WaterVision, LLC

TECHNICAL MEMORANDUM

To: Newt Tedder and Suzanne Warner, USEPA, Region 1

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Subject: **Stormwater Program Cost Evaluation for Massachusetts**

Date: January 18, 2016

Cc: Mark Voorhees and Steve Winnett, USEPA, Region 1

Introduction

We have conducted an evaluation of costs associated with permit action items (PAIs) in the 2014 Municipal Separate Storm Sewer System (MS4) permit and the 2003 MS4 permit for Massachusetts in coordination with the EPA Region 1 staff. This memo and associated spreadsheets and supporting documentation provide a set of PAI cost estimates along with the underlying rationale and source information. The goal of this cost evaluation is to provide substantive information to further knowledge and understanding of stormwater management program costs that will be incurred by municipalities. In addition, the cost evaluation will provide a technical basis to support EPA Region 1's responses to public comments on the MS4 permits.

The Massachusetts MS4 cost evaluation was extensive with cost estimates obtained and documented for over 150 PAIs. PAI's may be represented as ten Minimum Measure categories and three impaired Waters categories, as follows:

Minimum Measures Categories

- Public Education
- Public Participation
- Good Housekeeping
- Notice of Intent (NOI)
- Stormwater Management Plans (SWMP)
- Illicit Discharge Detection and Elimination (IDDE)
- Construction Site Control
- Post Construction Site Control
- Annual Report
- Miscellaneous

Impaired Waters Categories

- Charles River Total Phosphorus (TP) TMDL
- Lake & Pond TP TMDLs
- Impaired Waters

Each municipality that is subject to the MS4 permit is different. EPA and WaterVision team staff sought to make the cost evaluation as useful as possible for estimating costs for each individual municipality. We agreed to create three municipality size categories, rural, suburban, and urban, to expand the utility of the cost evaluation. A set of specifications was established for each sized community that was applied to create three sets of PAI cost estimates. This approach was found to be appropriate for the Minimum Measure PAI types, but not for the Impaired Waters types. For PAIs in the impaired waters categories, watershed size and land use (urban, suburban, rural) was determined to be more appropriate scaling metrics than community size. Due to this difference in scaling metrics, Impaired Waters-related PAIs were compiled separately from the Minimum Measure PAIs in this cost evaluation. Lastly, the cost evaluation includes costs for items to be completed in the first five years of the permit cycle only, as directed by EPA staff.

This memo contains two sections, one with Minimum Measure cost estimates and the other with Impaired Waters-related cost estimates. In each section, the cost evaluation process is described and specific cost estimates are provided for the 2014 and 2003 MS4 permits. At the end of each section, a comparison of 2014 and 2003 MS4 permit costs is provided.

Minimum Measures Cost Estimates

The cost evaluation results are detail-oriented and are provided in a set of Excel spreadsheets and a supporting document. The reader is encouraged to review each spreadsheet while reading the guide provided below.

1. MA MS4 Overview of Costs – This spreadsheet provides a cost summary and is useful for obtaining an overview of costs (but not for reviewing cost details). Spreadsheet tabs include:

- **Total Cost Overview**: Provides a set of tables summarizing cost ranges for the Minimum Measure PAI categories and for each of the three community sizes (rural, suburban, and urban). Separate tables are provided for 2014 and 2003 PAIs (Tables 1 and 2).
- **Cost summary information of each of the PAI categories**: (e.g., public participation, public outreach, good housekeeping, and so on) Evaluated using community size metrics.

Table 1: Estimated costs and hours for the 2014 MA MS4 permit for rural, suburban, and urban communities.

2014		Rural				Suburban				Urban			
Minimum Control Measure		**Cost**		**Hours**		**Cost**		**Hours**		**Cost**		**Hours**	
		Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Public Education		$9,400	$70,800	94	700	$11,200	$73,800	112	730	$12,000	$74,800	120	740
Public Participation		$9,000	$17,000	80	150	$9,000	$17,000	80	150	$9,000	$17,000	80	150
Good Housekeeping	*rented trucks*	$78,600	$153,000	411	800	$278,000	$557,000	602	1190	$807,000	$1,630,000	1320	3160
	purchased trucks	--	--	--	--	$390,000	$852,000	602	1190	$512,000	$1,110,000	1320	3160
NOI		$5,000	$11,200	50	112	$5,000	$11,200	50	112	$5,000	$11,200	50	112
SWMP		$12,800	$20,400	128	204	$12,800	$20,400	128	204	$12,800	$20,400	128	204
IDDE		$35,500	$81,000	337	767	$86,900	$267,000	806	2510	$178,000	$587,000	1600	5470
Construction Site Control		$4,200	$21,600	32	96	$4,200	$21,600	32	96	$4,200	$21,600	32	96
Post Construction Site Control		$17,200	$34,400	142	284	$21,200	$38,400	182	324	$29,200	$46,400	262	404
Annual Report		$25,300	$51,600	213	436	$25,300	$51,600	213	436	$25,300	$51,600	213	436
Total	*rented trucks*	**$197,000**	**$461,000**	**1490**	**3550**	**$454,000**	**$1,060,000**	**2210**	**5750**	**$1,080,000**	**$2,460,000**	**3810**	**10800**
	purchased trucks	**--**	**--**	**--**	**--**	**$566,000**	**$1,350,000**	**2210**	**5750**	**$788,000**	**$1,940,000**	**3810**	**10800**

Table 2: Estimated costs and hours for the 2003 MA MS4 permit for rural, suburban, and urban communities.

2003		Rural				Suburban				Urban			
Minimum Control Measure		**Cost**		**Hours**		**Cost**		**Hours**		**Cost**		**Hours**	
		Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Public Education		$3,000	$40,500	30	400	$3,000	$40,500	30	400	$3,000	$40,500	6	80
Public Participation		$7,000	$14,000	60	120	$7,000	$14,000	60	120	$7,000	$14,000	60	120
Good Housekeeping	*rented trucks*	$6,550	$41,000	48	60	$26,000	$383,000	72	84	$70,000	$1,190,000	112	124
	purchased trucks	--	--	--	--	$307,000	$678,000	72	84	$311,000	$682,000	112	124
NOI		$3,600	$9,600	36	96	$3,600	$9,600	36	96	$3,600	$9,600	36	96
SWMP		$20,000	$30,000	200	300	$20,000	$30,000	200	300	$20,000	$30,000	200	300
IDDE		$13,000	$19,200	125	177	$37,500	$65,100	370	619	$74,500	$140,000	740	1330
Construction Site Control		$10,800	$35,200	88	312	$10,800	$35,200	88	312	$10,800	$35,200	88	312
Post Construction Site Control		$6,000	$12,000	40	80	$6,000	$12,000	40	80	$6,000	$12,000	40	80
Annual Report		$10,000	$12,500	100	125	$10,000	$12,500	100	125	$10,000	$12,500	100	125
Total	*rented trucks*	**$80,000**	**$214,000**	**727**	**1670**	**$124,000**	**$602,000**	**996**	**2140**	**$205,000**	**$1,480,000**	**1380**	**2570**
	purchased trucks	**--**	**--**	**--**	**--**	**$405,000**	**$897,000**	**996**	**2140**	**$446,000**	**$976,000**	**1380**	**2570**

2. MA 2014 MS4 and 2003 MS4 PAI Spreadsheets – These six spreadsheets include three Massachusetts 2014 MS4 permit PAI spreadsheets;

- **MA MS4 PAI - Urban Town 2014**
- **MA MS4 PAI – Suburban Town 2014**
- **MA MS4 PAI - Rural Town 2014**

and three 2003 MS4 permit PAI spreadsheets;

- **MA MS4 PAI - Urban Town 2003**
- **MA MS4 PAI – Suburban Town 2003**
- **MA MS4 PAI – Rural Town 2003**

All are in the same format. The first spreadsheet, **MA MS4 PAI - Urban Town 2014** includes the following information (in individual tabs) for the MA 2014 MS4 urban municipality.

- **Overview of Total Costs**: Provides a summary of the overall program costs and hours estimated to complete each PAI. These costs and hours are presented as a range of lowest to highest estimated costs.
- **Cost summary information of each of the PAI categories**: Provides detailed cost estimates for each of the Minimum Measures PAI, by category (i.e., one category per tab).
    - Each PAI is summarized in a row of the spreadsheet and includes type of action, time period, frequency, statement of requirements, scale factors, and other considerations.
    - Notes are provided for most entries.
    - At the top of each spreadsheet, the task specific multipliers (such as number of residents, consultant rate, etc.) specific to that PAI are provided as well as a summary of total costs and hours for that specific task.
- **MS4 Stats**: Provides the community size metrics for reference. These stats are linked to each individual spreadsheet as a task specific multiplier.
- **Cost Scaling Considerations**: Provides some preliminary scaling factors and potential applications
- **WQ Analysis Costs**: Provides water quality sampling analysis costs.

The other five PAI spreadsheets are in the same format as the *MA MS4 PAI - Urban Town 2014* spreadsheet.

3. MS4 Supporting Documentation – This is a Word document containing detailed cost estimate source documentation for each PAI and is organized by PAI category. This document provides the rationale and sources for each cost estimate. This is a relatively long document intended to provide a resource for practitioners seeking more in-depth information.

MA MS4 2003 and 2014 Comparison

Massachusetts 2003 and 2014 MS4 permit cost estimates were compiled and compared for the Minimum Measure PAI categories. Costs to implement the 2014 permit for these minimum control measures are generally higher than those to implement the 2003 permit. In general, the 2014 permit is much more detailed and contains more specific requirements for each Minimum Measure category. While the 2003 permit often required developing a program in general terms, the 2014 permit detailed specific program components. Cost estimates increased significantly for several categories including Good Housekeeping and IDDE. Public Participation and Annual Reporting costs were estimated to have remained constant from 2003 and 2014 and SWMP and Construction Site Control costs were reduced in 2014.

Total cost and hours comparison for the Minimum Measures PAIs for 2003 and 2014 are provided in Appendix A for all community sizes. The differences in costs are scalable by size and are available in the **Overview of Costs** spreadsheet described above. Further detail including PAI specific tables regarding the differences between 2003 and 2014 costs for each category are provided below and shown in Appendices B-J.

Public Education and Outreach (Appendix B)

The 2003 PAIs for public education and outreach did not specifically note the number of educational messages required throughout the permit term. The 2014 PAIs specify two separate messages for four separate audiences for a total of eight total messages. As there were fewer requirements in the 2003 permit, it was assumed that the cost for this task included fewer outreach messages and that these messages were conducted once during the permit term.

Public Participation (Appendix C)

The estimated costs for the PAIs covered by the public participation program for the 2003 and 2014 permits did not vary significantly because the requirements for the program were similar in each permit year.

Pollution Prevention and Good Housekeeping (Appendix D)

The 2003 PAIs for the pollution prevention and good housekeeping program do not specifically list detailed requirements for this portion of the permit, instead requiring only that a program should be developed to minimize pollutant runoff from municipal operations. The 2014 permit specifies exactly what is required in that program, including specific requirements for street sweeping, catch basin cleaning, operation and maintenance for municipal facilities and municipally-owned Best Management Practices, and the development of SWPPPs. As these requirements were not listed in the 2003 permit, it was assumed that some level of effort went towards catch basin cleaning, street sweeping, and operation and maintenance plans for municipal facilities, but that these efforts were not as extensive as those required under the 2014 permit.

Notice of Intent (Appendix E)

The PAIs for the 2003 and 2014 NOI program are similar, but the 2014 program has more detailed and stricter requirements to complete NOI forms, and subsequently, slightly increased costs. These

requirements include providing information on the status of mapping and bylaws completed under the 2003 permit, providing a summary of receiving waters that receive flow from the MS4, number of outfalls, impairment, pollutants causing impairment, and whether there is a TMDL.

SWMPs (Appendix F)

The PAIs for the 2003 and 2014 SWMP program are similar, but the 2014 program assumes that SWMPs have already been developed for many communities. As this is likely the case, costs for these PAIs in 2014 are slightly lower than the same PAIs for 2003 because much of the work in developing new plans has already been completed.

IDDE (Appendix G)

The 2003 PAIs for the IDDE program do not specifically list detailed requirements for this portion of the permit. The 2003 permit required only that a program should be developed to minimize pollutant runoff from municipal operations. The 2003 and 2014 permits both require the development, implementation, and enforcement of a program to detect illicit discharges, including developing a storm system map. The 2014 permit requires the implementation of additional PAIs to identify IDDEs, including:

- Specifically requiring inventorying of sanitary sewer overflows,
- Developing an outfall interconnection inventory,
- Developing a written IDDE program,
- Conducting extensive dry weather screening of all outfalls and wet weather screening of some outfalls, and
- Developing catchment investigation procedures.

Because the 2014 program is more detailed and has multiple additional PAIs, the cost is higher than estimated for the 2003 program.

Construction Site Control (Appendix H)

The PAIs for the 2003 and 2014 Construction Site Control program are similar in some aspects. However, some of the PAIs for the 2014 permit were assumed to have been completed by municipalities under the 2003 permit including ordinance development and procedures for site plan review. As these items were assumed complete, the overall costs for the 2014 program were estimated to be lower than the 2003 program.

The 2014 program includes intermittent costs for pre-construction peer reviews and construction site inspections. These intermittent costs were not included in the 2003 permit and result in an increase in intermittent costs for the 2014 permit (Appendix H).

Post-Construction Site Control (Appendix I)

The PAIs for the 2014 Post-Construction Site Control program are much more extensive than those for 2003 and include the following items not addressed in 2003:

- Assess street design and parking lot guidelines;

- LID regulations and guidelines;
- Directly connected impervious area; and
- Inventory and rank municipal properties.

These additional PAIs were not included in the 2003 permit and result in an increase in cost for the 2014 permit.

Annual Reporting (Appendix J)

The requirements for annual reporting for the 2014 permit are much more extensive than those for 2003 and include the following items not addressed in 2003 and result in an increase in cost for the 2014 permit.

Impaired Waters-Related Cost Estimates - Charles River Phosphorus TMDL, Lake and Pond TMDL's and Impaired Waters.

TMDL and impaired waters are subject to scaling factors associated with watersheds, rather than municipal boundaries. It was therefore appropriate to scale these types of PAI by area and land use, rather than municipality size. As a result, Impaired Waters PAI cost estimates were compiled separately from the minimum measures PAIs described above.

Cost estimates are provided below for PAI's under the Charles River TP TMDL, Lake and Pond TMDLs and Impaired Waters categories of the Massachusetts 2014 MS4 Permit. As directed by USEPA Region 1, this analysis does not include costs associated with installation of BMPs but rather only the costs related to the permit term of five years. In the last section below, we provide a comparison with costs from the 2003 MS4 permit.

Most of the watershed planning conducted to date in Region 1 has been related to phosphorus and nitrogen. General cost data associated with these planning efforts can be found through EPA grant tracking databases. However, detailed cost estimates by specific task cannot be readily found. Cost data related to planning for chloride and other pollutants are not generally available, but many of the tasks associated with these parameters are covered at least in part in other PAI's contained in the MS4 permit.

The 2014 MS4 permit for Massachusetts contains a large number of requirements that are analogous to the EPA requirements for a watershed plan (USEPA 2008). Specifically, a watershed plan requires nine elements for approval:

a. Identify causes and sources of pollution.
b. Estimate pollutant loading into the watershed and the expected load reductions.
c. Describe management measures that will achieve load reductions and targeted critical areas.
d. Estimate amounts of technical and financial assistance and the relevant authorities needed to implement the plan.
e. Develop an information/education component.
f. Develop a project schedule.
g. Describe the interim, measurable milestones.

h. Identify indicators to measure progress.

i. Develop a monitoring component.

These nine elements are analogous to many of the PAI tasks that must be as a part of three major categories of requirements under the MS4 permit for Massachusetts. These categories are the Charles River TMDL, Lake and Pond TMDLs and Impaired Waters Assessments for nitrogen and phosphorus. The relationship between specific PAI's and watershed management elements (a through i) are presented in the accompanying Excel spreadsheet, **MA Impaired Waters and TMDL MS4 Permit - 2014.**

Direct costs associated with compliance with the planning aspects of the MS4 permit are currently unavailable as the permit requirements have yet to be enforced or costs currently incurred by municipalities for many of these tasks are part of other programs and cannot be isolated. Due to the 319 grant system for watershed planning, there is a relatively robust set of cost estimates available for watershed planning projects throughout Region 1 however, there are insufficient data to provide a relationship between watershed size and planning costs for each of the three communities discussed elsewhere in this assessment namely, urban, suburban and rural. Specifically, there are no available data on large urban watershed planning projects that would allow estimation of decreasing unit costs with increasing watershed size. If data from urban, suburban and rural watersheds are pooled, a preliminary non-linear relationship between watershed size and per unit costs may be developed.

Planning costs are presented as gross cost estimates then elements covered by other PAIs in the MS4 permit are subtracted out leaving the net cost of compliance for the TMDLs and Impaired Waters Assessments. It should be noted that these other PAIs may not be completely analogous to the requirements for watershed planning. Additional effort may be required to adapt PAIs such as public education to include the TMDL or impaired waters content. Because, planning estimates presented elsewhere are municipality wide and estimates provided herein are watershed based, the corrections should be used with caution.

Methodology

Most costing information used to obtain estimates for TMDL and impaired waters categories was obtained from the USEPA Grants Reporting and Tracking System (GRTS) database (http://iaspub.epa.gov/apex/grts/f?p=110:87:0::NO). Queries of the projects conducted in Region 1 over the past 10 years yielded 15 watershed planning projects (Phase 1) funded by USEPA under Section 319 of the Clean Water Act that were suitable for this cost estimation evaluation. Table 3 provides watershed information, including names, sizes, plan costs, and costs per acre, for the 15 watershed plans included in this cost evaluation. Figure 1 provides a plot of watershed cost per acre vs. watershed size.

Projects were selected if cost information existed, the grant primarily covered planning activities, and basic watershed information was available. Data were obtained directly from the database and from supporting documents linked to the database. Watershed planning cost estimates included in this document are total project costs which include both grant amounts and local match. All of the projects accessed through GRTS provided management plans for phosphorus although the requirements for nitrogen based plans are nearly identical, so costs may be similar.

A nitrogen based plan was recently completed for Cape Cod (http://www.capecodcommission.org/index.php?id=491&maincatid=76). Relevant information on the

cost and scope of this plan were available and were added to the list of plans utilized. Impervious cover estimates for Cape Cod were obtained from Massachusetts Bays Program (2010). Where impervious cover estimates were readily available, they are included in the table. Although impervious cover estimates were not available for many of the rural watersheds, it is assumed that impervious cover in these watersheds is below 15% in all and below 10% in some.

Table 3: Watershed based plans used to estimate cost of compliance with MS4 watershed planning requirements

Watershed Plan	Year	Parameter	Watershed Size (acres)	Land Use	Total Budget (2015 $)	Cost/acre
Ossipee Lake/Danforth Bay (NH)	2013	Phosphorus	21,120	rural	$110,605.00	$5.24
Moultonborough Bay Inlet (NH)	2013	Phosphorus	31,556	rural	$84,468.00	$2.68
Lake Warren (NH)	2014/2015	Phosphorus	3,237	rural	$83,350.00	$25.75
Province Lake (NH)	2012	Phosphorus	8,400	rural	$165,304.00	$19.68
Thatcher Brook(ME)	2012	Phosphorus	4,525	rural	$123,499.00	$27.29
Lake Wentworth (NH)	2011	Phosphorus	22,591	rural	$122,721.00	$5.43
Waukewan/Winona (NH)	2011	Phosphorus	8,409	rural	$100,563.00	$11.96
Mirror Lake (NH)	2010	Phosphorus	1,460	rural	$133,068.00	$91.14
Granite Lake (NH)	2007	Phosphorus	2,729	rural	$95,615.00	$35.04
Black Brook (NH)	2009	Phosphorus	3,000	rural	$51,846.00	$17.28
Pearly Pond (NH)	2013	Phosphorus	2,128	suburban	$77,543.00	$36.44
Concord Gully Brook (ME)	2012	Phosphorus	600	suburban	$67,788.00	$112.98
Topsham Fair Mall (ME)	2012	Phosphorus	320	urban	$67,761.00	$211.75
McQuesten Brook (NH)	2011	Phosphorus	563	urban	$77,219.00	$137.16
Goodall Brook (ME)	2012	Phosphorus	384	urban	$86,296.00	$224.73
Cape Cod (MA)	2015	Nitrogen	216,960	suburban	$3,350,000.00	$15.44

Note: Costs adjusted to 2015 dollars using Consumer Price Index calculator accessed at (http://data.bls.gov/cgi-bin/cpicalc.pl)

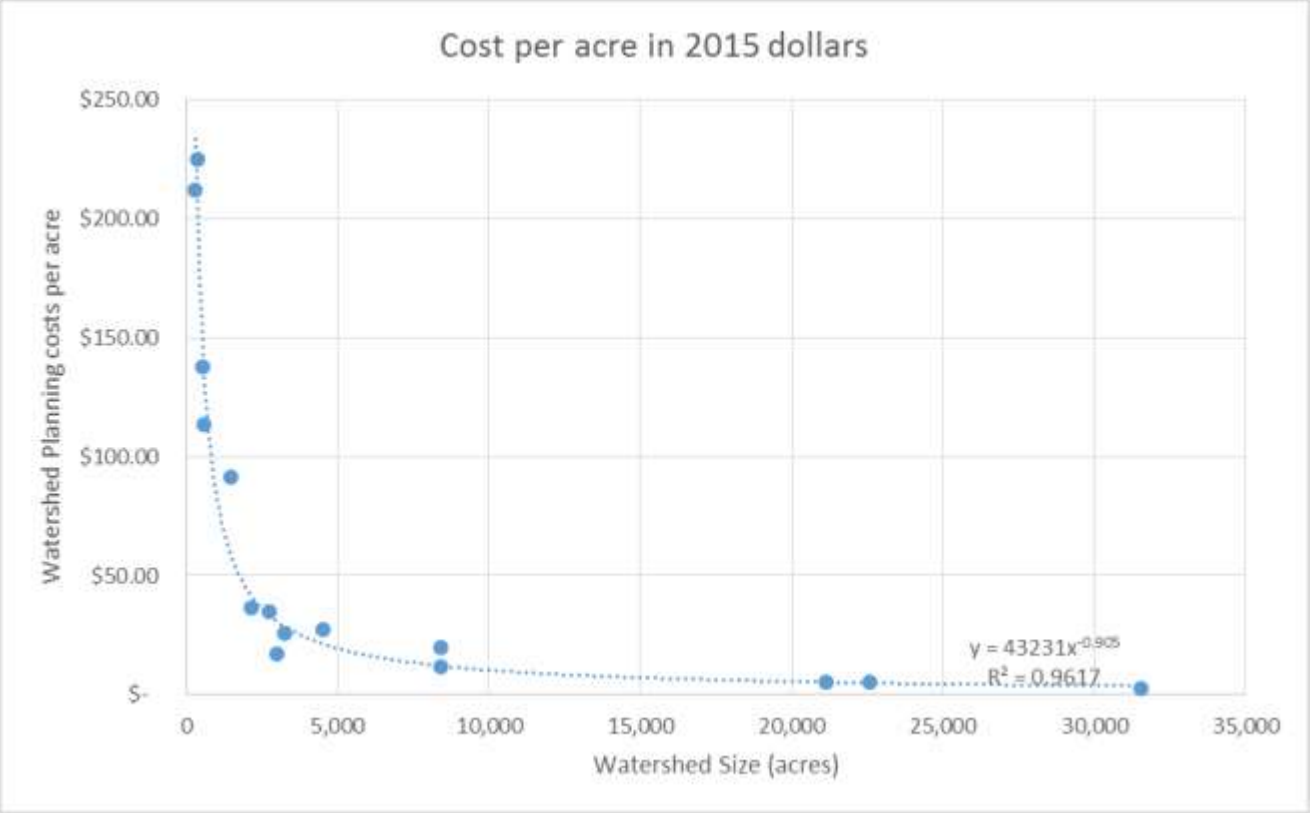

Figure 1: Cost per acre for watershed planning in EPA Region 1. Higher per unit costs are typically associated with the more urbanized watersheds. (Note that the Cape Cod Nitrogen Plan is not included due to its very large size relative to other watershed plans).

Planning costs based on median costs from completed studies

Based on the assessment of the projects listed in Table 3, gross costs in 2015 dollars associated with nutrient watershed assessments per acre are shown in Table 4. As discussed below, some TMDL and impaired water assessment tasks are covered, at least in part, by other PAIs included in the MS4 permit requirements.

Table 4: Range of unit costs for nutrient-focused watershed-based plans for rural, rural/urban, and urban watersheds

Predominant Land Use	Unit Cost Range (per acre)		
	Low	*High*	*Median*
Rural	$5	$91	$18
Suburban	$15	$113	$36
Urban	$137	$224	$212

It is anticipated that the watersheds of impaired waters will typically contain a mix of urban, suburban and rural characteristics. Therefore, the most accurate way to estimate assessment costs will likely be to use a weighted approach by multiplying the acreage of each use category in the impaired watershed and the per acre cost for each land use category. This approach may be readily conducted using existing spatial land use data.

Based on the range of watershed sizes provided in Table 3, example costs for watershed-based plan were developed. These example costs assumed various land uses using the median unit costs presented in Table 4 and are provided in Table 5. These costs are rough estimates, as most watersheds and towns would have a mix of urban, suburban, and rural characteristics. In addition, multiple watershed plans for various size watersheds may need to be developed for the same municipality, resulting in increased costs. The intent of this cost evaluation is to provide the cost estimation tools for practitioners to use to estimate costs for specific watersheds and municipalities. The confidence in predictions generated with this approach would be greatly increased if additional watershed planning cost estimates were added to the dataset, particularly in watersheds with urban and suburban characteristics.

Table 5: Range of costs for nutrient-focused watershed-based plans for rural, suburban, and urban watersheds of various sizes based on median costs

Watershed Size	Watershed Area (acres)	Cost Range (based on median costs)		
		Rural	*Rural/Urban*	*Urban*
		$18/acre	$36/acre	$212/acre
Small	600	$10,800	$21,600	$127,200
Medium	2,000	$36,000	$72,000	$424,000
Large	6,000	$108,000	$216,000	$1,272,000

Planning costs based on regression

An alternative to the use of the median to estimate costs associated with watershed management is the use of the power equation presented in Figure 1. This Equation is:

$$\text{Cost/Acre} = 43{,}231 * (\text{watershed size (acres)})^{-0.905)}$$

$$(R^2 = 0.96)$$

Because all watersheds are pooled regardless of the level of urbanization, the confidence in the predictions generated by the power equation may be improved over the median approach. However, because the data are pooled, there is no ability to discriminate between urban, suburban and rural watersheds with this approach. A range of costs based on this approach is presented in Table 6. As with the median value

approach, the addition of watershed plans to the database may allow separate regressions to be developed for urban, suburban and rural watersheds.

Table 6: Range of costs for nutrient-focused watershed-based plans based on watershed size.

Watershed Size	Watershed Area (acres)	Cost Range (cost/acre-based on power equation)	Cost (2015 dollars)
Small	600	$132	$79,200
Medium	2000	$45	$90,000
Large	6000	$16	$96,000

Correction for PAIs covered by other MS4 permit requirements

There are a number of watershed planning activities that will be covered, in part by other PAIs. As a result, the watershed planning cost estimates described above can be reduced by the amount of these redundant activities when calculating a whole cost for compliance with the MS4 permit. Because these other PAIs may not completely fulfill the requirements of a watershed plan (for example, impaired or TMDL watershed specific materials may need to be generated and presented to the public), only the minimum estimates for these PAIs were used in Table 7 below. Because the costs below are for an entire municipality, they must be scaled based on the percentage of the municipality that is in an affected watershed prior to being subtracted from the watershed planning cost estimates. This scaling factor will be different for each affected watershed in each town. In its simplest form, the scaling factor could be the watershed planning area/municipality area. This number is than multiplied by the cost estimates in Table 7 and the result is subtracted from the watershed planning estimates calculated above using per/acre estimates multiplied by watershed size.

Table 7: Minimum PAI cost estimates from other MS4 requirements that can be used to fulfill watershed planning requirements. A portion of these costs can be deducted from either the costs estimated using the median values or the power equation based on the percentage of the municipality in affected watersheds. The mean values should be used if reducing the power equation estimates.

PAI	Urban	Suburban	Rural	Mean
Public Education	$12,000	$11,200	$9,400	$10,867
Public Participation	$9,000	$9,000	$9,000	$9,000
Stormwater Management Planning	$12,800	$12,800	$12,800	$12,800
Impervious Cover Ordinance (if applicable to watershed)	$4,200	$4,200	$4,200	$4,200
Total (not including IC Ordinance)	$33,800	$33,000	$31,200	$32,667

Impaired Waters

The PAI's required for impaired waters over the first five years are directly analogous to watershed planning elements for waters impaired for excess phosphorus and nitrogen. Therefore, compliance estimates can be made directly using per acre estimates developed above.

PAIs that would be covered under nitrogen and phosphorus-focused watershed plans include:

- PAIs in Discharges to Nitrogen Impaired Waters
    - Enhanced BMPs
    - Develop a Nitrogen Source Identification Report
    - Potential Structural BMPs (excluding design and installation of one structural BMP)
- PAIs in Discharges to Phosphorus Impaired Waters
    - Enhanced BMPs
    - Develop a Phosphorus Source Identification Report
    - Potential Structural BMPs (excluding design and installation of one structural BMP)

PAIs that would be covered in other minimum control measures of the permit include:

- Discharges to Bacteria/Pathogen Impaired Waters
- Discharges to Chloride Impaired Waters (excluding the development of Salt Reduction Plans for private facilities))
- Discharges to Solids, Oil, and Grease Impaired Waters

Charles River Phosphorus and Lake and Pond TP TMDLs

The PAI's required for the Charles River TMDL over the first five years are directly analogous to watershed planning elements (Appendix A). Therefore, compliance estimates can be made directly using per acre estimates developed above either through the median value or the power equation approach. Specific cost estimates are dependent on watershed areas covered.

Lake and Pond TMDLs

The PAI's required for the Lake and Pond TMDLs over the first five years are directly analogous to watershed planning elements (Appendix K). Therefore, compliance estimates can be made directly using per acre estimates developed above either through the median value or the power equation approach. Specific cost estimates are dependent on watershed areas covered.

Comparison with 2003 MS4 Permit Requirements

The 2003 MS4 requirements relative to impaired waters were compiled in the accompanying Excel spreadsheet, **MA Impaired Waters and TMDL – 2003**. These requirements have been evaluated and compared to the current draft MS4 permit requirements. The 2003 MS4 permit requirements contained no explicit requirements for lake and pond TMDLs or for the Charles River TMDL, as required in the 2014 permit. However, both of these categories of requirements were implicitly covered by the general requirements for TMDL impaired waters. The general requirements of the 2003 permit would encompass many of the same tasks as the more detailed 2014 permit. However, the scant guidance associated with the 2003 permit likely resulted in a wide disparity among municipalities in what was completed relative to TMDLs and impaired waters. Some municipalities may have most of the requirements under the 2014 permit already completed, while others may still need to fulfill all of the requirements.

Assumptions and Limitations of Analysis

The analysis of costs associated with watershed planning activities in watersheds covered by a TMDL or listed as impaired without a TMDL was based on the similarity between the MS4 planning activities and the requirements of a watershed-based plan under Section 319 of the Clean Water Act. However, there are assumptions and limitations related to this assessment, including:

- The development of costs estimates for watershed planning tasks is limited by the amount of data from planning studies that are currently available. In particular, watershed planning cost estimates from large urban and suburban watersheds are not readily available.
- Tasks required under watershed planning may not be identical to tasks required in the MS4 permit in scope or detail.
- There are many planning tasks related to TMDLs and Impaired Waters under the MS4 that may be satisfied in part or wholly by other PAIs.
- Not all tasks will require the same level of effort in each watershed. For example, one watershed may have substantial portions of a pollutant control plan completed prior to issuance of the MS4 permit either through past watershed planning efforts or as the result of related programs. Having elements completed would result in lower planning costs under the MS4. For example communities on Cape Cod would likely have many PAIs satisfied by the watershed plan for nitrogen just completed by the Cape Cod Commission.
- Some watershed planning efforts included in the review above include additional tasks that are related to but not necessarily planning tasks. These include items like preliminary design of BMPs. Care was taken to select reference watershed management projects that included a minimum of non-planning tasks.
- Watershed planning costs are presented in this document on a per acre basis in 2015 dollars. Incremental planning costs decrease as the watershed gets larger. A plot of unit costs versus size of watershed is presented above (Figure 1) for illustration. Results are not be linear with increasing size of watershed, particularly as watersheds get very large. It is worth noting that all of the urban watersheds are clustered on one side of the plot and exhibit the highest unit costs. The remainder

of the projects are either rural or suburban, have lower unit planning costs and likely have much lower percentages of impervious cover.

- Regional watershed plans may have enough specificity to be used for compliance with MS4 permit compliance requirements for individual stream or pond segments.
- Completed TMDLs may already contain much of the information required for the draft MS4 permit.
- Because some of the elements required as a part of the 2014 draft MS4 permit may already be completed as a part of other PAIs, 2003 MS4 permit requirements and other related programs, the watershed planning costs presented may be overestimates of the actual cost of compliance by affected municipalities.

References

Massachusetts Bays Program. 2010. *State of the Bays.* Boston, Massachusetts.

USEPA. 2008. *Handbook for Developing Watershed Plans to Restore and Protect Our Waters.* EPA 841-B-08-002. U.S. Environmental Protection Agency. Office of Water, Nonpoint Source Control Branch. Washington, D.C.

Appendix A: Estimated costs and hours for the 2003 and 2014 MA MS4 permit for rural, suburban, and urban communities.

Rural		**2003**				**2014**			
Minimum Control Measure		**Cost**		**Hours**		**Cost**		**Hours**	
		Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Public Education		$3,000	$40,500	30	400	$9,400	$70,800	94	700
Public Participation		$7,000	$14,000	60	120	$9,000	$17,000	80	150
Good Housekeeping	*rented trucks*	$6,550	$41,000	48	60	$78,600	$153,000	411	800
	purchased trucks	--	--	--	--	--	--	--	--
NOI		$3,600	$9,600	36	96	$5,000	$11,200	50	112
SWMP		$20,000	$30,000	200	300	$12,800	$20,400	128	204
IDDE		$13,000	$19,200	125	177	$35,500	$81,000	337	767
Construction Site Control		$10,800	$35,200	88	312	$4,200	$21,600	32	96
Post Construction Site Control		$6,000	$12,000	40	80	$17,200	$34,400	142	284
Annual Report		$10,000	$12,500	100	125	$25,300	$51,600	213	436
Total	*rented trucks*	**$80,000**	**$214,000**	**727**	**1670**	**$197,000**	**$461,000**	**1490**	**3550**
	purchased trucks	--	--	--	--	--	--	--	--

Suburban		2003				2014			
Minimum Control Measure		**Cost**		**Hours**		**Cost**		**Hours**	
		Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Public Education		$3,000	$40,500	30	400	$11,200	$73,800	112	730
Public Participation		$7,000	$14,000	60	120	$9,000	$17,000	80	150
Good Housekeeping	*rented trucks*	$26,000	$383,000	72	84	$278,000	$557,000	602	1190
	purchased trucks	$307,000	$678,000	72	84	$390,000	$852,000	602	1190
NOI		$3,600	$9,600	36	96	$5,000	$11,200	50	112
SWMP		$20,000	$30,000	200	300	$12,800	$20,400	128	204
IDDE		$37,500	$65,100	370	619	$86,900	$267,000	806	2510
Construction Site Control		$10,800	$35,200	88	312	$4,200	$21,600	32	96
Post Construction Site Control		$6,000	$12,000	40	80	$21,200	$38,400	182	324
Annual Report		$10,000	$12,500	100	125	$25,300	$51,600	213	436
Total	*rented trucks*	**$124,000**	**$602,000**	**996**	**2140**	**$454,000**	**$1,060,000**	**2210**	**5750**
	purchased trucks	**$405,000**	**$897,000**	**996**	**2140**	**$566,000**	**$1,350,000**	**2210**	**5750**

Urban		2003				2014			
Minimum Control Measure		**Cost**		**Hours**		**Cost**		**Hours**	
		Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Public Education		$3,000	$40,500	6	80	$12,000	$74,800	120	740
Public Participation		$7,000	$14,000	60	120	$9,000	$17,000	80	150
Good Housekeeping	*rented trucks*	$70,000	$1,190,000	112	124	$807,000	$1,630,000	1320	3160
	purchased trucks	$311,000	$682,000	112	124	$512,000	$1,110,000	1320	3160
NOI		$3,600	$9,600	36	96	$5,000	$11,200	50	112
SWMP		$20,000	$30,000	200	300	$12,800	$20,400	128	204
IDDE		$74,500	$140,000	740	1330	$178,000	$587,000	1600	5470
Construction Site Control		$10,800	$35,200	88	312	$4,200	$21,600	32	96
Post Construction Site Control		$6,000	$12,000	40	80	$29,200	$46,400	262	404
Annual Report		$10,000	$12,500	100	125	$25,300	$51,600	213	436
Total	*rented trucks*	**$205,000**	**$1,480,000**	**1380**	**2570**	**$1,080,000**	**$2,460,000**	**3810**	**10800**
	purchased trucks	**$446,000**	**$976,000**	**1380**	**2570**	**$788,000**	**$1,940,000**	**3810**	**10800**

Appendix B: Estimated costs and hours for the 2003 and 2014 MA MS4 permit for rural, suburban, and urban communities for the Public Education PAIs (total costs do not include intermittent costs).

Estimated Costs for a Rural Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$600	$8,100	6	80	$1,200	$8,900	12	88
Estimated One-Time Costs	$0	$0	0	0	$1,600	$2,000	16	20
Estimated Intermittent Costs	$0	$0	0	0	$0	$0	0	0
Total Cost for Permit Term (5 years)*	**$3,000**	**$40,500**	**30**	**400**	**$9,400**	**$70,800**	**94**	**700**

Estimated Costs for a Suburban Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$600	$8,100	6	80	$1,400	$9,300	14	92
Estimated One-Time Costs	$0	$0	0	0	$2,400	$3,000	24	30
Estimated Intermittent Costs	$0	$0	0	0	$0	$0	0	0
Total Cost for Permit Term (5 years)*	**$3,000**	**$40,500**	**30**	**400**	**$11,200**	**$73,800**	**112**	**730**

Estimated Costs for an Urban Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$600	$8,100	6	80	$1,400	$9,300	14	92
Estimated One-Time Costs	$0	$0	0	0	$3,200	$4,000	32	40
Estimated Intermittent Costs	$0	$0	0	0	$0	$0	0	0
Total Cost for Permit Term (5 years)*	**$3,000**	**$40,500**	**30**	**400**	**$12,000**	**$74,800**	**120**	**740**

Appendix C: Estimated costs and hours for the 2003 and 2014 MA MS4 permit for all communities for the Public Participation PAIs (total costs do not include intermittent costs).

Estimated Costs for all Communities	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$1,400	$2,800	12	24	$1,800	$3,400	16	30
Estimated One-Time Costs	$0	$0	0	0	$0	$0	0	0
Estimated Intermittent Costs	$0	$0	0	0	$0	$0	0	0
Total Cost for Permit Term (5 years)*	**$7,000**	**$14,000**	**60**	**120**	**$9,000**	**$17,000**	**80**	**150**

Appendix D: Estimated costs and hours for the 2003 and 2014 MA MS4 permit for rural, suburban, and urban communities for the Good Housekeeping PAIs (total costs do not include intermittent costs).

Estimated Costs for a Rural Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$350	$7,000	0	0	$11,800	$24,300	63	128
Estimated One-Time Costs	$4,800	$6,000	48	60	$19,600	$29,000	96	160
Estimated Intermittent Costs	$0	$0	0	0	$0	$6,500	0	65
Total Cost for Permit Term (5 years)*	**$6,550**	**$41,000**	**48**	**60**	**$78,600**	**$153,000**	**411**	**800**

Estimated Costs for a Suburban Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost (rented truck)	$3,750	$75,000	0	0	$49,900	$102,000	94	198
Estimated Annual Cost (purchased truck)	$10,000	$20,000	0	0	$22,400	$47,700	94	198
Estimated One-Time Costs (rented truck)	$7,200	$8,400	72	84	$28,200	$43,400	132	184
Estimated One-Time Costs (rented truck)	$257,000	$578,000	72	84	$278,000	$613,000	132	184
Estimated Intermittent Costs	$0	$0	0	0	$0	$24,000	0	240
Total Cost for Permit Term (5 years) (rented truck)*	**$26,000**	**$383,000**	**$72**	**$84**	**$278,000**	**$557,000**	**602**	**1190**
Total Cost for Permit Term (5 years) (purchased truck)*	**$307,000**	**$678,000**	**$72**	**$84**	**$390,000**	**$852,000**	**602**	**1190**

Estimated Costs for an Urban Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost (rented truck)	$11,800	$235,000	0	0	$150,000	$311,000	228	582
Estimated Annual Cost (purchased truck)	$10,000	$20,000	0	0	$40,800	$93,600	228	582
Estimated One-Time Costs (rented truck)	$11,200	$12,400	112	124	$58,400	$72,800	184	248
Estimated One-Time Costs (rented truck)	$261,000	$582,000	112	124	$308,000	$643,000	184	228
Estimated Intermittent Costs	$0	$0	0	0	$0	$54,000	0	540
Total Cost for Permit Term (5 years) (rented truck)*	**$70,000**	**$1,190,000**	**112**	**124**	**$807,000**	**$1,630,000**	**1320**	**3160**
Total Cost for Permit Term (5 years) (purchased truck)*	**$311,000**	**$682,000**	**112**	**124**	**$512,000**	**$1,110,000**	**1320**	**3160**

Appendix E: Estimated costs and hours for the 2003 and 2014 MA MS4 permit for all communities for the NOI PAIs (total costs do not include intermittent costs).

Estimated Costs for all Communities	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$0	$0	0	0	$0	$0	0	0
Estimated One-Time Costs	$3,600	$9,600	36	96	$5,000	$11,200	50	112
Estimated Intermittent Costs	$0	$0	0	0	$0	$1,600	0	16
Total Cost for Permit Term (5 years)*	**$3,600**	**$9,600**	**36**	**96**	**$5,000**	**$11,200**	**50**	**112**

Appendix F: Estimated costs and hours for the 2003 and 2014 MA MS4 permit for all communities for the SWMP PAIs (total costs do not include intermittent costs).

Estimated Costs for all Communities	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$0	$0	0	0	$0	$0	0	0
Estimated One-Time Costs	$20,000	$30,000	200	300	$12,800	$20,400	128	204
Estimated Intermittent Costs	$0	$0	0	0	$0	$0	0	0
Total Cost for Permit Term (5 years)*	**$20,000**	**$30,000**	**200**	**300**	**$12,800**	**$20,400**	**128**	**204**

Appendix G: Estimated costs and hours for the 2003 and 2014 MA MS4 permit for rural, suburban, and urban communities for the IDDE PAIs (total costs do not include intermittent costs).

Estimated Costs for a Rural Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$0	$0	0	0	$3,700	$8,100	36	76
Estimated One-Time Costs	$13,000	$19,200	125	177	$23,400	$50,100	157	387
Estimated Intermittent Costs	$0	$0	0	0	$0	$33,700	0	320
Total Cost for Permit Term (5 years)*	**$13,000**	**$19,200**	**125**	**177**	**$35,500**	**$81,000**	**337**	**767**

Estimated Costs for a Suburban Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$0	$0	0	0	$4,500	$10,500	44	100
Estimated One-Time Costs	$37,500	$65,100	370	619	$74,000	$230,000	586	2010
Estimated Intermittent Costs	$0	$0	0	0	$0	$87,100	0	820
Total Cost for Permit Term (5 years)*	**$37,500**	**$65,100**	**370**	**619**	**$86,900**	**$267,000**	**806**	**2510**

Estimated Costs for an Urban Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$0	$0	0	0	$6,100	$14,100	60	136
Estimated One-Time Costs	$74,500	$140,000	740	1330	$164,000	$541,000	1300	4790
Estimated Intermittent Costs	$0	$0	0	0	$0	$162,000	0	1520
Total Cost for Permit Term (5 years)*	**$74,500**	**$140,000**	**740**	**1330**	**$178,000**	**$587,000**	**1600**	**5470**

Appendix H: Estimated costs and hours for the 2003 and 2014 MA MS4 permit for rural, suburban, and urban communities for the Construction Site Control PAIs (total costs do not include intermittent costs).

Estimated Costs for a Rural Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$0	$0	0	0	$0	$0	0	0
Estimated One-Time Costs	$10,800	$35,200	88	312	$4,200	$21,600	32	96
Estimated Intermittent Costs	$0	$0	0	0	$14,000	$72,000	140	720
Total Cost for Permit Term (5 years)*	**$10,800**	**$35,200**	**88**	**312**	**$4,200**	**$21,600**	**32**	**96**

Estimated Costs for a Suburban Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$0	$0	0	0	$0	$0	0	0
Estimated One-Time Costs	$10,800	$35,200	88	312	$4,200	$21,600	32	96
Estimated Intermittent Costs	$0	$0	0	0	$42,000	$120,000	420	1200
Total Cost for Permit Term (5 years)*	**$10,800**	**$35,200**	**88**	**312**	**$4,200**	**$21,600**	**32**	**96**

Estimated Costs for an Urban Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$0	$0	0	0	$0	$0	0	0
Estimated One-Time Costs	$10,800	$35,200	88	312	$4,200	$21,600	32	96
Estimated Intermittent Costs	$0	$0	0	0	$70,000	$240,000	700	2400
Total Cost for Permit Term (5 years)*	**$10,800**	**$35,200**	**88**	**312**	**$4,200**	**$21,600**	**32**	**96**

Appendix I: Estimated costs and hours for the 2003 and 2014 MA MS4 permit for rural, suburban, and urban communities for the Post-Construction Site Control PAIs (total costs do not include intermittent costs).

Estimated Costs for a Rural Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$0	$0	0	0	$0	$0	0	0
Estimated One-Time Costs	$6,000	$12,000	40	80	$17,200	$34,400	142	284
Estimated Intermittent Costs	$0	$0	0	0	$0	$0	0	0
Total Cost for Permit Term (5 years)*	**$6,000**	**$12,000**	**40**	**80**	**$17,200**	**$34,400**	**142**	**284**

Estimated Costs for a Suburban Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$0	$0	0	0	$0	$0	0	0
Estimated One-Time Costs	$6,000	$12,000	40	80	$21,200	$38,400	182	324
Estimated Intermittent Costs	$0	$0	0	0	$0	$0	0	0
Total Cost for Permit Term (5 years)*	**$6,000**	**$12,000**	**40**	**80**	**$21,200**	**$38,400**	**182**	**324**

Estimated Costs for an Urban Community	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$0	$0	0	0	$0	$0	0	0
Estimated One-Time Costs	$6,000	$12,000	40	80	$29,200	$46,400	262	404
Estimated Intermittent Costs	$0	$0	0	0	$0	$0	0	0
Total Cost for Permit Term (5 years)*	**$6,000**	**$12,000**	**40**	**80**	**$29,200**	**$46,400**	**262**	**404**

Appendix J: Estimated costs and hours for the 2003 and 2014 MA MS4 permit for all communities for the Annual Reporting PAIs (total costs do not include intermittent costs).

Estimated Costs for all Communities	2003				2014			
	Cost		Hours		Cost		Hours	
	Low	*High*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Estimated Annual Cost	$2,000	$2,500	20	25	$5,060	$10,300	43	87
Estimated One-Time Costs	$0	$0	0	0	$0	$0	0	0
Estimated Intermittent Costs	$0	$0	0	0	$0	$0	0	0
Total Cost for Permit Term (5 years)*	**$10,000**	**$12,500**	**100**	**125**	**$25,300**	**$51,600**	**213**	**436**

Appendix K: Relationship of MS4 planning requirements for the Charles River TMDL to USEPA Watershed Management Planning elements a-i.

Miscellaneous Water Quality Limited Waterbodies Requirements	MS4 Reference	EPA Watershed Plan Element a-
Develop a Phosphorus Control Plan (PCP) designed to reduce the amount of phosphorus in stormwater discharges.	Appendix F, A.I.1	
Phase 1 - Develop a written Phase 1 plan of the PCP.	Appendix F, A.I.1.a	
Legal analysis - Identify required changes to regulatory mechanisms to effectively implement the PCP. Adopt regulatory changes.	Appendix F, A.I.1.a.3	c
Funding source assessment - Describe known and anticipated funding mechanisms that will be used to fund PCP implementation. Describe steps to implement funding plan.	Appendix F, A.I.1.a.3	d
Calculate Phosphorus loads and reductions - Identify PCP area (e.g., entire drainage area to Charles River or only that area in MS4). Calculate baseline Phosphorus Load, Phosphorus Reduction Requirement and Allowable Phosphorus Loads from Tables F-2 or F-2 in permit. Option to update land uses and submit to EPA in Year 4 annual report for new baseline values.	Appendix F, A.I.1.a.3	b
Describe non-structural stormwater control measures to be used and associated phosphorus reductions (Use Attachment 2 to Appendix F for reductions).	Appendix F, A.I.1.a.3	e
Develop priority ranking of areas and infrastructure within the municipality for potential implementation of structural phosphorus controls during Phase 1. Coordinate with Good housekeeping municipal prioritization. Identify existing structural measures that can also be counted towards phosphorus reduction (should be those implemented after 2005 since that is basis for loads).	Appendix F, A.I.1.a.3	c
Estimate annual phosphorus reductions expected to result from existing and proposed structural measures consistent with Attachment 3 to Appendix F.	Appendix F, A.I.1.a.3	c
Describe O&M program for all structural BMPs being claimed for phosphorus reduction credit.	Appendix F, A.I.1.a.3	c
Develop schedule for implementation of all structural and non-structural BMPs. Include obtaining funding, training, purchasing, construction, inspections, monitoring, O&M, etc.	Appendix F, A.I.1.a.3	f
Implement all non-structural BMPs.	Appendix F, A.I.1.a.3	e
Structural BMPs shall be designed and constructed to ensure compliance with 8 year (80% allowable export) phosphorus load milestone.	Appendix F, A.I.1.a.3	c
Structural BMPs shall be designed and constructed to ensure compliance with 10 year (75% allowable export) phosphorus load milestone.	Appendix F, A.I.1.a.3	c
Estimate the cost of implementing the Phase 1 controls and associated O&M Program.	Appendix F, A.I.1.a.3	d
Complete written Phase 1 Plan and make available to public for public comment. EPA encourages posting online.	Appendix F, A.I.1.a.3	a-i
Evaluate the effectiveness of the PCP by tracking phosphorus reductions achieved through BMPs and increases resulting from development and include in annual report. Include non-structural & structural controls implemented, reductions, increases in load due to development, estimated yearly phosphorus export rate, certification that all structural BMPs are being inspected and maintained according to O&M.	Appendix F, A.I.1.a.3	i