/2023.

Town of Medfield

604B Grant Best Management Practice Installations

Total Cost Estimate Summary

Item No.	Location		Estimated BMP Cost
1	West Street	$	211,514.90
2	Wheelock School	$	306,997.53
3	South Street at Wilson Street	$	172,862.62
4	Highway Garage	$	23,273.45
		$	714,648.51
O&M	Annual Maintenance Cost (1%)	$	7,146.49

Enterprise Funds

An Enterprise Fund is essentially an accounting system for financial activities associated with a municipal service, in this case, stormwater management. The enterprise fund statute, M.G.L. Chapter 44, Section 53F½, was first enacted in 1986 as a way to allow Massachusetts municipalities to account for a range of financial activities associated with municipal services. Only Massachusetts cities and towns may adopt an enterprise fund pursuant to the law. Special purpose districts may not adopt an enterprise fund, unless permitted by special legislation.

Initially, the funds were most commonly used for water, gas and electric utility companies to account for annual operating costs, not the indirect costs, capital improvements or fixed assets of the service. Over the past decade, Massachusetts municipalities have looked to their sister/brother entities across the U.S. that have been utilizing Enterprise Funds to account for and manage stormwater drainage and other associated service fees.

Why Use an Enterprise Fund?

This accounting mechanism is quite beneficial because it allows the community to see the portion of the stormwater utility's cost that is paid for by user charges; and it helps to make clear what property owners are paying for and what they are getting in return. Under enterprise accounting, the revenues and expenditures for services are separated into separate funds with their own financial statements, rather than commingled with the revenues and expenses of all other government activities. The community decides which stormwater utility costs will be paid for through user fees (e.g. services versus capital costs). Additional advantages of using an enterprise fund include:

Useful Management Information - With the consolidation of revenues and the cost of services and information on the operating performance of the fund, municipalities will have useful information to make decisions on user charges and other budgetary items. They will be able to analyze how much the user fees and charges support the services and to what extent, if any, tax levy or other available revenues are needed to supplement the enterprise fund.

Investment Income and Surplus - Unlike services operating in the general fund, all investment earnings and any other operating surplus is retained in the enterprise fund rather than returned to the general fund at year-end. Once a surplus is certified as available it may be used to fund operating, capital or debt service costs.

Implement Capital Improvements - The enterprise fund will allow the entity (e.g. department or utility) providing the service to better plan for and implement capital improvements because these needs can be forecasted and integrated into the long-term financial management plans (expenditure, revenue and credit planning).

Adopting an Enterprise Fund

A city or town may adopt an enterprise fund by vote of its legislative body, subject to the local charter. Each enterprise fund must be adopted separately with its own vote. The *Enterprise Funds: G.L. c. 44, § 53F½* manual by the Massachusetts Department of Revenue provides the following sample language for a vote to adopt an enterprise fund:

"To see if the (city or town) will accept the provisions of Chapter 44, § 53F½ of the Massachusetts General Laws establishing (the service) as an enterprise fund effective fiscal year (year)."

Once adopted, the community begins the process of establishing the separate fund on its accounting records and identifying the assets, liabilities and equity in other funds if voted by the legislative body to be transferred to the enterprise fund. The community must operate the enterprise fund for a minimum of three years before the provisions may be rescinded like any local adoption law.

Budget

Under the enterprise fund statute, the entity responsible for operating the fund must submit a proposed line item budget to the local executive authority "no later than one hundred and twenty days prior to the beginning of each fiscal year" (March 1). The budget is then submitted to the community's executive authority like any other departmental request for review and appropriation. When preparing the budget, enterprise-related costs already included for appropriation in the General Fund operating budget must not be included for appropriation in the enterprise fund budget.

The budget is subject to the appropriation process. Any transfers among the enterprise fund's line-item appropriations require additional legislative action during the last two months of any fiscal year.

Expenses

All operating costs of the enterprise must be identified in the budget. Any surplus resulting from unspent appropriations as of June 30 is kept by the enterprise fund. At a minimum, common items to be broken out in enterprise fund budgets should include, salaries and wages, expenses, capital outlays, indirect costs, and a contingency for unforeseen events.

Revenues

Revenues may be appropriated by the town's legislative body until the tax rate is certified by the Bureau of Accounts. An estimated increase in revenues above the prior fiscal year's actual revenues must be supported in writing to the Bureau of Accounts using rate analysis, usage data, new rate implementation dates, etc., for tax rate certification purposes. Any surplus is kept by the enterprise fund at fiscal year-end.

As described in the Case Studies (see Appendices), the Towns of Newton and Reading have utilized an Enterprise Fund for their stormwater fees. For detailed descriptions of adoption and appropriations procedures of enterprise funds please review the *2008 Enterprise Funds Manual, G.L. c. 44, § 53F½* here, http://www.mass.gov/dor/docs/dls/publ/misc/enterprisefundmanual.pdf.

Other Financing Options

While the drainage service fee is the most effective way to implement a successful, long-term stormwater management program or utility, municipalities have a range of other financing options to consider when planning their stormwater system requirements and objectives. With the exception of general fund appropriations, however, most of these additional options are project specific; they are not dedicated or guaranteed, they vary from year to year, and are therefore far less predictable than

user fees. For these reasons, they limit a municipality's ability to pay for ongoing service delivery expenses, such as administration and operations.

Still, due to the range of stormwater system needs and expense types, many communities draw from a range of financing options, combining enterprise-based, user-fee revenues with other funding sources. This has been referred to as "blended funding." When setting up a management plan, municipalities could consider the following types of financing options.

General Fund Appropriation

General fund appropriations are a familiar, frequently used method to pay for stormwater management expenses. In most communities, they are used as the primary funding source for stormwater needs. The disadvantages of using general funds to pay for stormwater system expenses is that stormwater needs then compete against other municipal service needs and must be re-evaluated and re-appropriated each year, which does not provide for a stable funding source with which to make long-term plans. Additionally, there is no clear nexus between the source of the funds (which are primarily tax levies) and the uses. Finally, tax-exempt properties do not contribute to the general fund, though they impose costs on the stormwater/drainage system.

Bonds/Loans

A bond is a written promise to repay borrowed money on a definite schedule, and usually at a fixed rate of interest, for the life of the bond. Some types of bonds are tax exempt. Bonds represent a large source of capital, but can be a complex and more expensive way to borrow. The high expense results from the legal and administrative time required for issuing bonds. In some cases voter approval is required for issuing bonds.

A well-known municipal funding source, capital improvement bonds are especially appropriate for covering large capital expenses associated with stormwater management. Capital improvement typically is defined as a non-recurring expenditure or any expenditure for physical improvements, including costs for: acquisition of existing buildings, land, or interests in land; construction of streets and highways or utility lines; acquisition of fixed equipment; landscaping; and similar expenditures. There are two main types of capital improvement bonds for a municipality to consider: General Obligation Bonds and Revenue Bonds. General Obligation Bonds are backed by the "full faith and credit" of a municipality are not secured by a particular source of revenue. The municipality pledges to use legally available resources, including tax revenues, to repay bond holders. Revenue bonds are a municipal bond supported by the revenue from a specific project, such as a toll bridge, highway, or local stadium. A primary benefit for using revenue bonds versus GO Bonds is that they allow the municipality to avoid reaching legislated debt limits. It should be noted that if a municipality decided to use a revenue bond to pay for stormwater infrastructure capital expenses, it would need to keep user fees distinguishable as a revenue source.

Another bond option is a "Double-Barrel Bond": a municipal revenue bond secured by a pledge of two or more sources of payments, typically a user fee and the credit of the issuing government (generally taxes). State and local governments use double-barrel bonds to finance environmental improvements, including stormwater management and utility set-up, and/or the creation of stormwater management districts. The revenue stream pledge may be in the form of multiple taxes,

such as the real estate transfer tax or special assessment taxes. For further information on the use of this type of bond see *The Fundamentals of Municipal Bonds*; "General Obligation Bonds"[3] (http://www.amazon.com/Fundamentals-Municipal-Bonds-Wiley-Finance/dp/0471393657).

The State Revolving Fund (SRF) Water Pollution Control Program was implemented by the 1987 Clean Water Amendments to provide long-term, low-interest loans for capital improvement projects designed to abate point and nonpoint sources of water pollution. The SRF program is administered by states using federal grant money, matching state funds, and loan repayments to fund eligible projects. Massachusetts DEP and the Massachusetts Water Pollution Abatement Trust jointly administers the Massachusetts Clean Water State Revolving Fund (CWSRF), which provides a low-cost funding mechanism to assist municipalities in complying with federal and state water quality requirements. Financial assistance is available for planning and construction of projects, including CSO mitigation and nonpoint source pollution abatement projects (pollution prevention, and stormwater remediation). While the SRF is a viable funding source for many stormwater capital improvement projects, these loans are only available for projects that offer a solution for stormwater quality issues. Many municipalities also have important capital improvement projects that are intended to improve drainage and flooding issues. For further information on this loan program see the DEP State Revolving Fund Program webpage: http://www.mass.gov/dep/water/wastewater/srfinfo.htm.

Grants

Although an attractive source of funding by municipalities in years past, grants for water pollution from the federal government are far smaller than in earlier years with more stringent requirements. In addition, since grants are designed by the awarding agency or organization to meet certain, often specific, goals, they may carry additional mandates and those mandates may be costly to meet. A few notable grant programs still available to supplement a municipal stormwater management fee/utility include:

- *Clean Water Act Section 319 Nonpoint Source Competitive Grants Program*. This grant program is intended to provide supplemental funding for meeting the provisions of section 319 of the Clean Water Act: "implementation of projects that address the prevention, control, and abatement of nonpoint source (NPS) pollution." Grants can be used to finance the development of a stormwater utility and are often used for CIP projects even if the rest of the stormwater management system is funded through another source. Projects must address activities that are identified in the Massachusetts NPS Management Plan and a 40% non-federal match is required from the grantee. Further information regarding this program can be found on the Massachusetts Department of Environmental Protection (DEP) webpage: http://www.mass.gov/dep/water/grants.htm#319. When the Request for Responses (RFR) is issued, it is posted on the Commonwealth of Massachusetts Procurement Access & Solicitation System, at www.comm-pass.com.
- *Coastal Pollutant Remediation (CPR) Grant Program*. The CPR grant program was established in 1996 by the Massachusetts Legislature to compliment the 319 program to help coastal communities abate water contamination problems from nonpoint source pollutants. The CPR program offers funding to Massachusetts municipalities within the designated Massachusetts Coastal Zone to assess and remediate stormwater pollution from paved

[3] Temel, Judy W.; The Bond Market Association; *The Fundamentals of Municipal Bonds*; "General Obligation Bonds;" 5th ed., John Wiley & Sons, Inc.; 2001.

surfaces and to build boat waste pump-out facilities. Projects may not exceed one year in duration and must be completed by June 30 of each year. Further information regarding this program can be found on the Massachusetts Office of Coastal Zone Management (CZM) webpage: http://www.mass.gov/czm/cprgp.htm. When the RFR is issued, it is posted on the Commonwealth of Massachusetts Procurement Access & Solicitation System, at www.comm-pass.com.

- *Transportation Equity Act for the 21st Century* (TEA-21). TEA 21 authorizes over $200 billion to improve the Nation's transportation infrastructure, enhance economic growth and protect the environment. Municipalities can access this source of funding via submitting project proposals to the Boston Region Metropolitan Planning Organization for inclusion in the Transportation Improvement Program (TIP). TEA-21 allows up to 20% of the cost of a transportation facility reconstruction, rehabilitation, resurfacing or restoration project to be used for environmental mitigation, pollution abatement or construction of stormwater treatment systems.

Betterments

Betterments are a well-known way of funding improved or expanded infrastructure through a discrete charge on properties that benefit from the improvements. Each property benefitting from improved infrastructure is charged an additional special property tax. The cost may be paid in full or apportioned over a period of 20 years. In Massachusetts, municipalities may assess a betterments tax through legislative action such as a city council or town meeting vote. The betterments charge does not have to be for the entire cost of the improved or expanded infrastructure, but if it is less than the full cost, a city or town must decide what other funding sources will be used to pay the expense.

Because betterment fees must be tied to the direct benefit of each assessed property within a set timeframe, such a fee is more suited to a smaller area with discrete improvements rather than a generalized area. Often, if betterment fees are used to finance development of larger areas, it can pose severe administrative burdens on the town, and will require both a clear billing system and an efficient management team.

Plan Review, Development Inspection, and Other Review Fees

Municipal development review processes frequently attach fees to various permits to pay for improvements to public infrastructure. The rationale is that new private development often requires new or upgraded infrastructure, including stormwater infrastructure, and that these costs should be borne, at least in part, by the developer. Such fees are integrated into Planning Board Rules and Regulations that specify the requirements and process for development review.

Using development review fees to help finance stormwater systems or stormwater utilities is attractive because the costs are borne by a special user group – the developer. For this reason, using such fees to pay for stormwater upgrades is politically attractive – the public does not need to be charged for the improvements. The disadvantages of this option are that as with many financing tools, developer fees produce a relatively small amount of revenue that is project-specific. Also, in weaker market cities and towns, additional development fees may act as a deterrent to development.

A primary example of communities applying development review fees (also known as impact fees) can be found on Cape Cod. Towns within Barnstable County have been authorized to assess impact

fees by the Cape Cod Commission Act (Chapter 716 of the Acts of 1989 and Chapter 2 of the Acts of 1990) upon certification of their local comprehensive plans by the Commission. This type of fee is a one-time payment made by an applicant to the municipality as a condition of approval on a proposed development. The premise is that the impact fees offset the municipal capital costs of infrastructure necessary to service the proposed development. These funds must be used for governmental services or infrastructure improvements that are affected by the proposed development. Therefore, management of stormwater created by impervious surfaces on a proposed development are an appropriate use of these funds.

There is a significant challenge in relying upon these fees to make real progress in compliant municipal stormwater management, primarily due to the sporadic nature of their receipt. There are only so many development proposals that come before the Planning board per year, thereby providing a fixed, and rather minute, amount of revenue that can be generated by these fees.

Capitalization Recovery Fees

This financing option seeks to recapture public investment for properties undeveloped at the time a major stormwater system improvement was made. Later developers pay a charge to the municipality to help repay the investment. Capitalization recovery fees are appropriate and complementary for municipalities with a stormwater user service fee that does *not* apply to undeveloped properties.

Massachusetts municipalities could structure a capitalization recovery fee as a betterment that is charged to incoming property owners. However, the administration of such an arrangement would be complex: a municipality would first need to bond for the capital improvements (requiring a vote of the legislature), and then assess the betterment on incoming property owners (again requiring a vote of the legislature). For these reasons, advancing this type of financing option is more suited to more centralized forms of local government (e.g., city councils) and less to decentralized forms (e.g., town meeting).

Summary

Although there are several alternative financing methods that may be used in certain circumstances, only a drainage fee structure provides a long-term, sustainable, dedicated revenue source for stormwater management. These funding sources could be considered to supplement a drainage fee, yet it is unadvisable to a municipality to rely upon these sources to solely fund town-wide stormwater management needs.

As with any new fee or revenue source, public understanding and acceptance is one of the most critical aspects for success. The following section provides guidance and recommendations on public outreach and education to support the implementation of a drainage service fee and/or stormwater utility.

ATTACHMENT THREE

SUPPORTING CALCULATIONS FOR NON-STRUCURAL CONTROLS

CALCULATIONS FOR NON-STRUCURAL CONTROLS

(1) Enhanced Street Sweeping Program:

The Town of Medfield has opted to earn a phosphorus reduction credit for conducting an enhanced sweeping program of impervious surfaces located within the urbanized area. The table below outlines the default phosphorus removal factors for enhanced sweeping programs. The credit shall be calculated by using the following equation:

Credit sweeping = IA_{swept} x $PLE_{IC\text{-}land\ use}$ x $PRF_{sweeping}$ x AF

where:

Credit sweeping = Amount of phosphorus load removed by enhanced sweeping program (lb/year)

IA_{swept} = Area of impervious surface that is swept under the enhanced sweeping program (acres)

$PLE_{IC\text{-}land\ use}$ = Phosphorus Load Export Rate for impervious cover and specified land use (lb/acre/yr) (see Table 3-1)

$PRF_{sweeping}$ = Phosphorus Reduction Factor for sweeping based on sweeper type and frequency (see Table 3-3).

AF = Annual Frequency of sweeping (months/year)

For Medfield:

IA_{swept} = 230 acres

$PLE_{IC\text{-}land\ use}$ = 1.96 lbs/acre/yr (see Table 3-1, Medium Density Residential)

$PRF_{sweeping}$ = 0.08 (see Table 3-3, Weekly Vacuum Assisted).

AF = 0.75 (9 months/year)

Town-wide Credit Sweeping = 230 acres x 1.96 lbs/acre/yr x 0.08 x 0.75
= 27.0 lbs/yr

$CRWA_{UA}$ Credit Sweeping = 27.0 lbs/yr x 77.4% (CRW versus Town Area)
= 20.9 lbs/yr

Table 3-1: Proposed Average Annual Distinct P-Load Export Rates (for use in estimating P-Load reduction credits in the MA MS4 Permit)

Phosphorus Source Category by Land Use	Land Surface Cover	P Load Export Rate, lbs/acre/year	P Load Export Rate, kg/ha/yr
Commercial (Com) and Industrial (Ind)	Directly connected impervious	1.78	2.0
	Pervious	See* DevPERV	See* DevPERV
Multi-Family (MFR) and High-Density Residential (HDR)	Directly connected impervious	2.32	2.6
	Pervious	See* DevPERV	See* DevPERV
Medium -Density Residential (MDR)	Directly connected impervious	1.96	2.2
	Pervious	See* DevPERV	See* DevPERV
Low Density Residential (LDR) - "Rural"	Directly connected impervious	1.52	1.7
	Pervious	See* DevPERV	See* DevPERV
Highway (HWY)	Directly connected impervious	1.34	1.5
	Pervious	See* DevPERV	See* DevPERV
Forest (For)	Directly connected impervious	1.52	1.7
	Pervious	0.13	0.13
Open Land (Open)	Directly connected impervious	1.52	1.7
	Pervious	See* DevPERV	See* DevPERV
Agriculture (Ag)	Directly connected impervious	1.52	1.7
	Pervious	0.45	0.5
*Developed Land Pervious (DevPERV) – HSG A	Pervious	0.03	0.03
*Developed Land Pervious (DevPERV) – HSG B	Pervious	0.12	0.13
*Developed Land Pervious (DevPERV) – HSG C	Pervious	0.21	0.24
*Developed Land Pervious (DevPERV) – HSG C/D	Pervious	0.29	0.33
*Developed Land Pervious (DevPERV) – HSG D	Pervious	0.37	0.41

Notes:

- For pervious areas, if the hydrologic soil group (HSG) is known, use the appropriate value from this table. If the HSG is not known, assume HSG C conditions for the phosphorus load export rate.
- Agriculture includes row crops. Actively managed hay fields and pasture lands. Institutional land uses such as government properties, hospitals and schools are to be included in the commercial and industrial land use grouping for the purpose of calculating phosphorus loading.
- Impervious surfaces within the forest land use category are typically roadways adjacent to forested pervious areas.

Table 3-3: Phosphorus Reduction Efficiency Factors

($PRF_{sweeping}$) for sweeping impervious areas Frequency[1]	**Sweeper Technology**	**$PRF_{sweeping}$**
2/year (spring and fall)[2]	Mechanical Broom	0.01
2/year (spring and fall)[2]	Vacuum Assisted	0.02
2/year (spring and fall)[2]	High-Efficiency Regenerative Air-Vacuum	0.02
Monthly	Mechanical Broom	0.03
Monthly	Vacuum Assisted	0.04
Monthly	High Efficiency Regenerative Air-Vacuum	0.08
Weekly	Mechanical Broom	0.05
Weekly	Vacuum Assisted	0.08
Weekly	High Efficiency Regenerative Air-Vacuum	0.10

[1] For full credit for monthly and weekly frequency, sweeping must be conducted year-round. Otherwise, the credit should be adjusted proportionally based on the duration of the sweeping season (using AF factor).

[2] In order to earn credit for semi-annual sweeping the sweeping must occur in the spring following snow-melt and road sand applications.

(2) Catch Basin Cleaning:

The Town of Medfield can earn a phosphorus reduction credit, Credit CB, by removing accumulated materials from catch basins (i.e., catch basin cleaning) in the Watershed such that a minimum sump storage capacity of 50% is maintained throughout the year. The credit shall be calculated by using the following equation:

Credit CB = IACB x $PLE_{IC\text{-land use}}$ x PRFCB

where:

Credit CB = Amount of phosphorus load removed by catch basin cleaning (lb/year)

IACB = Impervious drainage area to catch basins (acres)

PRFCB = Phosphorus Reduction Factor for catch basin cleaning, 0.02

For Medfield:

IACB = 230 acres x 0.8 = 184 acres

$PLE_{IC\text{-land use}}$ = 1.96 lbs/acre/yr (see Table 3-1, Medium Density Residential)

PRFCB = 0.02

Town-wide Credit CB = 184 acres x 1.96 lbs/acre/yr x 0.02 = 7.2 lbs/yr

CRW_{UA} Credit CB = 7.2 lbs/yr x 77.4% (CRW versus Town Area) = 5.6 lbs/yr

(3) Enhanced Organic Waste and Leaf Litter Collection Program:

The Town of Medfield can earn a phosphorus reduction credit by performing regular gathering, removal and disposal of landscaping wastes, organic debris, and leaf litter from impervious surfaces from which runoff discharges to the TMDL waterbody or its tributaries. In order to earn this credit (Credit Leaf Litter), the town must gather and remove all landscaping wastes, organic debris, and leaf litter from impervious roadways and parking lots at least once per week during the period of September 1 to December 1 of each year. Credit can only be earned for those impervious surfaces that are cleared of organic materials in accordance with the description above. The gathering and removal shall occur immediately following any landscaping activities in the Watershed and at additional times when necessary to achieve a weekly cleaning frequency. The permittee must ensure that the disposal of these materials will not contribute pollutants to any surface water discharges. The permittee may use an enhanced sweeping program (e.g., weekly frequency) as part of earning this credit provided that the sweeping is effective at removing leaf litter and organic materials. The Credit leaf litter shall be determined by the following equation:

Credit Leaf Litter = (Watershed Area) x ($PLE_{IC\text{-}land\ use}$) x (0.05)

where:

Credit Leaf Litter = Amount of phosphorus load removed by leaf litter removal and disposal (lb/year)

Watershed Area = All impervious area (acre) from which runoff discharges to the TMDL waterbody or its tributaries in the Watershed

$PLE_{IC\text{-}land\ use}$ = 1.96 lbs/acre/yr (see Table 3-1, Medium Density Residential)

0.05 = 5% phosphorus reduction factor for organic waste and leaf litter collection program in the Watershed

For Medfield:

Credit Leaf Litter = 230 acres (roadways) + 43 acres (parcels) = 273 acres

$PLE_{IC\text{-}land\ use}$ = 1.52 lbs/acre/yr (see Table 3-1, Lower Density Residential)

Townwide Credit Leaf Litter = 273 acres x 1.52 lbs/acre/yr x 0.05 = 20.7 lbs/yr

CRW_{UA} Credit Leaf Litter = 20.7 lbs/yr x 77.4% (CRW versus Town Area) = 16.0 lbs/yr

ATTACHMENT FOUR

604B GRANT LIST OF PRIORITY STRUCTURAL BMP SITES

TOWN OF MEDFIELD 604B BMP GRANT SITE INVESTIGATION SUMMARY

Map Parcel ID	Site Address	Notes from Desktop Survey	Desktop GIS Based Ranking	Watershed	Impervious Surface (square meters)	Annual TN loading (lb)	Annual TP Loading (lb)	Annual TSS Loading (lb)	Soil Group A (acres)	Soil Group B (acres)	Soil Group C (acres)	Soil Group CD (acres)	Soil Group D (acres)	Soil Unclassified (acres)	Annual TSS Lodaing rate (lb/acre)	Annual TP Loading rate (lb/acre)	Annual TN Lodaing rate (lb/acre)	TN priority score	TP priority score	TSS priority score	% impervious	pri_pct_GW	Screen_Aer	FID	mapc_id	parloc_id
56-043	1 ICE HOUSE RD.	The Center at Medfield. Run off from parking lot could be treated in grassy area to SE	1	CHARLES	1636.983901	17.908709	2.5008217	1790.8709	1.282078	0.6118	0	0	0	5.2696369	250	0.349106926	2.5	0.576205	0.987549	0.961033	5.64677672	1	5	35	2140853	F_703417_2898120
33-092	17 ELM ST	Wheelock School. Could capture parkinglot runoff or connect to stormmain under Elm St. Potential site of new elementary school and future water and sewer building. Special town meeting on 11/7 and election on 11/15 to determine whether to build a new school on this site, behind the existing school. If approved, the project contains improvements campus-wide.	2	CHARLES	25896.43319	122.23833	15.723597	12223.833	0.000858	0.786442	0	0	0	7.4220652	250	0.321576658	2.5	0.576205	0.798709	0.961033	13.08738973	1	5	9	2138628	F_713738_2888271
38-001	POUND ST	Medfield High School. Could capture runoff from parkinglot, roof or off Pound St.	3	CHARLES	95902.09404	155.65066	14.268101	15565.066	1.614442	0.424674	3.960197	3.978165	3.921619	13.441598	250	0.229168654	2.5	0.962416	0.505188	0.961033	38.06252605	1	5	12	2139053	F_711887_2892836
56-045	2 ICE HOUSE RD.	The Kingsbury Club, lots of space for surface BMPs. Owned by the Town, but Town has a long-term ground lease with the Kingsbury Club	4	CHARLES	11287.76839	91.905472	4.9175899	13717.235	5.72557	0	0	0	0	7.9917231	1000	0.358497175	6.7	0.547614	0.982707	0.997694	20.3339611	1	4	22	2139909	F_702608_2898113
56-044	3 ICE HOUSE RD.	Behind Kingsbury Club and The Medfield Center. Potnetial to capture runoff from either parkinglot or Copperwood Rd. Check if devlopment planned here and what area is used for now	5	CHARLES	3133.299071	26.948716	3.7019368	2694.8716	2.854954	0.00298	0	0	0.053932	7.6275489	250	0.343424223	2.5	0.558912	0.944432	0.953655	7.18264234	1	4	27	2140368	F_701962_2898645
10-014	NOON HILL ST	Large open area with multiple outfalls, potential to treat moderatly large catchment. What is the existing use?	6	CHARLES	138.8177978	21.100982	3.1102534	2110.0982	4.457171	0	0	0.620024	3.363237	0	250	0.368496288	2.5	0.958497	0.932672	0.953655	0.40640866	1	4	5	2137886	F_709590_2882330
71-001	HOSPITAL RD	Medfield State Hospital, out to bid for proposals to sell the campus. It is not scheduled for any construction at this time. Even if a sale is approved at a future Town Meeting, the Town will likely end up retaining much of the parcel and selling only some of it.	7	CHARLES	120645.5399	406.72054	49.164184	40672.054	2.286329	5.074459	9.60531	0.136494	10.22791	37.648574	250	0.302198803	2.5	0.985243	0.753977	0.985243	18.32464796	1	4	0	2138077	F_701160_2901896
49-032	DALE ST	Dale St. School & Memorial School	8	CHARLES	25191.236	43.085876	4.0735095	4308.5876	4.348011	0	0	0	0	4.5225941	250	0.236359912	2.5	0.547614	0.505188	0.953655	36.11894269	1	4	23	2140301	F_706841_2895889
37-054	93 PLEASANT ST	Metacomet Park. Could capture runoff from parkinglot, tennis courts, Pleasant St, Curve St. not much unused space	9	CHARLES	5466.548921	21.820915	2.7296964	2182.0915	0	0	0	0.282167	0	8.4462344	250	0.312738533	2.5	0.415725	0.293521	0.953655	15.47607223	0	4	18	2139531	F_710306_2891063
49-084	NORTH ST	Medfield Town Police. Not much space, possible surface structure by Dale St or tennis courts. Coordinate with upcoming construction on North St.	10	CHARLES	6137.32199	6.9066453	0.4610566	690.66453	0	0	0	0	0	2.7626693	250	0.16688876	2.5	0.239567	0.114826	0.961033	54.8949298	0	4	25	2140318	F_707551_2894808
43-077	30 POUND ST	Medfield Housing Authority. Treat runoff from parking lot, roofs and pound st	11	CHARLES	8904.816585	15.600119	1.4946625	1560.0119	0	0	0	0	0	6.2400782	250	0.239527417	2.5	0.227577	0.112751	0.953655	35.26286014	0	4	13	2139080	F_710887_2892850
37-062	PLEASANT CT	Open area, could treat runoff from Pleasent Ct, potnetially redirect from stormdrains	12	CHARLES	72.77361666	0.4228723	0.0559315	42.287229	0	0	0	0	0	0.1691494	250	0.330664295	2.5	0.227577	0.341711	0.953655	10.63127154	0	3.5	21	2139899	F_709444_2891549
40-003	BRIDGE ST	By entrance to treatment plant. Could incorperate right of way. Potential to treat much of West St. stormwater before discharge to Charles. West St is scheduled for upcoming construction.	13	CHARLES	277.6725668	0.5185827	0.051363	51.858272	0	0	0	0	0	0.207435	250	0.24761248	2.5	0.383214	0.132811	0.985243	33.07770808	0	3.5	15	2139270	F_701393_2894103
49-086	124 NORTH ST	Medfield Parks and Rec. Possible Bioretention at corner of North and Dale. Coordinate with upcoming construction on North St.	14	CHARLES	1797.909853	2.7494619	0.2425399	274.94619	0	0	0	0	0	1.0997906	250	0.220534002	2.5	0.227577	0.112751	0.953655	40.39621574	0	3.5	24	2140308	F_707623_2895185

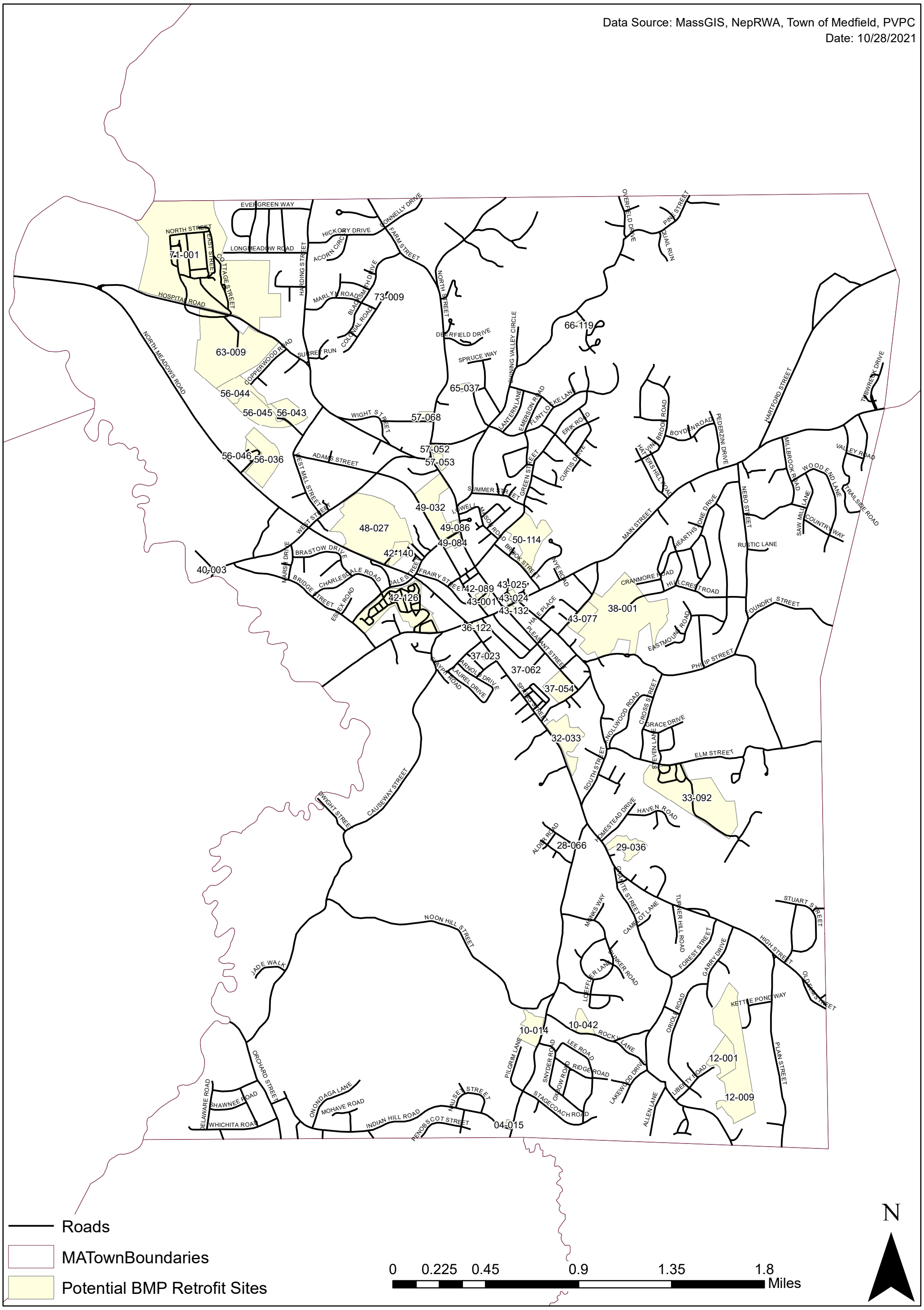
Map Parcel ID	Site Address	Notes from Desktop Survey	Desktop GIS Based Ranking	Watershed	Impervious Surface (square meters)	Annual TN loading (lb)	Annual TP Loading (lb)	Annual TSS Loading (lb)	Soil Group A (acres)	Soil Group B (acres)	Soil Group C (acres)	Soil Group CD (acres)	Soil Group D (acres)	Soil Unclassified (acres)	Annual TSS Lodaing rate (lb/acre)	Annual TP Loading rate (lb/acre)	Annual TN Lodaing rate (lb/acre)	TN priority score	TP priority score	TSS priority score	% impervious	pri_pct_GW	Screen_Aer	FID	mapc_id	parloc_id
48-027	REAR WEST & ADAMS STS	Medfield Highway Department & large field to west on north meadows rd. could treet water off of north meadows or Thomas Clewes rd. Look at West St side, West St. scheduled for upcoming construction.	15	CHARLES	11751.63293	130.27676	18.206525	13027.676	0	0	0	0	35.87647	9.3847394	250	0.349381672	2.5	0.958497	0.580355	0.953655	5.5725212	0	3	26	2140363	F_705506_2895165
36-122	0 UNKNOWN	Baxter Park, existing use may conflict with BMP. Coordinate with 109 construction	16	CHARLES	312.012068	2.4455986	0.3334218	244.55986	0	0	0	0	0	0.9782449	250	0.340838598	2.5	0.227577	0.556837	0.953655	7.88146011	0	3	28	2140369	F_708174_2892620
63-009	44 HOSPITAL RD	McCarthy Park. Lots of space for bioretention or swale to treat water off parking lot or Hospital Rd	17	CHARLES	9907.024614	142.17832	6.5307911	14217.832	2.253611	17.52177	3.987704	0.003064	6.548387	5.4719017	250	0.114834509	2.5	0.97579	0.510261	0.96403	4.30457554	1	3	14	2139163	F_701817_2899713
42-140	55 NO MEADOWS RD	Medfield Highway Department	18	CHARLES	8031.331356	10.421454	0.8080816	1042.1454	1.21997	0	0	0	0	2.9486272	250	0.193850493	2.5	0.547614	0.505188	0.953655	47.60797497	1	3	31	2140506	F_706171_2894527
43-001	UPHAM RD	Impoundment on Vine Brook, small space. coordinate with upcoming construction on north st?	19	CHARLES	183.9733802	3.2738799	0.4677138	327.38799	0	0	0	0	0	0.5985185	250	0.357155581	2.5	0.240489	0.368457	0.953655	3.47146446	0	3	39	2141365	F_708285_2893241
50-114	55-59 GREEN ST	Stephen Hinkley Park. Runoff from parkinglot OR treat at 2 outfalls from green st	20	CHARLES	8314.486721	47.887684	6.3271951	4788.7684	0	0	0	0	10.20423	7.464912	250	0.330314322	2.5	0.958497	0.36154	0.953655	10.72585904	0	3	1	2137097	F_709504_2894871
56-046	135 NO MEADOWS RD	Transfer Station, potentially high loading	21	CHARLES	10527.64813	9.6475276	0.4653057	964.75276	0	0	0	0	0	3.8339999	250	0.120576406	2.5	0.227577	0.112751	0.953655	67.41178204	0	3	6	2138076	F_702412_2897022
42-089	7 FRAIRY ST	Dwight-Derby House, existing use may conflict with BMP	22	CHARLES	497.7665695	1.2525664	0.1398697	125.25664	0	0	0	0	0	0.467394	250	0.279166266	2.5	0.227577	0.112751	0.953655	24.5496579	0	3	30	2140465	F_708241_2893413
43-025	15 JANES AVE	Large Parking lot across Janes St from Medfield town Hall. Not much space, possible swale on north west side or permiable pavement	23	CHARLES	1932.703075	1.3290936	0.0200015	132.90936	0	0	0	0	0	0.5316401	250	0.037622391	2.5	0.227577	0.112751	0.953655	89.83178622	0	3	40	2141367	F_709078_2893482
43-132	458 - 460 MAIN ST	Medfield Public Library, small space, is green space used by library? Coordinate with 109 construction?	24	CHARLES	2166.57811	2.2774374	0.1389735	227.74374	0	0	0	0	0	0.9109785	250	0.152554659	2.5	0.227577	0.112751	0.953655	58.7690112	0	2.6	37	2141273	F_709108_2893052
43-024	459 MAIN ST	Medfield Town Hall, very little space. Coordinate with 109 construction	25	CHARLES	1753.53426	1.4647356	0.0564576	146.47356	0	0	0	0	0	0.5858971	250	0.096361496	2.5	0.227577	0.112751	0.953655	73.95635233	0	2.6	38	2141309	F_708981_2893302
43-022	NORTH ST	Park between Starbucks and Nosh and Grog, not muc hspace. BMP may conflict with existing use. Coordinate with upcoming construction on North St.	26	CHARLES	138.3324172	0.2745815	0.0279905	27.458153	0	0	0	0	0	0.1098328	250	0.25484711	2.5	0.227577	0.112751	0.953655	31.12240279	0	2.6	41	2141368	F_708847_2893304
37-023	39 SPRING ST	Parcel along Spring St with existing outfall	27	CHARLES	14	1.7324213	0.2551183	173.24213	0.605555	0	0	0	0	0.0874162	250	0.368152873	2.5	0.547614	0.982707	0.953655	0.49922348	1	2.5	16	2139913	F_708401_2891890
12-009	REAR PLAIN ST	Parcel includes high voltage lines. potneital to treat stormwater from Cole Dr, Gary Dr.	28	NEPONSET	32.55450804	105.78276	15.652872	10578.276	5.81275	2.448717	0	0.716216	5.758128	0	250	0.369929657	2.5	0.958497	0.932672	0.953655	0.01901151	1	2.5	3	2137832	F_714753_2880611
66-119	3 HAWTHORNE DR	Mostly forested PArcel Along Hawthorne Drive with some open space	29	CHARLES	0	1.6920177	0.2504186	169.20177	0	0.672039	0	0.004771	0	0	250	0.37	2.5	0.547614	0.922066	0.953655	0	1	2.5	17	2140375	F_710797_2900362
28-066	JUNIPER LN	Small Strip of land along Juniper Ln at South St. potnetial for swale or infiltration trench	30	CHARLES	12.46168331	0.1452595	0.020359	14.525948	0	0	0.055361	0	0	0	250	0.350391046	2.5	0.383214	0.631543	0.985243	5.2997173	0	2.5	10	2138862	F_710606_2887061
29-036	REAR HIGH ST	Danielson Pond, could treat some water from high st surface or stormmain but oppertunities are limited	31	CHARLES	30.74576563	19.99052	2.9557858	1999.052	0	0.225914	0.963629	0	0.070206	0	250	0.369648453	2.5	0.981554	0.556837	0.985243	0.09501271	0	2.5	11	2138871	F_712011_2887009
57-052	NORTH ST	corner of North St and Winter St. with 2 outfalls. additional oppertunities along north st to capture surface runoff	32	CHARLES	0.0062988	1.573992	0.2329502	157.3992	0	0	0	0	0.629598	0	250	0.369999085	2.5	0.981554	0.303666	0.953655	0.00024722	0	2.5	33	2140843	F_707107_2897139
32-033	E SPRING ST	Kingsbury Pond, could treat outfall off of Spring St.	33	CHARLES	97.25351126	33.773763	4.9896252	3377.3763	0.306152	0	0	1.983914	2.165343	0	250	0.369341815	2.5	0.974406	0.701637	0.953655	0.17788786	0	2.2	20	2139871	F_710471_2889757
04-015	2 INDIAN HILL RD	Corner of Indian Hill Rd and South St, 9 town owned parcels, likely conservation	34	CHARLES	39.74184199	1.7288054	0.2522297	172.88054	0	0.447906	0	0	0.24362	0	250	0.364745589	2.5	0.655061	0.556837	0.985243	1.42011118	0	2.2	2	2137814	F_709002_2879914
57-053	NORTH ST	North St east of intersection with west st. Space along the right of way, potential outfall from Wheelwright rd	35	CHARLES	0	4.9431508	0.7315863	494.31508	0.403281	0	0	0	1.573986	0	250	0.37	2.5	0.981554	0.516717	0.953655	0	0	2.2	29	2140400	F_707241_2896856

Map Parcel ID	Site Address	Notes from Desktop Survey	Desktop GIS Based Ranking	Watershed	Impervious Surface (square meters)	Annual TN loading (lb)	Annual TP Loading (lb)	Annual TSS Loading (lb)	Soil Group A (acres)	Soil Group B (acres)	Soil Group C (acres)	Soil Group CD (acres)	Soil Group D (acres)	Soil Unclassified (acres)	Annual TSS Lodaing rate (lb/acre)	Annual TP Loading rate (lb/acre)	Annual TN Lodaing rate (lb/acre)	TN priority score	TP priority score	TSS priority score	% impervious	pri_pct_GW	Screen_Aer	FID	mapc_id	parloc_id
57-068	SCHOOL ST	Open area on corner of School St. and North St. Lots of space for surface feature	36	CHARLES	64.35498148	4.7672308	0.6996663	476.72308	1.6737	0	0	0.233199	0	0	250	0.36691441	2.5	0.576205	0.987549	0.961033	0.83394319	1	2.1	34	2140850	F_706892_2898006
65-037	15 CEDAR LN	Mostly forested parcel at end of Cedar Lane	37	CHARLES	19.58656563	2.9347814	0.4325569	293.47814	0	0	0	1.173587	0.00033	0	250	0.368474526	2.5	0.737607	0.774729	0.961033	0.41229019	0	2.1	19	2139854	F_707878_2898743
42-126	625 MAIN ST	Vine Lake Cemetary. Could coordinate with 109 reconstruction	38	CHARLES	22294.05479	78.031618	9.5103646	7803.1618	6.293024	0	0	0	0.352893	0	250	0.304695869	2.5	0.716855	0.753977	0.985243	17.64976506	1	2.1	32	2140839	F_706129_2893345
56-036	WEST MILL ST	Transfer Station	39	CHARLES	2616.508383	41.573325	5.9136283	4157.3325	0	0	0	0	0	15.983434	250	0.355614347	2.5	0.229882	0.519253	0.953655	3.88801424	0	2.1	8	2138357	F_702922_2896899
73-009	34 COLONIAL RD	End of Colonial Rd with outfall from 4 stormdrains	40	CHARLES	113.3210188	1.1811875	0.164455	118.11875	0.472478	0	0	0	0	0	250	0.348071252	2.5	0.383214	0.796634	0.953655	5.92668869	1	2	36	2140886	F_705938_2901075
10-042	ROCKY LN	By small bridge on Rocky Ln. could treat 2 outfalls before discharge to wetland but space is limited	41	CHARLES	125.7167119	11.216651	1.6485702	1121.6651	0	0	0	2.006477	2.431589	0	250	0.36743816	2.5	0.999078	0.739221	0.985243	0.69238921	0	2	4	2137884	F_710900_2882474
12-001	GRANITE ST	End of Liberty Rd, outfall with small catchment	42	NEPONSET	0	25.201372	3.7298031	2520.1372	0.407653	0	0	0	7.302554	0	250	0.37	2.5	0.981554	0.516717	0.953655	0	0	2	7	2138328	F_714492_2881602

Medfield, MA: Potential BMP Retrofit Sites

The 42 Town owned parcels displayed were identified by the Neponset River Watershed Association as potential sites for BMP Retrofits in Medfield, MA. Parcels were selected based on various site conditions including: amount of impervious area, amount of undeveloped openspace, existing stormdrain network, nearby resources (wetlands, streams), hydraulic soil groups and existing use.

Data Source: MassGIS, NepRWA, Town of Medfield, PVPC
Date: 10/28/2021



Potential BMP Retrofit Sites in Medfield, MA

The following town owned and right of way parcels have been identified as opportunities for stormwater structural best management practice retrofit in the Town of Medfield by the Neponset River Watershed Association. December 2021. The sites are listed in order of priority. This document contains field notes, photos, and maps for each site.

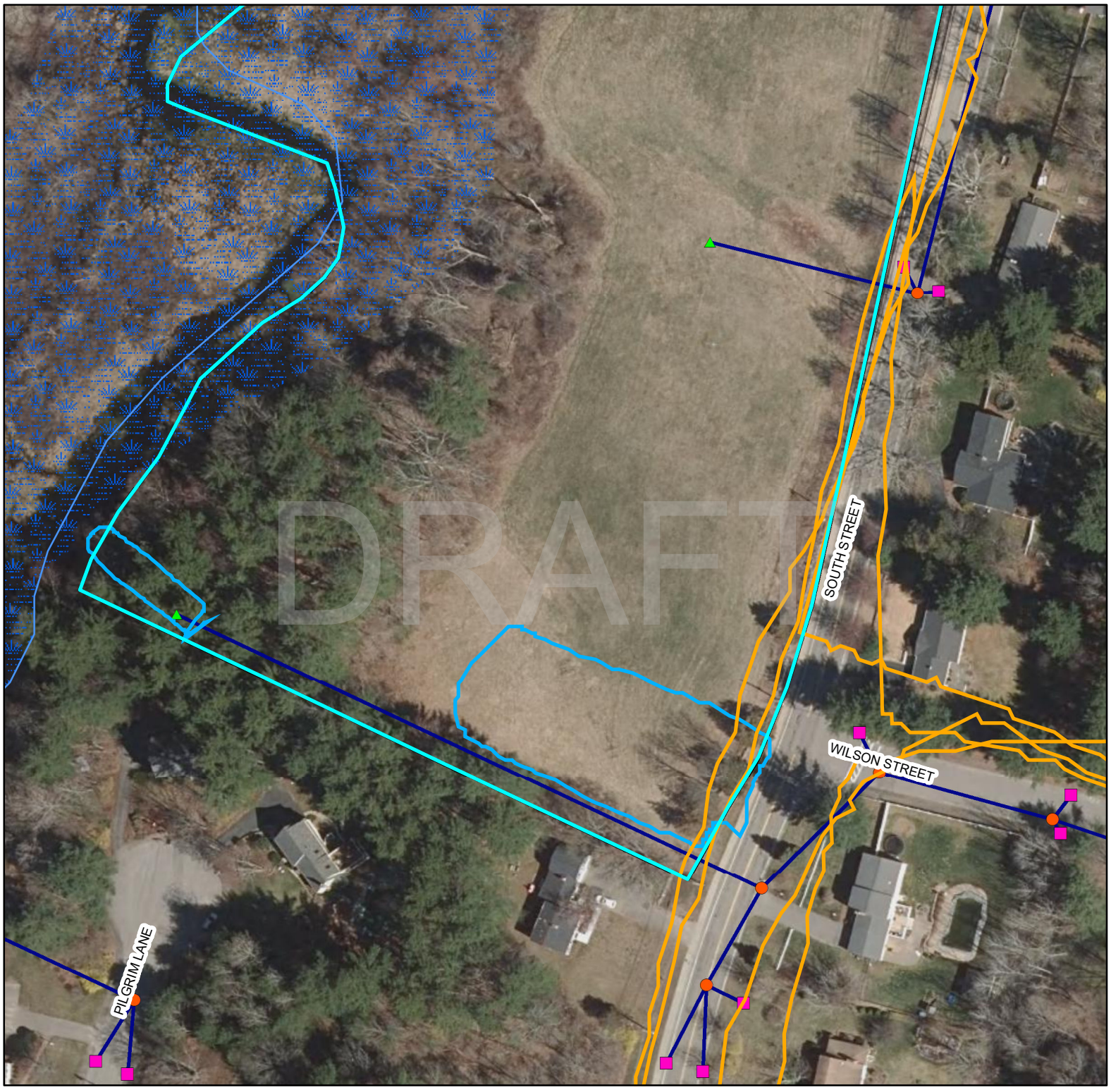
1. Meadow East of South St. by Wilson St.
2. Medfield High School
3. Wheellock School
4. West St @ The Charles River
5. Metacomet Park
6. Parking lot across Janes Ave from Town Hall
7. Vine Lake Cemetery
8. North St @ Harding and Winter St.
9. Medfield Senior Center/ Kensington Club
10. Medfield Highway Department
11. Memorial School
12. Medfield Middle School

Meadow East of South St. by Wilson St.

The site consists of a very large meadow between South St and the Stop River. A 30 inch drain pipe runs across the parcel and discharges directly into the Stop River. The outfall (190) is causing significant erosion in the forest. The upstream pipe network feeding this drainpipe captures about 0.6 miles of road runoff. Soils mapped as A and unknown.

There is an excellent opportunity for an infiltration cell or constructed wetland (depending on actual soil conditions) in the meadow that would treat the stormwater coming through the 30 inch drainpipe. Depth of drain pipe may be an issue. If this is conservation land there may be some resistance but the existing pipe network is contributing to significant erosion on site.

Potential BMP Retrofit Site: Meadow East of South St. by Wilson St.



Appx Drainage Area
Appx BMP Area
Potential BMP Retrofit Sites
Catch Basin
Drain Manhole
Outfall
Drain Pipe

0 50 100 200 Feet

Author: Devine, NepRWA

Date: 12/7/2021

Data Source: MassGIS, NepRWA, Town of Medfield, ESRI

N

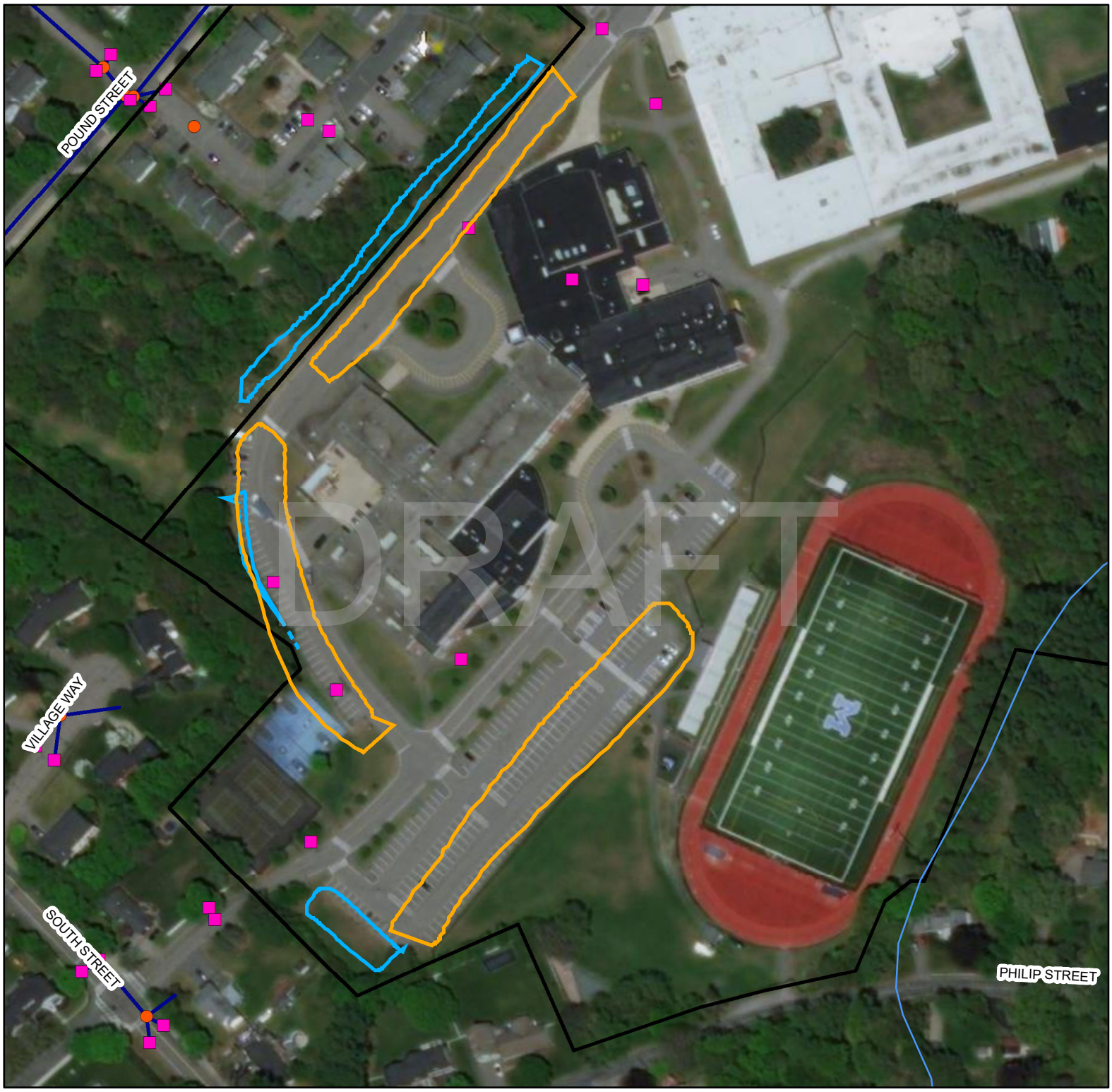
Medfield High School

Several good BMP opportunities on site. Should check that there is not already a subsurface BMP on site.

1. There is a 5,000 sq ft grass area at the SW downhill end of the main parking lot. The area already contains a catch basin in the middle of the grass area (unmapped). There is also a catch basin at the South end of the parking lot (unmapped). This catch basin could be replaced by a man hole and curb cuts could be added to direct sheet flow from parking lot into infiltration cell in parking lot. The catch basin in the center of the grass area would be used as the overflow. Design should be straightforward. Site has A soils.

2. There is an opportunity for a swale of infiltration feature in the space between the Medfield Housing Authority and the parking lot/roadway on the NE side of the Highschool. There are a number of catch basins along the NW side of this road which could be used for overflow. Existing trees and light posts may pose conflict. Site has A soils.

Potential BMP Retrofit Site:
Medfield High School



Appx Drainage Area
Appx BMP Area
Potential BMP Retrofit Sites
Catch Basin
Drain Manhole
Outfall
Drain Pipe

0 80 160 320 Feet

Author: Devine, NepRWA

Date: 12/7/2021

Data Source: MassGIS, NepRWA, Town of Medfield, ESRI

N

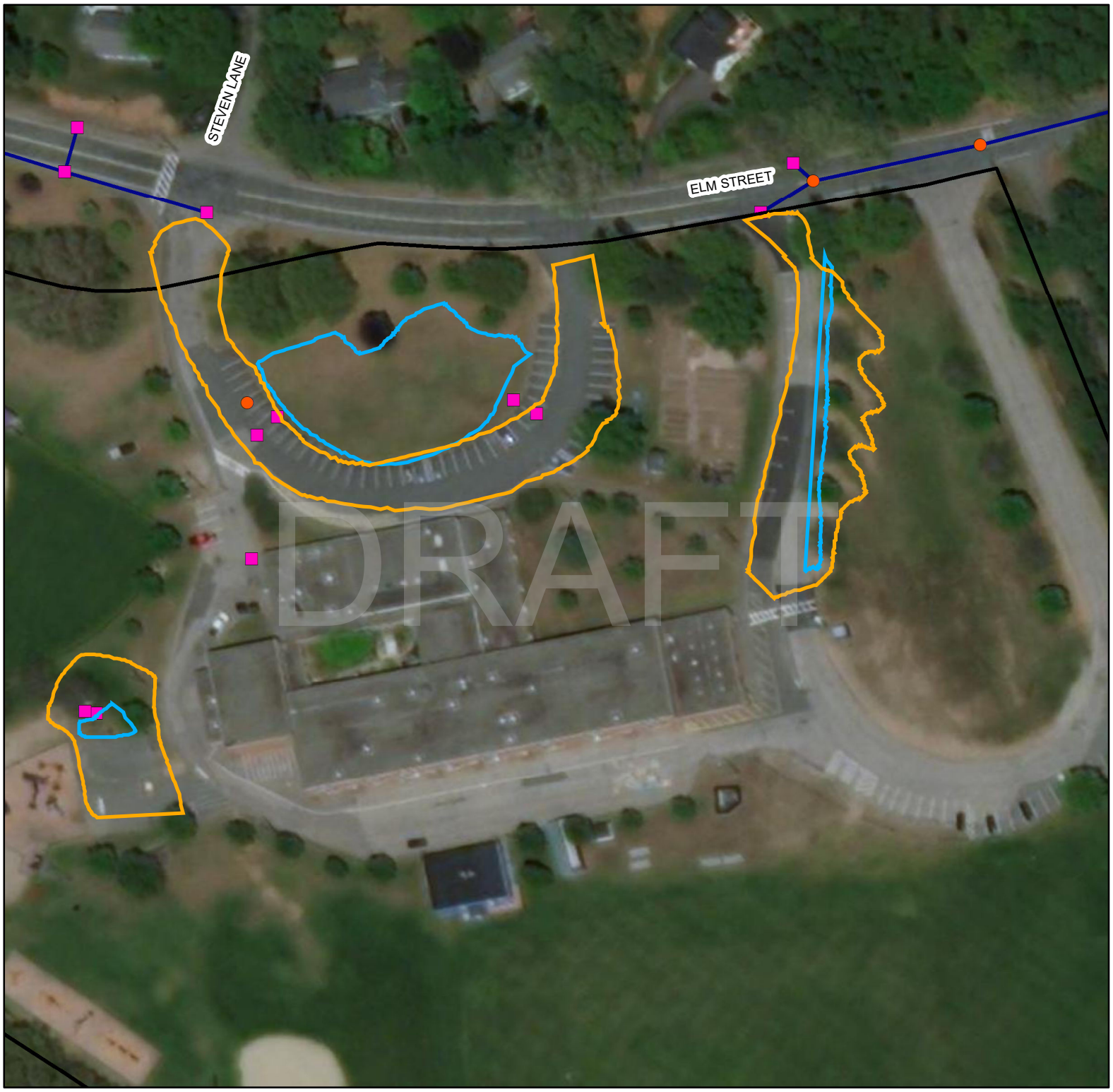
Wheellock School

Several good opportunities on site. Site may be on track for future construction. A soils. Maps indicate may discharge to Nantasket Brook and/or Mine Brook wetland.

1. There is a large open space in the center of the front parking circle which could be used for a surface or subsurface feature. Currently the paved circle drains to a pair of catch basins on each side of the circle. The water that currently flows into the catch basins at the curb could be diverted easily to a surface feature with the catch basins functioning as overflows. This would only capture some of the runoff from the circle. Alternatively, water could be directed after it enters all 4 catch basin to a BMP in the center of the circle. This would depend on the depth of the catchbasins/manholes and the acceptable depth of the BMP. More could be done with regrading of parking lot.

2. There is a catch basin on the West leg of the parking horseshoe which is located East of the school. Due to informal parking along the shoulder and grass along this parking area there is significant erosion and soil loading into the catch basin. There is a good opportunity to replace the catch basin with an infiltration cell to reduce sediment and nutrient loading. Alternatively, a water quality swale could be installed but this would significantly impact parking. Existing trees may pose a conflict. Could also consider using gravel or permeable pavers to stabilize eroding parking area.

Potential BMP Retrofit Site:
Wheellock Schooll



Appx Drainage Area
Appx BMP Area
Potential BMP Retrofit Sites
Catch Basin
Drain Manhole
Outfall
Drain Pipe

0 50 100 200
Feet

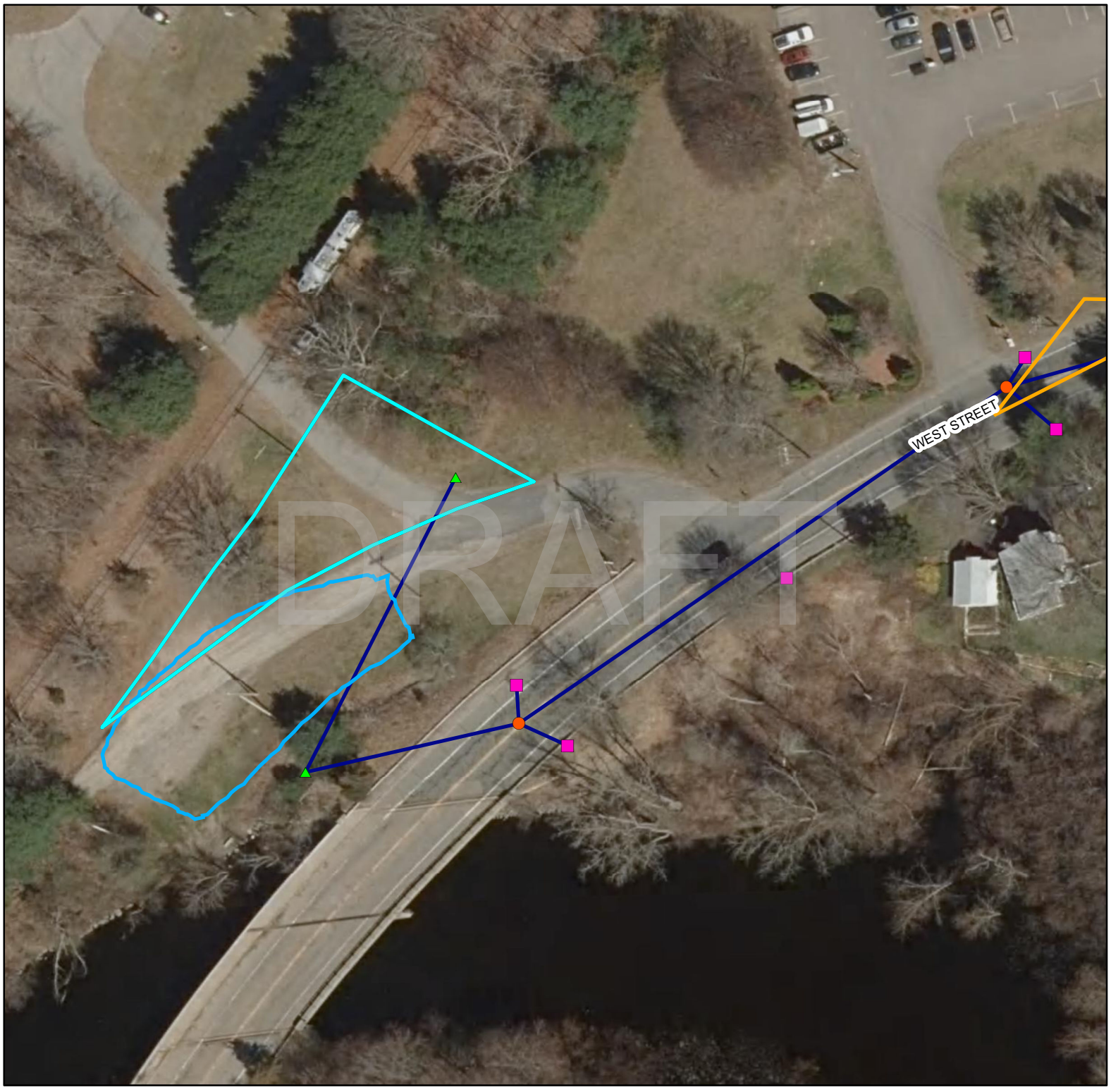
Author: Devine, NepRWA
Date: 12/7/2021
Data Source: MassGIS, NepRWA, Town of Medfield, ESRI

N

West St @ The Charles River

There is an outfall which drains all of West St. between the Charles and N Meadows St. along with some adjacent neighborhoods. Currently the outfall flows on a paved conveyance, through some riprap and directly into the mainstem of the Charles. There is an opportunity for an infiltration basin or bioretention cell here. Currently the area is a staging area for bridge construction. This area is part of the West St. Right of Way. Note: GIS mapping of outfall is inaccurate. Soils are A and B/D

Potential BMP Retrofit Site:
West St. @ The Charles River



Appx Drainage Area

Appx BMP Area

Potential BMP Retrofit Sites

Catch Basin

Drain Manhole

Outfall

Drain Pipe

0 30 60 120 Feet

Author: Devine, NepRWA

Date: 12/7/2021

Data Source: MassGIS, NepRWA, Town of Medfield, ESRI

N

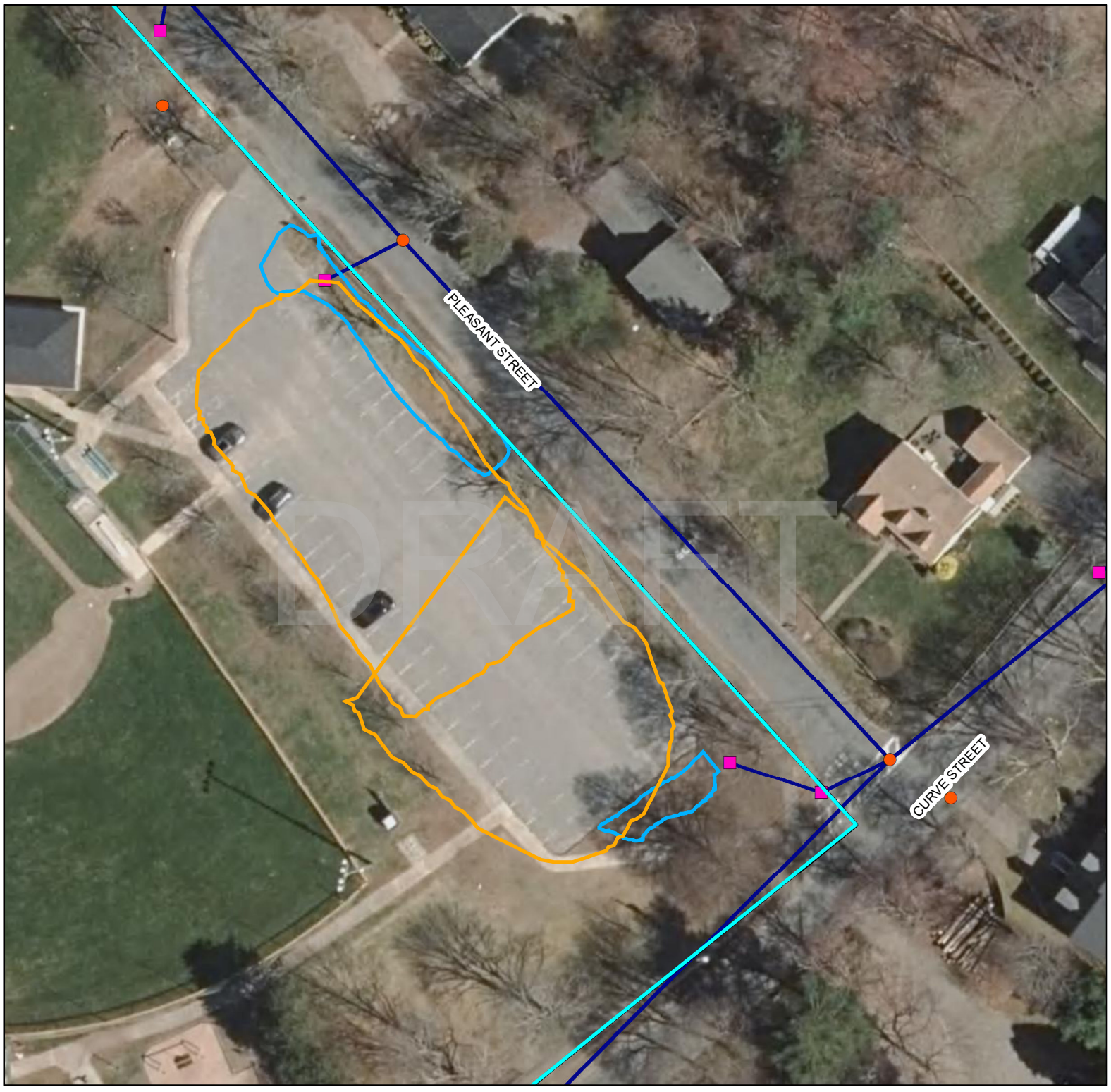
Metacomet Park

Opportunity for two surface infiltration cells to treat stormwater from the parking lot. One cell would be located just south of the parking ot entrance between the parking ot and the sidewalk. The second cell would be at the E/SE corner of the parking lot. Both cells would be adjacent to an existing catch basin which could be converted to an overflow structure. A 3rd cell could be positioned on the East side of the lot between the two mapped cells with over flow back onto the parking lot. Potential concern with existing trees and steep slope of BMP along sidewalk. Soils are A. Storm main mapping does not clearly indicate where current outfall is though possible discharge into Nantasket Brook.






Potential BMP Retrofit Site: Metacomet Park



Appx Drainage Area
Appx BMP Area
Potential BMP Retrofit Sites
Catch Basin
Drain Manhole
Outfall
Drain Pipe

0 25 50 100 Feet

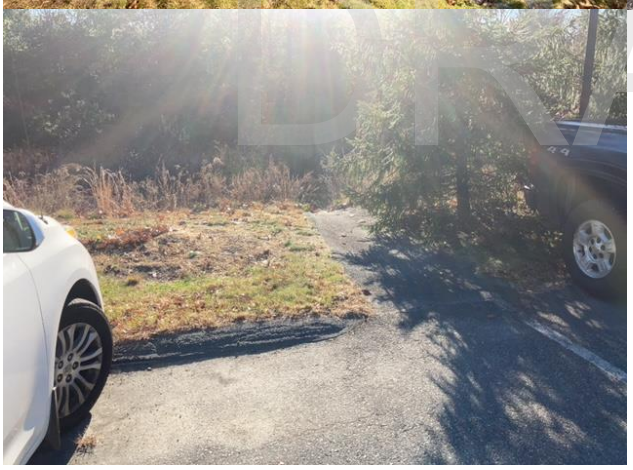
Author: Devine, NepRWA
Date: 12/7/2021
Data Source: MassGIS, NepRWA, Town of Medfield, ESRI

N

Medfield Senior Center/ Kensington Club

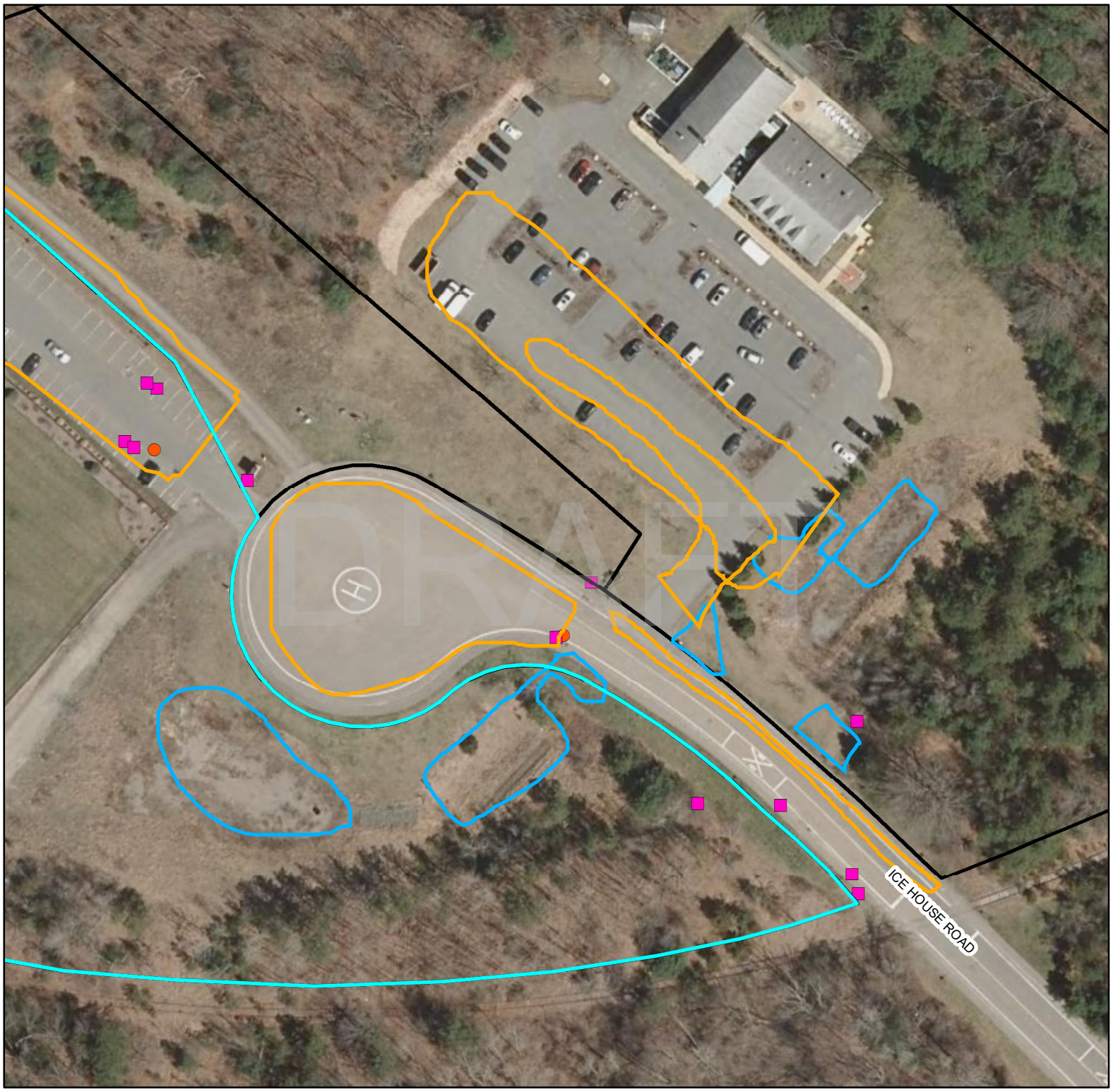
Both the Senior Center and Kensington Club have existing BMPs that are underutilized. A soils.

1. The Medfield Senior Center has a large infiltration basin at the SE end of the parking lot. The feature is likely sized to handle water from the whole parking lot but under existing conditions the SW 40% of the parking lot actually drains to the street or overflows the curb and erodes a gully down to the BMP. This could be remedied by adding a second conveyance such as a gravel or riprap channel to bring water from South corner of lot into existing BMP. There are also a few small infiltration cell/raingarden opportunities by the entrance to the parking lot and Ice House rd.



2. The Kensington Club has tow large basins in series to the south east of the Ice house Cul Du Sac. The first basin appears to be a dry detention basin which overflows to an infiltration basin. The outflow structure of the dry detention basin could be raised to convert this into an infiltration basin. As-builts should be consulted. Additionally, the catch basins at the end of Ice house Rd could be rerouted to flow into infiltration basin of Kensington Club. Pretreatment with oil & grit separator or stormcepter could be added along Ice house Rd. It is unclear where this system discharges currently.

Potential BMP Retrofit Site:
Senior Center & Kensington Club



Appx Drainage Area
Appx BMP Area
Potential BMP Retrofit Sites
Catch Basin
Drain Manhole
Outfall
Drain Pipe

0 45 90 180
Feet

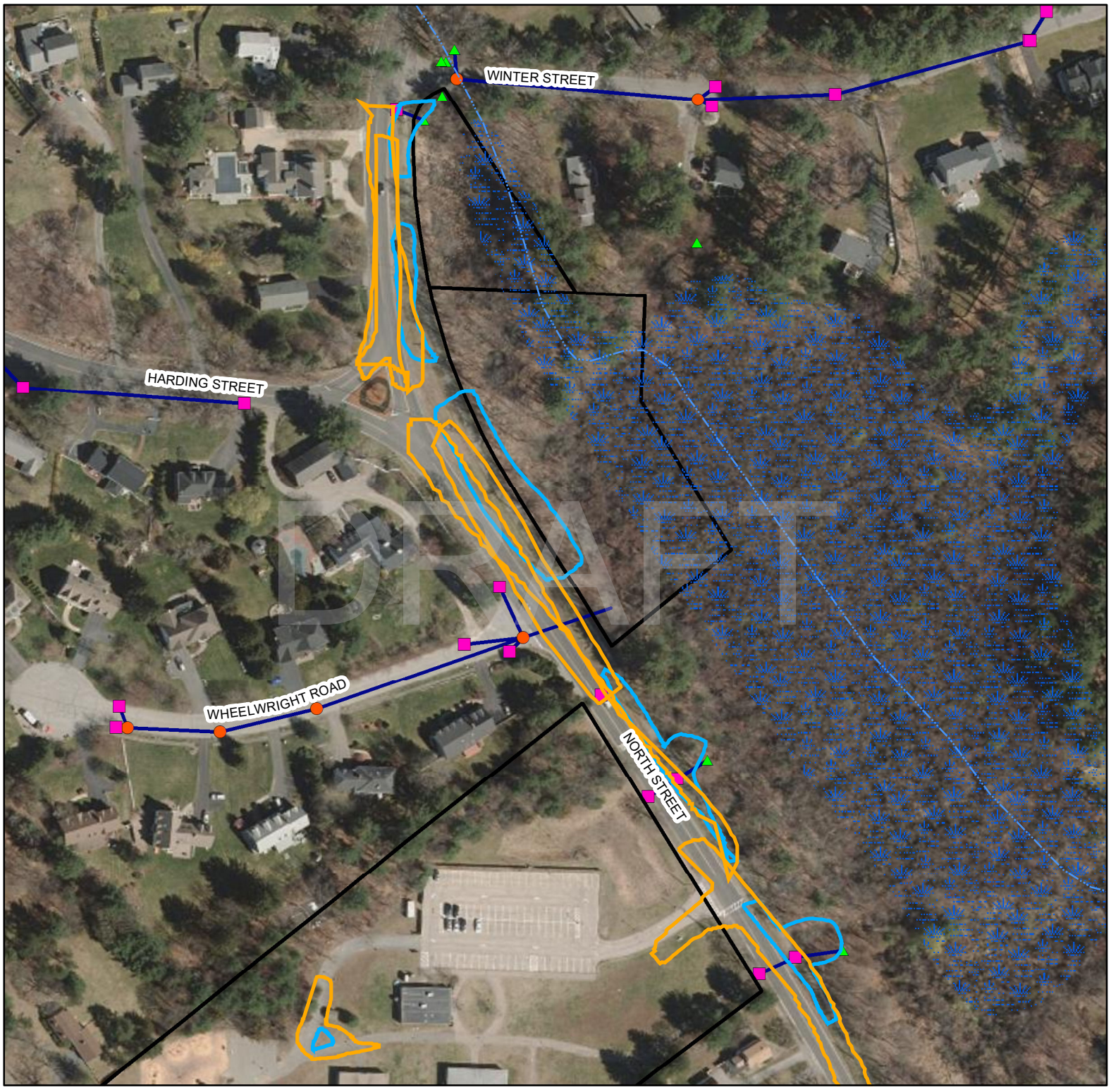
Author: Devine, NepRWA
Date: 12/7/2021
Data Source: MassGIS, NepRWA, Town of Medfield, ESRI

N

North St @ Harding and Winter St.

Very wide right of way with several opportunities for surface features East of North St between Winter St and Wheelwright Rd. Space for infiltration cells, bioretention or constructed wetland depending on soils and groundwater level. Existing system discharges to headwaters of Mill Brook (Charles) and surrounding wetlands. Soils B or unknown.

Potential BMP Retrofit Site:
North St. @ Harding St. and Winter St.



Appx Drainage Area
Appx BMP Area
Potential BMP Retrofit Sites
Catch Basin
Drain Manhole
Outfall
Drain Pipe

0 87.5 175 350 Feet

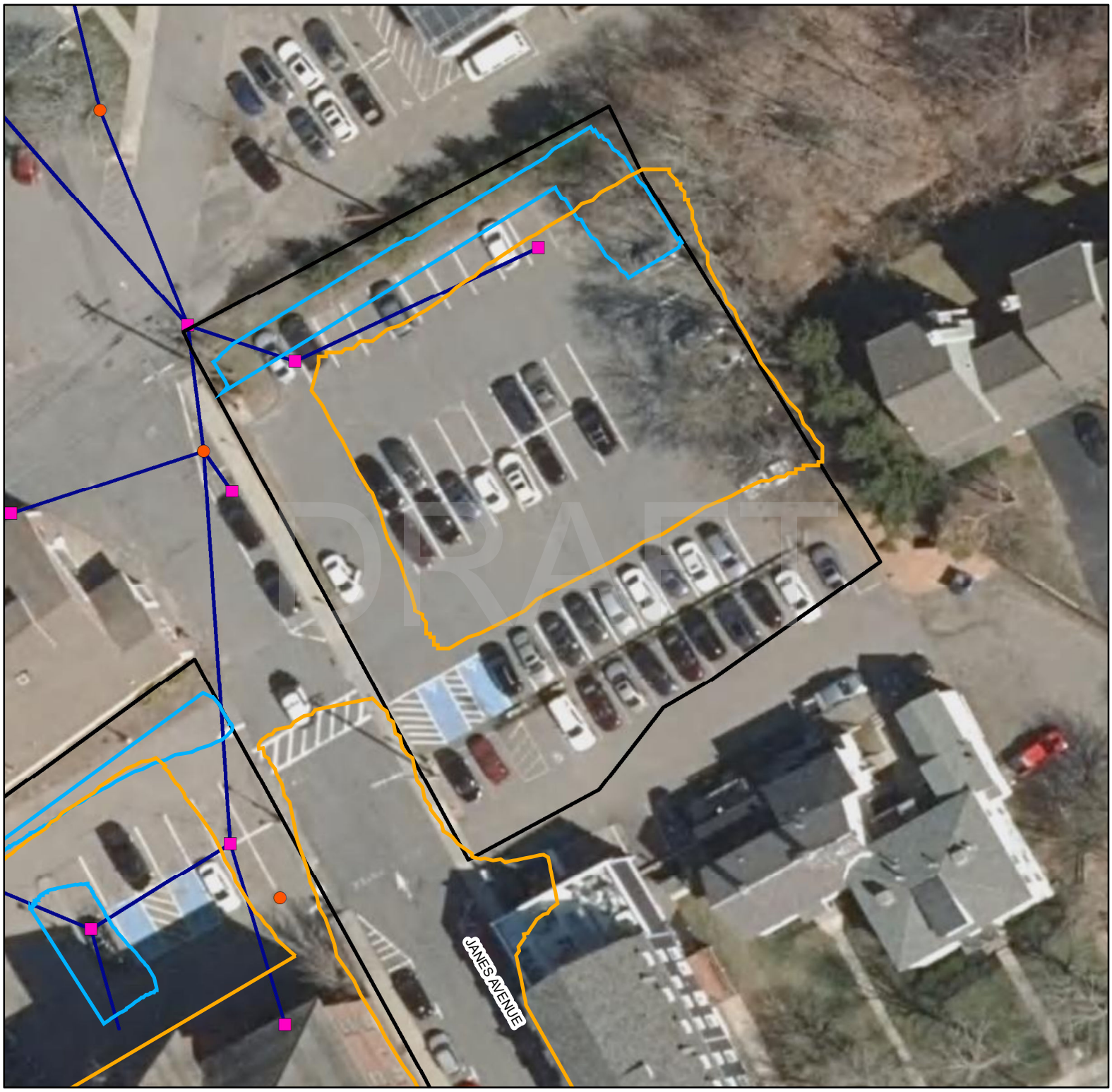
Author: Devine, NepRWA
Date: 12/7/2021
Data Source: MassGIS, NepRWA, Town of Medfield, ESRI

N

Parking lot across Janes Ave. from Town Hall

Parking lot drains to two catch basins on North End. The 25 foot wide island at the end of the parking lot could be converted to infiltration cell with existing catch basins converted to or connected to overflow structures. Currently catch basin in North corner or lot totally clogged with sediment. Some smaller existing trees would need to be removed. Drains to Vine Brook. Soils are A.

Potential BMP Retrofit Site: Parking Lot Across Janes Ave. from Town Hall



Appx Drainage Area
Appx BMP Area
Potential BMP Retrofit Sites
Catch Basin
Drain Manhole
Outfall
Drain Pipe

0 20 40 80
Feet

Author: Devine, NepRWA
Date: 12/7/2021
Data Source: MassGIS, NepRWA, Town of Medfield, ESRI

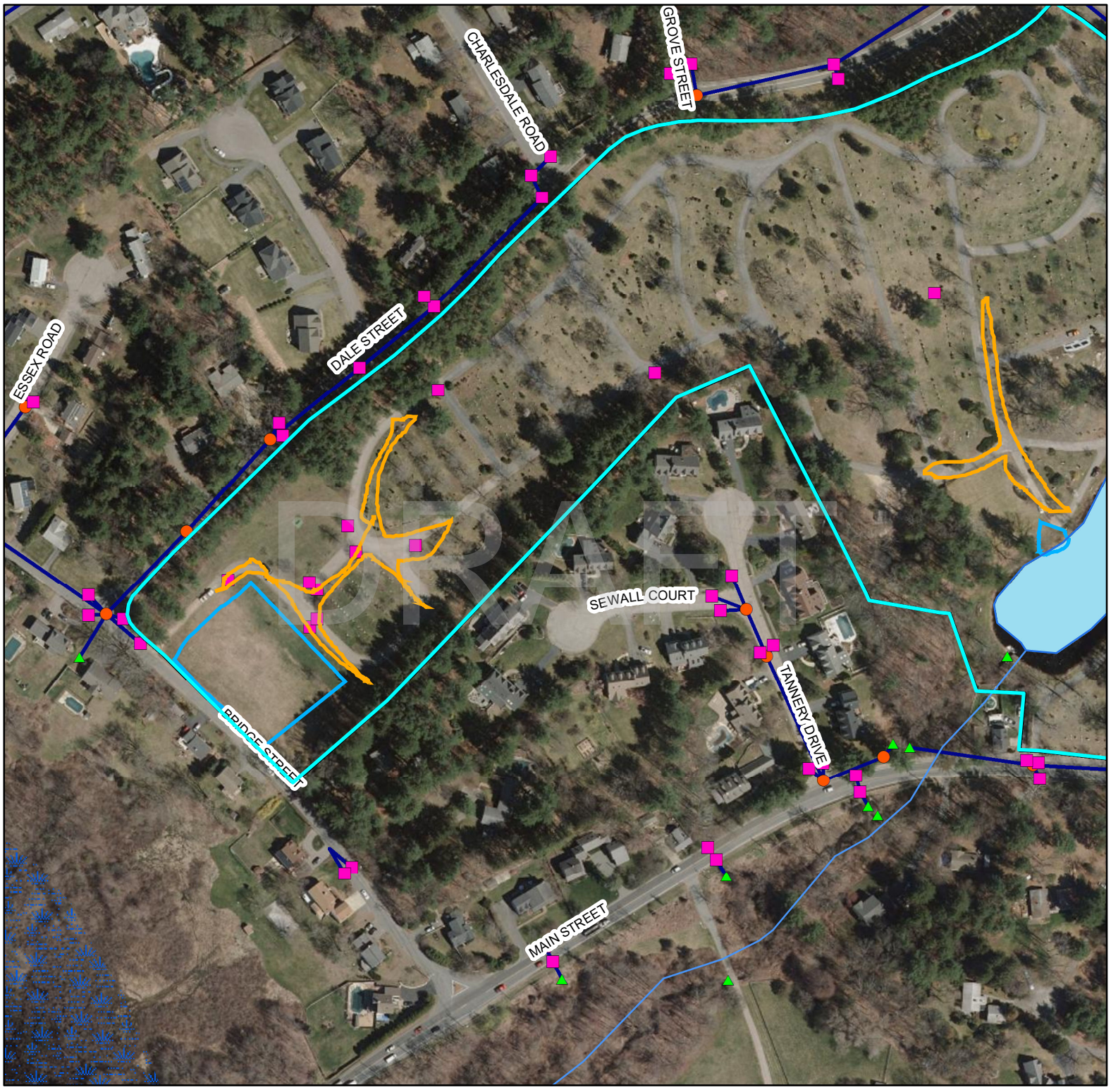
N

Vine Lake Cemetery

On West end of parcel there is a large lawn which slopes gently down from cemetery to Bridge St. There are several unmapped catch basins and manholes along the road to Bridge St. and in the field. An infiltration basin in the field could intercept the storm main draining a portion of the cemetery prior to connection with the main on Bridge St. Likely discharges to wetlands along the Charles. Loading on pavement is minimal. Soils are A.

There is a second smaller opportunity on site to install a raingarden in place of eroded gully draining to Vine Brook

Potential BMP Retrofit Site:
Vine Lake Cemetary



Appx Drainage Area

Appx BMP Area

Potential BMP Retrofit Sites

Catch Basin

Drain Manhole

Outfall

Drain Pipe

0 120 240 480 Feet

Author: Devine, NepRWA

Date: 12/7/2021

Data Source: MassGIS, NepRWA, Town of Medfield, ESRI

N

Medfield Highway Department

Site has a BMP which treats all onsite pavement. 24 inch Outfall 221 discharges directly into Turtle Brook and drains roughly 0.5 mile of Dale St. and North St.. This outfall could be rerouted to existing BMP on site. There is also potential to expand the existing BMP to increase capacity for water from outfall 221.

Potential BMP Retrofit Site:
Medfield Highway Dept.

Appx Drainage Area
Appx BMP Area
Potential BMP Retrofit Sites
Catch Basin
Drain Manhole
Outfall
Drain Pipe

0 55 110 220 Feet

Author: Devine, NepRWA
Date: 12/7/2021
Data Source: MassGIS, NepRWA, Town of Medfield, ESRI

N

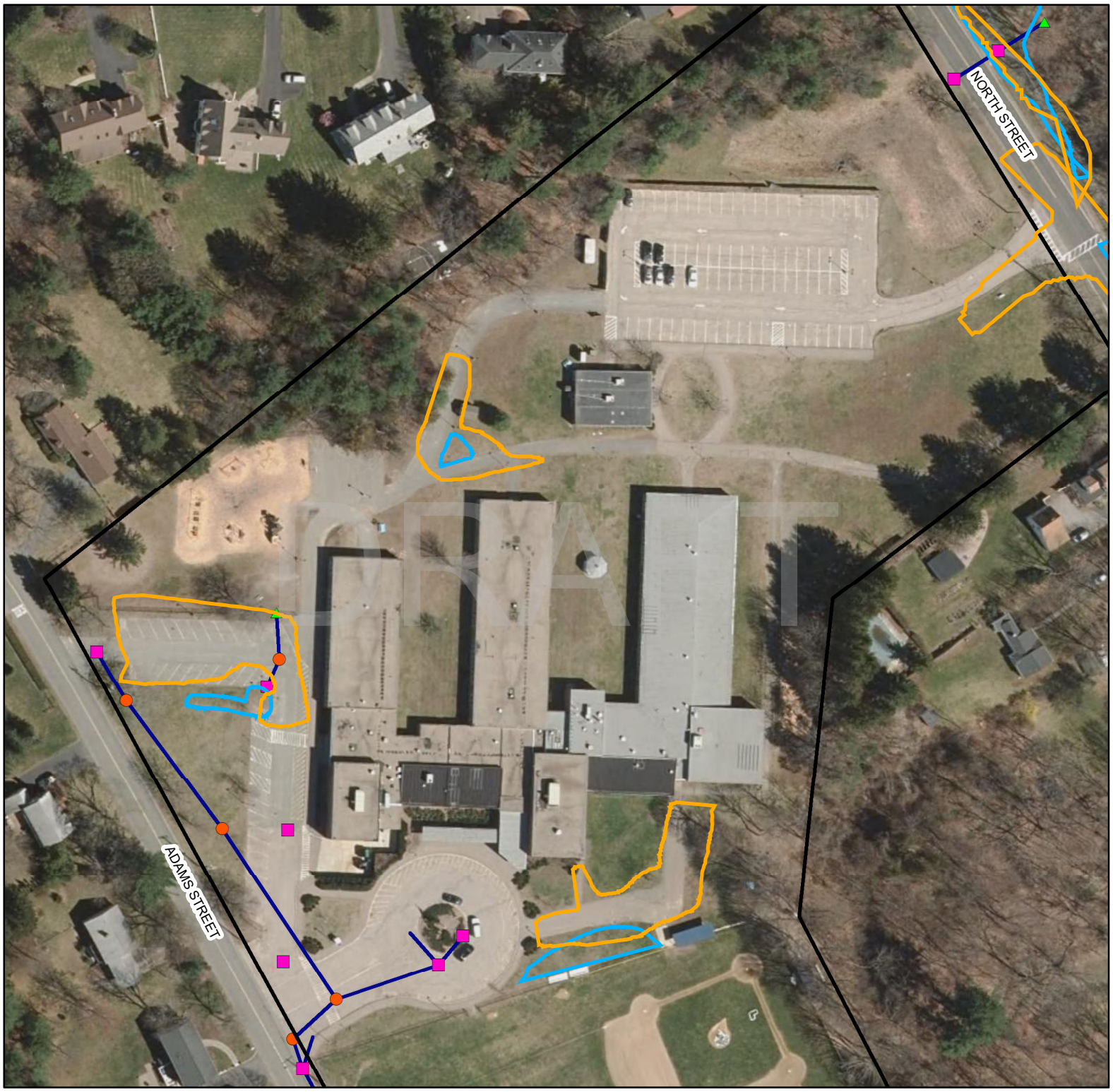
Memorial School

This site has many opportunities for small raingardens to treat stormwater from walking paths and grass around school. There is an existing large infiltration basin which treats parking lot at north end of parcel by North St. As-builts should be consulted to determine if southern parking lot is also treated by this BMP currently. There are two opportunities for medium sized infiltration basins on site. Soils are A. Existing system discharges to woods behind Adams St. according to GIS data.

1. NE parking lot mostly drains to single catch basin adjacent to grass island. The grass island could be converted to a infiltration cell with curb breaks and use of existing catch basin as overflow structure. Light post currently in the island.

2. There is a catch basin (unmapped) in the grass between the baseball field and the bus circle. This patch of grass could easily be converted to infiltration BMP with existing catch basin as over flow. The drainage area is not part of the parking lot so loading would not be super high. Potential conflict with existing use of the area for viewing baseball games.

Potential BMP Retrofit Site: Memorial School



Appx Drainage Area
Appx BMP Area
Potential BMP Retrofit Sites
Catch Basin
Drain Manhole
Outfall
Drain Pipe

0 55 110 220 Feet

Author: Devine, NepRWA
Date: 12/7/2021
Data Source: MassGIS, NepRWA, Town of Medfield, ESRI

N

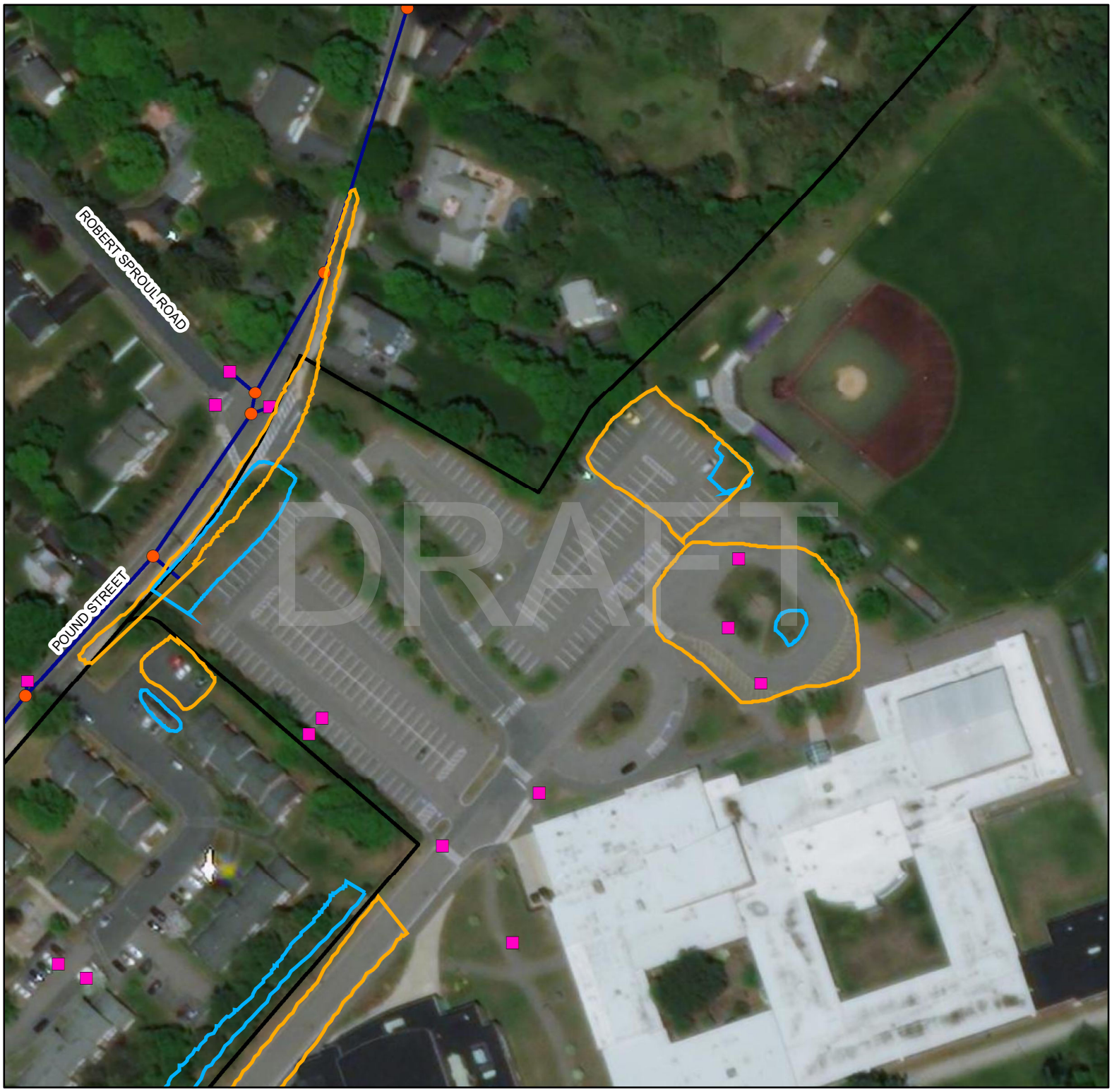
Medfield Middle School

Soils are A. There are a few small opportunities for infiltration cells in various islands throughout the parking lot though existing tree limit options. A soils. GIS indicates pipe network drains to outfall in woods by housing authority.

1. Opportunity in grass between the parking lot and ball fields for surface feature. Existing catch basin (unmapped) is full of sediment and leaves and could be used as overflow structure. May pose conflict with existing use in area.

2. Opportunity to take runoff from small section of Pound St via tree box filters. Bedrock and overhead wires on site may pose issue.

Potential BMP Retrofit Site:
Medfield Middle School



Appx Drainage Area
Appx BMP Area
Potential BMP Retrofit Sites
Catch Basin
Drain Manhole
Outfall
Drain Pipe

0 62.5 125 250
Feet

Author: Devine, NepRWA
Date: 12/7/2021
Data Source: MassGIS, NepRWA, Town of Medfield, ESRI

N

ATTACHMENT FIVE

SUPPORTING CALCULATIONS FOR STRUCTURAL CONTROLS

Table 2-3. Summary of Current Structural Controls

		WATERSHED																
facilityid	Checked	med_cbs_ou	sum_areaac	sum_impare	sum_ploadl	sum_nloadl	bmptype	bmp_removal_per	bmp_nremoval_per	bmp_typ_ot	name	locdesc	ownedby	imp_area_sf	imp_area_acre	sum_areaac_per	bmp_ploadl	bmp_nloadl
swBMP-1	x	OF-558 TO OF-240	1109.02	89.70	328.39	2522.48	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	55 North Meadows Road	Town	144,897.00	3.33	3.71%	12.18	25.26
swBMP-2	x	OF-512	2.12	0.91	1.67	13.20	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Ice House Road	Town	39,645.24	0.91	100.00%	1.67	3.56
swBMP-3	x	OF-374	3.70	1.39	2.60	20.23	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Memorial School at North Street	Town	60,346.39	1.39	100.00%	2.60	5.46
swBMP-4	x	OF-377	14.16	4.82	9.06	70.72	Sediment Separator	67.00%	27.00%	Sediment Separator	Sediment Separator	Memorial School, 56 Adams Street School	Town	18,600.00	0.43	8.86%	0.54	1.69
swBMP-5	x	OF-555 UPSTREAM SWBMP-3	3.70	1.39	2.60	20.23	Sediment Separator	67.00%	27.00%	Sediment Separator	Sediment Separator	Memorial School at North Street	Town		-	-	-	-
swBMP-6	x	OF-556 UPSTREAM SWBMP-3	3.70	1.39	2.60	20.23	Sediment Separator	67.00%	27.00%	Sediment Separator	Sediment Separator	Memorial School at North Street	Town		-	-	-	-
swBMP-7	x	OF-557 OF-425	3.48	2.54	4.87	36.04	Wet Detention Pond	100.00%	27.00%	Wet Detention Pond	Infiltration basin	Janes Ave. Outfall	Town	110,477.73	2.54	100.00%	4.87	9.73
swBMP-8	x	OF-394	7.08	0.78	2.59	26.09	Dry water quality swale	67.00%	27.00%	Dry water quality swale	Hospital road swale	44 Hospital Road	Town	33,895.00	0.78	100.00%	1.73	7.04
swBMP-9	x	UPSTREAM OF SWBMP-21B	21.32	11.74	23.22	168.47	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	Subsurface infiltration system	Public Safety Building, 112 North Street	Town		-	-	-	-
swBMP-10	x	UPSTREAM OF SWBMP-21B	21.32	11.74	23.22	168.47	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	Subsurface infiltration system	Public Safety Building, 112 North Street	Town		-	-	-	-
swBMP-11	x	UPSTREAM OF SWBMP-21B	21.32	11.74	23.22	168.47	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Bioretention area	Public Safety Building, 112 North Street	Town	7,451.20	-	-	-	-
swBMP-12	x	UPSTREAM OF SWBMP-21B	21.32	11.74	23.22	168.47	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	Subsurface infiltration system	Public Safety Building, 112 North Street	Town		-	-	-	-
swBMP-13	x	OF-222	21.32	11.74	23.22	168.47	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	Subsurface infiltration system	Dale street school parking lot	Town	20,440.00	0.47	4.00%	0.74	1.82
swBMP-14	x	OF-554 (OF-75)	27.02	9.08	18.13	133.45	Dry Detention Pond	100.00%	27.00%	Sediment Forebay	Sediment Forebay	45 Green Street Swim Pond	Town	395,567.01	9.08	100.00%	18.13	36.03
swBMP-15	x	OF-7	1.06	0.61	1.12	8.81	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	Subsurface infiltration system	7 Frairy Street Derby House	Town	1,800.00	0.04	6.78%	0.06	0.16
swBMP-16	x	OF-558 TO OF-240	1109.02	89.70	328.39	2522.48	Sediment Separator	67.00%	27.00%	Sediment Separator	Hydrodynamic seperator	55 North Meadows Road	Town	68,600.00	1.57	1.76%	3.86	11.96
swBMP-17	x	OF-558 TO OF-240	1109.02	89.70	328.39	2522.48	Sediment Separator	67.00%	27.00%	Sediment Separator	Hydrodynamic seperator	55 North Meadows Road	Town	57,100.00	1.31	1.46%	3.22	9.95
swBMP-18	x	OF-558 TO OF-240	1109.02	89.70	328.39	2522.48	Oil water separator	67.00%	27.00%	Oil water separator	Oil water separator	55 North Meadows Road	Town	877.00	0.02	0.02%	0.05	0.15
swBMP-19	x	OF-558 TO OF-240	1109.02	89.70	328.39	2522.48	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	Subsurface Infiltration System	55 North Meadows Road	Town	9,160.00	0.21	0.23%	0.62	1.60
swBMP-20	x	OF-558 TO OF-240	1109.02	89.70	328.39	2522.48	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	Subsurface infiltration system	55 North Meadows Road	Town	9,160.00	0.21	0.23%	0.62	1.60
swBMP-21A	x	OF-223	3.25	1.57	3.01	22.69	Dry Detention Pond	100.00%	27.00%	Sediment Forebay	Sediment Forebay	55 North Meadows Road, Behind fuel tank	Town	68,546.46	1.57	100.00%	3.01	6.13
swBMP-21B	**2024**	**OF-222**	**21.32**	**11.74**	**23.22**	**168.47**	**Dry Detention Pond**	**100.00%**	**27.00%**	**Sediment Forebay**	**Sediment Forebay**	**55 North Meadows Road, Behind fuel tank**	**Town**	**511,598.82**	**11.74**	**100.00%**	**23.22**	**45.49**
swBMP-22	x	OF-393 OF-386 OF-545	22.01	4.89	11.06	88.28	Wet Detention Pond	100.00%	27.00%	Wet Detention Pond	Infiltration basin	Birch Lane	Town	212,941.83	4.89	100.00%	11.06	23.84
swBMP-23	x	OF-490	8.38	1.57	3.20	24.17	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	10 Earle Kerr Road	Town	68,367.52	1.57	100.00%	3.20	6.53
swBMP-24	x	OF-488	13.10	3.32	7.53	58.53	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Ledgetree Road	Town	144,787.92	3.32	100.00%	7.53	15.80
swBMP-25	x	OF-559 CB-355	0.87	0.38	0.76	5.88	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	10 Cole Drive		16,552.06	0.38	100.00%	0.76	1.59
swBMP-26	x	OF-172 OF-469	0.89	0.20	0.39	2.98	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	7 Kettle Pond Way		8,545.58	0.20	100.00%	0.39	0.80
swBMP-27	x	OF-529 TO OF-530 OF-531	104.74	26.35	57.67	443.71	**Below-Grade Storage**	80.00%	27.00%	Below-Grade Storage	Subsurface infiltration system	High School at 88R South Street Parking Lot	Town	**382,581.17**	8.78	33.33%	15.38	39.93
swBMP-28	x	OF-529 TO OF-530 OF-531	104.74	26.35	57.67	443.71	Sediment Separator	67.00%	27.00%	Sediment Separator	Sediment Separator	High School at 88R South Street Parking Lot	Town	**382,581.17**	8.78	33.33%	12.88	39.93
swBMP-29	x	OF-529 TO OF-530 OF-531	104.74	26.35	57.67	443.71	Sediment Separator	67.00%	27.00%	Sediment Separator	Sediment Separator	High School at 88R South Street Parking Lot	Town	**382,581.17**	8.78	33.33%	12.88	39.93
swBMP-30	x	OF-536	1.59	1.20	2.14	17.01	Sediment Separator	67.00%	27.00%	Sediment Separator	Sediment Separator	High School at 88R South Street	Town	17,396.11	0.40	33.33%	0.48	1.53
swBMP-31	x	OF-560 UPSTREAM OF-244	145.77	9.91	42.14	321.18	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	2 Ice House Road	Private		0.00	0.00%	0.00	0.00
swBMP-32	x	OF-562 UPSTREAM OF-244	145.77	9.91	42.14	321.18	Infiltration	100.00%	27.00%	Infiltration	Infiltration	2 Ice House Road	Private		0.00	0.00%	0.00	0.00
swBMP-33	x	OF-174	17.13	3.13	9.20	79.32	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	245 South Street	Town	136,553.50	3.13	100.00%	9.20	21.42
swBMP-34	x	OF-169 OF-167	16.39	4.02	8.97	73.28	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	10 Loeffler Lane	Town	175,264.11	4.02	100.00%	8.97	19.79
swBMP-35	x	OF-536	1.59	1.20	2.14	17.01	**Below-Grade Storage**	80.00%	27.00%	Below-Grade Storage	Subsurface infiltration system	Middle School at 24 Pound Street	Town	17,396.11	0.40	33.33%	0.57	1.53
swBMP-36	x	OF-503 OF-502	18.61	5.34	13.30	107.03	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Quarry Road	Town	232,764.91	5.34	100.00%	13.30	28.90
swBMP-37	x	OF-270	0.29	0.14	0.28	2.21	Infiltration	100.00%	27.00%	Infiltration	Leaching pit	15 Boyden Road	Town	6,028.54	0.14	100.00%	0.28	0.60
swBMP-38	x	OF-271	0.55	0.24	0.47	3.71	Infiltration	100.00%	27.00%	Infiltration	Leaching pit	17 Boyden Road	Town	10,303.59	0.24	100.00%	0.47	1.00
swBMP-39	x	OF-563 UPSTREAM OF-273	39.79	5.10	14.33	134.05	Infiltration	100.00%	27.00%	Infiltration	Leaching pit, Roof	Vine Brook Road at 22 Boyden Road Yard	Town	0.00	0.00	0.00%	0.00	0.00
swBMP-40	x	OF-272	2.03	0.77	1.77	13.81	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Vine Brook Road at 22 Boyden Road	Town	33,644.97	0.77	100.00%	1.77	3.73
swBMP-41	x	OF-573 UPSTREAM OF-273	39.79	5.10	14.33	134.05	Infiltration	100.00%	27.00%	Infiltration	Leaching pit	Vine Brook Road	Town	5,000.00	0.11	2.25%	0.32	0.82
swBMP-42	x	OF-573 UPSTREAM OF-273	39.79	5.10	14.33	134.05	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Vine Brook Road	Town	5,000.00	0.11	2.25%	0.32	0.82
swBMP-43	x	OF-499	1.50	0.00	0.19	4.24	Infiltration	100.00%	27.00%	Infiltration	Leaching pit	39 Vine Brook Road	Town	0.00	0.00	-	-	-
swBMP-44	x	OF-566 UPSTREAM OF-149	194.40	5.65	39.67	521.19	Infiltration	100.00%	27.00%	Infiltration	Leaching pit, Roof	22 Minuteman Road	Town	4,096.00	0.09	1.66%	0.66	2.34
swBMP-45	x	OF-501	4.03	1.24	3.11	24.47	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	22 Minuteman Road	Town	54,126.44	1.24	100.00%	3.11	6.61
swBMP-46	x	OF-317	8.84	1.37	3.95	38.27	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	11 Jade Walk	Town	59,686.47	1.37	100.00%	3.95	10.33
swBMP-47	x	OF-508 OF-509 OF-510	2.87	0.48	1.51	15.62	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Walden Court	Private	20,928.54	0.48	100.00%	1.51	4.22
swBMP-48	x	OF-403 OF-404	2.54	0.88	2.15	18.24	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	17 Hawthorne Drive	Town	38,229.47	0.88	100.00%	2.15	4.92
swBMP-49	x	OF-506	7.46	1.38	4.23	34.16	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	78 Flint Locke Lane	Town	60,226.88	1.38	100.00%	4.23	9.22
swBMP-50	x	OF-229	3.92	1.26	2.44	18.63	Leaching pit	67.00%	27.00%	Infiltration	Leaching pit	4 Grist Mill Road	Town	55,088.28	1.26	100.00%	1.63	5.03
swBMP-51	x	OF-336	3.70	1.17	2.31	17.29	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Robinson Road	Town	51,055.66	1.17	100.00%	2.31	4.67
swBMP-52	x	OF-336 UPSTREAM SWBMP-51	3.70	1.17	2.31	17.29	Sediment Separator	67.00%	27.00%	Infiltration	Leaching pit	Robinson Road	Town		-	-	-	-
swBMP-53	x	OF-354	10.51	2.51	4.99	37.73	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Baker Road	town	109,128.50	2.51	100.00%	4.99	10.19
swBMP-54	x	OF-500 OF-574	3.55	1.02	2.53	19.74	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	39 Vine Brook Road	Town	44,523.82	1.02	100.00%	2.53	5.33
swBMP-55	x	OF-401 OF-402	1.76	0.61	1.56	12.63	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Walden Court	Private	26,687.37	0.61	100.00%	1.56	3.41
swBMP-56	x	OF-505	0.01	0.00	0.01	0.04	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Erik Road	Town	95.63	0.00	100.00%	0.01	0.01
swBMP-57	x	OF-504 UPSTREAM OF-149	194.40	5.65	39.67	521.19	Infiltration	100.00%	27.00%	Infiltration	Leaching pit	25 Erik Road	Town	0.00	0.00	0.00%	0.00	0.00
swBMP-58	x	OF-503 DOWNSTREAM SWBMP-36	18.61	5.34	13.30	107.03	Infiltration	100.00%	27.00%	Infiltration	Leaching pit	Quarry Road	Town	0.00	0.00	0.00%	0.00	0.00
swBMP-59	x	OF-230	3.37	0.66	1.33	10.18	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Haven Road	Town	28,954.84	0.66	100.00%	1.33	2.75
swBMP-60	x	OF-168	3.69	0.87	1.90	15.13	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Wild Holly Lane	Town	37,847.69	0.87	100.00%	1.90	4.08
swBMP-61		UNKNOWN																
swBMP-62	x	OF-227	24.85	7.67	16.13	117.11	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	Subsurface detention	Powder House Road	Town	15,850.00	0.36	4.74%	0.61	1.50
swBMP-63	x	OF-227	24.85	7.67	16.13	117.11	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	Subsurface detention	Powder House Road	Town	15,850.00	0.36	4.74%	0.61	1.50
swBMP-64	x	OF-227	24.85	7.67	16.13	117.11	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	Subsurface detention	Powder House Road	Town	15,850.00	0.36	4.74%	0.61	1.50
swBMP-65	x	OF-227	24.85	7.67	16.13	117.11	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	Subsurface detention	Powder House Road	Town	15,850.00	0.36	4.74%	0.61	1.50
swBMP-66	x	OF-355 OF-546	27.86	5.47	11.24	83.45	Sediment Separator	80.00%	27.00%	Below-Grade Storage	Subsurface detention	1 Rockwood Lane	Town	9,000.00	0.21	3.77%	0.34	0.85
swBMP-67	x	OF-355 OF-546	27.86	5.47	11.24	83.45	Sediment Separator	80.00%	27.00%	Below-Grade Storage	Subsurface detention	3 Rockwood Lane	Town	23,000.00	0.53	9.65%	0.87	2.17
swBMP-68	x	OF-355 OF-546	27.86	5.47	11.24	83.45	Infiltration	80.00%	27.00%	2 rows Leaching galleys	Subsurface detention	3 Rockwood Lane	Town	23,000.00	0.53	9.65%	0.87	2.17
swBMP-69	x	OF-355 OF-546	27.86	5.47	11.24	83.45	Infiltration	80.00%	27.00%	MC-4500 stormtech chambers	Subsurface detention	1 Rockwood Lane	Town	4,000.00	0.09	1.68%	0.15	0.38
swBMP-70	x	OF-516	0.19	0.08	0.15	1.22	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Ice House Road	Town	3,671.99	0.08	100.00%	0.15	0.33
swBMP-71	x	UNDEFINED	79.50	34.26	71.87	580.91	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	24' Galley	Prentiss Place	Private	17,000.00	0.39	1.14%	0.65	1.79
swBMP-72	x	UNDEFINED	79.50	34.26	71.87	580.91	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	20' Galley	11 Prentiss Place, Unit 11	Private	17,000.00	0.39	1.14%	0.65	1.79
swBMP-73	x	CB-2306	1.08	0.52	1.17	7.49	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	24' Galley	Prentiss Place	Private	7,463.18	0.17	33.00%	0.31	0.67
swBMP-74	x	CB-2306	1.08	0.52	1.17	7.49	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	24' Galley	Prentiss Place	Private	7,463.18	0.17	33.00%	0.31	0.67
swBMP-75	x	CB-2306	1.08	0.52	1.17	7.49	Below-Grade Storage	80.00%	27.00%	Below-Grade Storage	20' Galley	Prentiss Place	Private	7,463.18	0.17	33.00%	0.31	0.67
swBMP-76	x	OF-511	39.92	3.67	10.47	76.58	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Ice House Road	Town	39,645.00	0.91	24.79%	2.60	5.12
swBMP-77	x	OF-507 OF-575 UPSTREAM OF-390	16.83	4.57	10.09	79.95	Dry Detention Pond	100.00%	27.00%	Dry Detention Pond	Infiltration basin	Green Street and 57 Flint Locke Lane	Town	28,700.00	0.66	14.40%	1.45	3.11
swBMP-78	x	OF-390 DOWNSTREAM SWBMP-77	16.83	4.57	10.09	79.95	Infiltration	100.00%	27.00%	Infiltration	Leaching manhole	Green Street and 57 Flint Locke Lane	Town	0.00	0.00	0.00%	0.00	0.00
swBMP-79	x	OF-536	1.59	1.20	2.14	17.01	Sediment Separator	80.00%	27.00%	Stormceptor 500	Subsurface detention	Middle School at 24 Pound Street	Town	17,396.11	0.40	33.33%	0.57	1.53
swBMP-80	2025	OF-191	22.67	3.99	13.39	116.94	Infiltration	80.00%	27.00%	StormTech MC-3500 (24)	Sursurface Leaching	South Street and Wilson Street	Town	173,799.88	3.99	100.00%	10.71	31.57
swBMP-81	2025	OF-144	22.58	10.27	19.41	149.48	Infiltration	98.00%	27.00%	Infiltration	Infiltration basin	Montrose School, 29 North Street Field	Town	573,992.00	3.38	14.97%	2.85	6.04
																TOTAL EST. EXISTING STRUCTURAL BMP REDUCTION (LBS/DAY) =	**234.01**	**554.09**

Town of Medfield
604B Grant for Best Management Practice Solutions
June 10, 2023

Table 1 - Baseline Phosphorous and Nitrogen Loading Estimates, In Pounds

Project No.	Location	Outfall	Watershed	Subwatershed Area (acres)	Impervious Area[1] (acres)	BMP Load $_{lbs\text{-}P}$ [2] Phosphorous Load (NSP sum_ploadl)	BMP Load $_{lbs\text{-}N}$ [2] Nitrogen Load (NSP sum_nloadl)	Proposed Best Management Practice[3]
1A	West Street	OF-353	Charles River	36.87	10.88	21.03	161.19	Rip-rap Dry Infiltration Basin
1B	West Street	OF-464	Charles River	40.13	15.76	29.72	237.30	Rip-rap Dry Infiltration Basin and Galleys
2A	Wheelock School	OF-475	Charles River	3.32	1.39	2.57	20.19	Infiltration Galleys & Rain Garden
2B	Wheelock School	CB-2098 (@20%)	Charles River	0.48	0.30	0.54	4.25	Infiltration Galleys & Rain Garden
3	South Street & Wilson Street	OF-191	Charles River (Stop River)	22.67	3.99	13.39	116.94	Earthen Dry Infiltration Basin & Rip-rap Outlet
			Project Totals	**103.47**	**32.32**	**67.24**	**539.87**	

NOTES:
(1) Impervious area is the portion of the Town that is paved, covered by buildings, or otherwise rendered unable to absorb water naturally due to development. Impervious area for the town was calculated using the MassGIS 2016 Land Cover/Land Use data layer which was published in 2019.
(2) The estimates of phosphorus and nitrogen loading potential were created for the Town's storm drain outfall catchments using the methods described in the Nutrient Source Identification Report Town of Medfield, prepared by the Neponset River Watershed Association and dated June 14, 2021.
(3) Town parcels were examined for potential BMP retrofit opportunities using the Neponset Stormwater Partnership's BMP Tool.

Town of Medfield
604B Grant for Best Management Practice Solutions
June 10, 2023

Table 2 - Estimated Phosphorous and Nitrogen Load Reduction, In Pounds

Project No.	Location	Outfall	Watershed	BMP Load $_{lbs\text{-}P}$ [1] Phosphorous Load (NSP sum_ploadl)	BMP Load $_{lbs\text{-}N}$ [1] Nitrogen Load (NSP sum_nloadl)	Proposed Best Management Practice[2]	Estimated Soil Infiltration Rate[3] (Inches/hour)	Physical Storage Capacity of BMP (Inches)	P_{Target} Phosphorous BMP Performance Standard (%)	N_{Target} Nitrogen BMP Performance Standard (%)	BMP-Reduction $_{lbs\text{-}P}$ Estimated Phosphorous Reduction (Pounds)	BMP-Reduction $_{lbs\text{-}N}$ Estimated Nitrogen Reduction (Pounds)
1A	West Street	OF-353	Charles River	21.03	161.19	Rip-rap Dry Infiltration Basin	2.41	> 2.0	100.0%	100.0%	21.03	161.19
1B	West Street	OF-464	Charles River	29.72	237.30	Rip-rap Dry Infiltration Basin and Galleys	2.41	> 2.0	100.0%	100.0%	29.72	237.30
2A	Wheelock School	OF-475	Charles River	2.57	20.19	Infiltration Galleys & Rain Garden	2.41	> 2.0	67.0%	79.0%	1.72	15.95
2B	Wheelock School	CB-2098 (@20%)	Charles River	0.54	4.25	Infiltration Galleys & Rain Garden	2.41	> 2.0	67.0%	79.0%	0.36	3.36
3	South Street & Wilson Street	OF-191	Charles River (Stop River)	13.39	116.94	Earthen Dry Infiltration Basin & Rip-rap Outlet	2.41	> 2.0	100.0%	100.0%	13.39	116.94
			Project Totals	**67.24**	**539.87**						**66.22**	**534.74**

NOTES:
(1) The estimates of phosphorus and nitrogen loading potential were created for the Town's storm drain outfall catchments using the methods described in the Nutrient Source Identification Report Town of Medfield, prepared by the Neponset River Watershed Association and dated June 14, 2021.
(2) Town parcels were examined for potential BMP retrofit opportunities using the Neponset Stormwater Partnership's BMP Tool.
(3) The esimated infiltration rate is from test pits conducted at the site in silty sand or sand and sily, "Loamy Sand" (General Permit, Appendix F, Attachment Three, Table B-2).
(4) The Phosphorous and Nitrogen BMP Performance Standards were estimated from the pertinent tables found in the General Permit, Appendix F, Attachment Three.

Town of Medfield

604B Grant for Best Management Practice Solutions

June 24, 2023

Table 3 - Baseline Phosphorous and Nitrogen Loading Estimates, In Pounds

Project No.	Location	Outfall	Watershed	Subwatershed Area (acres)	Impervious Area[1] (acres)	BMP Load $_{lbs\text{-}P}$ [2] Phosphorous Load (NSP sum_ploadl)	BMP Load $_{lbs\text{-}N}$ [2] Nitrogen Load (NSP sum_nloadl)	Proposed Best Management Practice[3]
4	Medfield High School	OF-529	Charles	104.74	26.34	57.67	443.71	Infiltration galleys/basin
5	Medfield High School & Medfield Middle School	OF-536	Charles	1.59	1.20	2.14	17.00	Infiltration galleys/basin
6	Medfield Middle School	OF-538	Charles	0.59	0.17	0.32	2.56	Infiltration galleys/basin
7	Medfield Highway Department	OF-222	Charles	21.32	11.74	23.22	168.47	DMH diversion to large infiltration forebay upstream of detention area
8	Metacomet Park	(OF-227)	Charles	-	-	-	-	Surface feature such as infiltration cell
9	North Street at Harding/Winter	OF-113	Charles	27.38	3.23	9.97	65.17	Infiltration Galleys or Rain Garden
10	Medfield WWTP	OF-532	Charles	2.09	0.46	0.92	6.91	Infiltration Galleys or Rain Garden
11	Medfield WWTP	OF-533	Charles	2.18	1.09	1.98	15.68	Infiltration Galleys or Rain Garden
12	Memorial School	OF-377	Charles	14.16	4.82	9.05	70.72	Infiltration Galleys or Rain Garden
13	Parking Lot on Janes Avenue	OF-425	Charles	3.48	2.54	4.87	36.04	Infiltration Galleys or Rain Garden
14	Vine Lake Cemetery	OF-344	Charles	27.87	4.28	11.09	72.79	Infiltration Galleys or Rain Garden
15	Senior Center (Kensington Club)	OF-511	Charles	39.92	3.67	10.47	76.58	Infiltration Galleys or Rain Garden
			Project Totals	**245.32**	**59.54**	**131.70**	**975.63**	

NOTES:
(1) Impervious area is the portion of the Town that is paved, covered by buildings, or otherwise rendered unable to absorb water naturally due to development. Impervious area for the town was calculated using the MassGIS 2016 Land Cover/Land Use data layer which was published in 2019.
(2) The estimates of phosphorus and nitrogen loading potential were created for the Town's storm drain outfall catchments using the methods described in the Nutrient Source Identification Report Town of Medfield, prepared by the Neponset River Watershed Association and dated June 14, 2021.
(3) Town parcels were examined for potential BMP retrofit opportunities using the Neponset Stormwater Partnership's BMP Tool.

Town of Medfield
Other Proposed Best Management Practice Solutions
June 24, 2023

Table 4 - Estimated Phosphorous and Nitrogen Load Reduction, In Pounds

Project No.	Location	Outfall	Watershed	BMP Load $_{lbs-P}$ [1] Phosphorous Load (NSP sum_ploadl)	BMP Load $_{lbs-N}$ [1] Nitrogen Load (NSP sum_nloadl)	Proposed Best Management Practice[2]	Estimated Soil Infiltration Rate[3] (Inches/hour)	Physical Storage Capacity of BMP (Inches)	P $_{Target}$ Phosphorous BMP Performance Standard (%)	N $_{Target}$ Nitrogen BMP Performance Standard (%)	BMP-Reduction $_{lbs-P}$ Estimated Phosphorous Reduction (Pounds)	BMP-Reduction $_{lbs-N}$ Estimated Nitrogen Reduction (Pounds)
4	Medfield High School	OF-529	Charles	57.67	443.71	Infiltration Galleys/Basins	2.41	> 2.0	100.0%	100.0%	57.67	443.71
5	Medfield High School & Medfield Middle School	OF-536	Charles	2.14	17.00	Infiltration Galleys/Basins	2.41	> 2.0	100.0%	100.0%	2.14	17.00
6	Medfield Middle School	OF-538	Charles	0.32	2.56	Infiltration Galleys/Basins	2.41	> 2.0	100.0%	100.0%	0.32	2.56
7	Medfield Highway Department	OF-222	Charles	23.22	168.47	DMH diversion to large infiltration forebay upstream of detention area	2.41	> 2.0	100.0%	100.0%	23.22	168.47
8	Metacomet Park	(OF-227)	Charles	-	-						-	-
9	North Street at Harding/Winter	OF-113	Charles	9.97	65.17	Infiltration Galleys or Rain Garden	2.41	> 2.0	67.0%	79.0%	6.68	51.48
10	Medfield WWTP	OF-532	Charles	0.92	6.91	Infiltration Galleys or Rain Garden	2.41	> 2.0	67.0%	79.0%	0.62	5.46
11	Medfield WWTP	OF-533	Charles	1.98	15.68	Infiltration Galleys or Rain Garden	2.41	> 2.0	67.0%	79.0%	1.33	12.39
12	Memorial School	OF-377	Charles	9.05	70.72	Infiltration Galleys or Rain Garden	2.41	> 2.0	67.0%	79.0%	6.06	55.87
13	Parking Lot on Janes Avenue	OF-425	Charles	4.87	36.04	Infiltration Galleys or Rain Garden	2.41	> 2.0	67.0%	79.0%	3.26	28.47
14	Vine Lake Cemetery	OF-344	Charles	11.09	72.79	Infiltration Galleys or Rain Garden	2.41	> 2.0	67.0%	79.0%	7.43	57.50
15	Senior Center (Kensington Club)	OF-511	Charles	10.47	76.58	Infiltration Galleys or Rain Garden	2.41	> 2.0	67.0%	79.0%	7.01	60.50
			Project Totals	**131.70**	**975.63**						**108.73**	**842.91**

NOTES:
(1) The estimates of phosphorus and nitrogen loading potential were created for the Town's storm drain outfall catchments using the methods described in the Nutrient Source Identification Report Town of Medfield, prepared by the Neponset River Watershed Association and dated June 14, 2021.
(2) Town parcels were examined for potential BMP retrofit opportunities using the Neponset Stormwater Partnership's BMP Tool.
(3) The esimated infiltration rate is from test pits conducted at the site in silty sand or sand and sily, "Loamy Sand" (General Permit, Appendix F, Attachment Three, Table B-2).
(4) The Phosphorous and Nitrogen BMP Performance Standards were estimated from the pertinent tables found in the General Permit, Appendix F, Attachment Three.

ATTACHMENT SIX

BMP OPERATIONS AND MAINTENANCE PROGRAM

GENERAL BMP INSPECTION AND MAINTENANCE

Detention basins, subsurface infiltration systems and rain gardens require regular inspection and maintenance to ensure that they are functioning properly to protect property and improve water quality. At a minimum, the Town of Medfield will conduct an annual inspection and an inspection after major storms, as described below and detailed in the **BMP Maintenance Tasks and Schedule**.

The inspections shall be of the following:

1. Structural Integrity - Inspect piping and stormwater structures to make sure they are structurally sound and operating as designed.
2. Soil Erosion – Inspect grassed and vegetated soil slopes (3H:1V max.) for any signs of erosion or sliding. Repair the grading, replenish with topsoil, mulch or stone as needed.
3. Grass Stand and Vegetation – Inspect the grass stand and vegetation. Place new seed or replace landscaping as required.
4. Rip Rap – Inspect rip rap placed in or near the basins to prevent erosion. Check for erosion or missing rip rap.
5. Obstructions - Inspect the pipe end to determine if sediment, dirt, or debris is obstructing the flow of water from the pipe into the basin. Minor amounts of sediment around pipe openings can be removed with a shovel and wheelbarrow, spread evenly on upland areas and seeded with turf grass.

BMP Maintenance Tasks and Schedule

Tasks	Components: Detention Basin Side-Slopes	Detention Basin Bottom	Detention Basin Inlets	Detention Basin Outlet or Outflow Control Structures	Catch Basin Inlets	Catch Basin Sumps	Storm Sewer System	Schedule
Inspect for sediment accumulation		•	•	•	•	•	•	Annually
Remove sediment accumulation		•	•	•	•	•	•	Every 5-10 years as needed
Inspect for debris (dead vegetation and trash)	•	•	•	•	•	•	•	Early spring, fall and after major storms
Clean debris	•	•	•	•	•	•	•	As needed
Inspect for erosion on banks and bottom	•	•	•	•				Early spring, fall and after major storms
Reestablish permanent vegetation on eroded slopes	•	•						As needed
Rake out dead vegetation			•	•				Annually - early spring
Inspect for and remove purple loosestrife	•	•	•	•				Annually - July
Replace stone rip-rap			•	•				Every 3-5 years as needed
Mowing	•	•						0 to 2 times per year
Inspect structural elements during wet weather and compare to as-built plans			•	•			•	Annually
Make adjustments or replacements as determined by annual wet weather inspection		•	•	•			•	As needed
Keep records of all inspections and maintenance activities at the Medfield Highway Department.	•	•	•	•	•	•	•	Annually
Keep records of all costs for inspections, maintenance and repairs at the Medfield Highway Department.	•	•	•	•	•	•	•	Annually
The Town of Medfield shall have a professional engineer carry out emergency inspections upon identification of severe problems	•	•	•	•	•	•	•	As needed

ATTACHMENT SEVEN

BMP IMPLEMENTATION SCHEDULE

ATTACHMENT EIGHT

BMP IMPLEMENTATION COST ESTIMATE

ATTACHMENT NINE

DOCUMENTATION OF PUBLIC COMMENTS

SUPPLEMENTAL CRWA APPENDICES

(WORKSHEETS & GUIDANCE)

APPENDIX R.1 AND R.2

As the PCP is an attachment to the SWMP, the person listed as the program contact must retain a copy of the current SWMP. In addition, the SWMP must be available to the public during normal business hours and posted online if the community has a website on which to post the SWMP. As a reminder, the SWMP including any significant revisions, such as the PCP, are required to be signed in accordance with Appendix B, Subsection 11, including the date of signature.

The following information must be reported in the municipality's Annual Reports:

- *Annual progress updates on the PCP*
- *Performance Evaluations for Years 6-10*

Annually, starting Permit Year 5, the following must also be reported in each Annual Report:

- *All non-structural controls implemented in the reporting year and associated phosphorus reduction*
- *All structural controls implemented during the reporting year, locations, associated phosphorus reduction, and date of latest maintenance and inspections*
- *Phosphorus load increases due to development*
- *Estimated yearly phosphorus export rate, subtracting reductions*
- *Certification that all structural BMPs are being inspected and maintained according to O&M program*
- *Certification that all municipally owned and maintained turf grass areas are being managed in accordance with Massachusetts Regulation 331 CMR 31 pertaining to proper use of fertilizers on turf grasses*

Optional: Per Appendix F Part A.I.1.a.3), "the Permittee may submit more accurate land use data from 2005, which is the year chosen as the baseline land use for the purposes of permit compliance, for EPA to recalculate baseline phosphorus stormwater loads for use in future permit reissuances. Updated land use maps, land areas, characteristics, and MS4 area and catchment delineations ***shall be submitted to EPA along with the year 4 annual report*** *in electronic GIS data layer form for consideration for future permit requirements[3]. Until such a time as future permit requirements reflect information submitted in the year 4 annual report, the permittee shall use the Baseline Phosphorus Load, Stormwater Phosphorus Reduction Requirement and Allowable Phosphorus Load Table F-2 [of Appendix F of the MS4 Permit] (if its PCP Area is the permittee's entire jurisdiction) or Table F-3 [of Appendix F of the MS4 Permit] (if its PCP Area is the regulated area only) to calculate compliance with milestones for Phase 1, 2, and 3 of the PCP."*

---

[3] *This submission is optional and needs only be done if the permittee has more accurate land use information from 2005 than information provided by MassGIS (http://www.mass.gov/anf/research-andtech/it-serv-and-support/application-serv/office-of-geographic-informationmassgis/datalayers/lus2005.html, retrieved 10/1/2013) or the permittee has updated MS4 drainage area characteristics and the permittee would like to update the Baseline Phosphorus Load.*

APPENDIX R.1

PCP APPROACH GUIDANCE

1 PCP Approach Guidance

Goal: Workflow to create a prioritized list of tools and strategies for your municipality to gain a better understanding of existing capacity, and need for capacity-building, with respect to program development over subsequent Permit terms.

After selecting your PCP Area, determining your Baseline, changes since 2005 due to development, and then quantifying credits from existing structural and non-structural BMPs, you next need to develop a plan moving forward to achieve your PCP goal of reaching your Allowable Phosphorus Load. This Approach Guidance Tool aims to walk you through major factors influencing decisions that shape your PCP, since no two PCPs are likely to be the same.

To start, we first walk you through an inventory of current resources and practices that may be able to play a role in your stormwater management program going forward, if they are not already. This exercise will help you frame opportunities for overlap between achieving Permit compliance and other community goals, such as increasing tree canopy or open space, protecting natural spaces, and adapting to climate change. These co-benefits may eventually factor into BMP prioritizations down the line.

Assessing the tools currently available to the Town of Medfield and where there are resource gaps is critical to developing a path to achieving Permit compliance. Tools can be anything from the staff you have available, to available land to install BMPs, to political will for policy changes that may drive P-reductions. The tools described below are some, but not all, of the tools to consider during your initial assessment. They can be categorized in a variety of ways, but for our planning exercise, we have organized them into four buckets: **Organizational Tools**, **Natural/Infrastructure Assets or Constraints**, **Policy/Social Tools**, **and Economic Development Context**.

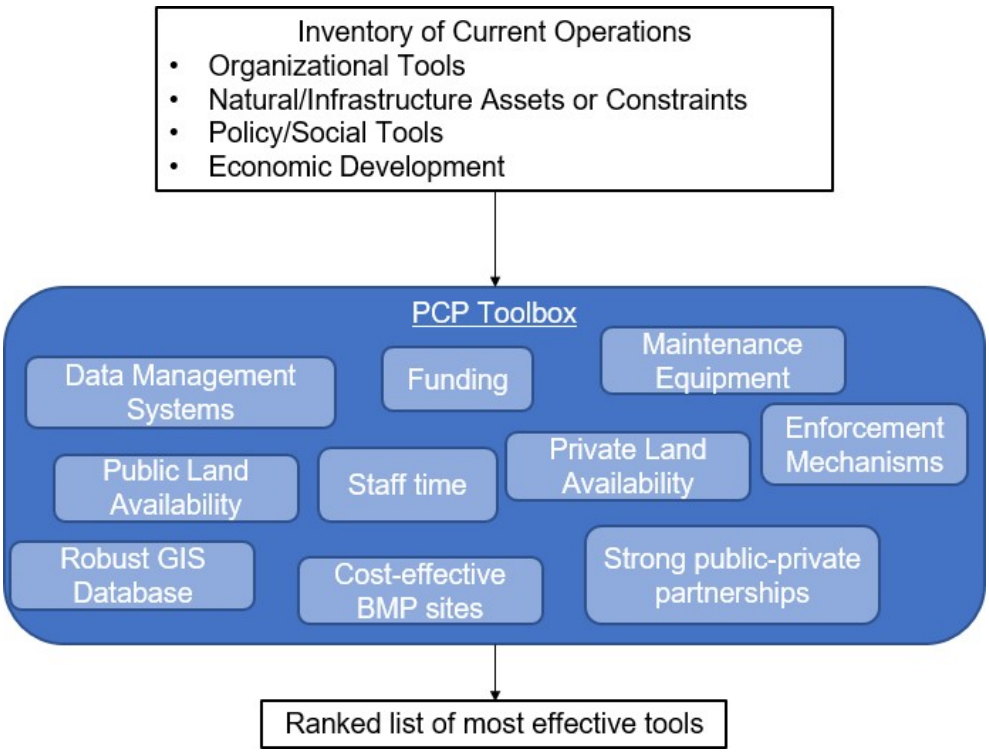


Figure 1. Schematic of Workflow Goals

Perform Inventory

Inventory the current tools at your disposal. Under each category provide quantifiable responses where possible (e.g. number of staff in departments that may undertake the PCP, amount of funding available, etc.). Add any other tools in each category that may be used to develop or implement your PCP.

Example Assessment Criteria – Use this to guide how you build your inventory.

- What is your estimated future stormwater program budget over the next 3-5 years?
- Available equipment, and do you have the capacity to purchase more equipment?
- What existing stormwater-related contracts do you have (non-structural practices, maintenance, planning and design, etc.)?
- Current FTEs available for your municipal stormwater program (i.e. for maintenance, enforcement, inspections, site visits, plan review, education/outreach, etc.)? Across multiple departments including:
    - DPW/Engineering
    - Conservation
    - Parks/Open Space
    - Planning Department
    - Other
- Any existing plans/designs that could be leveraged (open space plans, past subwatershed plans, concept designs, community supported designs, climate action plans, etc.)?
- Have you performed assessments of additional funding sources (Stormwater utility feasibility study, grants, CPA, etc.)?

- Review your legal analysis, what tools are in place or planned to require or incentivize BMPs on private property?
- Review your legal analysis, what data reporting and record-keeping requirements are in place or planned to require or incentivize BMPs on private property?
- Available space (street, public parcels, parking lots, parks, schools, etc.)
- Opportunities for savings (Water Management Act permit compliance, I/I reduction, flood mitigation)
- Technical expertise
    - In House
    - On boards/commissions that provide project review
    - Available for free (MAPC technical assistance, local watershed associations, regional stormwater groups)
- Technical tools (Accurate and up to date GIS data, stormwater system model, Flood Models, BATT, OptiTool, asset management system, BMP installation and tracking spreadsheets)
- Existing /potential public-private partnerships or public-public partnerships (DCR, DCAMM, MassDOT, Army Corps, etc.)
- Town master plan/data on rate of development/redevelopment, upcoming development/redevelopment projects
- Strength of enforcement mechanisms, and capacity to conduct enforcement inspections

Organizational Tools

☐ Staff Resources: (number, training status, experience, etc.) _____

_____

_____

☐ Funding Source: (enterprise/utility, general fund, etc.) _____

_____

_____

☐ IT Infrastructure: (Asset Management System, GIS, database management, BATT, etc.)

_____

_____

☐ Other_____

_____

_____

Natural/Infrastructure Assets or Constraints

☐ Equipment Inventory: (street sweeper/type, Vac Trucks, GI maintenance, etc.) _____

_____

_____

☐ Open Space: (ac. publicly held, privately held, conservation/protection status, etc.)

_____

- Wetland Resources: (ac. Under development constraints, etc.) _____
- Planned capital projects: _____
- Municipally owned land (including buildings, roads and parking lots): _____
- Climate adaptation/resilience actions identified through the MVP process that will have stormwater control benefits: _____
- Other: _____

Policy/Social Tools

- Regulatory Controls (which of these do you have, not any requirements for phosphorus removal):
  - Stormwater ordinance/ bylaw & regulations: _____
  - Local wetlands ordinance/ bylaw & regulations: _____
  - Large project / subdivision review: _____
  - Board of health regulations: _____
  - Other: _____
- Community Support _____
- Complementary Municipal Planning Initiatives and Priorities (i.e. open space plan, master plan, zoning review, climate mitigation and adaptation plans, etc.) _____

_____

Economic Development Context

- Build out status and rate of growth _____

_____

_____

- Land Use (type, conversions, new/redevelopment, etc.) _____

_____

_____

Rank & Prioritize Tools

Populate the table below with the specific items inventoried above. Rank each on a scale of 0-5 to assess the strength of each tool, such that:

0 = No available resources
1 = Minimal available resources, capacity is very stressed by our current program
2 = Some available resources, capacity is not quite enough to meet the needs of our current program
3 = Capacity is meeting the needs of our current program
4 = Capacity is meeting the needs of our current program and could be expanded
5 = Strongly developed tool readily available for near-term PCP implementation

This table will help you to prioritize your tools across each of the categories against each other, documenting the strengths your municipality already has to build this program and where your growth opportunities are. Some items are already filled in to start, but add in as many specific tools as possible.

For example, while the phosphorus reduction benefits of non-structural BMPs can be relatively small, they are widespread and often already a part of a permittee's operations.

Table 1. Ranked Tools

Tool	Ranking	Notes
Staff size	*2*	*Ex: Do not have sufficient staff to maintain BMPs currently, and therefore would need to invest in additional staff if we plan to install significantly more to reach our PCP goals.*
Staff Training	*4*	*Ex: Existing staff is well trained on maintaining BMPs*

Tool	Ranking	Notes

1.1 Prioritize Top Tools: List the tools from Table 1 in order from highest ranked (5) to lowest (0)

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____

At the end of this section, the goal is to have a prioritized list of strengths which will be used to build your program. For example, if your municipality has strong development/redevelopment regulations with strict stormwater management requirements, it may make sense to lean on private development to achieve structural BMP credits. If you have very limited public space to install publicly owned structural BMPs, that is an indication that you will likely need to work to build other more robust areas of your program from the start to achieve your PCP target.

2 Matching Tools to Strategies and Quantifying Benefits

Goal: Develop tailored PCP implementation strategies and program capacity assessment.

The PCP Approach Guidance Tool above detailed the exercise for you to best understand your biggest strengths for potential PCP implementation strategies in the near term and guide growth in the long term. Based on the tools you ranked as highest, select strategies that align and would be easiest to implement in the Town of Medfield immediately.

Examples of high-priority tools, and associated strategies that align with each, are included in Figure 4-1. This is not an exhaustive list, but rather a set of examples meant to help guide strategy selection.

Of course, every municipality will have a different list of tools and strategies, based on the ranked list in the PCP Approach Guidance above. However, the top items in Figure 2– non-structural BMPs and structural BMPs on Town-owned land – tend to be two strategies that are good starting places for any community.

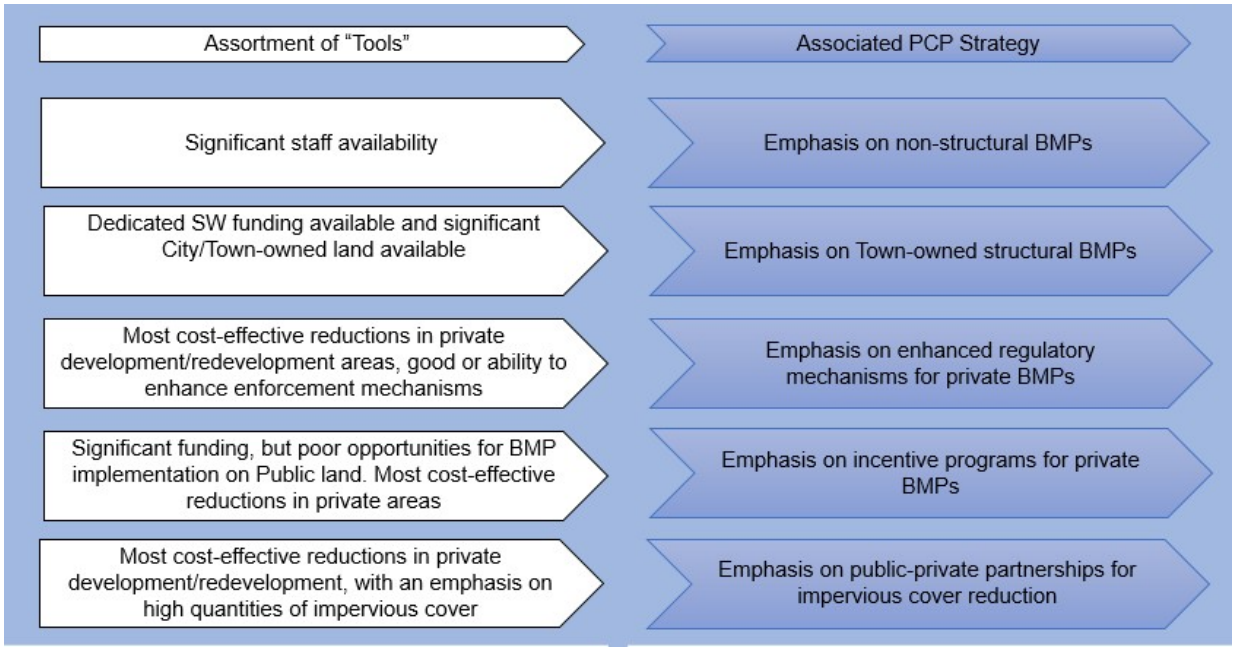


Figure 2. Example Tools and Associated Strategies

As you select strategies, you shall then begin estimating planning level phosphorus credits that can be realized from each strategy. These estimates can be calculated via multiple tools, which are expanded upon below. Continue adding strategies, moving down your ranked list from Table 1, until your planning level analysis illustrates your suite of strategies will achieve your overall PCP target. Be sure to work from the augmented values in reported in your PCP Template and the Calculation Support Worksheets in Appendix R.1, which accounted for actions taken since 2005.

Combine Tools and Select Strategies:
Start with the top four or five tools from Table 1 and develop strategies for each that seem most easily implemented in your municipality.

Table 2. Tool to Strategy Table

Tool	Strategy	Notes
Ex. Well trained staff and Town-owned maintenance equipment	*Employ enhanced street sweeping program*	*Determine feasibility of implementing at various levels (twice a year, monthly, weekly)*

Estimate Phosphorus Credits for Selected Strategies:
See Appendix R.3 for full list of resources to estimate benefits; but some examples are outlined below:

- EPA OptiTool
- Simple Planning Spreadsheet
- MassDEP Watershed Based Planning Tool

Use these tools, and/or others, to begin estimating phosphorus credits based on the equations and guidance in Attachments 2 and 3 to Appendix F. Report estimated benefits for each tool and strategy combination in Table 2, and maintain a running total credit to track until you've reached your PCP goal. Start with the easiest strategies to implement (e.g. top ranked tools, like non-structural BMPs and structural BMPs on publicly owned land) and iteratively add strategies. These will likely change over the life of the PCP, but this provides a guide at the outset and will inform the written Phase 1 PCP.

Re-Report Item 2.7: Remaining Phosphorus Reduction Requirement: _____lb/yr

Note: The exercises undertaken in the Calculation Support Worksheet 2 in Appendix R.1 indicate how development, and any changes in land use and impervious area added

phosphorus loads. This updating of annual loads to current conditions (i.e. calculating Item 2.1) is not static – as development continues to happen, your loads will change. This will move the dial on how much is required to achieve your goal, since the static target is your Allowable Phosphorus Load (Item 1.3). So while this exercise in Table 3 *below is meant to chart your entire path, know that significant development and increases in load over the Permit term could create a larger reduction requirement needed to achieve your Allowable Phosphorus Load.*

Table 3. Strategy Accounting Table

Tool	Strategy	Estimated P Credit	Notes
Ex. Well trained staff and Town-owned maintenance equipment	*Employ enhanced street sweeping program – Monthly*	*Calculate P credit using Attachment 2 for total area swept.*	*Assuming monthly was selected because it maximized credit while maintaining an implementable plan.*
Keep adding columns above as needed.			
TOTAL P CREDIT		**Sum of above columns**	

The strategies in Table 3 will directly feed your written Phosphorus Control Plan.

APPENDIX R.2

WORKSHEETS FOR CALCULATION SUPPORT

1 Calculation Support Worksheet for Determination of PCP Area

Goal: Provide guidance and support to select your PCP scope (area) based on land use analysis. Many communities have a decision to make between implementing the PCP in just the Urbanized Area, or within your municipality's entire jurisdiction within the watershed.

"Item 1-3" of Permit Appendix F allows municipalities to select the PCP Area (PCP Scope) Baseline. This dictates:

(a) Where within the municipality the PCP will be implemented, and
(b) What the associated Phosphorus reduction target is for the area selected.

Here, we will walk you through the key considerations for PCP-scope determination. Table 1 compares the differences in reduction targets for each municipality between your entire watershed and your Urbanized Area. This information is pulled from Tables F-2 and F-3 of Permit Appendix F, which are also presented in Table 3 and Table 4 at the end of this worksheet. Note that the information in Table 1 is reported in pounds/year instead of kg/year. For ease of tracking, we recommend converting each of the key parameters to lbs/yr. This will likely align with your internal tracking and operations more seamlessly. Conversion presented below:

1 kg/year = 2.2045 lb/year

For municipalities NOT highlighted in yellow in Table 1, the entire Charles River watershed area in the Town of Medfield is also completely Urbanized/Regulated MS4 area, and therefore PCP Scope is pre-determined. Skip to the final section of the Calculation Support Worksheet titled "PCP Area" (page 3).

Note: In all cases, the selected PCP Area must be entirely located within the Charles River Watershed boundary. For municipalities that straddle the Charles River Watershed and another watershed, even if you select the "Entire Jurisdiction," you are only required to implement the PCP within your municipality's jurisdiction within Charles River Watershed.

Table 1. Comparison of PCP Area for Each Municipality[1]

Community	Stormwater Phosphorus Load Reduction Requirement, Entire Jurisdiction in Charles River (lb/yr)	Stormwater Phosphorus Load Reduction Requirement, Urbanized Area Only in Charles River (lb/yr)	Reduction Requirement Difference
Arlington	233.7	233.7	0.0
Ashland	147.7	147.7	0.0
Bellingham	2087.8	1765.9	321.9
Belmont	445.3	445.3	0.0
Boston	15181.0	15181.0	0.0
Brookline	3604.6	3604.6	0.0

Community	Stormwater Phosphorus Load Reduction Requirement, Entire Jurisdiction in Charles River (lb/yr)	Stormwater Phosphorus Load Reduction Requirement, Urbanized Area Only in Charles River (lb/yr)	Reduction Requirement Difference
Cambridge	1128.8	1128.8	0.0
Dedham	1774.7	1774.7	0.0
Dover	1832.0	621.7	1210.3
Foxborough	4.4	4.4	0.0
Franklin	5167.6	5097.1	70.5
Holliston	3401.7	2996.1	405.7
Hopedale	235.9	235.9	0.0
Hopkinton	643.7	617.3	26.5
Lexington	1168.4	1157.4	11.0
Lincoln	1307.3	806.9	500.4
Medfield	**2105.4**	**1823.2**	**282.2**
Medway	2343.5	2286.2	57.3
Mendon	63.9	22.0	41.9
Milford	3551.6	3276.1	275.6
Millis	2136.3	1104.5	1031.8
Natick	2442.7	2191.4	251.3
Needham	3906.6	3904.4	2.2
Newton	8562.7	8562.7	0.0
Norfolk	2213.4	2206.8	6.6
Somerville	1424.2	1424.2	0.0
Sherborn	1865.1	447.5	1417.6
Walpole	350.5	350.5	0.0
Waltham	6395.6	6395.6	0.0
Watertown	2484.6	2484.6	0.0
Wayland	101.4	101.4	0.0
Wellesley	3154.8	3154.8	0.0
Weston	2588.2	2588.2	0.0
Westwood	828.9	762.8	66.1
Wrentham	1362.5	1225.8	136.7
Mass-DCR	928.1	873.0	55.1

[1] Note: Highlighted rows have differences between two options (“decision communities”) and require analysis. Non-highlighted rows have no differences between scope areas (“no decision communities”).

For those municipalities highlighted in yellow in Table 1, this will guide the comparison between the two options, presenting suggested considerations for your decision. The required reduction in the entire jurisdiction is higher than that for just the Urbanized Area.

There are a few reasons you may decide to implement your PCP across your entire jurisdiction, including:

- Most readily developable and re-developable land is located outside the Urbanized Area;
- Key large parcels suitable for structural BMPs are located outside the Urbanized Area;
- Soil types, groundwater conditions, etc. most suitable to BMPs outside the Urbanized Area (this may be a consideration for communities with a very small difference);
- New development with modern stormwater controls is present/prevalent outside the Urbanized Area.
- Planned practices/approaches will be implemented at the municipal scale and you want to "take credit" for all the non-structural and structural stormwater practices being implemented in the community
- Your municipality's Urbanized Area covers almost the entire watershed.
- Creating a distinction of the Urbanized Area will complicate BMP tracking. (i.e. how easy or difficult will it be to implement and track enhanced non-structural BMPs in a targeted area vs. entire town?)

Please see the maps in Appendix R.4, which contains overlays illustrating where some of the best land area for structural BMPs, both within and outside of the Urbanized Area, is located for each municipality. This will help indicate if there is ample opportunity for phosphorus-credits outside the Urbanized Area.

We also recommend considering the following question:

- Local regulation does not yet require the same phosphorus removal standards in UA vs outside of UA;

Note: A community can always elect to expand the PCP Area from only the Urbanized Area to the entire Charles River Watershed in their municipal bounds *at a later phase of PCP planning*; however, if you select your entire jurisdiction, you cannot go backwards.

PCP Area: For use in Template

Based on these instructions and considerations, select a PCP Area and enter your selection below:

- ☐ Urbanized Area Only
- ☐ Entire Charles River Watershed
- ☐ N/A no distinction

Based on this selection, enter the associated values from either Table 3 or Table 4 into the table below. These values will be input into Tables 1-3 and 1-4 of your PCP. Note that the first column, "Item Number," will be used throughout this Appendix and the Template to track calculated values.

Table 2. Selected Phosphorus Load Characteristics

Item Number	Name	lbs/yr	kg/yr
1.1	Baseline Phosphorus Load		
1.2	Stormwater Phosphorus Load Reduction Requirement		
1.3	Allowable Phosphorus Load		
1.4	Stormwater Percent Reduction in Phosphorus Load		

Table 3. (Permit Table F-2) Community Annual Stormwater Phosphorus Load Reduction by Permittee, Charles River Watershed

Community	Baseline Phosphorus Load, kg/yr	Stormwater Phosphorus Load Reduction Requirement, kg/yr	Allowable Phosphorus Load, kg/yr	Stormwater Percent Reduction in Phosphorus Load (%)	Stormwater Phosphorus Load Reduction Requirement, kg/yr					
					PCP Phase 1		PCP Phase 2		PCP Phase 3	
					Permit Year 8	Permit Year 10	Permit Year 13	Permit Year 15	Permit Year 18	Permit Year 20
					20%	25%	35%	50%	70%	100%
Arlington	106	68	38	64%	13.6	17	23.8	34	47.6	68
Ashland	67	28	39	42%	5.6	7	9.8	14	19.6	28
Bellingham	947	398	549	42%	79.6	99.5	139.3	199	278.6	398
Belmont	202	105	97	52%	21	26.25	36.75	52.5	73.5	105
Boston	6,886	4145	2741	60%	829	1036.25	1450.75	2072.5	2901.5	4145
Brookline	1,635	968	667	59%	193.6	242	338.8	484	677.6	968
Cambridge	512	317	195	62%	63.4	79.25	110.95	158.5	221.9	317
Dedham	805	404	401	50%	80.8	101	141.4	202	282.8	404
Dover	831	180	652	22%	36	45	63	90	126	180
Foxborough	2	0	2	0%	0	0	0	0	0	0
Franklin	2,344	1012	1332	43%	202.4	253	354.2	506	708.4	1012
Holliston	1,543	496	1046	32%	99.2	124	173.6	248	347.2	496
Hopedale	107	47	60	44%	9.4	11.75	16.45	23.5	32.9	47
Hopkinton	292	89	203	31%	17.8	22.25	31.15	44.5	62.3	89
Lexington	530	242	287	46%	48.4	60.5	84.7	121	169.4	242
Lincoln	593	127	466	21%	25.4	31.75	44.45	63.5	88.9	127
Medfield	955	345	611	36%	69	86.25	120.75	172.5	241.5	345
Medway	1,063	400	662	38%	80	100	140	200	280	400
Mendon	29	11	17	40%	2.2	2.75	3.85	5.5	7.7	11
Milford	1,611	809	802	50%	161.8	202.25	283.15	404.5	566.3	809
Millis	969	301	668	31%	60.2	75.25	105.35	150.5	210.7	301
Natick	1,108	486	622	44%	97.2	121.5	170.1	243	340.2	486
Needham	1,772	974	797	55%	194.8	243.5	340.9	487	681.8	974

Community	Baseline Phosphorus Load, kg/yr	Stormwater Phosphorus Load Reduction Requirement, kg/yr	Allowable Phosphorus Load, kg/yr	Stormwater Percent Reduction in Phosphorus Load (%)	Stormwater Phosphorus Load Reduction Requirement, kg/yr					
					PCP Phase 1		PCP Phase 2		PCP Phase 3	
					Permit Year 8	Permit Year 10	Permit Year 13	Permit Year 15	Permit Year 18	Permit Year 20
					20%	25%	35%	50%	70%	100%
Newton	3,884	2365	1519	61%	473	591.25	827.75	1182.5	1655.5	2365
Norfolk	1,004	286	718	28%	57.2	71.5	100.1	143	200.2	286
Somerville	646	400	245	62%	80	100	140	200	280	400
Sherborn	846	156	690	18%	31.2	39	54.6	78	109.2	156
Walpole	159	37	121	24%	7.4	9.25	12.95	18.5	25.9	37
Waltham	2,901	1755	1146	60%	351	438.75	614.25	877.5	1228.5	1755
Watertown	1,127	703	424	62%	140.6	175.75	246.05	351.5	492.1	703
Wayland	46	19	27	42%	3.8	4.75	6.65	9.5	13.3	19
Wellesley	1,431	821	609	57%	164.2	205.25	287.35	410.5	574.7	821
Weston	1,174	375	799	32%	75	93.75	131.25	187.5	262.5	375
Westwood	376	150	226	40%	30	37.5	52.5	75	105	150
Wrentham	618	210	407	34%	42	52.5	73.5	105	147	210
Mass-DCR	421	91	330	22%	18.2	22.75	31.85	45.5	63.7	91

Table 4. (Permit Table F-3) Urbanized Area Annual Stormwater Phosphorus Load Reduction by Permittee, Charles River Watershed

Community	Baseline Phosphorus Load, kg/yr	Stormwater Phosphorus Load Reduction Requirement, kg/yr	Allowable Phosphorus Load, kg/yr	Stormwater Percent Reduction in Phosphorus Load (%)	Stormwater Phosphorus Load Reduction Requirement, kg/yr					
					PCP Phase 1		PCP Phase 2		PCP Phase 3	
					Permit Year 8	Permit Year 10	Permit Year 13	Permit Year 15	Permit Year 18	Permit Year 20
					20%	25%	35%	50%	70%	100%
Arlington	106	68	38	64%	13.6	17	23.8	34	47.6	68
Ashland	67	28	39	42%	5.6	7	9.8	14	19.6	28

Community	Baseline Phosphorus Load, kg/yr	Stormwater Phosphorus Load Reduction Requirement, kg/yr	Allowable Phosphorus Load, kg/yr	Stormwater Percent Reduction in Phosphorus Load (%)	Stormwater Phosphorus Load Reduction Requirement, kg/yr					
					PCP Phase 1		PCP Phase 2		PCP Phase 3	
					Permit Year 8	Permit Year 10	Permit Year 13	Permit Year 15	Permit Year 18	Permit Year 20
					20%	25%	35%	50%	70%	100%
Bellingham	801	352	449	44%	70.4	88	123.2	176	246.4	352
Belmont	202	105	97	52%	21	26.25	36.75	52.5	73.5	105
Boston	6886	4145	2741	60%	829	1036.25	1450.75	2072.5	2901.5	4145
Brookline	1,635	968	667	59%	193.6	242	338.8	484	677.6	968
Cambridge	512	317	195	62%	63.4	79.25	110.95	158.5	221.9	317
Dedham	805	404	401	50%	80.8	101	141.4	202	282.8	404
Dover	282	82	199	29%	16.4	20.5	28.7	41	57.4	82
Foxborough	2	0	2	0%	0	0	0	0	0	0
Franklin	2,312	1007	1305	44%	201.4	251.75	352.45	503.5	704.9	1007
Holliston	1,359	466	892	34%	93.2	116.5	163.1	233	326.2	466
Hopedale	107	47	60	44%	9.4	11.75	16.45	23.5	32.9	47
Hopkinton	280	88	191	32%	17.6	22	30.8	44	61.6	88
Lexington	525	241	284	46%	48.2	60.25	84.35	120.5	168.7	241
Lincoln	366	84	282	23%	16.8	21	29.4	42	58.8	84
Medfield	827	335	492	41%	67	83.75	117.25	167.5	234.5	335
Medway	1,037	390	647	38%	78	97.5	136.5	195	273	390
Mendon	10	6	5	57%	1.2	1.5	2.1	3	4.2	6
Milford	1,486	798	688	54%	159.6	199.5	279.3	399	558.6	798
Millis	501	200	300	40%	40	50	70	100	140	200
Natick	994	456	538	46%	91.2	114	159.6	228	319.2	456
Needham	1,771	974	797	55%	194.8	243.5	340.9	487	681.8	974
Newton	3,884	2365	1519	61%	473	591.25	827.75	1182.5	1655.5	2365
Norfolk	1,001	285	716	29%	57	71.25	99.75	142.5	199.5	285
Somerville	646	400	245	62%	80	100	140	200	280	400

Community	Baseline Phosphorus Load, kg/yr	Stormwater Phosphorus Load Reduction Requirement, kg/yr	Allowable Phosphorus Load, kg/yr	Stormwater Percent Reduction in Phosphorus Load (%)	Stormwater Phosphorus Load Reduction Requirement, kg/yr					
					PCP Phase 1		PCP Phase 2		PCP Phase 3	
					Permit Year 8	Permit Year 10	Permit Year 13	Permit Year 15	Permit Year 18	Permit Year 20
					20%	25%	35%	50%	70%	100%
Sherborn	203	52	151	26%	10.4	13	18.2	26	36.4	52
Walpole	159	37	121	24%	7.4	9.25	12.95	18.5	25.9	37
Waltham	2,901	1755	1146	60%	351	438.75	614.25	877.5	1228.5	1755
Watertown	1,127	703	424	62%	140.6	175.75	246.05	351.5	492.1	703
Wayland	46	19	27	42%	3.8	4.75	6.65	9.5	13.3	19
Wellesley	1,431	821	609	57%	164.2	205.25	287.35	410.5	574.7	821
Weston	1,174	375	799	32%	75	93.75	131.25	187.5	262.5	375
Westwood	346	143	203	41%	28.6	35.75	50.05	71.5	100.1	143
Wrentham	556	196	361	35%	39.2	49	68.6	98	137.2	196
Mass DCR	396	89	307	22%	17.8	22.25	31.15	44.5	62.3	89

2 Calculation Support for Structural and Non-Structural BMP Tracking

Goal: Provide guidance to calculate phosphorus loads/credits for:

- Land use, development, and impervious cover changes since 2005; and
- Structural and non-structural BMPs.

The three sections of this worksheet will provide guidance for calculating both of these items.

Most of the calculations here will need to be performed in an accounting tool while leveraging data within your municipality. A summary of potential inputs and calculation tools is provided in Table 5. The BMP Accounting and Tracking Tool (BATT) is strongly recommended for any calculations that will be used to document permit compliance. A more detailed resource summary is included Appendix R.3:

Table 5. Accounting Resources

Potential Input Sources	Potential Methods to Perform Calculations
● Town maps/ GIS data ● Oliver online tool ● MassGIS land use (2005 vs 2016) ● MassGIS impervious cover data (2005) and more recent impervious cover that is specific to a municipality ● Local permit filings (Stormwater Authority/ Agency, Planning Board Records, Conservation Commission NOIs, Board of Health review, etc.) ● Zoning, Conservation, and Public Works/ Engineering Records	● MassDEP Watershed Based Planning Tool ● BMP Accounting and Tracking Tool (BATT) ● Accounting Spreadsheet (Appendix R.5)

The Accounting Spreadsheet listed in Table 5 was produced in conjunction with this template and these calculation support tools, and it is included as Appendix R.5. The purpose of this spreadsheet is to provide a simplified basis for performing calculations in alignment with Attachments 1-3 to the Permit Appendix F. **We recommend this spreadsheet be used for planning purposes, and that BATT be used for compliance purposes.** There are separate tabs to address the items in each of the three Permit attachments, as well as additional calculation resources implementation planning, which will be referenced throughout the template.

Part (2a). Changes to Land Use, Development, and Conversion of Impervious Cover from 2005 – 2021

Under the Performance Evaluation section in Appendix F, permittees are required to calculate "phosphorus export increases since 2005 due to development[1]" and augment

[1] Appendix F – Requirements for Discharges to Impaired Waters with an Approved TMDL. Note, this is **NOT** the same exercise as the optional re-baselining that the Permit also allows. This activity is required under the Permit in Years 6 and 7 under the Performance Evaluation (Item 1-11). However, we

their baseline loads accordingly. The PCP Area and Baseline selected in Worksheet 1 was calculated based on Phosphorus Loading Export Rates (PLERs) estimated from different land use/land cover types, and these can be used to make updates from the changes since 2005, as detailed in Attachment 1 to Appendix F of the Permit.

You will need to estimate the following items:
(1) Acreage of net change to impervious cover since 2005, and
(2) Acreage of changed land uses since 2005.

-

If you have in house GIS capability, the easiest way to do this will likely be to compare MassGIS 2016 Land Cover/Land Use Layer to 2005 Land Use for your PCP Area to document the changes. You can also compare changes to impervious cover using MassGIS or locally available ortho/fly over imagery of impervious cover, or other locally managed GIS data.

If you do not have GIS capabilities in house you can estimate changes based on changes at the site scale using:

- Planning Board plans and records
- Zoning Board plans and records

Tip/Trick: If you do not have GIS capacity in house nor the funds to hire out this analysis you could consider getting assistance with this task from a local university at this stage in your planning process as this is a recommended estimate. This activity is required under the Permit in Years 6 and 7 under the Performance Evaluation. However, we recommend completing this now, as it will be beneficial to understand how impervious cover and development since 2005 impacts your progress towards the reduction target early on.

Land areas, in acres, for each can be input into the “Land Use Loads” tab of the Accounting Spreadsheet in Appendix R.5. This will use the PLERs in Attachment 1 to calculate the changes in Phosphorus loading based on the different land use types.

Item 2.1: Report the net change from the Spreadsheet (+ means added Phosphorus, - means removed Phosphorus) here: _____lb/yr Phosphorus

This change will be used to calculate your current phosphorus load, which will update the total amount of phosphorus that must be mitigated to meet your Allowable Phosphorus Load selected in Worksheet 1. Use the value above (Item 2.1) and the results from Worksheet 1 to fill in the following Table. For simplicity of calculation, we ask you to re-report the values determined on Worksheet 1 below:

Table 6. Phosphorus Loads Reflecting Current Conditions

Condition	Value
Baseline P-Load, lbs/yr	*[Item 1.1]*
Allowable P-Load, lbs/yr	*[Item 1.3]*
Stormwater P-Load Reduction Requirement, lbs/yr[3]	*[Item 1.2]*
Changes in P-Load Since 2005 (P-inc), lbs/yr	*[Item 2.1]*
Current P-Load, lbs/yr	*Item 2.2 = [Item 1.1 + Item 2.1]*
Current Stormwater P-Load Reduction Requirement, lbs/yr	*Item 2.3 = [Item 2.2 – Item 1.3]*
Year 8 Milestone: 20% of Reduction, in lbs/yr	*0.2 * [Item 2.3]*
Year 10 Milestone: 25% of Reduction, in lbs/yr	*0.25 * [Item 2.3]*

Note: recommend completing this now, as it will be beneficial to understand how impervious cover and development since 2005 impacts your progress towards the reduction target early on.

Part (2b). Non-Structural BMP Calculation for Current Practices

Appendix F also allows municipalities to take credit for any enhanced non-structural BMPs that are currently in practice. Step (2b) focuses on the three non-structural BMPs for which permittees can receive credit: street sweeping, catch basin cleaning, and yard waste/leaf litter collection. See Permit Appendix F Attachment 2 excerpts detailing what may be credited:

Street Sweeping: For full credit for monthly and weekly sweeping frequencies, sweeping must be conducted year-round. If not, an adjustment factor will be used[2]. The following frequencies are considered enhanced:

- *2 times / year*
- *Monthly*
- *Weekly*

Catch Basin Cleaning: To take credit, you must maintain a minimum sump storage capacity of 50% throughout the year, and clean catch basins semi-annually.

Enhanced Organic Waste and Leaf Litter Collection Program: In order to earn this credit (Credit leaf litter), the permittee must gather and remove all landscaping wastes, organic debris, and leaf litter from impervious roadways and parking lots at least once per week during the period of September 1 to December 1 of each year. Credit can only be earned for those impervious surfaces that are cleared of organic materials in accordance with the description above. The gathering and removal shall occur immediately following any landscaping activities in the Watershed and at additional times when necessary to achieve a weekly cleaning frequency. The permittee must ensure that the disposal of these materials will not contribute pollutants to any surface water discharges. The permittee may use an enhanced sweeping program (e.g., weekly frequency) as part of earning this credit provided that the sweeping is effective at removing leaf litter and

organic materials.[3]

If employing any of these enhancements currently, use the "NonStructural BMP P-Reductions" tab of the Accounting Spreadsheet in Appendix R.6 to calculate associated phosphorus credits that can be taken for current practices. You will need estimates of impacted areas, categorized by the associated land use type, to input into the spreadsheet.

[2] Attachment 2 to Appendix F, page 5 of 10: "for example, if sweeping does not occur Dec – Feb, the adjustment factor would be 9/12 (months) = 0.75. Year-round sweeping has an adjustment factor of 1.0.
[3] Attachment 2 to Appendix F Excerpt, page 9 of 10

Note that this tab of the Accounting Spreadsheet can also be used for planning purposes to estimate credits for augmenting your enhanced non-structural BMPs. First, we recommend you calculate your credits from ***existing*** BMPs to better understand what portion of your Stormwater Phosphorus Load Reduction (determined in Worksheet 1) you are currently getting credit for. Then, the guidance provided here can also be used to estimate and track credits for ***planned*** BMPs.

Report Results by Category:

Table 7. Existing Non-Structural BMPs

Non-Structural BMP	Implementation Levels	Average Annual P-Reduction (lbs/yr)
Street Sweeping		
CB Cleaning		
Leaf Litter Program		
Item 2.4: Total Existing Non-Structural Credit		

Use the information in the table above to enter into Table 1-5 of the Template.

Part (2c). Structural BMP Calculation from Constructed and Maintained BMPs

Before determining enhancements that should be undertaken moving forward, this is an opportunity to take credit for any structural BMPs already in place that are receiving proper maintenance and are currently working as intended. Part (2c) focuses on structural BMP implementation. **EPA's BMP Accounting and Tracking Tool (BATT) is the tool that is best suited for this step.** It will also help you establish a good database for tracking structural controls going forward.

Note that if you decide to take credit for existing BMPs, we recommend you complete this ASAP to get a better idea of how much progress you've already made towards your Allowable Phosphorus Load, which will direct how you continue to plan your program.

We recommend that you undertake this effort if there has been considerable development in the Town of Medfield in the past two decades that has involved installation of stormwater BMPs and 1. You have documentation on these system, 2. The systems have been maintained and are functioning as designed.

To calculate reduction credit, you will need to build an inventory of all installed structural BMPs that includes the following information:

- BMP Type
- BMP Drainage Area (acres)
- BMP Location
- Impervious and Pervious Area Contributions, with
  - Impervious Land Use Type and Area (acres)
  - Pervious Hydrologic Soil Group (HSG) and Area (acres)
- Phosphorus Reduction (% Removal)

  - Note, this can be calculated based on the storage capacity of a BMP using the performance curves in Attachment 3 (utilized in the BATT tool). Need BMP type and storage volume.

Some recommendations on how to compile the above information is as follows:

- BMP record plans and as-built drawings
- BMP design documents
- Local GIS information for land use

For all structural BMPs that have already been installed, use the BATT tool to calculate associated phosphorus credits that can be taken. BATT uses the equations in Attachment 3 to Appendix F to estimate phosphorus credits. The Accounting Spreadsheet provided can also be used for planning purposes such as if you want to make an educated guess about how much credit you might get from BMPs that are currently installed before tracking down all the data needed for the BATT and investing in staff capacity to learn BATT. **EPA recommends using the BATT tool for compliance reporting and documentation.**

Based on BATT, or any other tool used, enter the summary of current structural BMPs and their associated phosphorus credit in the table below. This will be replicated in 1-9 of the template.

Table 8. Structural BMPs

Current Structural BMP Type	Number of BMPs	Total Acres Managed	Total Annual P-Reduction (lb/yr)
Item 2.5: Total Phosphorus Credit from Current Structural BMPs			

Note that the procedures for Parts (2b) and (2c) will be replicated for planned BMPs in subsequent sections of the PCP. The guidance here should be followed for all planned BMPs. Take note of any data that was not easily accessible for calculation here – procedures for structural BMP implementation moving forward should work to address this deficiency, by working with developers to obtain this information during your site plan approval or other permitting processes should be standardized and efficient moving forward. Maintenance requirements that are the Town's responsibility should be detailed in your Stormwater Water Management Plan (SWMP).

Calculation Summary: With your current phosphorus load (Item 2.2) calculated above, and your reductions due to current structural and non-structural BMPs, you can now apply these credits to augment that reduction requirement, progressing you further towards your Allowable Phosphorus Load. Use the information calculated in this worksheet to populate the following table.

Table 9. Calculation Summary for Existing Conditions

Condition	From Permit[1]
Current Stormwater P-Load Reduction Requirement, lbs/yr	*Item 2.3 = [Item 2.3 – Item 1.3]*
Non-Structural BMP Reduction Credit, lbs/yr	*Item 2.4*
Structural BMP Reduction Credit, lbs/yr	*Item 2.5*
Total Reductions due to Existing BMPs, lbs/yr	*Item 2.6 = [Item 2.4 + Item 2.5]*
Remaining Stormwater P-Load Reduction Requirement, lbs/yr	*Item 2.7 = [Item 2.3 – Item 2.6]*

Other Useful Benchmarking Exercises

Based on the data collected in this worksheet, we recommend a couple of benchmarking exercises, based on the work done so far, which may help lend some context to your future planning. This information will not be explicitly used in the Template, but it will be good information to inform your PCP approach,

Non-Structural Control Benchmark: Re-Report 2.2: Total phosphorus credit associated with current non-structural BMPs: _____lb/yr

What BMPs are in practice to achieve this reduction: _____

_____

_____

How much does this cost, annually (if available): _____

_____

_____

Describe level of effort to maintain (staff time, equipment purchasing/maintenance, tracking, etc.

_____

_____

_____

Structural Control Benchmark: Re-Report 2.3: Total phosphorus credit associated with existing structural BMPs: _____lb/yr

What types of BMPs (and how many of each) were implemented to achieve this reduction :

_____

_____

_____

How much did this cost overall to implement (if available; for municipally owned): _____

_____

_____

_____

How much does this cost, annually, to maintain (if available; for municipally maintained):

_____

_____

_____

Describe level of effort to maintain (staff time, equipment purchasing/maintenance, tracking, etc.

_____

_____

_____

Approximate Historical Unit Cost for Non-Structural BMPs = [Total implementation cost] / [lb removed] _____

Approximate Historical Unit Cost for Structural BMPs = [Total implementation cost] / [lb removed] _____

If cost information is not readily available, use this as an opportunity to more qualitatively determine the relative efficacy of structural and non-structural BMPs based on historical data. The PCP Guidance Tools in Appendix R.2 will walk you through the process to begin selecting methods to obtain further phosphorus reduction credits, including, but not limited to, structural and non-structural BMPs. Some considerations, based on historical data, you should consider, include:

- How effective are the existing structural and non-structural BMPs?
- Is O&M manageable? Sustainable? What is the effort required to implement and maintain?
- Do you have capacity to enhance over existing? For example, if sweeping monthly, do you have the capacity to enhance further to weekly?

What are your limiting factors if enhancing over current operations does not seem feasible? Staff availability? Funding? O&M training?

APPENDIX R.3

CRWA FUNDING SOURCE ASSESSMENT: OVERVIEW AND GUIDANCE

Funding Source Assessment: Overview and Guidance

1 BACKGROUND

The General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) in Massachusetts requires municipalities in the Charles River watershed to create a Phosphorus Control Plan (PCP) to meet pollutant reduction requirements of the Permit. A similar requirement applies to communities in which there are lakes or ponds subject to a phosphorus Total Maximum Daily Load (TMDL).One element of the PCP is a Funding Source Assessment (FSA) "to describe known and anticipated funding mechanisms…that will be used to fund PCP implementation." This document has been developed to assist communities in meeting this FSA requirement and provides a general overview of typical funding sources and potential suitability for sustaining the level of investment required to meet Permit terms and targeted pollutant reductions. It also provides reference to various tools for evaluation of potential program costs for which funding is required.

2 POTENTIAL FUNDING MECHANISMS

The majority of communities in Massachusetts currently fund stormwater management programs through the General Fund. In this manner, projects are funded when appropriations are presented annually, and funds are approved on the basis of a Town Meeting vote. There are a variety of methods available to communities, however, some of which may provide a more sustainable or consistent revenue upon which to plan for implementation of future program elements. Table 1 provides a summary of common funding mechanisms.

Table 1
Summary of Common Stormwater Funding Mechanisms

Funding Type	Description	Notes
Taxes	Most general purpose local governmental functions are primarily funded through taxes. The purpose is to defray the expenses of general government, as distinguished from the expense of a specific function or services. It is not necessary that a tax have a demonstrable association with any particular purpose or function.	*Positives*: It is a sustainable revenue source and a familiar process. *Drawbacks*: Tax exempt properties do not contribute to solutions for a challenge to which they contribute; funding priorities are subject to change; potentially

Table 1 Summary of Common Stormwater Funding Mechanisms		
		inequitable distribution of service burden.
Bonds and Grants	Bonds involve borrowing money and accruing debt. While they may be useful for major capital projects, they are not a stable source, and are subject to annual vote. Grants are competitive and criteria specific, which may limit their availability or applicability to need.	*Positives*: Good option for larger scale, intermittent individual projects of known scope and cost. *Drawbacks*: Not easily adaptable to programmatic and operations budgeting; no guarantee of funding through competitive processes.
Special Assessment	A special assessment must confer some direct benefit to the property assessed, as the assumption for the assessment is the premise that it improves the value of the property. An assessment may be based on property value or other factors such as street frontage.	*Positives:* Not particularly well suited to this need. *Drawbacks*: Assessments typically have a specific purpose and therefore may have some limitation in terms of how the dollars are applied within a program; convincing the public of the "value" of stormwater management is a difficult task.
Service Fee/Utility	These fees provide the funds to provide services and facilities, or basically to recover the costs of provision of services. The utility must adopt a service charge rate methodology that equitably assigns appropriate fees or charges.	*Positives:* Provides a stable revenue stream upon which short and long term planning and investments can be based; includes all property owners, not just taxed properties; is not as subject to changes in political priorities or competition with other local priorities. *Drawbacks:* Implementation requires political will and popular support that may take time to develop so initial investment is required for

Table 1 Summary of Common Stormwater Funding Mechanisms		
		public outreach and education; implementation may require administrative changes and updates to billing systems, etc.

The MS4 Permit does not include a condition requiring the development and institution of a stormwater utility or other specific funding mechanism. However, the FSA component of the PCP requires communities to investigate possible funding mechanisms, such as a utility or enterprise-funded program, that can be sustained over time and anticipated to meet the funding obligations of the permit as detailed in the PCP. Results of the analysis are intended to provide the framework for "next steps" to ensure a funding plan is successfully implemented. This document focuses on stormwater utilities as the other standard mechanisms are generally better understood, but also typically more restricted in their potential uses.

A stormwater utility is an enterprise fund through which customers are charged a service fee that recovers the cost of providing stormwater management services and maintaining stormwater infrastructure, as well as regulatory compliance. For a successful program, the fee for service would be equitably assigned. This funding mechanism is dedicated to stormwater, just like a water or sewer enterprise fund is dedicated to those services.

In Massachusetts, there are two companion pieces of legislation that allow municipalities to set up stormwater utilities: MGL Chapter 83, Section 16 and MGL Ch 40 Section 1A. MGL Ch 83 Section 16 allows municipalities to set up a stormwater management utility and to charge utility fees for managing stormwater. MGL Ch 40 Section 1A provides a definition of a district for the purpose of water pollution abatement, water, sewer, and/or other purposes. Since Massachusetts passed this enabling legislation, approximately 22 communities have adopted utility or fee-based systems to support program administration and capital programs. Attachment B provides some additional detail.

The benefit of stormwater utilities as a funding option is that they provide dedicated revenue solely for the stormwater program; consolidate/coordinate responsibilities; and allow for development of a more comprehensive and predictable program.

3 GETTING STARTED

PCP development includes an evaluation of the structural and non-structural Best Management Practices (BMP) necessary to achieve target reductions. This exercise also provides a basis for understanding the magnitude of future program costs that will likely exceed investments historically dedicated to stormwater management in a community. If

continued reliance on the General Fund is considered inadequate, other options must be explored.

There are multiple options for the level of funding and the type of fee structure adopted by a utility. Municipalities will need to evaluate three key program elements:

- anticipated stormwater management program revenue needs,
- stormwater utility billing approaches, and
- the legal mechanisms for adopting a stormwater utility. A proposed process is outlined below.

4 STORMWATER MANAGEMENT PROGRAM COST ANALYSIS

An efficient first step in the evaluation is to prepare a stormwater management gap analysis. That analysis should encompass regulatory elements as well as physical infrastructure operations and maintenance and program management. The gap analysis should also include a program cost estimate for budgeting purposes.

A planning-level stormwater management program cost analysis should start with existing data from a municipality's Capital Improvements Plan and operating budgets. The analysis should capture stormwater program cost for the proportion of Town staff labor costs (Town Personnel Services) dedicated to stormwater management responsibilities.

In addition to historical information about past program costs, there are a variety of tools and resources available to supplement program cost estimating. A 2016 technical memorandum from WaterVision, LLC to USEPA Region 1 summarizes an evaluation of costs associated with permit required activities. The evaluation included development of cost estimating worksheets for small, medium and large communities, all of which can be found at https://www.epa.gov/npdes-permits/stormwater-tools-new-england#ms4cei. Note that the evaluation and the spreadsheets are specific to MS4 related activities only. Municipalities may choose to develop a stormwater utility to cover all or portions of stormwater management within the community, including flood mitigation, operations and maintenance or other infrastructure management tasks associated with the stormwater management system. If the utility is to comprehensively cover these costs, historical cost data can be an appropriate reference point.

For many communities stormwater management is a very decentralized function, with multiple departments sharing responsibility for operations, maintenance, inspection, enforcement, etc. In order to capture all of the costs currently embedded in stormwater management, it is critical to fully inventory the manner in which the Town of Medfield deals with various tasks, and account for that effort in the overall cost estimate. The September 30, 2011 Final Report entitled *Sustainable Stormwater Funding Evaluation for the Upper Charles River Communities of Bellingham, Franklin, and Milford, MA* funded by EPA Region 1 provides a good program cost framework starting point.

4.1 STORMWATER UTILITY IMPLEMENTATION

As noted, a stormwater utility may be utilized to collect fees to cover system operation and maintenance, budgeting, and master planning. The use of the funds generated would be defined within a local bylaw or ordinance establishing the utility. Public stormwater utilities may cover a broad array of stormwater management services, including the following:

- Improvement and maintenance to sewers, drains, stormwater Best Management Practices (BMPs), and treatment facilities
- Management of runoff
- Updating systems that do not comply with state or federal regulations
- Street sweeping and catch basin cleaning
- Monitoring and inspecting stormwater control devices
- Labor costs related to stormwater management or utility billing and administration

There are additional administrative costs associated with implementing and maintaining a stormwater utility. For example, there may be costs for creating a new bill and updating these bills, (utility billing and management support). In addition, while a municipality would be able to attach a lien on the property for unpaid stormwater bills, the stormwater utility must account for a small proportion of customers that may not pay utility bills on time or at all (bad debt).

The cost to implement and maintain a stormwater utility may range from $25,000 to $50,000 annually, based on recent implementation experience in Massachusetts. The stormwater utility implementation costs should also account for credits, which would reduce the amount of revenue available. The municipality may choose to issue credits for structural stormwater best management practices that improve water quality or reduce stormwater flows into the MS4 (such as infiltration basins or rain gardens as opposed to rain barrels). Consideration of how the utility can encourage behaviors or projects identified in the PCP will also influence revenue expectations.

General information is provided below regarding getting started with a stormwater utility. There are additional resources developed by non-governmental organizations and others which can provide detailed guidance for this undertaking. Some of these resources are listed in Attachment C.

5 TOWN-WIDE GIS ANALYSIS

To evaluate potential fee structures, the municipality can perform a preliminary analysis of the potential customer base for a stormwater utility using publicly available data. Data can be sourced from the Massachusetts Office of Geographic Information System (MassGIS) which includes layers for land use, parcels, building footprints, and impervious area. The most recently available aerial imagery is also valuable information.

The MassGIS impervious layer may significantly under-capture impervious area due to new development, surface-confusion of impervious area projections, shadowing from the angle of photography, and inaccurate alignment of parcel lines. As a preliminary analysis, however, this is useful information. If the municipality chooses to advance the concept of a utility to implementation, additional data refinement will be required.

6 FEE STRUCTURES

There are multiple ways to structure fees for a stormwater utility, four of which are presented below. These fee structures include one that is analogous to the funding mechanism common to most communities (i.e. taxes) as well as the three most frequently used fee structures within the United States, according to data from the Western Kentucky University Stormwater Utility Survey.[1] Each fee structure offers a different perspective on applying stormwater utility costs equitably.

- **Assessed Property Value -** the most closely analogous distribution of fees to the most common stormwater management funding source, the general fund, which receives tax revenue proportional to assessed property values.
- **Flat fee –** all developed parcels are billed equally as a proportion of the municipality's anticipated revenue needs.
- **Fee per stormwater equivalent residential unit (ERU) or standard billing unit (SBU) –** a charge based on the average amount of impervious area on a residential property or based on every 1,000 square feet of impervious area on a parcel. Impervious area is highly correlated with stormwater runoff and pollution potential and is therefore typically used for billing.
- **Tiered or Two Level –** a separate rate structures with fee classifications based on land use type. This is a hybrid approach that communities use to set different rates for residential and non-residential parcels. Rates are typically developed to increase the proportion of fees paid by commercial, institutional, industrial, and "all other" non-residential landowners.

[1] Based on data from the Western Kentucky University Storm Water Utility Survey (2019) https://digitalcommons.wku.edu/cgi/viewcontent.cgi?article=1000&context=seas_faculty_pubs

GIS analysis can be employed to complete a preliminary evaluation of the costs to property owners under each of the fee structures.

6.1 OPTION 1: ASSESSED PROPERTY VALUE

Property owners receive an annual tax bill which funds local government programs. This tax bill is relative to the assessed value of the property and the Town's budget. Under this stormwater utility rate structure stormwater utility fees would be assessed based on a proportion of the assessed value of a property, analogous to the real estate tax billing. Fees would be based on property value and overall revenue needs for the stormwater management program. In theory, the stormwater utility fee would offset a portion of the municipality's annual budget, thereby decreasing the tax burden charged through real estate taxes. In practice this may not prove to be equal to the stormwater utility fee, therefore taxpayers may not experience a corresponding reduction in the tax bill, however there will be some offset which will need to be determined. Under this fee structure, properties that are tax exempt, such as religious or charitable organizations, would not be charged a stormwater utility fee.

While this distribution of program costs is similar to funding through the general fund, it is less equitable than other fee structures described below, which are based on the amount of impervious area on each parcel. Impervious area is the predominant factor in determining stormwater runoff and is therefore typically used in developing stormwater utility fee structures.[2] Property value does not necessarily correlate well with impervious surfaces and therefore the corresponding amount of stormwater runoff generated on the parcel.

6.2 OPTION 2: FLAT FEE

The simplest rate structure is a flat rate fee for all developed properties. Under this fee structure, rates would be set as a proportion of the total estimated revenue needs. This option accounts for all developed properties to be assessed an equal stormwater fee, regardless of their size or use.

[2] EPA Region 1 Factsheet (2009) - Funding Stormwater Programs
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/FundingStormwater.pdf

6.3 OPTION 3: EQUIVALENT RESIDENTIAL UNIT (ERU) OR STANDARD BILLING UNIT (SBU)

6.3.1 Option 3A: Equivalent Residential Unit (ERU)

The most typical rate structure for stormwater utilities in the United States[3] is based on an equivalent residential unit (ERU), or a fixed fee that is scaled based on the amount of impervious area on a parcel, regardless of land use. The ERU is based on the average amount of impervious area on a residential property. Therefore, each property is billed according to the ERUs based on the proportion of impervious area to the ERU value.

6.3.2 Option 3B: Standard Billing Unit (SBU) fee structure

Given technological improvements to GIS, some communities are choosing to use a variation of the ERU, called a standard billing unit (SBU). The SBU is smaller than the ERU. Under the SBU fee structure, the Town has a more granular billing unit size, and therefore there is a larger range of fees compared to the ERU structure. Non-residential parcels with larger billing areas would pay most of the fees, and therefore the average residential property owner would pay less under this fee structure compared to the ERU fee structure.

6.4 OPTION 4: TWO LEVEL OR TIERED FEE STRUCTURE WITH CUSTOMERS CATEGORIZED BY LAND USE TYPE (RESIDENTIAL AND NON-RESIDENTIAL)

Under this fee structure, a billing unit or stormwater billing unit (SBU) would be developed based on the distribution of total impervious area for residential parcels Conclusion and

7 ADDITIONAL CONSIDERATIONS

Figure 1 summarizes the funding mechanisms and fee structures for a stormwater utility as described in this memorandum. Pros and cons of each fee structure with regards to equity and implementation complexity are briefly described in this figure and next steps are described below.

[3] Western Kentucky University Stormwater Utility Survey (2018)
https://www.wku.edu/seas/undergradprogramdescription/swusurvey2018.pdf

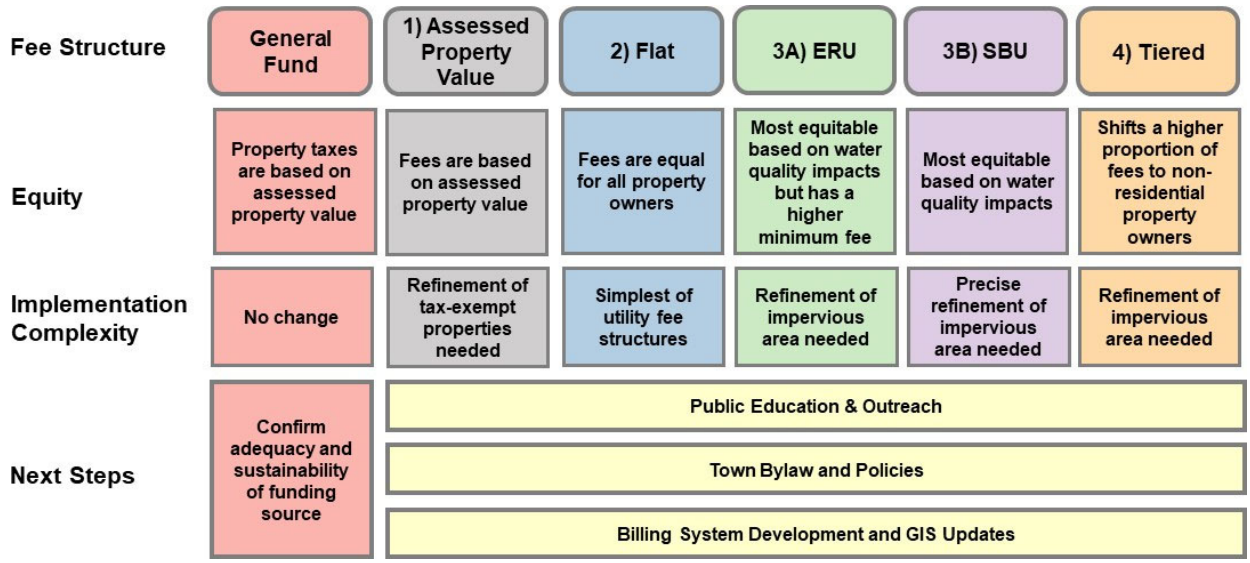


Figure 1: Summary of stormwater management program

Public Education and Outreach
Establishing a new fee for stormwater management is typically controversial and significant investment in a public education and outreach campaign is recommended. This campaign should seek to share information and ensure a transparent process through utility development and implementation.

Local Bylaw
The implementation of a stormwater utility would typically require an amendment to a municipality's bylaws, ordinances, and/or supporting regulations. The municipality will need to create a stormwater enterprise account and then pass a stormwater utility bylaw/ordinance to establish the authority to assess a fee for stormwater. Once the enterprise fund has been created, the stormwater utility bylaw will need to be sponsored by a body, such as the Board of Selectmen, and passed by a majority vote at Town Meeting or comparable appropriate action. Additional information on the legal basis for a stormwater utility is included in Attachment B.

Billing System Development and GIS Updates
Prior to sending the first stormwater utility bill, the municipality must develop a billing file and integrate this into the existing billing system. Typically, the billing file is generated from GIS.

8 NEXT STEPS

The purpose of the FSA is to ensure that the Town of Medfield understands the costs and program elements of a successful MS4 program, and can ensure a sustainable funding source or strategy that will allow the program to be implemented successfully.

Based on steps described above, an FSA will:

- Develop MS4 program (and/or overall stormwater management program) cost estimates using both historical experience and level of effort established through PCP development tasks;
- Identify a funding mechanism suitable to provide adequate financing to implement the program; and,
- Identify a path towards establishing that mechanism.

Attachment A: Stormwater Utilities in Massachusetts Communities and Legal Mechanisms for Adopting a Stormwater Utility

There is precedent for funding stormwater management programs through a utility under a variety of billing structures. Approximately twenty communities in Massachusetts have an implemented stormwater utility or will have a stormwater utility fee by 2020. A summary of Stormwater Utilities in Massachusetts is provided in the table below.

Select Examples of Stormwater Utility Fees in Massachusetts

Community	Fee Type	Typical Residential Monthly Fee	Year Established	Population	Annual Revenue	Revenue per Capita	Revenue per Area of Municipality ($/mi^2)
Ashland	Flat	$-	2019	16,593	$-	$-	$-
Bellingham	Unknown	$-	2019	17,093	$-	$-	$-
Braintree	Tiered	$2.08	2018	35,744	$-	$-	$-
Chelmsford	Tiered	$3.33	2017	33,802	$2M	$59.17	$86,206
Chicopee	Property Area	$8.33	1998	54,653	$1M	$18.30	$41,841
Fall River	Flat	$11.67	2008	91,938	$4.66M	$50.69	$115,633
Gloucester	Unknown	$4.42	2011	30,273	$-	$-	$-
Longmeadow	Tiered	$3.39	2017	15,864	$-	$-	$-
Milton	Tiered	$4.33	2016	27,003	$705K	$26.11	$53,008
Millis	SBU	$2.75	2017	10,000	$675K	$67.50	$54,878
Newton	Flat	$2.08	2006	83,829	$575K	$6.86	$31,593
Northampton	Tiered	$5.00	2014	28,592	$1.98M	$69.25	$55,385
Pepperell	Flat	$5.00	2019	12,146	$-	$-	$-
Reading	SBU	$3.33	2006	24,145	$357K	$14.79	$36,061
Westfield	Property Area	$-	2010	41,094	$600K	$14.60	$12,658

Attachment B: Legal Mechanisms for Adopting a Stormwater Utility

Massachusetts General Law Chapter 83 Section 16 provides the enabling legislation for Stormwater Utilities. Chapter 83 focuses on sewers, drains and sidewalks and section 16 of Chapter 83 more specifically goes into details about sewers with a utility plan. Originally established for sanitary sewer systems, this section was revised in 2004 to include "main drains and related stormwater facilities," thereby enabling municipalities to charge a fee for stormwater services. The following comments regarding the enabling legislation are provided for consideration in the development of a stormwater utility (i.e., bylaw, ordinance):

- The fee is to "supplement" other available funds (e.g. real estate tax-derived general funds); however, a definition of what should be considered available is not provided.
- Stipulates that charges must be either quarterly or annual, which will influence the billing options that are considered.
- Fees must be charged uniformly across residential properties and a uniform fee established for non-residential properties. The alternative option given is that a uniform fee be established for all properties.
- Current language allows for policy decisions to be made if it is fair, equitable, and uniform.
- The language states that such a fee shall be paid "by every person" indicating that all properties (including real estate tax-exempt) would be required to pay said stormwater fee. This interpretation is further substantiated by the discussion of credits as an option to reduce a fee – a credit system is not required by this legislation.

Attachment C: Stormwater Utility Implementation Guidance

The following references provide additional information for creating and implementing a stormwater utility:

https://www.mass.gov/doc/massachusetts-stormwater-fee-summary/download

https://www.mapc.org/resource-library/stormwater-financing-utility-starter-kit/

Getting Community Buy-in for Stormwater Funding: A Four Session Participatory Workshop: Facilitator Manual
https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NHEERL&dirEntryId=346132

The Potential Advantages of a Stormwater Utility for Financing Your Stormwater Management Needs
https://www.hrg-inc.com/the-potential-advantages-of-a-stormwater-utility-for-financing-your-stormwatermanagement-needs/

APPENDIX R.4

RESOURCE LIBRARY

Appendix R.4

List of Phase 1 PCP Resources

Tool Name	Information for Use	Link to Access/Download
Calculating Phosphorus Removal from Structural BMPs		
MS4 GP Appendix F Attachment 3	This attachment provides methods to determine design storage volume capacities and to calculate phosphorus and nitrogen (nutrient) load reductions for certain structural and semi-structural Best Management Practices (BMPs).	https://www3.epa.gov/region1/npdes/stormwater/ma/2016fpd/appendix-f-attach-3-2016-ma-sms4-gp-mod.pdf
Best Management Practice Accounting and Tracking Tool (BMP-BATT)	The BMP Accounting and Tracking Tool (BATT) is a customized spreadsheet-based tool for EPA Region 1 that facilitates watershed based nutrient accounting, tracking, and reporting associated with nutrient load reduction requirements in the Massachusetts and New Hampshire small MS4 permit. The tool provides three primary functions: (1) accounting and tracking of BMP implementation, (2) accounting and tracking changes in land use, and (3) reporting	https://www.epa.gov/npdes-permits/stormwater-tools-new-england#swbmp
Stormwater Management Optimization Tool (Opti-Tool)	Stormwater Nutrient Management Optimization Tool (Opti-Tool) is a spreadsheet-based tool that provides both a planning level and an implementation level analysis to assist stormwater managers in developing technically sound and economically feasible management plans to address stormwater impacts and reduce excessive nutrient loadings. The planning level analysis uses BMP performance curves and Excel Solver to identify an optimal solution. The implementation level analysis calls the SUSTAIN (System for Urban Stormwater Treatment and Analysis Integration) dynamic link library to estimate BMP performance and retrieve optimization results to provide cost-effective BMP sizing strategies.	https://www.epa.gov/npdes-permits/stormwater-tools-new-england#swbmp

Tool Name	Information for Use	Link to Access/Download
Recommendations to facilitate Documentation of Phosphorus Reduction on Private New and Redevelopment Sites, Recommendations to help Track Maintenance on Private Sites		
Northern Middlesex Stormwater Collaborative Model Bylaw (Can be used as Ordinance)	Proposed model language for ordinance/bylaw that includes documentation of phosphorus tracking and reporting, as well as operation and maintenance requirements and reporting.	https://www.nmstormwater.org/s/NMSC-Model-Stormwater-Bylaw.docx
Northern Middlesex Stormwater Collaborative Model Regulations		https://www.nmstormwater.org/s/NMSC-Model-Stormwater-Regulations.docx
CRWA Phosphorus-Specific Additions to Ordinance/Bylaw		https://www.crwa.org/uploads/1/2/6/7/126781580/crwa_recommended_additions_to_stormwater_bylaws_re_phosphorus_reduction-2.pdf
CRWA Phosphorus-Specific Additions to Regulations		https://www.crwa.org/uploads/1/2/6/7/126781580/crwa_recommended_additions_to_stormwater_regs_re_phosphorus_reduction-2.pdf
Developing and Implementing a Stormwater BMP Operation & Maintenance Program		
Central Massachusetts Regional Stormwater Collaborative Town-wide Operation and Maintenance Plan Template	Template for a town-wide plan for all requirements of the MS4GP. See Section 6 of the plan for Structural Stormwater BMP O&M guidance/template.	https://www.centralmastormwater.org/toolbox/pages/operation-maintenance-plan-template
Central Massachusetts Regional Stormwater Collaborative SOP 9: Inspection and Maintenance of Structural Stormwater Best Management Practices (BMPs)	This Standard Operating Procedure (SOP) provides general inspection and maintenance frequencies and procedures for eight common structural stormwater BMPs. This SOP is based on the Massachusetts Stormwater Handbook and is not intended to replace the stormwater BMP Operation and Maintenance guidance contained in the Handbook.	PDF: https://www.centralmastormwater.org/sites/g/files/vyhlif386/f/uploads/sop9structuralbmps.pdf Word: https://www.centralmastormwater.org/home/files/sop9-forms https://www.centralmastormwater.org/home/files/sop9-forms

Tool Name	Information for Use	Link to Access/Download
Land Use		
2005 MassGIS Land Use	Can be used to understand and identify phosphorus load increases and reductions since the TMDL was completed.	https://www.mass.gov/info-details/massgis-data-land-use-2005
2016 MassGIS Land Use		https://www.mass.gov/info-details/massgis-data-2016-land-coverland-use
Environmental Justice & Climate Vulnerable Population Identification		
Massachusetts Environmental Justice Information	Environmental Justice communities and neighborhoods should be considered in PCP development and implementation	Information: https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts Viewer: http://maps.massgis.state.ma.us/map_ol/ej.php
Climate Vulnerable Populations	Populations vulnerable to climate change impacts should be considered in PCP development and implementation. EEA now has an Environmental Justice & Equity portal for reference information. The MA **Department of Public Health "Climate Change Vulnerability Map"** is a statewide resource that quickly sorts by typical indicator groups (age, poverty, education, living alone, English isolation).	Information: https://resilientma.org/mvp/content.html?toolkit=justice Map: http://maps.massgis.state.ma.us/map_ol/cc_vuln.php
Stormwater Utility References		
MassDEP's list of stormwater utilities in Massachusetts	Helps understand other communities stormwater utilities, including date established, fees, exemptions, and provides links and additional notes.	https://www.mass.gov/doc/massachusetts-stormwater-fee-summary/download
Metropolitan Area Planning Council Stormwater Financing/Utility Starter Kit	MAPC and project partners developed a Stormwater Utility/Funding Starter Kit to help municipalities take control of local water quality issues via a long-term funding source for stormwater management, which is encouraged by the U.S. Environmental Protection Agency and The Massachusetts Department of Environmental Protection.	https://www.mapc.org/resource-library/stormwater-financing-utility-starter-kit/
Getting Community Buy-in for Stormwater Funding: A Four Session Participatory	This resource can help local utility proponents understand how to successfully "sell" a stormwater utility. While this is a Facilitator Manual for an agency or organization to	https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NHEERL&dirEntryId=346132

Tool Name	Information for Use	Link to Access/Download
Workshop: Facilitator Manual	implement a multi-session, participatory workshop for municipalities to engage their communities in the development of stormwater funding solutions, the approach and lessons learned are applicable to individual communities. The Manual is a paired resource with a Participant Workbook.	
The Potential Advantages of a Stormwater Utility for Financing Your Stormwater Management Needs		https://www.hrg-inc.com/the-potential-advantages-of-a-stormwater-utility-for-financing-your-stormwater-management-needs/
Cost Estimation Information		
Stormwater Program Cost Evaluation for Massachusetts	Excel workbooks provide cost-estimation guidance for hours needed for various parts of MS4 permit compliance. This can be used as a guide to estimate labor associated with developing and implementing PCP.	https://www.epa.gov/npdes-permits/stormwater-tools-new-england#ms4cei
Community-enabled Lifecycle Analysis of Stormwater Infrastructure Costs (CLASIC) tool	The CLASIC tool is a screening tool utilizing a lifecycle cost framework to support stormwater infrastructure decisions on extent and combinations of green, hybrid green-gray and gray infrastructure practices. Users can create scenarios of stormwater control measures including climate and land use projections to assess lifecycle costs, performance, and co-benefits associated with those scenarios.	clasic.erams.com
Sustainable Stormwater Funding Evaluation for the Upper Charles River Communities of Bellingham, Franklin, and Milford, MA	Provides a program cost framework starting point. Costs are dated 2011.	https://www3.epa.gov/region1/npdes/charlesriver/pdfs/20110930-SWUtilityReport.pdf

Tool Name	Information for Use	Link to Access/Download
Stormwater Management Optimization Tool (Opti-Tool)	Includes capital and maintenance costs prepared by CRWA and University of New Hampshire Stormwater Center in 2016.	https://www3.epa.gov/region1/npdes/stormwater/ma/green-infrastructure-stormwater-bmp-cost-estimation.pdf
San Francisco Public Utilities Commission Green Infrastructure Maintenance Cost Model	Overview of San Francisco's maintenance cost model. More detail provided on the City's Public Utilities Commission website.	http://www.12000raingardens.org/wp-content/uploads/2019/05/GI-Maintenance-Model-Webinar-050719.pdf
National Cooperative Highway Research Program (NCHRP) (2014) "Long-Term Performance and Life-Cycle Costs of Stormwater Best Management Practices" Report 792		http://www.trb.org/Publications/Blurbs/171471.aspx
BMP-REALCOST: Best Management Practices - Rational Estimation of Actual Likely Costs of Stormwater Treatment		https://www.horrycounty.org/Portals/0/Docs/stormwater/Documents/Engineers/Cost%20Estimators/BMP-REALCOSTManual_V1.0.pdf
Subwatershed Plans with Phosphorus Reduction Goals		
Subwatershed Restoration Plan for Milford, MA	Includes a list of nearly 70 proposed BMPs to achieve a target phosphorus reduction for the subwatershed study area.	https://www.crwa.org/uploads/1/2/6/7/126781580/crwa_subwatershed_restoration_plan_12-30-20.pdf
Stormwater Management Plan for Spruce Pond Brook Subwatershed	Subwatershed plan (developed prior to the 2016 MS4 permit) with phosphorus reductions targets. Multiple BMPs proposed in this plan have now been implemented. Page 6 describes a method for delineating drainage areas in urban settings.	https://www.crwa.org/uploads/1/2/6/7/126781580/crwa_franklin_plan.pdf