CITY OF SOMERVILLE, MA PHOSPHORUS SOURCE IDENTIFICATION REPORT

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GLOSSARY OF ABBREVIATIONS

BMP	Best Management Practices
City	City of Somerville, Massachusetts
DCIA	Directly Connected Impervious Area
DCR	Massachusetts Department of Conservation and Recreation
GIS	Geographic Information System
GSI	Green Stormwater Infrastructure
HDR	High-Density Residential
HSG	Hydrologic Soil Group
HUC-12	Hydrologic Unit Code 12
IA	Impervious Area
MassDEP	Massachusetts Department of Environmental Protection
MassGIS	Massachusetts Geographic Information System
MDR	Medium-Density Residential
MS4	Municipal Separate Storm Sewer System
NRCS	Natural Resources Conservation Service
OSRP	Open Space & Recreation Plan
PLER	Phosphorus Load Export Rates
PSIR	Phosphorus Source Identification Report
SCM	Stormwater Control Measure
SDE	Stacey DePasquale Engineering
TMLD	Total Maximum Daily Load
TP	Total Phosphorus
USDA	United States Department of Agriculture
USEPA	U.S. Environmental Protection Agency

1. INTRODUCTION

The City of Somerville is subject to the requirements of the United States Environmental Protection Agency (USEPA) 2016 Massachusetts Small Municipal Separate Storm Sewer Systems (MS4) General Permit. The current MS4 General Permit became effective on July 1, 2018, and modifications became effective on January 6, 2021.

The City of Somerville (the City) is required to develop and execute a Phosphorus Source Identification Report (PSIR) for its discharges to the Mystic River and Alewife Brook. Both waterbodies are listed in the Massachusetts Department of Environmental Protection (MassDEP) Final 2018/2020 Integrated List of Waters (303(d) List) for being water quality limited due to phosphorus without a USEPA approved total maximum daily load (TMDL). The goal of this PSIR is to reduce the amount of phosphorus in stormwater discharges from the City's MS4 to the impaired waterbodies or their tributaries.

The PSIR was submitted to USEPA in the Year 4 Annual Report. The PSIR Year 4 was required to include the following elements in accordance with Appendix H, Part II. 1. b.:

- Calculation of total MS4 area draining to the water quality limited receiving water segments or their tributaries, incorporating updated mapping of the MS4 and catchment delineations produced pursuant to part 2.3.4.6.
- All screening and monitoring results pursuant to part 2.3.4.7.b., targeting the receiving water segment(s).
- Impervious area and directly connected impervious area (DCIA) for the target catchment.
- Identification, delineation, and prioritization of potential catchments with high phosphorus loading.
- Identification of potential retrofit opportunities or opportunities for the installation of structural Best Management Practice (BMPs) during redevelopment, including the removal of impervious area.

The Year 4 PSIR was updated to include the following required elements for Year 5 in accordance with Appendix H, Part II. 1. c.:

- Evaluation of all permittee-owned properties located within the water quality limited waterbody's watershed for retrofit opportunities.
- Next planned infrastructure, resurfacing, or redevelopment activity planned for the property or planned retrofit date.
- Estimated cost and engineering and regulatory feasibility of redevelopment or retrofit.
- List of planned structural BMPs and a plan and schedule for implementation. The permittee shall plan and install a minimum of one structural BMP in a prioritized catchment as a demonstration project within six years of the permit effective date.
- Documentation of structural BMPs installed by the permittee in the regulated area with their associated phosphorus removal, BMP type, total area treated, and the design storage volume of the BMP.

In addition to the MS4 General Permit, an Alternative TMDL Development for Phosphorus Management report was developed and published in January 2020 for the Mystic River Watershed by USEPA and MassDEP. The Alternative TMDL estimated a watershed-wide stormwater phosphorus load reduction necessary to abate freshwater quality impairments between 59% and 62%. While the Alternative TMDL does not currently create any specific stormwater control requirements for the City, the next MS4 General Permit draft will likely include Mystic River-specific requirements.

2. WATERSHED CHARACTERISTICS

The City of Somerville is located in Middlesex County, Massachusetts about two miles north of Boston. The City is about 4 square miles with a population of about 81,500 (2019 census). Somerville is the most densely populated community in New England. The City is known for being ethnically diverse; immigrants from all over the world reside here, and more than 50 languages are spoken in City schools.

2.1 Watershed Boundary

The City is within two Hydrologic Unit Code 12 (HUC-12) watersheds: the Mystic River and the Charles River, as shown in Figure 2-1: Hydrology. The Charles River has a MassDEP approved TMDL for total phosphorus. Somerville has requirements for this watershed under Appendix F of the MS4 General Permit but currently does not discharge stormwater into the Charles River from the MS4. The portion of the City within the Mystic River watershed is the priority of this PSIR. The City has requirements for this watershed under Appendix H of the MS4 General Permit.

2.2 Hydrology

The portion of the City within the Mystic River watershed contains multiple receiving waterbodies, some of which are impaired with one or more pollutant. Table 2-1 below outlines the major receiving rivers and brooks in this area and associated impairments as presented in the Massachusetts 2018/2020 303(d) List of Impaired Waters. Figure 2-1 below identifies the major waterbodies and watersheds within Somerville.

Table 2-1: Somerville Impaired Waterbodies 303(d) List 2018/2020

Waterbody Segment	Impairments
Mystic River (MA71-02)	Arsenic, Chlordane in Fish Tissue, Chlorophyll-a, DDT in Fish Tissue, Dissolved Oxygen (DO), DO Supersaturation, E. coli, PCBs in Fish Tissue, high pH, Total Phosphorus, Sediment Bioassay, Transparency/Clarity
Mystic River (MA71-03)	Ammonia, Contaminants in Fish and/or Shellfish, DO, Fecal Coliform, Flocculant Masses, Nutrient/Eutrophication Biological Indicators, Odor, Oil and Grease, PCBs in Fish Tissue, Petroleum Hydrocarbons, Scum/Foam
Alewife Brook (MA71-20)*	Chloride, Copper in Sediment, DO, E. coli, Flocculant Masses, Lead in Sediment, Odor, Oil and Grease, PCBs in Fish Tissue, Total Phosphorus, Scum/Foam, Sediment Bioassay, Transparency/Clarity, Trash

*Previously a portion of Segment MA71-04 in the Massachusetts 2016 303(d) List of Impaired Waters

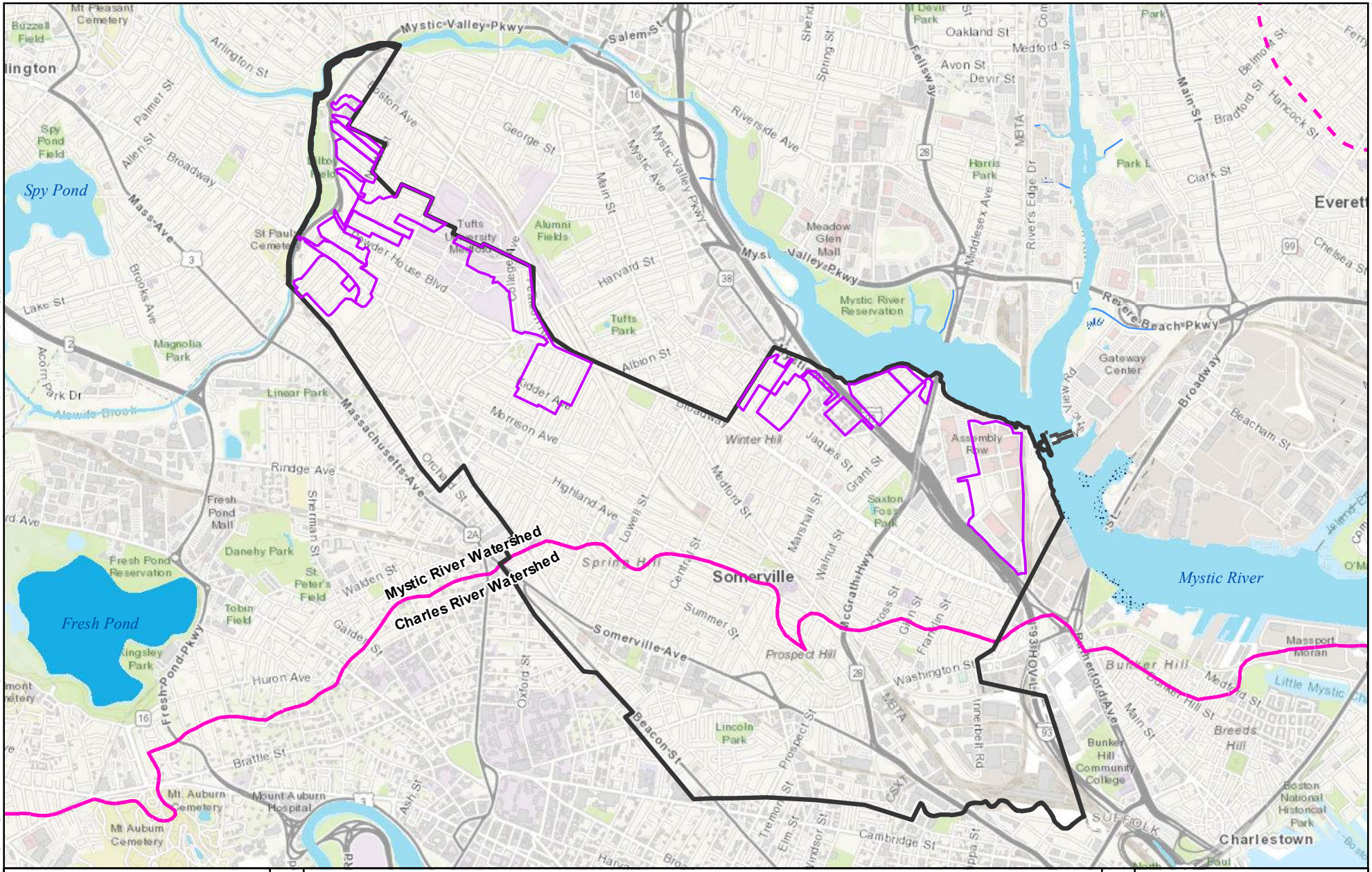


Figure 2-1
Hydrology
Phosphorus Source Identification Report (PSIR)
Somerville, MA

Legend

Woodard & Curran

Project #: 0232622.01
Map Created: June 2022

2.3 Land Cover

Impervious surfaces can contribute to increased stormwater runoff, route surface pollutants quickly to receiving waters, and restrict the recharge of groundwater, while pervious areas allow the infiltration of precipitation to recharge shallow and deep groundwater and preserve the hydrologic integrity of a watershed. Most impervious cover is made up of buildings, parking lots, driveways, and roads. The percentage of impervious cover in a watershed can indicate the probable health of the watershed and associated waterbody. Extensive literature sources indicate that watersheds with greater than 10% of their land area covered by impervious surfaces exhibit various signs of impairment due to untreated stormwater runoff. The City's Mystic River watershed MS4 catchment areas, henceforth referred to as the Study Area, consist of approximately 80% impervious area based on a 2021 impervious surfaces dataset prepared by the City. Detailed land cover information for each outfall per the City's 2021 dataset is provided in Table 2-2.

2.4 Land Use

Land use is also an important factor when evaluating a watershed for sources of stormwater-based pollution. Typically commercial, industrial, medium- and high-density residential (HDR), and highway land uses generate higher concentrations of pollutants in stormwater runoff than undeveloped or rural areas. The Massachusetts Geographic Information System (MassGIS) 2016 land use/cover data set was used to evaluate land use in the Study Area. The City's land use distribution is illustrated in Figure A-2 in Appendix A, and Table 2-2 outlines the land use in the Study Area by MS4 outfall.

2.5 Soils

Based on data from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), the portion of the City in the Mystic River watershed consists primarily of Not Rated/Not Available soil group, which is typically found in developed areas where soil may consist primarily of human transported material (fill). The MS4 General Permit prescribes classifying these soils as hydrologic soil group (HSG) C. HSG A soils generally have the lowest runoff potential and HSG D the greatest. Understanding watershed soils aids stormwater runoff mitigation decision making, since stormwater control measures (SCM) are more effective on HSG A and B soils due to infiltration capacity. Figure A-3 in Appendix A illustrates the locations of each HSG in the City, and Table 2-2 provides the total area of each HSG in the Study Area by MS4 outfall.

Table 2-2: Land Use Distribution in Somerville's Catchment Areas

		Area (ac.)																
	Outfall	4	6	7	8	9	10*	11	12	19	21	25	26	28	29	31	32	Total
	Land Use																	
Impervious	Commercial/ Industrial	0.7	-	1.1	3.1	1.3	0.1	0.2	1.5	0.0	3.5	2.7	0.4	0.0	0.0	8.2	36.5	59.4
	HDR	9.6	-	5.4	7.1	11.6	6.9	3.3	0.2	3.0	5.0	1.8	7.0	1.7	0.3	24.9	5.0	92.8
	MDR	0.8	-	0.1	0.6	0.6	0.3	0.0	0.0	0.9	0.9	-	0.8	0.3	0.0	0.5	-	5.6
	Highway	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
	Forest	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
	Open Land	0.0	-	0.2	0.0	0.0	0.0	-	-	0.0	0.1	-	0.3	0.0	0.4	0.0	9.3	10.3
	Agriculture	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
	Right-of-Way	4.8	0.1	4.6	2.9	7.0	3.3	1.3	0.0	2.6	4.0	2.2	5.2	2.0	0.2	17.2	7.8	65.3
Pervious	Forest	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
	Agriculture	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
	Developed HSG A	4.7	-	0.0	1.2	2.7	1.5	0.6	0.1	-	-	-	-	-	-	2.3	-	13.1
	Developed HSG B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.3	-	3.3
	Developed HSG C	0.2	-	2.1	2.4	0.2	0.2	0.1	0.7	0.0	1.6	1.3	1.7	0.4	0.7	4.4	8.3	24.5
	Developed HSG D	-	-	-	-	3.4	0.2	0.1	-	2.3	2.0	-	2.8	0.5	0.1	5.0	-	16.4
	Total Impervious	15.8	0.1	11.4	13.7	20.5	10.5	4.8	1.8	6.5	13.5	6.8	13.8	3.9	0.9	50.8	58.6	**233.4**
	Total Pervious	5.0	0.0	2.1	3.5	6.2	2.0	0.8	0.8	2.4	3.6	1.3	4.5	1.0	0.8	15.0	8.3	**57.3**
	Total	20.8	0.1	13.5	17.2	26.7	12.5	5.6	2.6	8.9	17.1	8.1	18.3	4.9	1.7	65.8	66.9	**290.7**

* Catchment 10 and 10A are combined as contributing area to Outfall 10. This may change pending further investigations and coordination with DCR.

2.6 Zoning and Public/Private Property

Zoning can be a tool for communities to encourage or limit development in certain areas and protect land conservation areas. The City currently has five zoning categories: Residential, Mixed Use, High Rise, Commercial, and Special Districts. The Special Districts category includes the Civic District. Public property presents opportunities for stormwater management in the Study Area, as discussed further in Section 4. The City's zoning map is presented as Figure A-4 in Appendix A.

The Somerville Open Space & Recreation Plan (OSRP) for 2016-2023 estimates approximately 160 acres, or 6%, of the City meets the OSRP definition of open space. Historically, the City has utilized these spaces for stormwater management and green infrastructure, such as at Chuckie Harris Park. An open space inventory map prepared by the City and presented in the OSRP is included as Figure A-5 in Appendix A.

2.7 Utility Infrastructure

Considering the urban nature of the City, the City has extensive utility infrastructure systems including sewer, water, stormwater, electric, telecom, etc. The majority of stormwater runoff within the City is captured and conveyed via an existing closed conduit system. The City's infrastructure is aged, and significant portions of the City have combined sewer and stormwater systems, as discussed in further detail in Section 3.

3. PHOSPHORUS SOURCE IDENTIFICATION

Per Appendix A of the MS4 General Permit, an outfall catchment is defined as, "The land area draining to a single outfall or interconnection. The extent of an outfall's catchment is determined not only by localized topography and impervious cover but also by the location of drainage structures and the connectivity of MS4 pipes". Appendix H of the MS4 General Permit requires identification, delineation, and prioritization of potential catchments with high phosphorus loading. This section of the PSIR describes the calculation of total MS4 area discharging to the receiving waterbody through separate stormwater catchment delineation confirmation, outlines screening and monitoring results for outfalls to the receiving waterbody, and characterizes the MS4 catchments through impervious area, directly connected impervious area, and total phosphorus load estimates.

3.1 Separate Stormwater Catchment Delineations

The MS4 separate stormwater catchment delineations were refined to estimate the City's total MS4 area discharging to the Mystic River and Alewife Brook. These catchments are delineated to include area within the City that drains either via a closed conduit drainage system or overland flow to the City's MS4 inlets; areas from other municipalities draining to the City's MS4 and areas draining to state-owned infrastructure have been excluded.

Figure 3-1 below identifies the 16 current separate stormwater catchment areas based on their outfall to the Mystic River or Alewife Brook. These catchment delineations are still being refined as additional field investigations are performed. The City owns 13 of these 16 outfalls; outfalls 9, 10, and 12 are understood to be owned by the Massachusetts Department of Conservation and Recreation (DCR). DCR has a separate MS4 permit than the City; however, the City's catchments 9, 10, and potentially 10A interconnect with DCR drainage infrastructure upstream of these outfalls. Investigations to confirm catchment 10A connectivity and catchment 12 ownership are ongoing; currently, the drainage infrastructure contributing to catchment 12 is understood to be privately-owned. Revisions to catchments 9, 10, 10A, and 12 will be made as needed once connectivity and ownership investigations are completed. Finally, future storm/sewer separation within the City is planned and will be reflected as needed in subsequent annual reports. The 16 current catchments are identified by their outfall number and receiving waterbody, as shown in Figure 3-1: Catchment Areas; their drainage areas are listed in Table 2-2.

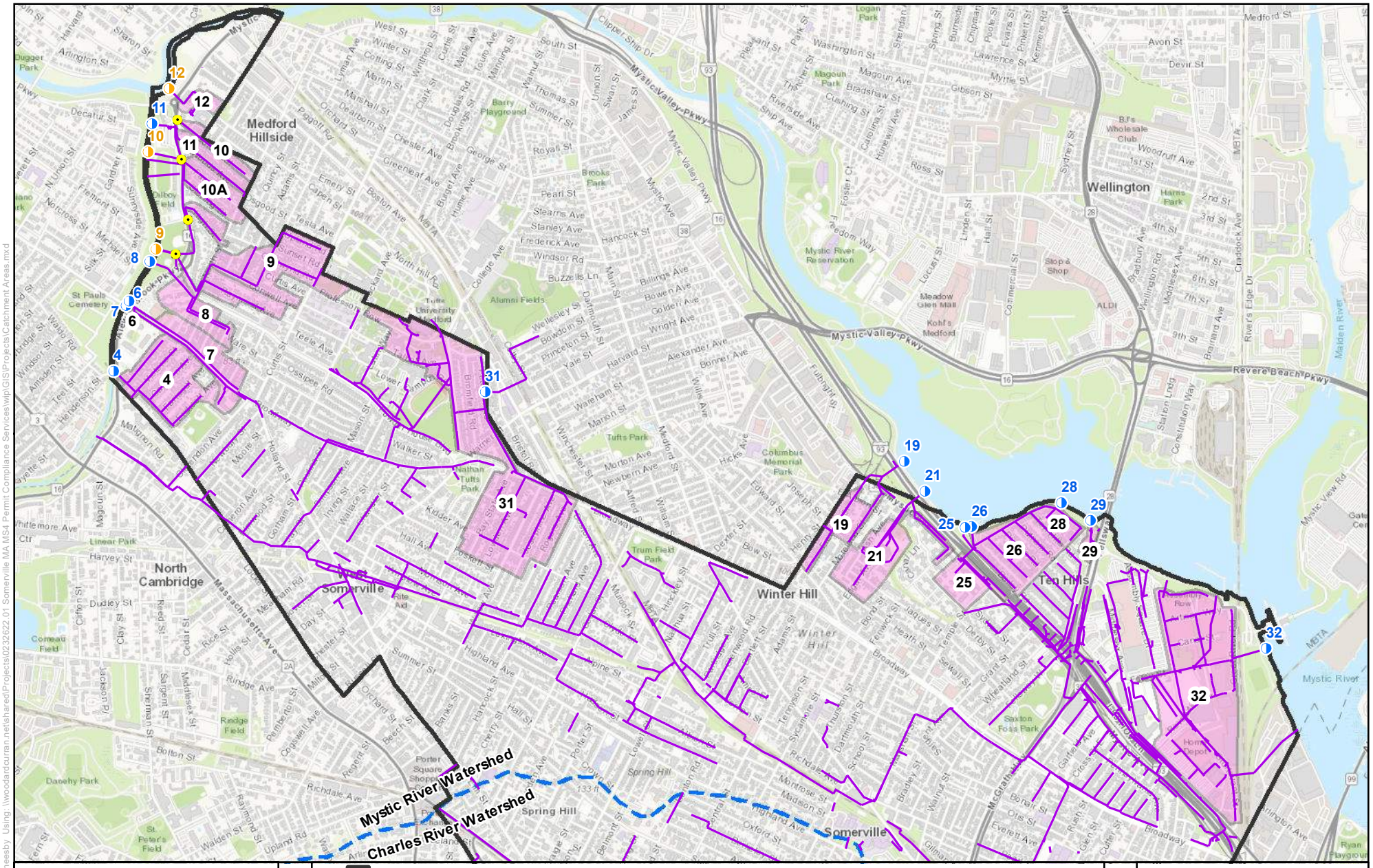


Figure 3-1
Catchment Areas

Phosphorus Source Identification Report (PSIR)

Somerville, MA

Legend

Woodard & Curran

Project #: 0232622.01

Map Created: June 2022

3.2 Outfall Screening and Monitoring

Stacey DePasquale Engineering (SDE) and Hazen and Sawyer performed dry and wet weather outfall screening and sampling in October 2020 and July 2021. The results are included in Appendix B and summarized in Table 3-1 below.

Table 3-1: Catchment Drainage Area and Outfall Screening Results

Outfall	Receiving Waterbody	Waterbody Segment	Total Phosphorus (mg/L)	
			Dry Weather	Wet Weather
4	Alewife Brook	MA71-20	-	0.09
6	Alewife Brook	MA71-20	-	-
7	Alewife Brook	MA71-20	0.08	0.07
8	Alewife Brook	MA71-20	0.05	0.10
9	Alewife Brook	MA71-20	-	0.15
10	Alewife Brook	MA71-20	0.11	0.07
11	Alewife Brook	MA71-20	0.09	0.09
12	Mystic River	MA71-02	-	-
19	Mystic River	MA71-02	0.11	0.10
21	Mystic River	MA71-02	<0.02	0.08
25	Mystic River	MA71-02	0.03	0.06
26	Mystic River	MA71-02	-	0.08
28	Mystic River	MA71-02	0.12	0.10
29	Mystic River	MA71-02	0.10	0.06
31*	Mystic River	MA71-02	0.10	0.11
32	Mystic River	MA71-03	0.23	-

Note
* Interconnection with City of Medford

3.3 Data Sources and Limitations

Several datasets were used for this PSIR. Table 3-2 below outlines the datasets, the sources of the data, and the dates that they were either published or updated. The shapefiles and maps produced in this PSIR were created and calculated using ESRI's ArcMap v.10.8 GIS software.

It should be noted that the phosphorus loads calculated using these data sources are estimates and are not necessarily reflective of actual loads discharging to the Mystic River and Alewife Brook. These datasets were built for various reasons, but they were not prepared specifically for phosphorus load calculations. The MassGIS 2016 land use/land cover dataset was developed using 2016 aerial imagery, and the land use data was derived from standardized parcel information for Massachusetts. The City's impervious surfaces dataset was used for land cover rather than the MassGIS 2016 dataset, which is a 1-meter raster. The phosphorus load estimates developed using these data sources should be used for planning purposes only and should be updated if higher-resolution or newer data becomes available.

Table 3-2: Data Sources

Dataset	Source	Date
MassDEP 2010 Integrated List of Waters (Watershed)	MassGIS	2010
Separate Stormwater Catchments	Somerville/Woodard & Curran	2022
Sewer and Storm Infrastructure	Somerville	Received 11/18/21
Impervious Surfaces	Somerville	2021
Land Use/Land Cover 2016	MassGIS	2019
Hydrologic Soils	USDA/NRCS	Tabular Data: 2021 Spatial Data: 2019
Municipal Parcels	Somerville	2021
City Limits	Somerville	2014
Contours 1 Foot	Somerville	2016

3.4 Phosphorus Source Identification Methodology

Phosphorus loads for each catchment were quantified using the methodology presented in Attachment 1 to Appendix F of the MS4 General Permit. This methodology estimates the baseline phosphorus load using phosphorus load export rates (PLERs) for different land uses and land cover types found in Table 1-2 in Attachment 1 to Appendix F. The ArcGIS "Intersect" geoprocessing tool was used to intersect land use, impervious area, hydrologic soils, and catchment boundaries, and these subareas were then multiplied by their respective PLER to estimate total phosphorus load. Table 3-3 below presents the total catchment drainage areas by land use, as presented in Table 2-2, with their associated PLER and resulting total phosphorus load.

Table 3-3: Area, PLER, and Total Phosphorus Load by Land Use Type

	Land Use	Total Area (acre)	PLER (lb/ac/ year)	TP Load (lb/year)
Impervious	Commercial/ Industrial	59.4	1.78	105.8
	HDR	92.8	2.32	215.4
	MDR	5.6	1.96	11.0
	Highway	0.0	-	-
	Forest	0.0	-	-
	Open Land	10.3	1.52	15.7
	Agriculture	0.0	-	-
	Right-of-Way	65.3	1.95	127.3
Pervious	Forest	0.0	-	-
	Agriculture	0.0	-	-
	Developed HSG A	13.1	0.03	0.4
	Developed HSG B	3.3	0.12	0.4
	Developed HSG C	24.5	0.21	5.1
	Developed HSG D	16.4	0.37	6.1
	Total	290.7	-	487.0

3.5 Impervious Area and DCIA

The impervious area (IA) and directly connected impervious area (DCIA) within the catchments was estimated using the Sutherland Equation per *EPA's Methodology to Calculate Baseline Estimates of Impervious Area (IA) and Directly Connected Impervious Area (DCIA) for Massachusetts Communities*, dated March 9, 2010. DCIA is the portion of any developed parcel or catchment that would route stormwater runoff directly into drainage systems and ultimately to receiving waters. It is estimated based on impervious area and land use. The Sutherland Equation is an empirical equation, and therefore, DCIA estimates should be considered representative values for planning rather than actual values for each catchment. Table 3-4 below shows the total impervious areas and DCIA for each catchment using the City's 2021 impervious surface dataset.

Table 3-4: Catchment Characteristics

Outfall	Receiving Waterbody	Waterbody Segment	Drainage Area (acres)	Impervious Area (acres)	DCIA (acres)	TP Load (lbs/year)	Normalized TP Load (lbs/acre/ year)
4	Alewife Brook	MA71-20	20.8	15.8	10.8	34.6	1.7
6	Alewife Brook	MA71-20	0.1	0.1	0.1	0.1	1.8
7	Alewife Brook	MA71-20	13.5	11.3	7.5	24.3	1.8
8	Alewife Brook	MA71-20	17.2	13.7	8.6	29.4	1.7
9	Alewife Brook	MA71-20	26.7	20.5	13.8	45.3	1.7
10	Alewife Brook	MA71-20	12.5	10.5	7.9	23.3	1.9
11	Alewife Brook	MA71-20	5.6	4.8	3.6	10.6	1.3
12	Mystic River	MA71-02	2.6	1.8	1.3	3.5	1.7
19	Mystic River	MA71-02	8.9	6.6	4.1	14.8	1.7
21	Mystic River	MA71-02	17.1	13.5	7.6	28.6	1.7
25	Mystic River	MA71-02	8.1	6.8	4.1	13.7	1.7
26	Mystic River	MA71-02	18.3	13.8	8.9	30.7	1.8
28	Mystic River	MA71-02	4.9	3.9	2.7	8.6	1.1
29	Mystic River	MA71-02	1.7	0.9	0.5	2.0	1.7
31*	Mystic River	MA71-02	65.8	50.8	32.2	110.1	1.7
32	Mystic River	MA71-03	66.9	58.6	36.1	107.6	1.9
Total/Average			290.7	233.4	150.0	487.0	1.7

Note:

* Interconnection with City of Medford

3.6 High Load Potential

Table 3-4 summarizes the catchment characteristics as required by the MS4 General Permit. The normalized total phosphorus load is the total phosphorus load per catchment drainage area (lbs/acre/year). This load has been included to provide a comparable average unit load for each catchment. Figure 3-2: Phosphorus Load by Land Use and Land Cover, below illustrates areas of high, moderate, and low phosphorus load export rates in the catchments.

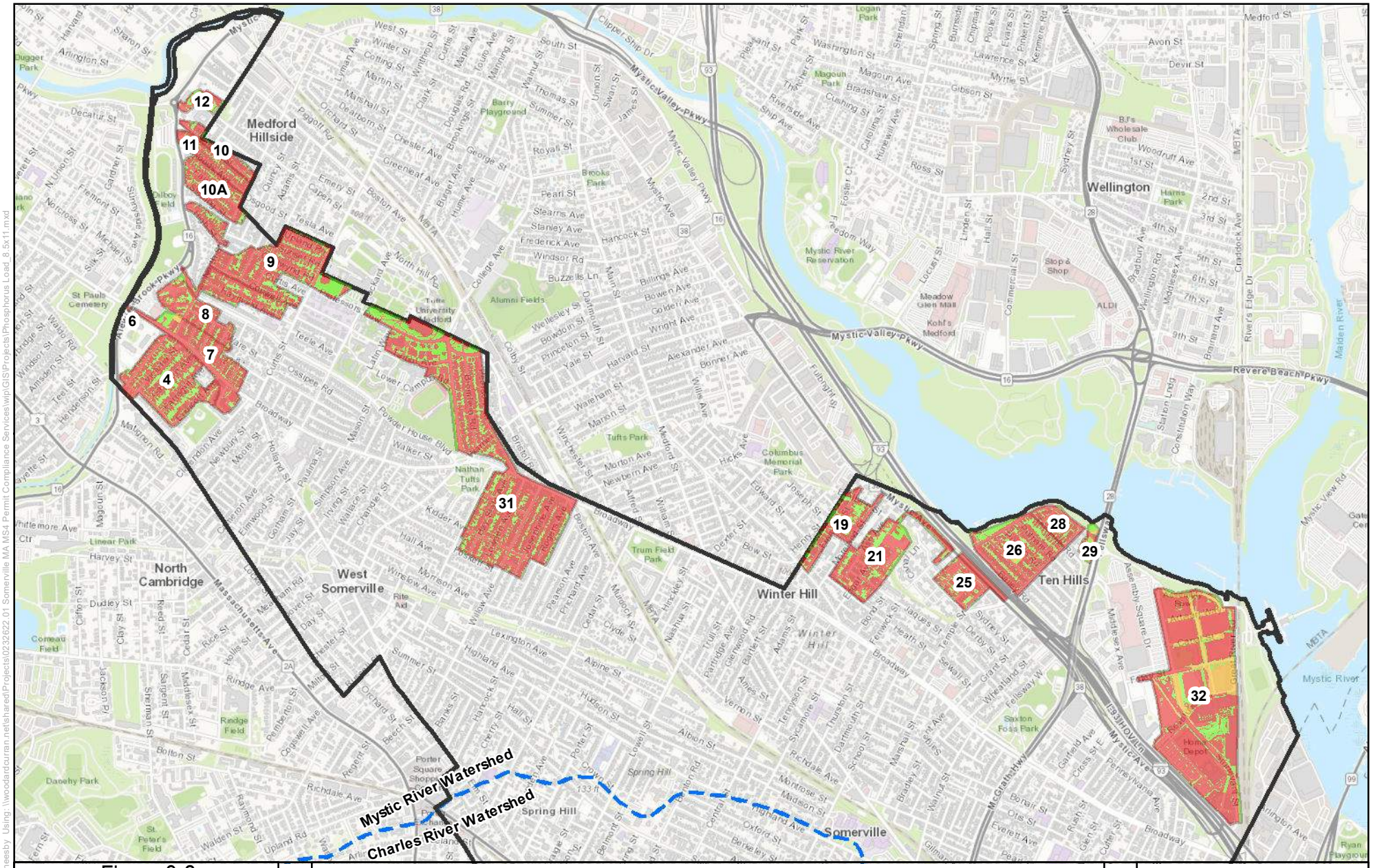


Figure 3-2
Phosphorus Load by Land Use and Land Cover

Phosphorus Source Identification Report (PSIR)

Somerville, MA

Woodard & Curran

Project #: 0232622.01

Map Created: June 2022

Figure Exported: 6/29/2022 By: esneesby Using: \\woodardcurran.net\shared\Projects\0232622.01 Somerville MA MS4 Permit Compliance Services\wip\GIS\Projects\Phosphorus Load_8.5x11.mxd

3.7 Catchment Prioritization

Typically, structural stormwater management strategies are prioritized at a watershed-scale based on location of concentrated flows (drainage infrastructure), catchment area, development (impervious area and land use), and ownership. Stormwater retrofits tend to be either not feasible or difficult to design and construct if the contributing stormwater flow is diffused rather than concentrated in pipes or ditches. However, the Study Area is uniformly densely developed with an extensive drainage network. Runoff from most of the Study Area is concentrated and discharges directly to the receiving waterbodies through piped infrastructure, so this is not a consideration that narrows the priority catchments. The location of municipally-owned properties that can be retrofitted with a structural SCM is a larger factor in prioritization than catchment area. Therefore, the catchment prioritization for this PSIR is based on:

- Estimated normalized total phosphorus load per acre (25% weight);
- Number of City-owned parcels within or immediately adjacent to the catchment (25% weight; and
- Area of City-owned parcels within or immediately adjacent to the catchment (50% weight).

Table 3-5 below presents the catchment prioritization data for all the catchments in the Mystic River watershed by outfall in order of highest normalized total phosphorus load to lowest. Only the MS4 catchments were ranked for this PSIR, as shown in Table 3-6. Further details and scoring results can be found in Appendix C.

Table 3-5: Mystic River Watershed Catchment Prioritization Data

Outfall	Receiving Waterbody	Waterbody Segment	Normalized TP Load (lbs/acre/year)	Municipal Land	
				Number of Parcels	Parcel Area (acres)
11	Alewife Brook	MA71-04	1.9	0	0
10	Alewife Brook	MA71-04	1.9	0	0
7	Alewife Brook	MA71-04	1.8	3	1
6	Alewife Brook	MA71-04	1.8	0	0
28	Mystic River	MA71-02	1.8	0	0
8	Alewife Brook	MA71-04	1.7	3	2.2
9	Alewife Brook	MA71-04	1.7	0	0
21	Mystic River	MA71-02	1.7	1	3.3
25	Mystic River	MA71-02	1.7	0	0
26	Mystic River	MA71-02	1.7	1	0.4
31	Mystic River	MA71-02	1.7	2	5.2
4	Alewife Brook	MA71-04	1.7	1	0.1
19	Mystic River	MA71-02	1.7	0	0
12	Mystic River	MA71-02	1.3	0	0
29	Mystic River	MA71-02	1.1	0	0
11	Alewife Brook	MA71-04	1.9	0	0

Note:

* Interconnection with City of Medford

Table 3-6: Somerville MS4 Catchment Prioritization Ranking

Outfall	Receiving Waterbody	Waterbody Segment	Rank
31*	Mystic River	MA71-03	1
8	Alewife Brook	MA71-04	2
21	Mystic River	MA71-02	3
7	Alewife Brook	MA71-04	4
26	Mystic River	MA71-02	5
4	Alewife Brook	MA71-04	6
11	Alewife Brook	MA71-04	7
10	Alewife Brook	MA71-04	8
28	Mystic River	MA71-02	9
9	Alewife Brook	MA71-04	10
25	Mystic River	MA71-02	11
19	Mystic River	MA71-02	12
29	Mystic River	MA71-02	13
6**	Alewife Brook	MA71-04	14
12***	Mystic River	MA71-02	15

Notes:

* Interconnection with City of Medford

** Moved to bottom of ranking – very small catchment area

*** Moved to bottom of ranking – DCR/private catchment area

The catchment area for Outfall 32 drains into the Mystic River below the Amelia Earhart Dam, which spans the Mystic River between Somerville and Everett. This waterbody segment, MA71-03, does not have a listed phosphorus impairment (see Table 2-1), and as a result this catchment area is excluded from prioritization. For reference, this catchment has a normalized total phosphorus load of 1.6 pounds per acre per year and contains five municipal parcels for a total of 6.2 acres.

4. STORMWATER MANAGEMENT OPPORTUNITIES

4.1 Non-Structural Control Measures

Non-structural pollution prevention practices prevent or reduce stormwater related runoff pollution by reducing the exposure and generation of pollutants that can be washed off during precipitation events. Non-structural management approaches can also include public education and outreach, or new or refined regulatory policies that minimizes creation or impact of land development or other sources of stormwater and groundwater pollution. Non-structural management practices typically refer to stormwater runoff management that does not require extensive engineering design and construction efforts, hence the term non-structural. Non-structural controls can be the most cost-effective stormwater attenuation strategies for any given watershed but require careful planning and organization of labor resources, enforcement or incentives, education, and outreach, and may require specialized equipment.

The MS4 General Permit currently allows credit for three non-structural control measures: enhanced sweeping, catch basin cleaning, and organic waste and leaf litter collection. The total phosphorus reduction credit percentage ranges for these non-structural control measures are provided in Table 4-1. Table 4-2 compares the City's current non-structural operational standards and associated phosphorus reduction credit percentage to enhanced standards and credit potential. Current non-structural operational standards are based on the City's Year 3 Annual Report.

Table 4-1: EPA Region 1 Non-Structural Control Nutrient Reduction Credits

Practice/Technology		Frequency	Total Phosphorus Reduction Credit (%)
Enhanced Sweeping	Mechanical Broom	Semi-Annually	1
	Vacuum Assisted		2
	High-Efficiency Regenerative Air		2
	Mechanical Broom	Monthly	3
	Vacuum Assisted		4
	High-Efficiency Regenerative Air		8
	Mechanical Broom	Weekly	5
	Vacuum Assisted		8
	High-Efficiency Regenerative Air		10
Catch Basin Cleaning		Semi-Annually	2
Organic Waste and Leaf Litter Collection		Weekly (Sept. – Dec.)	5

Table 4-2: Somerville's Non-Structural Control Standards

Control Measure	Current Operational Standard	Reduction Factor	Enhanced Operational Standard	Enhanced Reduction Factor
Sweeping	**Weekly** sweeping of municipally owned roadways, parking lots or other municipally-operated impervious surfaces using a **mechanical broom** sweeper from **April 1st – December 31st**	5% annual reduction, prorated by 0.75 for period between April and December	Weekly sweeping using a high-efficiency regenerative air-vacuum sweeper from April 1st – December 31st	10% annual reduction, prorated by 0.75
Catch Basin Cleaning	**Annual** cleaning of municipally-owned catch basins within MS4 area, ensuring a minimum **sump storage of 50%** is maintained	Not creditable	Semi-annual cleaning of municipally-owned catch basins within MS4 area, ensuring a minimum sump storage of 50% is maintained	2% annual reduction
Organic Waste and Leaf Litter Collection	**Weekly** sweeping of municipally owned roadways, parking lots or other municipally-operated impervious surfaces using a **mechanical broom** sweeper from **September 1 to December 1.** Yard waste program for curbside collection of organic debris.	5% annual reduction	Current operations maximize current permit credit	

4.2 Semi-Structural Control Measures

The MS4 General Permit provides nutrient load reduction credits for four semi-structural control measures: impervious area disconnection through storage (e.g., rain barrels, cisterns, etc.), impervious area disconnection, conversions of impervious area to permeable pervious area, and soil amendments to enhance permeability of pervious areas. Phosphorus load reduction credit ranges for these measures are provided in Table 4-3 below. Implementation of a rain barrel program or impervious area reduction in prioritized catchment areas are viable options for additional phosphorus reduction in the Study Area.

Table 4-3: EPA Region 1 Semi-Structural Control Standards

Control Measure	Description	Example	Phosphorus Reduction Credit Range
Impervious Area Disconnection Through Storage	Temporary storage of runoff from impervious areas and discharge to adjacent vegetated, permeable surfaces	Rain barrel/cistern	21%-92%
Impervious Area Disconnection	Diversion of runoff from impervious areas and discharge to adjacent vegetated permeable surfaces	Remove curb/gutter and allow sheet flow through adjacent buffer	3%-85%
Conversion of Impervious to Pervious Area	Replacing existing impervious surfaces with permeable surfaces	Reduce impervious by removing parking spaces or narrowing roadway. Replace with vegetation or permeable pavement	70%-99%
Soil Amendments	Improving the permeability of pervious areas through incorporation of soil amendments, tilling, and establishing dense vegetation	Restore infiltration capacity of compacted pervious areas through tilling	41%-93%

4.3 Structural Control Measures

Pollution prevention, outreach, and planning actions may be the most cost-effective, long-term stormwater pollution mitigation strategies, but structural stormwater management actions could be necessary for an overall watershed management strategy. Structural retrofitting of existing developed areas can be expensive and challenging but successful with the right approach. Private property, below ground utilities and existing infrastructure connections constrain opportunities. For this report and future MS4 Appendix H required planning efforts, structural retrofit opportunities will be focused on public land, as facilitation of private retrofits can be administratively challenging. It is anticipated that private property retrofitting will be accomplished over time and through Somerville land development and redevelopment policies. This section discusses the City's municipally-owned opportunity areas and mechanisms for private retrofitting through redevelopment requirements.

4.3.1 Existing Measures

As required by the MS4 General Permit, any structural SCMs installed in the regulated area by the City are tracked, and the phosphorus reduction from these SCMs has been estimated. Of the thirteen (13) municipal

parcels within the MS4 catchment areas, one parcel has existing SCMs creditable based on MS4 General Permit Appendix F guidelines. The North Street Veterans Park was redeveloped in 2014, and subsurface infiltration chambers were installed. The annual phosphorus reduction from these measures is estimated to be 0.1 lbs/year. Calculations were performed using EPA Region 1's Best Management Practice Accounting and Tracking Tool (BMP-BATT). Calculations, including the total area treated by the SCMs and their design storage volumes, are included in Appendix D.

4.3.2 Planned Measures on Municipal Parcels

Planned structural control measures will be prioritized on municipal property within the Study Area. A list of all City-owned parcels in the Mystic River watershed is included in Appendix E. City-owned parcels within MS4 catchment areas were assessed for stormwater retrofit opportunities, as required by the MS4 General Permit for Permit Year 5. A high-level planning assessment was performed using the available GIS data listed in Table 3-2. Of the thirteen (13) municipal parcels within MS4 catchment areas, five (5) were identified as having a potential retrofit opportunity. Additional data collection and site investigations, such as test pits and survey, would be necessary to fully evaluate cost, engineering, and regulatory feasibility of redevelopment or retrofit potential on these parcels. No planned infrastructure, resurfacing, or redevelopment activity is planned for these properties. Stormwater retrofits on these properties will be assessed as redevelopment is planned. The retrofit assessment is included in Table 4-4 below. Parcels within catchment 32 are excluded from Table 4-4, as this catchment drains into waterbody segment MA71-03 which is not impaired for Phosphorus.

Table 4-4: Municipal Parcel Retrofit Assessment

Parcel ID	Address Number	Street	Current Use	Catchment	Retrofit Potential (Yes/No)	Potential Stormwater Control Measure	Evaluation Notes
4-A-1	-	ALEWIFE BROOK PKWY	Courts/Recreational Fields*	9	Yes	Subsuface Sand Filter or Proprietary System	Potential to divert and treat prior to outfalls 8 and 9. Likely high groundwater given proximity to Alewife Brook.
5-B-2	-	NORTH ST	North Street Playground	7 & 8	No	-	Playground recently redeveloped in 2014. Currently treats on-site area.
28-A-1	201	WILLOW AVE	Brown School	31	Yes	Impervious Area Reduction	Redevelopment planned Summer 2023.
56-C-1	0	GOVERNOR WINTHROP RD	Ten Hills Park Playground	26	Yes	Leaching Catch Basin or Subsurface Infiltration Trench	Limited potential to treat on-site impervious area given park size (0.44 ac.) and development.
5-B-4	-	BROADWAY	Veteran's Cemetery	7 & 8	No	-	Veteran's cemetery.
8-C-35	-	RUSSELL RD	Vacant (Sliver Parcel)	7	No	-	Very small parcel (<0.01 ac.) between residential buildings.
6-A-20	-	ALEWIFE BROOK PKWY	Woodstock Street Playground	4	No	-	Very limited potential to treat on-site impervious area given park size (0.08 ac.) and development.
55-B-9	-	TEN HILLS RD	Pedestrian Stairs	29	No	-	Very small parcel (0.01 ac.) with unsuitable topography.
46-D-27	5	MEACHAM ST	Healey School	21	Yes	Biofiltration Tree Box Filters	Schoolyard renovation and soccer field construction recently completed. Very limited additional potential along Meacham Street.
46-D-8	-	MT VERNON AVE	Vacant (Healey School Rear Parcel)	21	No	-	Included in Healey School redevelopment.
67-A-5	0	FELLSWAY	Sylvester Baxter Riverfront Park	29	No	-	Included in StreamStats delineation but (depending on catch basin connectivity) does not appear to be within Catchment 29.
8-A-21	177-179	POWDER HOUSE BLVD	West Somerville School	8	Yes	Subsurface Infiltration Trench/Chamber	Some potential for subsurface infiltration to treat schoolyard or parking lot.
19-F-1	838	BROADWAY	Nathan Tufts Park	31	No	-	Included in StreamStats delineation but does not appear to be within Catchment 31.

Note:
*Assessor's database includes pool building on this parcel, but map excludes building and only includes courts/fields and playground to the south.
Additional site investigations, including test pits and survey, would be needed to confirm retrofit potential on municipal parcels.

4.3.3 Planned Measures on Municipal Rights-of-Way

Municipal rights-of-way present additional opportunity areas. A Green Stormwater Infrastructure Feasibility Report was prepared for the City in June 2019 by Stantec under a Municipal Vulnerability Preparedness Grant. The report discusses the feasibility of constructing green stormwater infrastructure (GSI) within the public right-of-way for six City neighborhoods. The study concludes that there are limited opportunities to implement GSI in the City rights-of-way due to soil characteristics, limited available space, and utility conflicts. Priority areas should be those that capture large drainage areas and have adequate space for surface practices, such as bump outs and raingardens. Of the six studied neighborhoods, 4.5 neighborhoods are within the Mystic River watershed. The remaining 1.5 neighborhoods are within the Charles River watershed. The report can be found on the City's website at the following link: FINAL GSI Feasibility Deliverable 2019-06-28 - OneDrive (sharepoint.com). Additionally, a Green Stormwater Infrastructure Planning & Guidance Document was prepared by Stantec for the City. This document is intended to be a guideline for retrofitting sidewalks, streets, and public properties to provide GSI. The document can be found at the following link: https://www.somervillema.gov/sites/default/files/gsi-planning-guidance.pdf.

The City completed a Citywide Flood Mitigation and Water Quality Improvements Plan, which consists of a collection of infrastructure projects that will reduce flooding, improve water quality, and mitigate combined sewer overflows. The identified projects consist mostly of gray infrastructure, which are usually constructed below grade and are designed to manage water quality by providing treatment through mechanical, hydraulic, or chemical means. Dewberry identified gray BMPs that could potentially be implemented, including proprietary filter or media systems such as the Jellyfish Filter. Additionally, a Geographic Information System (GIS)-based desktop analysis was completed to identify potential candidate sites for GSI BMPs and estimate the potential phosphorus load reduction per BMP. The City identified 25 potential infrastructure projects and requested feedback from the community to prioritize preferred alternatives and projects. The master plan can be found at the following link: Citywide Drainage and Water Quality Master Plan | SomerVoice (somervillema.gov). The City recently procured design services for the first two projects recommended by this plan, The Morrison Avenue Linear Storage project and the New Mystic River Outfall project.

Finally, in PY5 the City evaluated opportunities for stormwater retrofits within municipal rights-of-ways. Planned structural control measures will be prioritized in CCTV inspection and sewer rehabilitation areas within the MS4 catchments, as this presents an additional benefit of phosphorus load reduction on rights-of-way that are scheduled for construction. The areas assessed for stormwater retrofit opportunities are identified in Figure A-8 under Appendix A. Of these opportunity areas, the roadways within the West Somerville and Ten Hill neighborhoods will be prioritized based on their anticipated construction schedule for sewer rehabilitation. Additional data collection and site investigations would be necessary to evaluate cost, engineering, and regulatory feasibility of retrofit potential of the identified rights-of-way. Specific rights-of-way for retrofits will be identified and evaluated in the coming permit year.

The City has identified two preferred types of stormwater control measures for rights-of-way retrofits: infiltration trenches and biofiltration systems. Infiltration trenches, typically retrofitted with existing catch basins, provide high phosphorus load reduction and are one of the most cost-effective measures of the creditable SCMs listed in the MS4 General Permit. Their small footprint allow for an accelerated construction schedule and minimizes the potential of traffic disruption. Proprietary biofiltration systems, or tree box filters, retain the performance and aesthetic benefits of rain gardens through their vegetation and filtration media, while maintaining a compact footprint comparable with infiltration trenches. Further

details including typical design and operation and maintenance considerations for both SCMs are provided in Appendix F.

4.3.4 Private Redevelopment

Strict redevelopment standards are a tool for the City to reduce phosphorus loads from private properties. The City's Engineering Site Permit Rules and Regulations require a Site Construction Permit prior to the start of construction for projects, including but not limited to, constructing more than 30 square feet or repairing more than 100 square feet of pavement, increasing building roof area by more than 30 square feet, altering or constructing a stormwater management system, or altering the flow of stormwater across property lines. These regulations apply to redevelopment projects and therefore apply to all construction projects in the City. Requirements vary depending on the project size, but example requirements include infiltration of all on-site runoff from impervious areas during a ¾-inch storm for Medium Projects, reduction of stormwater runoff to the public right-of-way such that the 10-year proposed peak flow is less than the 2-year existing peak flow for Large Projects, and reduction of total phosphorus loads by at least 62% for Large Projects. The regulations can be found on the City's website at the following link: https://www.somervillema.gov/departments/department-infrastructure-and-asset-management-iam/engineering.

5. NEXT STEPS

As required by the MS4 General Permit, the City has evaluated all municipal properties located within the MS4 separate stormwater catchments discharging to the Mystic River and Alewife Brook. The City has also evaluated municipal rights-of-way for retrofit opportunities. The City plans to further evaluate, design, and install retrofits in conjunction with sewer rehabilitation projects in the next permit year. The estimated cost and engineering and regulatory feasibility of these retrofits will be further evaluated as CCTV inspections are completed and project areas are finalized.

Additionally, the City has tracked municipal, structural SCMs installed in the MS4 area and estimated their phosphorus removal. These calculations are documented in this report.

In addition to these required activities, continued refinement of the separate stormwater catchment boundaries is recommended. This report was developed prior to completion of catch basin investigations by SDE, and the catchments are recommended to be updated based on the results from these investigations and future separation activities.

APPENDIX A: FIGURES

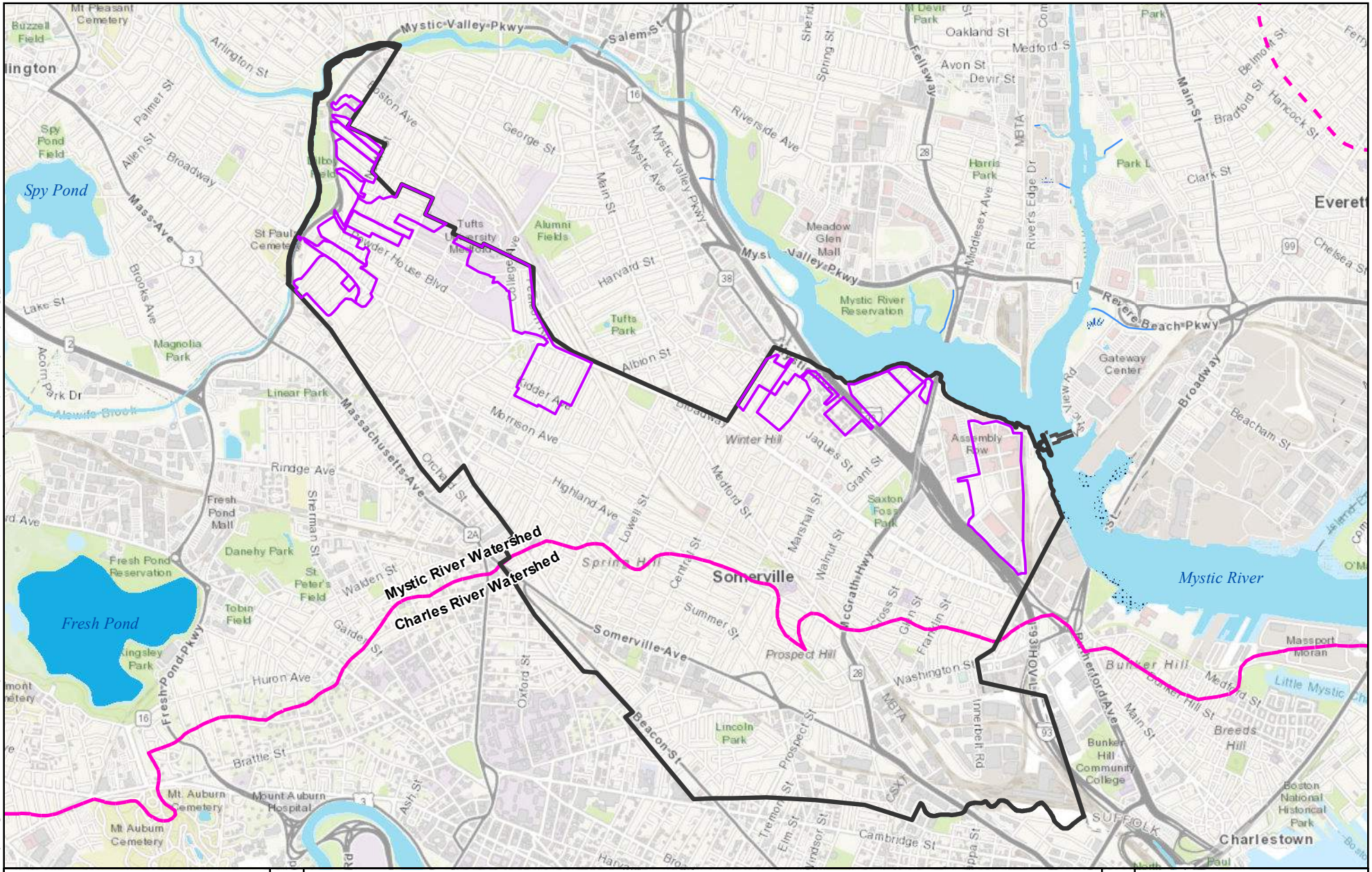


Figure A-1
Hydrology
Phosphorus Source Identification Report (PSIR)
Somerville, MA

Legend

- Somerville Boundary
- Watershed Boundary (HUC 12)
- Mystic River Watershed Catchments
- Perennial Stream
- Dam
- Pond, Lake, Ocean
- Reservoir
- Wetland
- Tidal Flat

N

0 0.125 0.25 0.5 Miles

Woodard & Curran

Project #: 0232622.01
Map Created: June 2022

Figure Exported: 6/29/2022 By: esneesby Using: \\woodardcurran.net\shared\Projects\0232622.01 Somerville MA MS4 Permit Compliance Services\wip\GIS\Projects\Hydrology_8.5x11.mxd

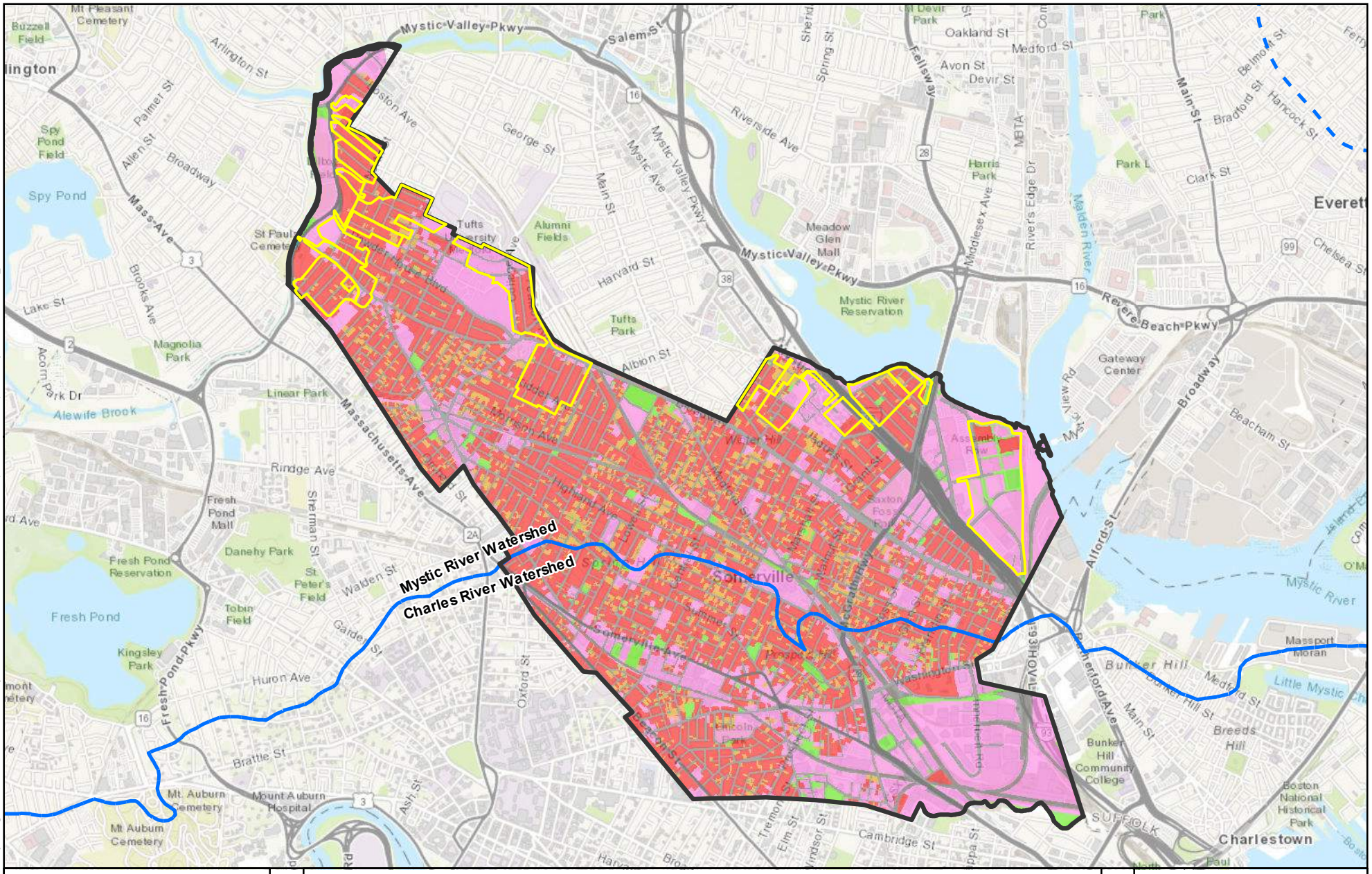


Figure A-2
Land Use Categories
Phosphorus Source Identification Report (PSIR)
Somerville, MA

Legend

- Somerville Boundary
- Watershed Boundary (HUC 12)
- Mystic River Watershed Catchments

PLER Land Use Categories

- Commercial & Industrial
- Multi-Family & High-Density Residential
- Medium-Density Residential
- Right-of-Way
- Open Land
- Water

0 0.125 0.25 0.5 Miles

N

Woodard & Curran

Project #: 0232622.01
Map Created: June 2022

Figure Exported: 6/29/2022 By: esneesby Using: \\woodardcurran.net\shared\Projects\0232622.01 Somerville MA MS4 Permit Compliance Services\wip\GIS\Projects\PLER Landuse_8.5x11.mxd

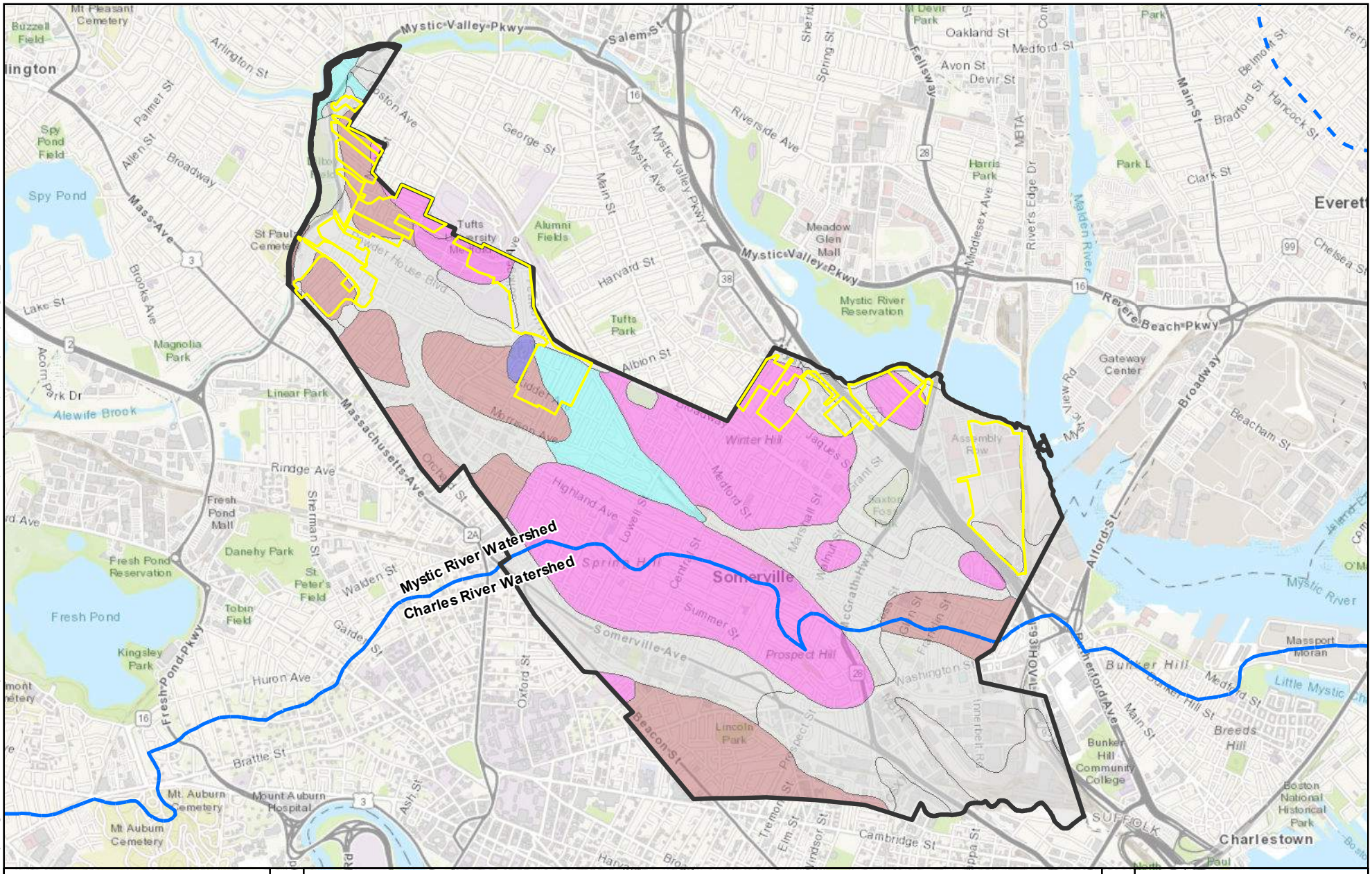


Figure A-3
Hydrologic Soils
Phosphorus Source Identification Report (PSIR)
Somerville, MA

Legend

- Somerville Boundary
- Watershed Boundary (HUC 12)
- Mystic River Watershed Catchments

Hydrologic Soil Groups

- Not rated or not available
- A
- B
- B/D
- D

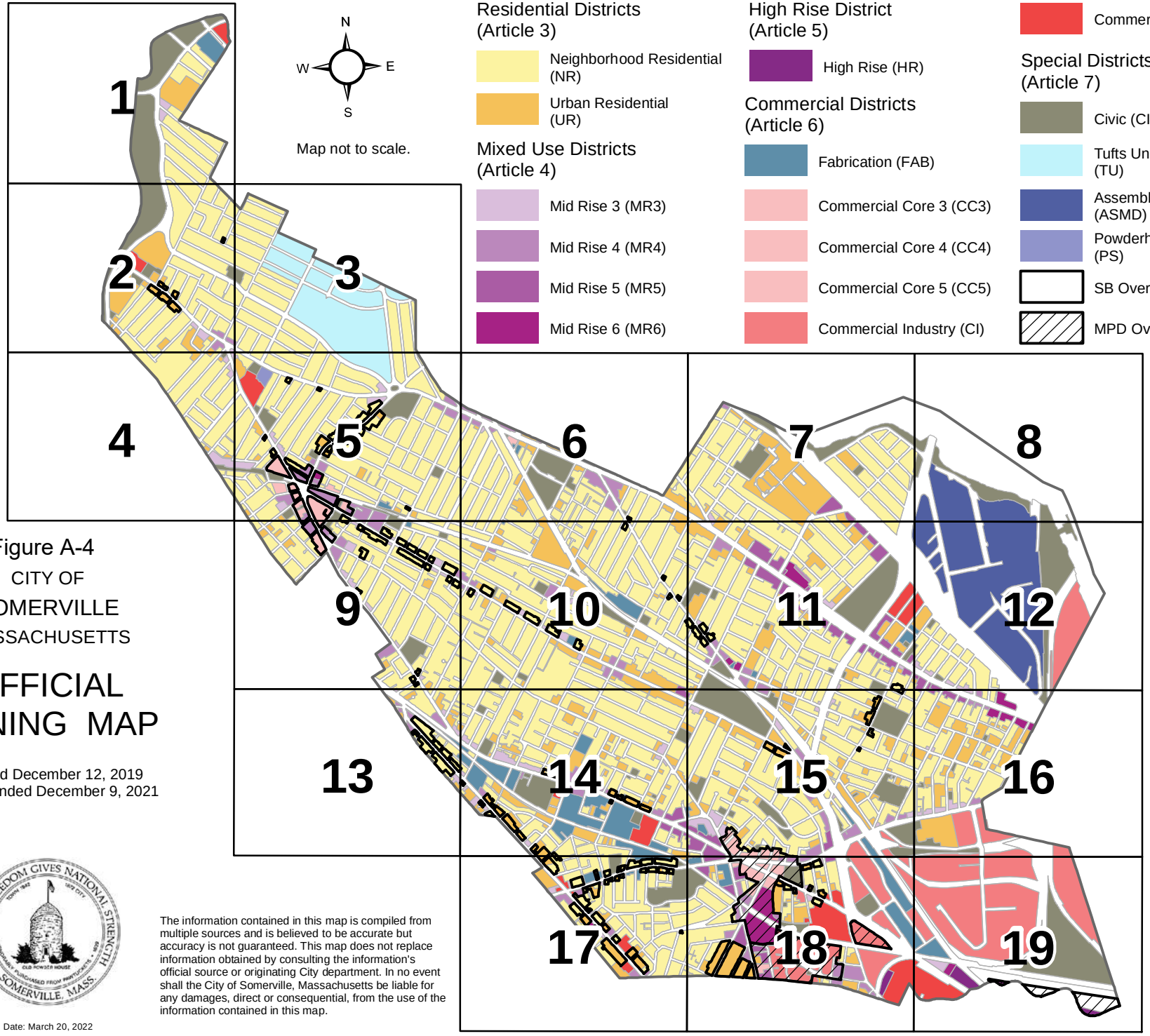
0 0.125 0.25 0.5 Miles

N

Woodard & Curran

Project #: 0232622.01
Map Created: June 2022

Figure Exported: 6/29/2022 By: esneesby Using: \\woodardcurran.net\shared\Projects\0232622.01 Somerville MA MS4 Permit Compliance Services\wip\GIS\Projects\Hydrologic Soils_8.5x11.mxd



For overlay maps see Article 8

Figure A-4

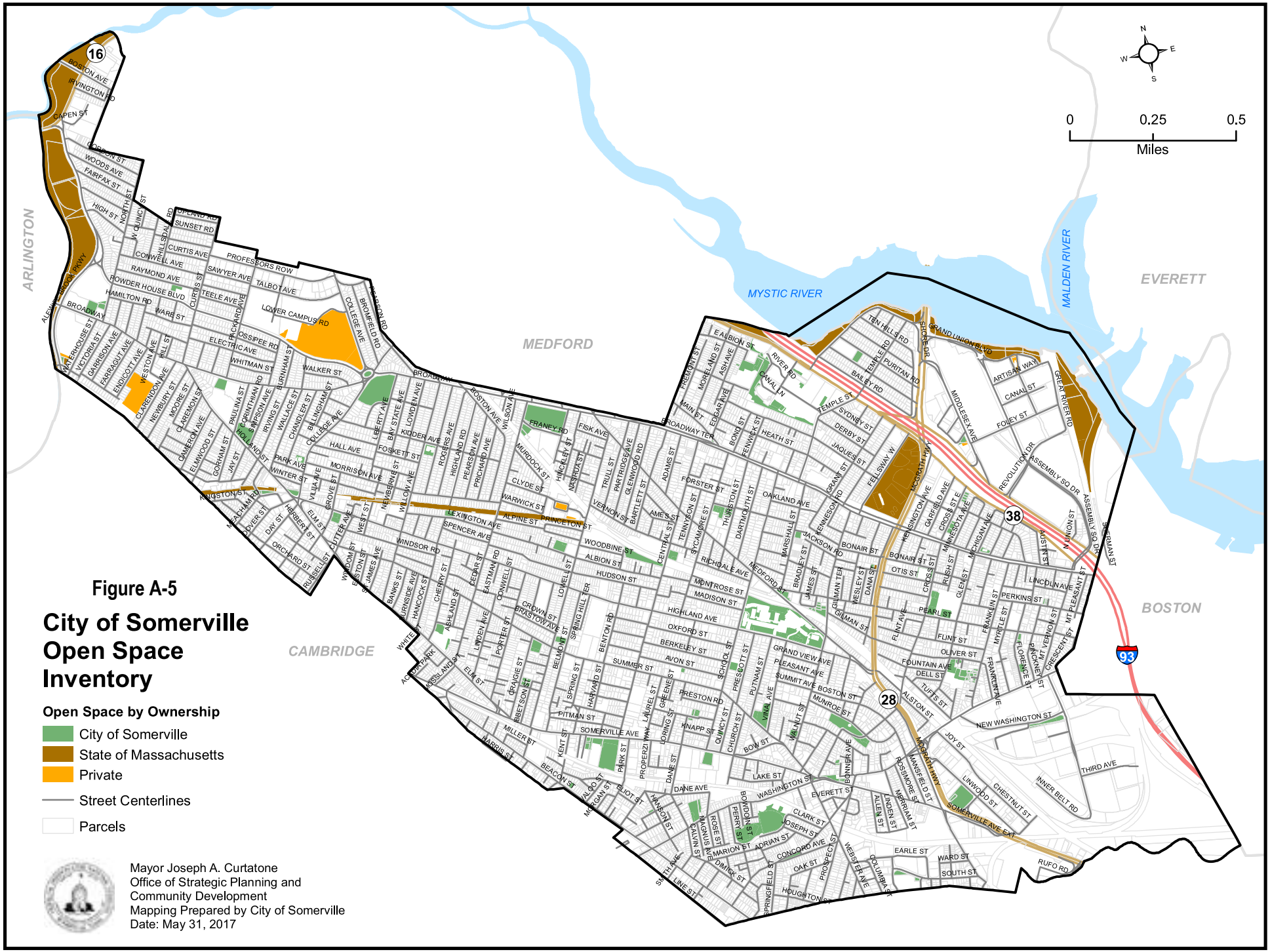
CITY OF
SOMERVILLE
MASSACHUSETTS

OFFICIAL ZONING MAP

Adopted December 12, 2019
Last Amended December 9, 2021

MUNICIPAL FREEDOM GIVES NATIONAL STRENGTH
SOMERVILLE, MASS.

Date: March 20, 2022


ARLINGTON
MEDFORD
CAMBRIDGE
EVERETT
BOSTON
MYSTIC RIVER
MALDEN RIVER
N
S
E
W
0
0.25
0.5
Miles
Figure A-5
City of Somerville
Open Space
Inventory
Open Space by Ownership
City of Somerville
State of Massachusetts
Private
Street Centerlines
Parcels
Mayor Joseph A. Curtatone
Office of Strategic Planning and
Community Development
Mapping Prepared by City of Somerville
Date: May 31, 2017

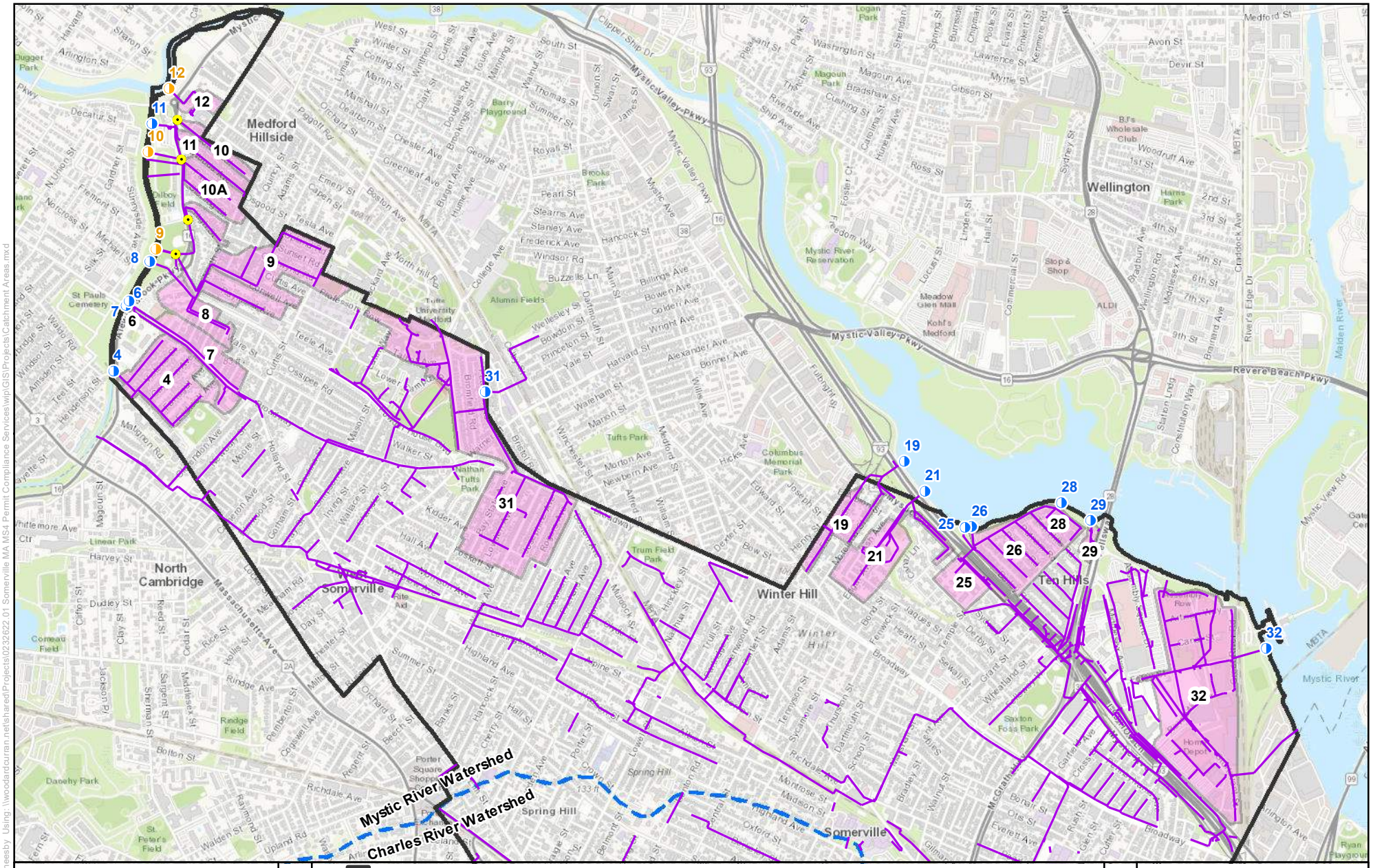


Figure A-6
Catchment Areas

Phosphorus Source Identification Report (PSIR)

Somerville, MA

Woodard & Curran

Project #: 0232622.01

Map Created: June 2022

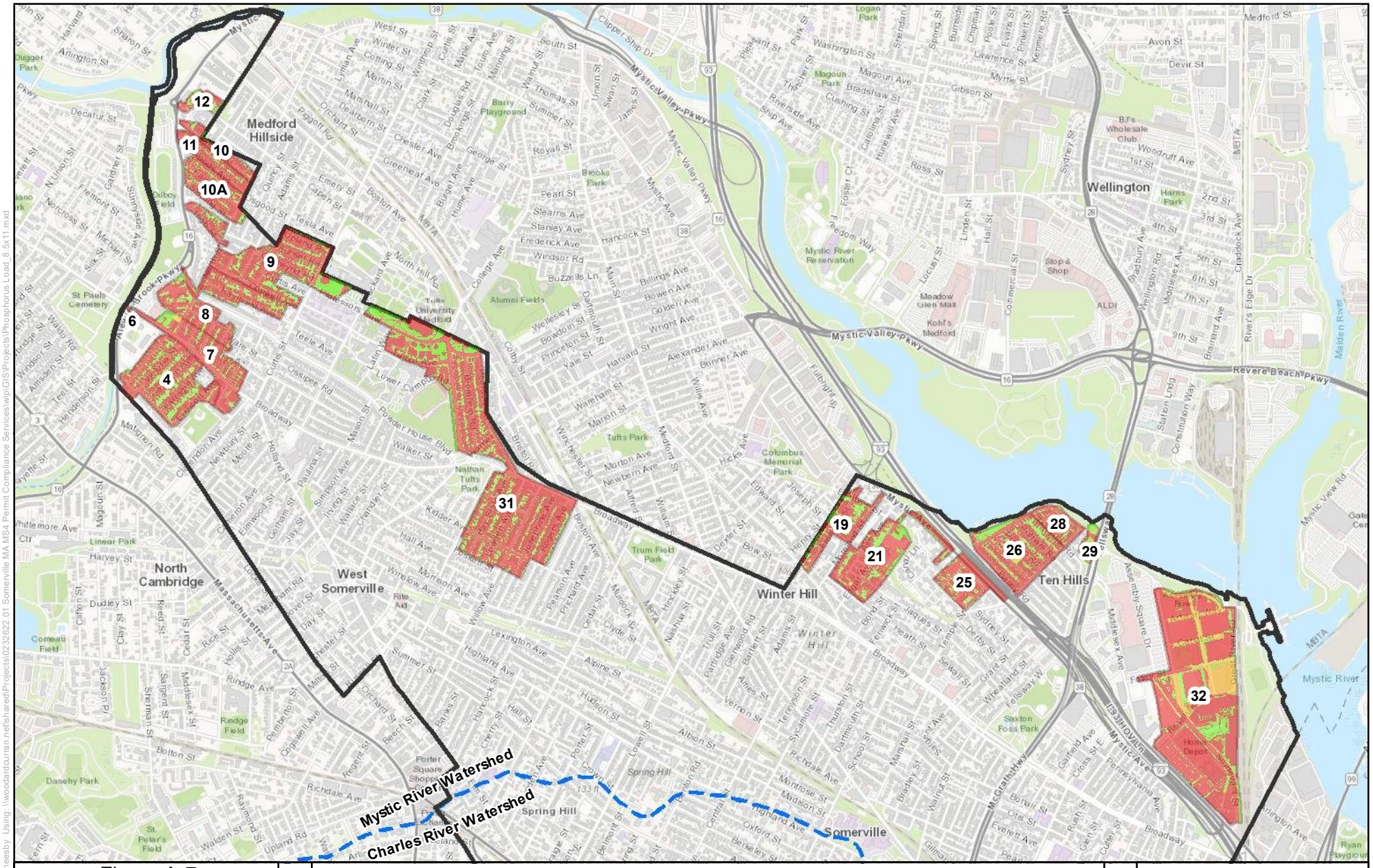


Figure A-7
Phosphorus Load by Land Use and Land Cover
Phosphorus Source Identification Report (PSIR)
Somerville, MA

Legend

- Somerville Boundary
- Watershed Boundary (HUC 12)
- Mystic River Watershed Catchments

Phosphorus Load Export

- High (> 1.50 lbs/ac/year)
- Moderate (>.75 - ≤ 1.50 lbs/ac/year)
- Low (≤ .75 lbs/ac/year)

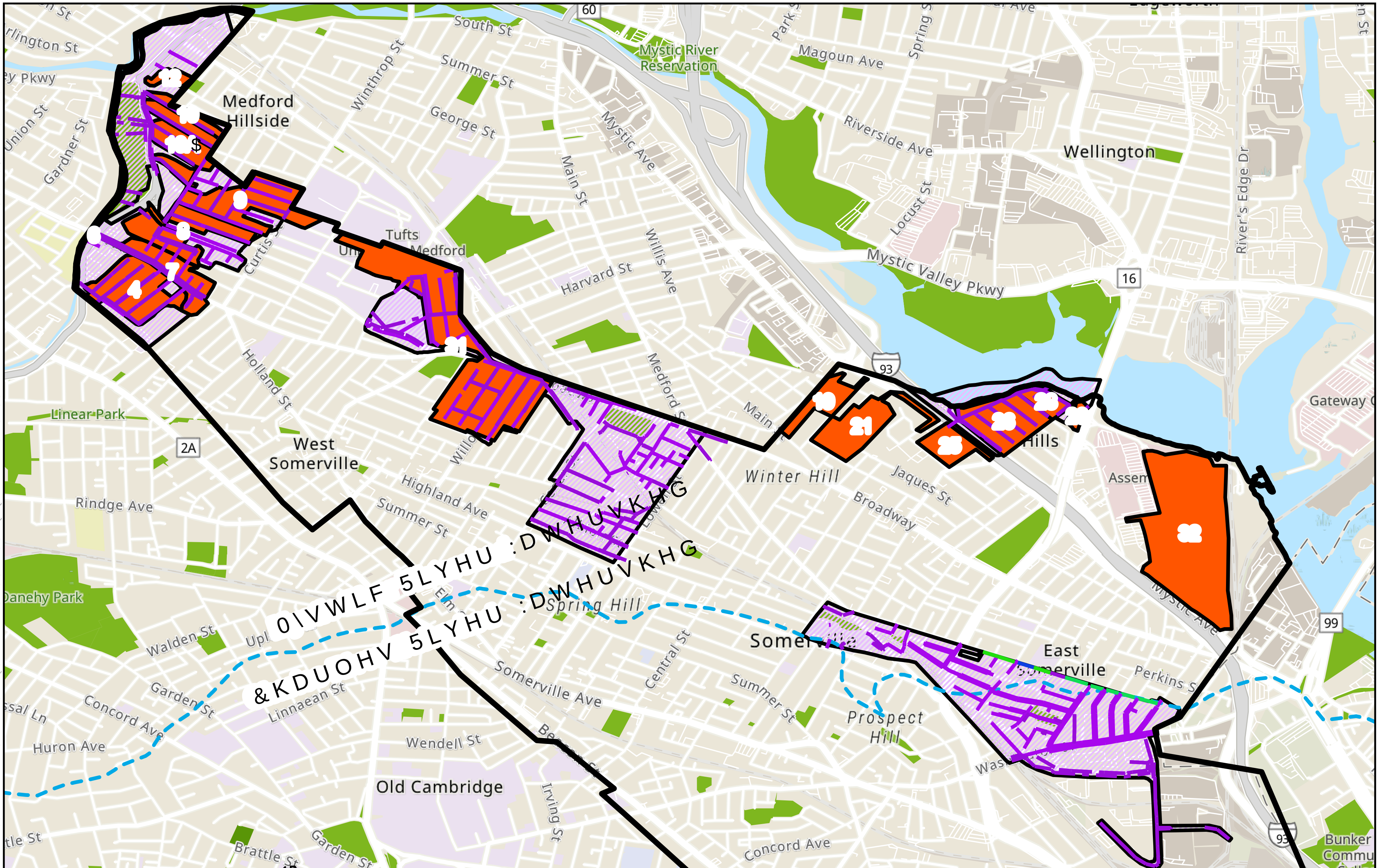
0 0.125 0.25 0.5 Miles

N

Woodard & Curran

Project #: 0232622.01
Map Created: June 2022

Figure Exported: 6/29/2022 By: esneesby Using: \\woodardcurran.net\shared\Projects\0232622.01 Somerville MA MS4 Permit Compliance Services\wip\GIS\Projects\Phosphorus Load_8.5x11.mxd



)LJXUH $

)< 6HZHU 3LSH ,QVSHFWLRQV
3KRVSKRUXV 6RXUFH
,GHQWLILFDWLRQ 5HSRUW 36,5
6RPHUYLOOH 0$

/HJHQG

6WRUP 3LSH ,QVSHFWLRQV
9LVLWHG 1RW 3HUIRUPHG
3DUWLDO ,QVSHFWLRQ
3DUWLDO ,QVSHFWLRQ &DQQRW 3DVV
9LVLWHG 3RW 3HUIRUPHG 1R 5HSRUW
&RPSOHWH
1RW <HW ,QVSHFWHG

6HZHU 3LSH ,QVSHFWLRQV
1HHGV)XUWKHU 5HYLHZ
3DUWLDO 5HWXUQ ,QVSHFWLRQ
3DUWLDO ,QVSHFWLRQ &DQQRW 3DVV
5HWXUQ 1HHGHG 3HUIRUPHG 1R 5HWXUQ 1HHGHG
&RPSOHWH
1RW <HW ,QVSHFWHG

6WRUP :DWHU &DWFKPHQW %RXQGDULHV
<HDUV)XWXUH 5HWXUQ $UHDV
0LVWLF 5LYHU :DWHUVKHG
6RPHUYLOOH %RXQGDU\
+8&

0LOHV

3URMHFW
0DS &UHDWHG -XQH

7KLUG 3DUW\ *,6 'LVFODLPHU 7KLV PDS LV IRU UHIHUHQFH DQG JUDSKLFDO SXUSRVHV RQO\ DQG VKRXOG QRW EH UHOLHG XSRQ E
$Q\ UHOLDQFH XSRQ WKH PDS RU GDWD FRQWDLQHG KHUHLQ VKDOO EH DW WKH XVHUV¶ VROH ULVN

APPENDIX B: OUTFALL SCREENING RESULTS

MS4 Outfall	Receiving Water	Segment ID	Date	Testing Company	Weather	Outfall Located	Outfall Material	Outfall Size (Inches)	Outfall Condition[1]	Needs Cleaning	Needs Repair	Weather (Dry/Wet)	Precipitation, Antecedent 24 hours	Standing Water	Sampling Location	If MH, ID
4	Alewife Brook	MA71-04	10/16/2020	SDE, Inc.	Partly Cloudy	Yes	Vitrified Clay	18	Good	No	No	Dry	<0.1	No	Outfall	
6	Alewife Brook	MA71-04	10/15/2020	SDE, Inc.	Sunny	Yes	Reinforced Concrete	12	Good	No	No	Dry	<0.1	No	Outfall	
7	Alewife Brook	MA71-04	10/15/2020	SDE, Inc.	Sunny	Yes	Reinforced Concrete	24	Good	No	No	Dry	<0.1	No	Outfall	
8	Alewife Brook	MA71-04	10/15/2020	SDE, Inc.	Sunny	Yes	Cement Concrete	24	Good	No	No	Dry	<0.1	No	Outfall	
9	Alewife Brook	MA71-04	10/15/2020	SDE, Inc.	Sunny	Yes	Cement Concrete	30	Good	No	No	Dry	<0.1	No	Outfall	
10	Alewife Brook	MA71-04	10/15/2020	SDE, Inc.	Sunny	Yes	Reinforced Concrete	36	Good	No	No	Dry	<0.1	No	Outfall	
11	Alewife Brook	MA71-04	10/15/2020	SDE, Inc.	Sunny	Yes	Cement Concrete	12	Good	No	No	Dry	<0.1	No	Outfall	
12	Mystic River	MA71-02	11/4/2020	SDE, Inc.	Sunny	Yes	Cement Concrete	18	Good	No	No	Dry	<0.1	No	Outfall	
19	Mystic River	MA71-02	10/15/2020	SDE, Inc.	Sunny	Yes	Reinforced Concrete	60	Good	No	No	Dry	<0.1	No	Outfall	
21	Mystic River	MA71-02	10/15/2020	SDE, Inc.	Sunny	Yes	Reinforced Concrete	60	Good	No	No	Dry	<0.1	No	Outfall	
25	Mystic River	MA71-02	10/15/2020	SDE, Inc.	Sunny	Yes	Reinforced Concrete	60	Good	No	No	Dry	<0.1	No	Outfall	
26	Mystic River	MA71-02	7/29/2021	SDE, Inc.	Sunny	Yes	Reinforced Concrete	24	Good	No	No	Dry	<0.1	No	Manhole	26-5447
28	Mystic River	MA71-02	10/15/2020	SDE, Inc.	Sunny	Yes	Cast Iron	16	Good	No	No	Dry	<0.1	No	Outfall	
29	Mystic River	MA71-02	10/15/2020	SDE, Inc.	Sunny	Yes	Reinforced Concrete	32	Good	No	No	Dry	<0.1	No	Outfall	
31	Interconnection with City of Medford		10/15/2020	SDE, Inc.	Sunny	Yes	Reinforced Concrete	48	Good	No	No	Dry	<0.1	No	Manhole	31-5008
32	Mystic River	MA71-03	10/16/2020	SDE, Inc.	Partly Cloudy	No	Unknown	Unknown				Dry	<0.1	No	Manhole	32-6334

[1] Outfall Conditions: Good: No significant issues or damage – functioning as intended, Fair: Visible damage/wear (cracking, spalling, erosion, etc.) but still functioning as intended, Poor: significant damage/wear - not functioning as intended.

ONE CALL - CITY HALL 3 1 1 SOMERVILLE

Department of Public Works Building, First Floor • 1 Franey Road • Somerville, Massachusetts 02145
(617) 625-6600, Ext. 5400 Fax: (617) 625-4454 www.somervillema.gov

MS4 Outfall	Sample Taken	If no, why	Flow	Velocity[2]	Flow Color	Depth of Flow (Inches)	Sediment	Sediment (%)	Floatables	Odor	pH	Temperature (ºC)	Specific Conductivity (µs/cm)	Salinity (µg/L or ppt)	Ammonia (mg/L)	Surfactants (mg/L)	Chlorine (mg/L)	E. Coli (MPN/100mL)	Meets Likely Sewer Indicators? (Yes/No)[3]
4	No	Dry	No				No		None	None									-
6	No	Dry	No				No		None	None									-
7	Yes		Yes	Medium	Clear	0.5	No		None	None	8.02	17	1,772	0.9	0	0.25	0.11	1,607	No
8	Yes		Yes	Medium	Clear	0.5	No		None	None	8.06	16	2	1	0.1	0.5	0	4,106	No
9	No	Dry	No				No		None	None									-
10	Yes		Yes	Slow	Clear	0.1	No		None	None	8.21	18	688	0.3	0.1	0	0.06	8,164	No
11	Yes		Yes	Slow	Clear	0.5	No		None	Musty	6.97	20	393	0.2	0	0.25	0	985	No
12	No	Dry	No				No		None	None									-
19	Yes		Yes	Medium	Clear	0.1	No		None	None	8.59	19	1,846	0.9	0.1	0	0.04	168	No
21	Yes		Yes	Medium	Clear	0.1	No		None	None	8.38	19	1,681	0.8	0	0	0.16	<10	No
25	Yes		Yes	Medium	Yellow	0.2	Yes	5	Oily Sheen	None	7.95	17	6,300	3.4	2	1	0.17	63	Yes
26	Yes		Yes	Slow	Clear	0.5	Yes	1	None	None	6.96	24	909	0	0	0	0	528	No
28	Yes		Yes	Medium	Clear	0.1	Yes	10	None	None	7.05	17	2,680	1.4	2	0.5	0.17	<10	Yes
29	Yes		Yes	Medium	Clear	0.1	No		None	None	8	16	1,436	0.7	0.1	0.5	0.16	246	No
31	Yes		Yes	Slow	Clear	1	No		None	None	7.23	20	1,475	0.7	5	0.25	0.06	>24,196	Yes
32	Yes		Yes	Slow	Clear	6	No		None	Musty	6.99	20	3,570	1.8	5	1.5	0	20	Yes

[2] Velocity ranges (visual): slow: 0 – 0.5 ft/s, medium: 0.5 – 1.75 ft/s, fast: 1.75 ft/s or above

[3] Per the 2016 MS4 Permit, likely sewer indicators are the following: Olfactory or visual evidence of sewage; Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water; or Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine.

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MS4 Outfall	BOD_5 (mg/L)	Dissolved Oxygen (mg/L)	Total Suspended Solids (TSS) (mg/L)	Phosphorus (Total) (µg/L)	Total Lead (mg/L)	Total Arsenic (mg/L)	Total Copper (mg/L)	Oil and Grease (mg/L)	Fecal Coliform (CFU/100mL)	Comments
4										
6										
7	<3.0	8.01	3.7	80	<0.025	n/a	<0.025	0.6	n/a	
8	<3.0	7.92	4.7	50	<0.025	n/a	<0.025	2.0	n/a	
9										
10	<3.0	8.14	9.0	110	<0.025	n/a	<0.025	= <0.5	n/a	
11	<3.0	5.79	16.0	90	<0.025	n/a	<0.025	= <0.5	n/a	
12										
19	<3.0	6.48	8.3	110	n/a	<0.05	n/a	n/a	n/a	
21	<3.0	6.45	3.3	Below Detection Limit	n/a	<0.05	n/a	n/a	n/a	
25	<10	5.53	28.0	30	n/a	<0.05	n/a	n/a	n/a	
26	<3.0	8.75	74	400	n/a	<0.05	n/a	n/a	n/a	
28	<3.0	3.96	18.0	120	n/a	<0.05	n/a	n/a	n/a	
29	<3.0	6.38	13.0	100	n/a	<0.05	n/a	n/a	n/a	
31	<3.0	3.01	9.7	300	n/a	<0.05	n/a	n/a	n/a	Construction in area of interconnection.
32	<8.0	2.67	n/a	230	n/a	n/a	n/a	1.4	70	Iron deposits.

Note, n/a indicates the parameter was not a pollutant of concern at the outfall where the sample was taken.

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MS4 Outfall	Receiving Water	Segment ID	Date	Testing Company	Weather	Outfall Located	Outfall Material	Outfall Size (Inches)	Outfall Condition[1]	Needs Cleaning	Needs Repair	Weather (Dry/Wet)	Precipitation, Antecedent 24 hours	Standing Water	Sampling Location	If MH, ID
26	Mystic River	MA71-02	7/12/2021	SDE, Inc.	Raining	Yes	Reinforced Concrete	8	Good	No	No	Wet	>0.1	No	Outfall	
19	Mystic River	MA71-02	7/12/2021	SDE, Inc.	Raining	Yes	Reinforced Concrete	60	Good	No	No	Wet	>0.1	No	Outfall	
25	Mystic River	MA71-02	7/12/2021	SDE, Inc.	Raining	Yes	Reinforced Concrete	60	Good	No	No	Wet	>0.1	No	Outfall	
21	Mystic River	MA71-02	7/12/2021	SDE, Inc.	Raining	Yes	Reinforced Concrete	48	Good	No	No	Wet	>0.1	No	Outfall	
28	Mystic River	MA71-02	7/12/2021	SDE, Inc.	Raining	Yes	Cast Iron	8	Good	Yes	Yes	Wet	>0.1	No	Outfall	
29	Mystic River	MA71-02	7/12/2021	SDE, Inc.	Raining	Yes	Vitrified Clay	32	Fair	No	No	Wet	>0.1	No	Outfall	
32	Mystic River	MA71-02	7/12/2021	SDE, Inc.	Cloudy	Yes	Unknown	Unknown				Wet	>0.1	Yes	Manhole	32-6334
31	Interconnection with City of Medford		7/12/2021	SDE, Inc.	Cloudy	Yes	Reinforced Concrete	12	Good	No	No	Wet	>0.1	No	Manhole	31-5008
4	Alewife Brook	MA71-04	7/12/2021	SDE, Inc.	Raining	Yes	Vitrified Clay	15	Good	No	No	Wet	>0.1	No	Outfall	
7	Alewife Brook	MA71-04	7/12/2021	SDE, Inc.	Raining	Yes	Corrugated Metal	15	Good	No	No	Wet	>0.1	No	Outfall	
9	Alewife Brook	MA71-04	7/12/2021	SDE, Inc.	Raining	Yes	Vitrified Clay	30	Good	No	No	Wet	>0.1	No	Outfall	
10	Alewife Brook	MA71-04	7/12/2021	SDE, Inc.	Raining	Yes	Reinforced Concrete	36	Good	No	No	Wet	>0.1	No	Outfall	
12	Alewife Brook	MA71-04	7/12/2021	SDE, Inc.	Raining	Yes	Reinforced Concrete	24	Good	No	No	Wet	>0.1	Yes	Manhole	12/1/1991
6	Alewife Brook	MA71-04	7/12/2021	SDE, Inc.	Raining	No	Reinforced Concrete	12	Good	No	No	Wet	>0.1	No	Manhole	6/1/1986
8	Alewife Brook	MA71-04	7/12/2021	SDE, Inc.	Raining	Yes	Cast Iron	24	Good	No	No	Wet	>0.1	No	Outfall	
11	Alewife Brook	MA71-04	7/12/2021	SDE, Inc.	Raining	Yes	Cast Iron	12	Good	No	No	Wet	>0.1	No	Outfall	

[1] Outfall Conditions: Good: No significant issues or damage – functioning as intended, Fair: Visible damage/wear (cracking, spalling, erosion, etc.) but still functioning as intended, Poor: Significant damage/wear – not functioning as intended.

MS4 Outfall	Sample Taken	If no, why	Flow	Velocity[2]	Flow Color	Depth of Flow (Inches)	Sediment	Sediment (%)	Floatables	Odor	pH	Temperature (^{0}C)	Specific Conductivity (µs/cm)	Salinity (ppt)	Ammonia (mg/L)	Surfactants (mg/L)	Chlorine (mg/L)	E. Coli (MPN/100mL)	Meets Likely Sewer Indicators? (Yes/No)[3]
26	Yes		Yes	Medium	Clear	1.5	No		None	None	6.87	20	104.1	0	0	0	0.2	27550	No
19	Yes		Yes	Fast	Clear	6	No		None	None	6.54	20	302	0.1	0.1	0	0.33	17329	No
25	Yes		Yes	Fast	Clear	3	No		None	None	7.04	19	224	0.1	0.1	0	0.08	17329	No
21	Yes		Yes	Fast	Clear	2	No		None	None	6.53	19	351	0.1		0	0	24196	No
28	Yes		Yes	Fast	Clear	1	Yes	1	None	None	6.29	20	353	0.2	0.2	0	0.11	9804	No
29	Yes		Yes	Medium	Clear	1	Yes	1	None	None	6.65	20	499	0.2	0.2	0	0.01	3654	No
32	No	Standing water	No				No		OilySheen	None									
31	Yes		Yes	Slow	Clear	4	No		None	None	6.86	20	978	0.5	0.2	0.25	0	4106	No
4	Yes		Yes	Fast	Clear	5	No		None	None	6.89	20	113.6	0	0	0	0	34480	No
7	Yes		Yes	Fast	Clear	6	No		None	None	6.89	19	535	0.2	0	0	0.2	4884	No
9	Yes		Yes	Medium	Brown	6	No		None	None	6.69	19	938	0.2	0.2	0.25	0.22	15531	No
10	Yes		Yes	Medium	Clear	6	No		None	None	6.82	19	657	0.3	0.1	0	0.11	8164	No
12	No	Upstream Structure Dry	No				No		None	None									
6	No	Dry	No				Yes	15	None	None									
8	Yes		Yes	Medium	Clear	4	No		None	None	7.12	18	1049	0.5	0.1	0.5	0.09	8164	No
11	Yes		Yes	Medium	Clear	4	No		None	None	7.15	19	361	0.2	0.1	0.2	0.06	12033	No

[2] Velocity ranges (visual): slow: 0 – 0.5 ft/s, medium: 0.5 – 1.75 ft/s, fast: 1.75 ft/s or above

[3] Per the 2016 MS4 Permit, likely sewer indicators are the following: Olfactory or visual evidence of sewage; Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water; or Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine.

MS4 Outfall	BOD_5 (mg/L)	Dissolved Oxygen (mg/L)	Total Suspended Solids (TSS) (mg/L)	Phosphorus (Total) (mg/L)	Total Lead (mg/L)	Total Arsenic (mg/L)	Total Copper (mg/L)	Oil and Grease (mg/L)
26	<3.0	12.05	11	0.077		<0.050		
19	<3.0	12.01	41	0.095		<0.050		
25	<3.0	11.58	20	0.064		<0.050		
21	<3.0	12.27	26	0.084		<0.050		
28	<3.0	12.17	5.3	0.097		<0.050		
29	<3.0	11.47	5.3	0.064		<0.050		
32								
31	<3.0	10.39	8	0.11		<0.050		
4	<3.0	10.24	13	0.087	<0.025		<0.025	0.96
7	<3.0	10.26	7.3	0.071	<0.025		<0.025	<0.50
9	<3.0	9.01	10	0.15	<0.025		<0.025	0.57
10	<3.0	9.17	4.3	0.068	<0.025		<0.025	0.67
12								
6								
8	<3.0	9.44	5	0.096	<0.025		<0.025	0.67
11	<3.0	8.50	8	0.086	<0.025		<0.025	0.78

APPENDIX C: CATCHMENT PRIORITIZATION TABLES

Table 1: Mystic River Watershed Catchment Prioritization Data

Outfall	Receiving Waterbody	Waterbody Segment	Normalized TP Load (lbs/acre/year)	Municipal Land	
				Number of Parcels	Parcel Area (acres)
11	Alewife Brook	MA71-04	1.9	0	0
10	Alewife Brook	MA71-04	1.9	0	0
7	Alewife Brook	MA71-04	1.8	3	1
6	Alewife Brook	MA71-04	1.8	0	0
28	Mystic River	MA71-02	1.8	0	0
8	Alewife Brook	MA71-04	1.7	3	2.2
9	Alewife Brook	MA71-04	1.7	0	0
21	Mystic River	MA71-02	1.7	1	3.3
25	Mystic River	MA71-02	1.7	0	0
26	Mystic River	MA71-02	1.7	1	0.4
31	Mystic River	MA71-02	1.7	2	5.2
4	Alewife Brook	MA71-04	1.7	1	0.1
19	Mystic River	MA71-02	1.7	0	0
12	Mystic River	MA71-02	1.3	0	0
29	Mystic River	MA71-02	1.1	0	0
11	Alewife Brook	MA71-04	1.9	0	0

Table 2: Somerville MS4 Catchment Prioritization Ranking

Outfall	Receiving Waterbody	Waterbody Segment	Normalized TP Load Rank
31*	Mystic River	MA71-03	1
8	Alewife Brook	MA71-04	2
21	Mystic River	MA71-02	3
7	Alewife Brook	MA71-04	4
26	Mystic River	MA71-02	5
4	Alewife Brook	MA71-04	6
11	Alewife Brook	MA71-04	7
10	Alewife Brook	MA71-04	8
28	Mystic River	MA71-02	9
9	Alewife Brook	MA71-04	10
25	Mystic River	MA71-02	11
19	Mystic River	MA71-02	12
29	Mystic River	MA71-02	13
6**	Alewife Brook	MA71-04	14
12***	Mystic River	MA71-02	15

Table 3: Catchment Ranking Based on Municipal Parcels

Outfall	Receiving Waterbody	Waterbody Segment	Municipal Parcels	Factored Parcels (percent)
7	Alewife Brook	MA71-04	3	1
8	Alewife Brook	MA71-04	3	1
31	Mystic River	MA71-02	2	0.67
4	Alewife Brook	MA71-04	1	0.33
21	Mystic River	MA71-02	1	0.33
26	Mystic River	MA71-02	1	0.33
6	Alewife Brook	MA71-04	0	0
9	Alewife Brook	MA71-04	0	0
10	Alewife Brook	MA71-04	0	0
11	Alewife Brook	MA71-04	0	0
12	Mystic River	MA71-02	0	0
19	Mystic River	MA71-02	0	0
25	Mystic River	MA71-02	0	0
28	Mystic River	MA71-02	0	0
29	Mystic River	MA71-02	0	0

Table 4: Catchment Ranking Based on Municipal Area

Outfall	Receiving Waterbody	Waterbody Segment	Municipal Area (acres)	Factored Area (percent)
31*	Mystic River	MA71-02	5.2	1
21	Mystic River	MA71-02	3.3	0.63
8	Alewife Brook	MA71-04	2.2	0.42
7	Alewife Brook	MA71-04	1	0.19
26	Mystic River	MA71-02	0.4	0.08
4	Alewife Brook	MA71-04	0.1	0.02
6	Alewife Brook	MA71-04	0	0
9	Alewife Brook	MA71-04	0	0
10	Alewife Brook	MA71-04	0	0
11	Alewife Brook	MA71-04	0	0
12	Mystic River	MA71-02	0	0
19	Mystic River	MA71-02	0	0
25	Mystic River	MA71-02	0	0
28	Mystic River	MA71-02	0	0
29	Mystic River	MA71-02	0	0

Table 5: Catchment Ranking Summary

Outfall	Receiving Waterbody	Waterbody Segment	Factored Normalized TP Load (percent)	Factored Municipal Parcels (percent)	Factored Municipal Area (percent)	Weighted Sum of Ranking Factors****	Rank
31*	Mystic River	MA71-02	0.72	0.67	1	0.85	1
8	Alewife Brook	MA71-04	0.73	1	0.42	0.64	2
21	Mystic River	MA71-02	0.73	0.33	0.63	0.58	3
7	Alewife Brook	MA71-04	0.78	1	0.19	0.54	4
26	Mystic River	MA71-02	0.72	0.33	0.08	0.30	5
4	Alewife Brook	MA71-04	0.72	0.33	0.02	0.27	6
11	Alewife Brook	MA71-04	0.82	0	0	0.21	7
10	Alewife Brook	MA71-04	0.80	0	0	0.20	8
28	Mystic River	MA71-02	0.76	0	0	0.19	9
9	Alewife Brook	MA71-04	0.73	0	0	0.18	10
25	Mystic River	MA71-02	0.73	0	0	0.18	11
19	Mystic River	MA71-02	0.72	0	0	0.18	12
29	Mystic River	MA71-02	0.49	0	0	0.12	13
6**	Alewife Brook	MA71-04	0.77	0	0	0.19	14
12***	Mystic River	MA71-02	0.57	0	0	0.14	15

Notes

* Interconnection with City of Medford

** Moved to bottom of ranking - very small catchment area

*** Moved to bottom of ranking - DCR/private catchment area

**** The weighted sum of ranking factors includes 25% of each factored normalized total phosphorus load and factored number of municipal parcels, and 50% of factored municipal area.
Outfall 32 is excluded from prioritization as it drains to MA71-03, which is not impaired for Phosphorus.

APPENDIX D: EXISTING MUNICIPAL SCM CALCULATIONS

State	MASSACHUSETTS
Municipality	SOMERVILLE
Permit Type	MS4
Permit Number	
Major Watershed	MYSTIC
TP Load Reduction Target	N/A
TN Load Reduction Target	N/A
TSS Load Reduction Target	N/A

Table 1. Project Summary Credit for SOMERVILLE, MASSACHUSETTS

Project Type	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)
Structural	0.11	0.99	25.16
Non-Structural	0	0	0
Land Use Conversion	0	0	0
Total	0.11	0.99	25.16

Table 2. Structural Project Summary for SOMERVILLE, MASSACHUSETTS

Project ID	BMP Type	BMP Storage Capacity (ft^3)/ Filter Depth (in.)	Phosphorus BMP Efficiency (%)	Nitrogen BMP Efficiency (%)	Sediment BMP Efficiency (%)	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)	Impervious Area Treated (ac)	Runoff Depth (in.)
North Street Playground	INFILTRATION TRENCH	793	91.6	97	99	0.11	0.99	25.16	0.067355	3.24

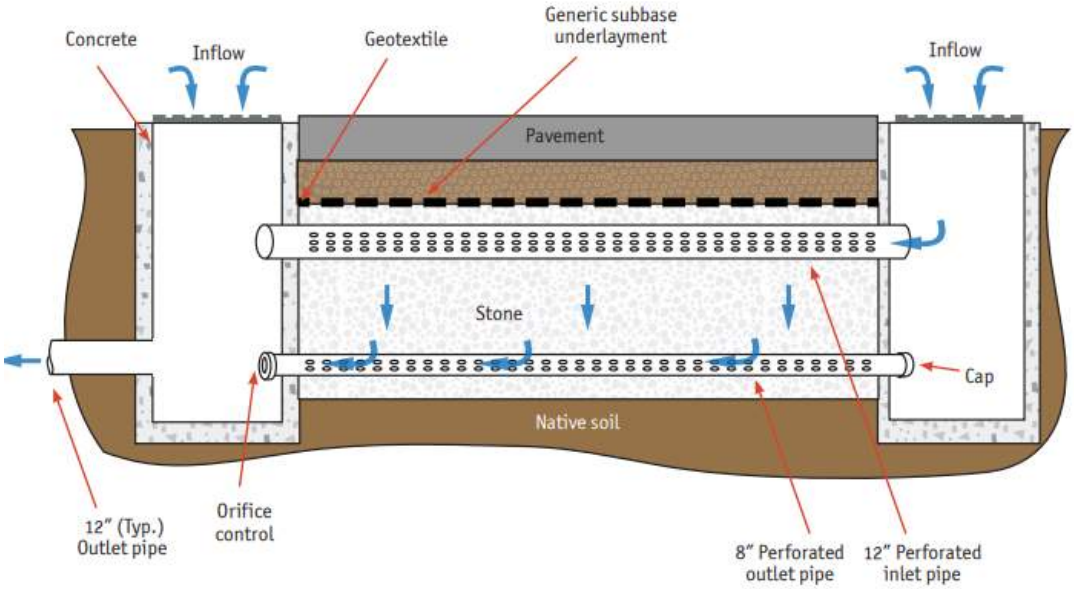
APPENDIX E: MUNICIPAL PARCELS

Map-Block-Lot	Address Number	Street	Current Use	Parcel Size (SF/ac.)		OWNER	Catchment	Adjacent Catchment
85-A-14	0	ASSEMBLY ROW	Assembly Square ROW	207,971	4.77	CITY OF SOMERVILLE	32	
4-A-1		ALEWIFE BROOK PKWY		292,293	6.71	CITY OF SOMERVILLE		
90-F-10	42	CROSS ST		4,737	0.11	CITY OF SOMERVILLE		
5-B-2		NORTH ST	North Street Playground	10,058	0.23	CITY OF SOMERVILLE		7, 8
12-A-11	1060	BROADWAY		82,979	1.90	CITY OF SOMERVILLE		
28-I-15	0	LEXINGTON AVE		13,593	0.31	CITY OF SOMERVILLE		
40-H-12	487	MEDFORD ST		2,812	0.06	CITY OF SOMERVILLE		
5-A-1A		ALEWIFE BROOK PKWY		43,204	0.99	CITY OF SOMERVILLE		
99-A-17	0	ASSEMBLY ROW	Assembly Square ROW	3,427	0.08	CITY OF SOMERVILLE	32	
101-B-5	0	ASSEMBLY SQ DR	Multi-use Path	1,978	0.05	CITY OF SOMERVILLE	32	
61-F-2	93	HIGHLAND AVE		573,328	13.16	CITY OF SOMERVILLE		
101-B-10	13	MYSTIC AVE		2,022	0.05	CITY OF SOMERVILLE		
28-A-1	201	WILLOW AVE	Brown School	26,861	0.62	CITY OF SOMERVILLE		31
89-H-11	115	BROADWAY		10,797	0.25	CITY OF SOMERVILLE		
61-D-4	0	SKILTON AVE		2,104	0.05	CITY OF SOMERVILLE		
56-C-1	0	GOVERNOR WINTHROP RD	Ten Hills Park Playground	19,325	0.44	CITY OF SOMERVILLE	26	
35-H-1	0	MOUNTAIN AVE		578	0.01	CITY OF SOMERVILLE		
5-B-4		BROADWAY	Veteran's Cemetary	34,455	0.79	CITY OF SOMERVILLE		7, 8
8-C-35		RUSSELL RD	Vacant (Sliver Parcel)	96	0.00	CITY OF SOMERVILLE	7	
6-A-20		ALEWIFE BROOK PKWY	Woodstock Street Playgrou	3,541	0.08	CITY OF SOMERVILLE	4	
13-A-1	238	HOLLAND ST		8,037	0.18	CITY OF SOMERVILLE		
12-A-27	133	HOLLAND ST		9,949	0.23	CITY OF SOMERVILLE		
12-B-20	0	HOLLAND ST		62,611	1.44	CITY OF SOMERVILLE		
35-A-17	0	HIGHLAND AVE		215	0.00	CITY OF SOMERVILLE		
42-B-15		CENTRE ST		463	0.01	CITY OF SOMERVILLE		
16-F-16	40	COLLEGE AVE		17,834	0.41	CITY OF SOMERVILLE		
55-B-9		TEN HILLS RD		315	0.01	CITY OF SOMERVILLE		
32-K-1	546	BROADWAY		188,217	4.32	CITY OF SOMERVILLE		
46-D-27	5	MEACHAM ST	Healy School	142,822	3.28	CITY OF SOMERVILLE	21	
46-D-8		MT VERNON AVE	Vacant (Healy School Rear	2,481	0.06	CITY OF SOMERVILLE	21	
20-B-1	45	COLLEGE AVE		6,772	0.16	CITY OF SOMERVILLE		
32-L-16	0	BROADWAY		23,527	0.54	CITY OF SOMERVILLE		
24-G-1	0	HIGHLAND AVE		9,077	0.21	CITY OF SOMERVILLE		
22-D-1	44	DAY ST		23,765	0.55	CITY OF SOMERVILLE		
25-A-1	0	HIGHLAND AVE		22,696	0.52	CITY OF SOMERVILLE		
42-B-16	112	CENTRAL ST		62,422	1.43	CITY OF SOMERVILLE		
78-D-10	59	OTIS ST		4,195	0.10	CITY OF SOMERVILLE		
47-H-20		BROADWAY		1,439	0.03	CITY OF SOMERVILLE		
25-A-25	7	GROVE ST		7,821	0.18	CITY OF SOMERVILLE		
71-C-2	266-268	BROADWAY		18,926	0.43	CITY OF SOMERVILLE		
49-F-15	0	CENTRAL ST		22,338	0.51	CITY OF SOMERVILLE		
29-E-1	0	SPENCER AVE		133	0.00	CITY OF SOMERVILLE		
34-E-11	265	HIGHLAND AVE		9,826	0.23	CITY OF SOMERVILLE		
34-D-8	0	ALBION ST		176	0.00	CITY OF SOMERVILLE		
34-C-34	0	ALBION ST		33,321	0.76	CITY OF SOMERVILLE		
71-B-10		WALNUT RD		89	0.00	CITY OF SOMERVILLE		
71-D-41	48	MARSHALL ST		11,173	0.26	CITY OF SOMERVILLE		
31-A-1	75	ELM ST		118,002	2.71	CITY OF SOMERVILLE		
89-L-2	24	CROSS ST E		7,681	0.18	CITY OF SOMERVILLE		
89-K-13	165	BROADWAY		9,008	0.21	CITY OF SOMERVILLE		
61-D-1B				12,433	0.29	CITY OF SOMERVILLE		
61-D-3		SKILTON AVE		791	0.02	CITY OF SOMERVILLE		
90-I-8	33	CROSS ST		44,331	1.02	CITY OF SOMERVILLE		
90-F-9	115	PEARL ST		204,854	4.70	CITY OF SOMERVILLE		
92-I-2		AUBURN AVE		188	0.00	CITY OF SOMERVILLE		
101-B-11	15	MYSTIC AVE	Assembly Square ROW	2,365	0.05	CITY OF SOMERVILLE	32	

Map-Block-Lot	Address Number	Street	Current Use	Parcel Size (SF/ac.)		OWNER	Catchment	Adjacent Catchment
101-B-9	11	MYSTIC AVE		5,733	0.13	CITY OF SOMERVILLE		
67-A-5	0	FELLSWAY		13,301	0.31	CITY OF SOMERVILLE		
99-A-16	0	GRAND UNION BLVD	Assembly Square ROW	52,832	1.21	CITY OF SOMERVILLE	32	
32-C-2	0	BROADWAY		14,362	0.33	CITY OF SOMERVILLE		
17-D-3	56A	HOLLAND ST		2,324	0.05	CITY OF SOMERVILLE		
17-F-3A	61	MEACHAM RD		5,004	0.11	CITY OF SOMERVILLE		
8-A-21	177-179	POWDER HOUSE BLVD	West Somerville School	53,080	1.22	CITY OF SOMERVILLE		8
61-D-15	98	WALNUT ST		14,764	0.34	CITY OF SOMERVILLE		
25-A-26	9	GROVE ST		2,928	0.07	CITY OF SOMERVILLE		
32-J-3	1	FRANEY RD		87,110	2.00	CITY OF SOMERVILLE		
61-G-2	350	MEDFORD ST		49,098	1.13	CITY OF SOMERVILLE		
48-D-11	115	SYCAMORE ST		27,470	0.63	CITY OF SOMERVILLE		
60-A-1	50	EVERGREEN AVE		10,541	0.24	CITY OF SOMERVILLE		
89-B-1	0	CROSS ST E		2,989	0.07	CITY OF SOMERVILLE		
89-K-15	15-25	CROSS ST E		16,730	0.38	CITY OF SOMERVILLE		
90-A-12		MCGRATH HWY		264	0.01	CITY OF SOMERVILLE		
101-C-3		MYSTIC AVE		11,453	0.26	CITY OF SOMERVILLE		
103-H-18		PERKINS ST		1,932	0.04	CITY OF SOMERVILLE		
87-C-1A	0	MIDDLESEX AVE		8,823	0.20	CITY OF SOMERVILLE		
19-F-1	838	BROADWAY	Nathan Tufts Park	197,502	4.53	CITY OF SOMERVILLE		31

APPENDIX F: MUNICIPAL RIGHTS-OF-WAY

Infiltration Trench/Catch Basin Retrofit



FACTS AT A GLANCE

TP Removal Efficiency

75-94%

Stormwater Infiltration Trenches consist of a stone/sand/soil reservoir to provide temporary storage and infiltration into native soils. This concept can be connected to a catch basin(s), known as a catch basin retrofit. These systems are widely recognized as a highly cost-effective retrofit option and are recommended in areas with high infiltrating soils.

Design Considerations

Site Conditions

- Identify existing catch basins to retrofit
- Avoid spanning across driveways in residential areas
- Conduct test pits to verify soil conditions

Design

- Depth from rim to invert no greater than 4'
- Max depth between 5'-6' recommended
- Minimum separation to groundwater >1'

Operations & Maintenance

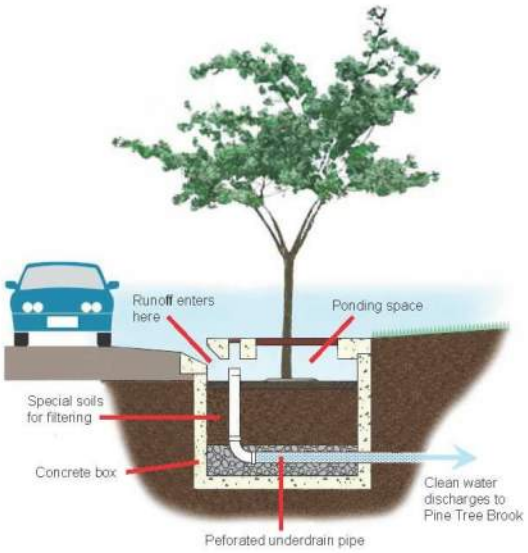
Frequency

- Inspection and maintenance twice a year, or after major rain event

Labor

- Removal of debris
- Jet-vac for sediment removal
- Jetting of cleanout (as needed)

Proprietary Devices - Biofiltration



FACTS AT A GLANCE

TP Removal Efficiency

Varies by manufacturer, up to 70%

Proprietary biofiltration practices (e.g. Tree Box Filters) consist of plants or trees housed in a compact subsurface precast concrete structure. Typically flow-through structures with limited infiltration, they require minimal surface footprint and can be retrofitted to existing catch basin structures.

Design Considerations

Site Conditions

- Smaller drainage areas (up to 0.5 acre for most systems)
- Typically line along curbs
- Can be constructed in areas without well-draining soils

Design

- 5'-6' vertical depth required
- No runoff reduction credit, therefore infiltration rates not considered in design
- Refer to manufacturer to provide guidance on system sizing

Operations & Maintenance

Frequency

- Twice a year inspection and maintenance

Labor

- Plant inspection and pruning
- Removal and replacement of mulch layer
- Jetting of cleanout

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