

Comprehensive Cost Analysis of the 2014 Massachusetts MS4 Permit

An Interactive Qualifying Project Report

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Abstract

Stormwater runoff is one of the leading causes of water pollution in the United States. The MS4 permit reduces pollution by regulating the runoff of pollutants into stormwater drains. With the assistance of the MassDEP and the Worcester Community Project Center, we sought to provide the Massachusetts towns of Southbridge, Holden, and Millbury with a cost analysis for implementation of the 2014 draft MS4 permit. In order to achieve this goal, we learned the details of the 2003 permit and 2014 draft permit, interviewed town officials, and performed water quality sampling. After creating our cost analysis, we provided our subject towns with findings and recommendations assessing the feasibility of implementing the permit, and suggestions for best practices each town uses to manage stormwater.

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Additionally, we would like to thank Robert Lowell and Larry Pistrang from the Department of Conservation and Recreation (DCR) for allowing us to interview them and gain from their experience. We would also like to thank Kelley Freda from the DCR, for contributing a detailed cost estimation.

We would also like to thank the Central Massachusetts Regional Stormwater Coalition, in particular Aubrey Strause and Matthew St. Pierre for giving us data, answering our questions, and allowing us to attend steering committee meetings.

Finally, we would like to thank our advisors Corey Dehner and Anne Ogilvie for their ongoing support and dedication to the success of our projects. Thank you for pushing us to

perform to the best of our ability no matter what happened during the term. We would also like to thank you for the various donuts, pizzas, and coffee to keep us going along the way.

Executive Summary

Background

Water Pollution affects an enormous number of water bodies in the United States. "In 2006, there were over 15,000 beach closings or swimming advisories issued due to bacterial levels exceeding health and safety standards" (Council, 2008). Much of this pollution is due to stormwater runoff. Stormwater runoff occurs when water becomes displaced by weather and flows over impervious surfaces, such as roads and roofs. When stormwater flows over these surfaces, it often collects pollutants such as oils, nutrients, ammonia, sediments, and heavy metals (EPA, 2012). These pollutants can have environmental, aesthetic, and economic ramifications on surface bodies of water. In order to combat stormwater runoff, the United States Environmental Protection Agency (USEPA) has created a system to move stormwater runoff into nearby bodies of water through what is known as Municipal Separate Storm Sewer Systems (MS4). Unfortunately, while these systems are useful for draining stormwater runoff, they are also very effective at directing pollutants into water bodies.

Before 1972, stormwater runoff and sewage drained through the same pipe, which led to frequent overflows (Robert B. Stegmaier, 1942). These overflows led to the pollution of topsoil, and the need for a better solution became apparent. This situation led to the creation of the Clean Water Act (CWA) in 1972 (Andreen, 2003a). In 1990, the USEPA first released the MS4 permit as part of the CWA. The MS4 permit allows municipalities to regulate the discharge of pollutants into stormwater drains. The MS4 permit defines six minimum control measures to reduce pollution caused by stormwater runoff. These control measures are:

- 1) Public Education
- 2) Public Involvement and Participation
- 3) Illicit Discharge Detection and Elimination (IDDE)
- 4) Construction Site Runoff Control

- 5) Post-Construction Runoff Control
- 6) Pollution Prevention and Good Housekeeping

Municipalities fulfill these control measures with Best Management Practices (BMPs). These BMPs can include street sweeping, waste collection, and outfall sampling. The implementation of these BMPs cost municipalities money. Massachusetts has been regulated under the same MS4 permit since 2003. Even though this permit expired in 2008, the USEPA continued to administer it indefinitely until they were able to release a new permit. On September 30, 2014, the USEPA released the 2014 draft MS4 permit. This new draft permit is much more detailed than the 2003 permit and has much more stringent regulations. Due to this increased level of regulation, the 2014 draft MS4 permit will cost much more to implement than the 2003 MS4 permit.

The Massachusetts Department of Environmental Protection (MassDEP), in collaboration with Worcester Polytechnic Institute (WPI), developed this project in order to assess the cost of implementing the 2014 draft MS4 permit in three Massachusetts towns: Southbridge, Holden, and Millbury. Our subject towns are part of the Central Massachusetts Regional Stormwater Coalition (CMRSWC). As of the 2014 fiscal year, The CMRSWC consists of communities that share resources for stormwater management, such as water sampling kits and GPS mapping equipment. Our goal for this project was to provide a comprehensive analysis of the cost of implementing the 2014 draft MS4 permit in Southbridge, Holden, and Millbury Massachusetts.

Methodology

In order to achieve our goal of providing a comprehensive analysis of the cost of implementing the 2014 draft MS4 permit in Southbridge, Holden, and Millbury Massachusetts, we utilized the following methodology.

- 1) Became educated on the details of the 2003 MS4 permit and 2014 MS4 permit
- 2) Assessed what Holden, Millbury, and Southbridge, Massachusetts have done to meet the requirements of the 2003 MS4 permit
- 3) Identified Holden, Millbury, and Southbridge's total current expenditures for stormwater management
- 4) Identified what changes each of our subject towns will have to make in order to comply with the requirements of the 2014 MS4 permit
- 5) Provided a detailed analysis of the complete costs for each town to comply with the requirements of the 2014 MS4 permit
- 6) Created an informational video to explain the costs of implementing the 2014 MS4 permit

Throughout our project, we used various research methods such as document analysis, field work, and interviews in order to learn about the cost of compliance with the MS4 permit. By analyzing various background documents about stormwater management, including the 2003 MS4 permit and 2014 draft MS4 permit, we were able to learn about the need for stormwater management as well as the BMPs typically used to manage stormwater.

We conducted interviews with various municipal officials, including public works directors, fire chiefs, town engineers, and members of town conservation commissions. These interviews allowed us to learn about our subject towns' stormwater programs and the costs associated with these programs. We also conducted an interview with the Department of Conservation and Recreation (DCR), which allowed us to estimate costs of BMPs, which town officials could not provide to us.

During our project, we also performed field work, which included outfall sampling using the CMRSWC kits, using dry and wet weather screening forms, and using the geographical information system (GIS) maps of our subject towns. This fieldwork allowed us to gain a more accurate understanding of the amount of labor involved with screening outfalls, which ultimately assisted us in completing our cost analysis.

After we completed our goals and objectives, we were able to provide findings and recommendations to our subject towns.

Findings and Recommendations

Finding 1: The 2014 draft MS4 permit may cost too much for the towns to effectively implement

The costs associated with stormwater management are very high, yet many towns have a limited budget for stormwater. The MS4 permit may cost too much for towns to individually implement. For implementation of the 2014 draft MS4 permit, Holden should expect to spend \$258,790 annually, Millbury should expect to spend \$753,173 annually, and Southbridge should expect to spend \$343,008 annually.

Recommendation 1: Effective regionalization will allow towns to better implement their stormwater management programs

Due to the high cost of implementing the 2014 draft MS4 permit, we recommend that the towns regionalize. Regional organization, such as through the CMRSWC, can reduce the cost of many materials related to stormwater management.

Finding 2: Using innovative funding techniques can help the towns spend less from their general funds on stormwater management

The CMRSWC has received funding from the Community Innovation Challenge (CIC) grant. The first year of the Coalition's existence was fully funded by the CIC grant program and the subsequent two years of grant funding supplemented the Coalitions expenditures. In FY2014, member towns paid 4,000 dollars to continue as members of the Coalition. Millbury has begun applying for other grants to support implementation of BMPs, which may save them money over time.

Recommendation 2: The towns should seek alternative sources of funding such as additional grants beyond the CIC

Due to the reduction of CMRSWC funding from the CIC, we recommend that the towns apply for other grants. These grants can include the 604(b) grant from the MassDEP. The Towns should apply to these grants as quickly as possible, and the Coalition should lobby for additional future funding from the USEPA and MassDEP.

Finding 3: Using innovative stormwater management techniques can help the towns save money and thus implement the permit more effectively

Millbury uses innovative stormwater BMPs, such as a school art contest, to fulfill the public participation control measure. These BMPs allow Millbury to implement the MS4 permit effectively and at a low cost.

Recommendation 3: The towns should strive to utilize innovative stormwater management techniques

Millbury's use of creative BMPs has saved them money in implementing the MS4 permit. We encourage other towns to do the same, as they may be able to come up with BMPs, which are more efficient and cost-effective than their current BMPs.

Finding 4: Towns that communicate with other towns, even to a small extent, can more effectively manage and fund their stormwater management programs

A previous IQP group from WPI demonstrated that the CMRSWC towns spend less money on stormwater management than towns that work independently. This type of collaboration can also help generate more innovative BMPs, which will save the towns money.

Recommendation 4: Regionalization can help towns save money by sharing information and resources

We recommend that the towns regionalize and attempt to share information and resources. This practice will help them implement the 2014 draft MS4 permit more effectively.

Finding 5: In each of our subject towns, stormwater management information was divided amongst different departments

In many of our subject towns, there was not one person fully dedicated to stormwater management. Multiple departments in each town were responsible for implementing the stormwater management programs. As a result, we often had to request information from more than one department in each town.

Recommendation 5: Having a central source of stormwater management should allow for easier implementation of future MS4 permits and make continuous compliance easier for the towns

We recommend that the towns research the feasibility of either creating a position dedicated to managing stormwater information, or making this responsibility part of a single position. If smaller towns cannot afford to pay for this position, we recommend that multiple towns share a person dedicated to stormwater information. This practice will make it easier to implement the MS4 permit in the future.

Finding 6: The IDDE control measure will be a significant contributor to the increase in cost between the 2003 and 2014 draft MS4 permits

The 2014 draft MS4 permit has many more requirements than the 2003 MS4 permit, especially in the IDDE control measure. Much of the increase in cost between the two permits will be due to the increased stringency of the IDDE measure. The IDDE measure will also have more detailed requirements for practices such as outfall sampling with water testing kits.

Recommendation 6: The CMRSWC should have one person in charge of keeping track of and maintaining the sampling kits

When we performed sampling in the field, the sampling kits were often disorganized and had expired components, which slowed down our work. Having the kits intact will make it easier to sample, and will thus save money on sampling costs.

Finding 7: The current Asus tablet in use by the CMRSWC is slow and ineffective

When we used the tablet in the field, it was often slow to load. Town employees often complained about the delay. When we used a new smart phone, we did not see this delay. The delay caused by the old technology costs the towns in the CMRSWC money on labor costs.

Recommendation 7: The towns should use software, which can collect data offline and then upload it to an online database later, as well as a tablet, which is more up to date. This would allow the DPW workers to work more efficiently, thus saving the town labor costs

We recommend that the Coalition should purchase a new tablet, such as an Apple iPad.

The labor costs that the tablet will save will pay for the cost of the tablet very quickly.

Other Recommendations

The Massachusetts Department of Environmental Protection should research the potential of providing standardized materials available to Massachusetts municipalities

Many of the control measures of the permit, such as public education and public involvement and participation, require municipalities to create similar documents. If the MassDEP could create standardized templates for these requirements, it could reduce the cost to towns, as well as give them more time to focus on eliminating pollutants.

The CMRSWC should streamline and update the digital forms. This practice would reduce the time needed to inspect outfalls, thus saving money

While we performed fieldwork in Holden, we found that the dry and wet weather forms had categories relating to pollutants, which are not regulated by the MS4 Permit. These extra categories made the forms time-consuming to fill out. Collecting this additional information causes the towns to spend increased labor costs. By updating the forms, the CMRSWC can reduce labor costs for the towns.

Recommendations for Future Research

We recommend that future project groups research the cost of implementing Total Maximum Daily Load (TMDL) requirements in towns. These requirements may generate a very large cost, which has not been researched well. We also recommend that future research groups

attempt to eliminate some of the biases, which may have appeared in our research. These biases stemmed from our limited sources of budget data, and as a result, some of our cost figures may be inaccurate. We recommend other project groups eliminate this bias by finding multiple sources for town budget data.

Conclusion

The findings and methods that we present should help the towns understand and prepare for the financial implications of implementing the 2014 draft MS4 permit. The towns will have to work hard to comply with this new permit, but this effort will be worth protecting people and the environment from the negative effects of stormwater runoff. Among our most important recommendations, we emphasize the benefits of regionalization, the use of innovative stormwater management and funding techniques, and the centralization of stormwater management in each town. We also recommend that the towns reach out to the MassDEP for advice on implementing the 2014 draft MS4 permit. Although the task of effective stormwater management is daunting, the towns can plan to effectively manage stormwater, thus protecting human health and the environment.

Authorship

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2.2 Stormwater Runoff	Cameron Peterson, Eric Correia
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2.2.2 Low Impact Designs	Cameron Peterson
2.2.3 Economic Impacts of Stormwater Management	Eric Correia
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Table of Acronyms

Acronym	Meaning
<u>WPI</u>	Worcester Polytechnic Institute
<u>MS4</u>	Municipal Separate Storm Sewer System
<u>MassDEP</u>	Massachusetts Department of Environmental Protection
<u>DCR</u>	Department of Conservation and Recreation
<u>CMRSWC</u>	Central Massachusetts Regional Stormwater Coalition
<u>USEPA</u>	United States Environmental Protection Agency
<u>CWA</u>	Clean Water Act
<u>BMP</u>	Best Management Practice
<u>GPS</u>	Global Positioning System
<u>GIS</u>	Geographical Information System
<u>IDDE</u>	Illicit Discharge Detection and Elimination
<u>NPDES</u>	National Pollutant Discharge Elimination System
<u>U.S.</u>	United States
<u>NWQIR</u>	National Water Quality Inventory Report
<u>E. Coli</u>	Escherichia coli
<u>PCB</u>	Polychlorinated biphenyl
<u>TMDL</u>	Total Maximum Daily Load
<u>EIA</u>	Effective Impervious Area
<u>HAB</u>	Harmful Algal Blooms
<u>LID</u>	Low Impact Designs
<u>FWPCA</u>	Federal Water Pollution Control Act
<u>NEETF</u>	National Environmental Education and Training Foundation
<u>CIC Grant</u>	Community Innovation Challenge Grant

<u>SWPPP</u>	Stormwater Pollution Prevention Plan
<u>SWMP</u>	Stormwater Management Program
<u>DPW</u>	Department of Public Works
<u>CCTV</u>	Closed Circuit Television
<u>EPG</u>	Environmental Partners Group
<u>MassEEA</u>	The Massachusetts Environmental and Energy Agency
<u>MassDFG</u>	Massachusetts Department of Fish and Game
<u>CSO</u>	Combined Sewer Overflow
<u>TDS</u>	Total Dissolved Solids

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1.0 Introduction

Pollution affects a staggering number of water bodies in the United States. "In 2006 there were over 15,000 beach closings or swimming advisories issued due to bacterial levels exceeding health and safety standards" (Council, 2008). A 2012 United States Environmental Protection Agency (USEPA) study evaluating 57% of the lakes, reservoirs, and ponds in the United States found that 97.5% of the examined water bodies contained unacceptable levels of pollution (USEPA, 2012).

One illustrative example of the extent of water pollution is in Ohio's Cuyahoga River. The water pollution in the Cuyahoga River was so profound that the river has actually caught on fire multiple occasions, as Figure 1 illustrates. In the 1960s, industries used the river as a dumping ground for contaminants such as oil, industrial waste, sludge, and sewage.



Figure 1. Cuyahoga River on Fire

(Greater Elkhart County Stormwater Partnership)

In 1969, one of these fires captivated national attention, and caused a chain of events, which spawned the creation of the Clean Water Act (EPA, 2013). The Cuyahoga river fires are just one of many cases of such extreme water pollution.

Water displaced by the weather events, also known as stormwater runoff, pollutes the surface waters of the United States. Stormwater runoff occurs when stormwater flows over an impervious surface, an area that water cannot pass through, such as house roofs, streets, and

parking lots. As the stormwater flows over these surfaces, it often collects pollutants such as oils, sediment, and heavy metals (EPA, 2012). These pollutants are detrimental to aquatic life, which in turn, affects the people in the surrounding areas. Pollutants such as nutrients can cause severe harm to aquatic life through the formation of algal blooms. These are algal blooms that become harmful under certain conditions including light availability and an abundance of nutrients. These harmful algal blooms can damage aquatic plants by



Figure 2. Example of sediment runoff
(Lehman, 2010)

blocking sunlight and depleting nutrients from the water, which can kill aquatic fauna (Kuentzel, 1969). Beyond the flora and fauna, stormwater runoff pollution also erodes natural structures such as deltas as illustrated in Figure 2.

To combat the issue of stormwater runoff, the USEPA created a system to move stormwater runoff into nearby bodies of water this is known as Municipal Separate Storm Sewer Systems (MS4s). In order to minimize stormwater flow over impervious surfaces, the design of the area around MS4s incorporates efficient methods of directing stormwater into the MS4s. The issue with moving the stormwater runoff directly into the bodies of water is that the pollutants that the stormwater runoff carries end up in the body of water.

To mitigate the impact of stormwater runoff, the USEPA has created an MS4 permitting system. The USEPA categorizes these permits as either MS4 or National Pollutant Discharge Elimination System (NPDES). NPDES permits are a more general category of permits, which apply to facilities that have a wastewater output. The MS4 permits fall under the category of the

NPDES permits, but MS4 permits deal with requirements more specific to stormwater runoff (US EPA, 2014b). Figure 3 shows a simplified example of an MS4. The MS4 permit contains measures, which help mitigate the impacts of stormwater runoff. (USEPA, 2014c)

The MS4 permit contains six minimum control measures that permittees must follow in order to maintain compliance with the permit. These six measures provide general guidelines for stormwater management and public education. On September 30, 2014, the USEPA issued a new draft MS4 permit for permit holders in Massachusetts. In Massachusetts, the USEPA issues the MS4 permit. In the meantime, the Massachusetts Department of Environmental Protection (MassDEP) acts as the cosigner, while the USEPA enforces the permit.

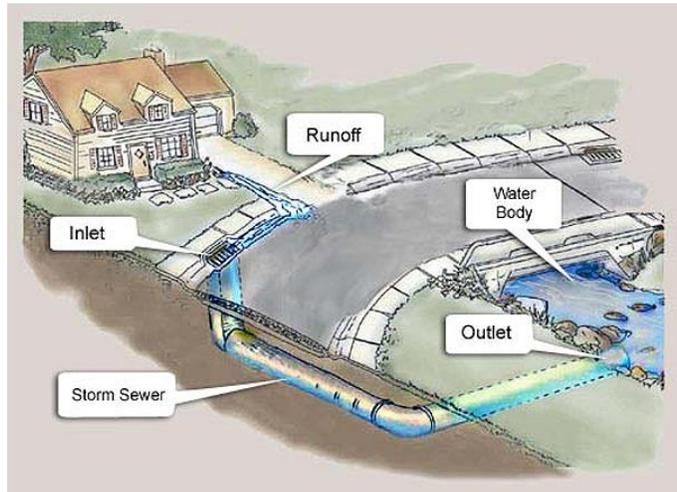


Figure 3. Example of a simple MS4

(Bardstown, 2014)

The MassDEP has developed this project requesting assistance from students with Worcester Polytechnic Institute's (WPI) Worcester Community Project Center. Our project was specifically aimed to assist the Central Massachusetts towns of Holden, Millbury, and Southbridge in understanding the costs of updating to the new 2014 draft MS4 permit. The goal of this project was to assess various municipalities' stormwater management practices for compliance with the MS4 permit, and provide a detailed analysis of the financial cost needed to fulfill the requirements of the 2014 draft MS4 permit. In addition to the cost analyses, we created

an informational video to help selectmen and town meeting members understand the implications of both stormwater runoff and the new MS4 permit requirements.

In chapter 2, we provide a detailed overview of stormwater runoff and its effects, the history and details of the MS4 permit, our sponsor the MassDEP, and the role of the Central Massachusetts Regional Stormwater Coalition (CMRSWC). In chapter 3, we describe the methodology we used to learn the details of the 2014 MS4 Draft permit and assess the total financial expenditures for compliance with its requirements. In our final two chapters, chapter 4 and 5, we outline our findings and provide recommendations for future research to the CMRSWC, the MassDEP, and the towns we worked with, Holden, Millbury, and Southbridge based on our findings.

We hope that this project will have a lasting and meaningful impact on stormwater management in Central Massachusetts. With the assistance of the MassDEP and CMRSWC, we hope our efforts help Central Massachusetts' municipalities prepare for the MS4 permit and protect the waters of the United States (U.S.) from pollution.

2.0 Background

2.1 Introduction

Rainwater runoff poses a serious risk of pollution to the world's surface water bodies. Impervious manmade surfaces such as roads and sidewalks drain pollutants into local water bodies after rain events occur. These pollutants, which can include chemicals, oils, metals, sediment, and bacteria, can directly affect human health by polluting local sources of drinking water (Gaffield, Goo, Richards, & Jackson, 2011). We discuss stormwater runoff and its impacts in more detail in section 2.2 of this chapter. To fully understand the problem of stormwater that the United States (U.S.) faces, we discuss the history of stormwater management in section 2.3

of this chapter. To help mitigate the impacts of stormwater, the United States Environmental Protection Agency (USEPA) released Municipal Separate Storm Sewer System (MS4) permit. This permit helps municipalities reduce pollution in water bodies by using effective stormwater management, which we discuss in more detail in section 2.4 (USEPA, 2014f). The Massachusetts Department of Environmental Protection (MassDEP), a Massachusetts state agency, helps municipalities navigate the intricacies of the MS4 permit. The MassDEP served as our sponsor throughout our project; we introduce them in section 2.5. We discuss the Central Massachusetts Regional Stormwater Coalition (CMRSWC), formed in 2012 to help communities meet the requirements of the MS4 permit (Spain, 2014); in section 2.6.

2.2 Stormwater Runoff

There is a difference between stormwater and stormwater runoff. Stormwater is the water that falls from storms or that which snowmelt produces. Stormwater runoff is the water that travels along impervious surfaces and gathers pollutants. The USEPA defines stormwater runoff as "generated when precipitation from rain and snowmelt events flows over land or impervious surfaces and does not percolate into the ground" (USEPA, 2014g). An impervious surface is a surface which water cannot pass through, such as asphalt and roofs. The stormwater runoff that flows over these impervious surfaces often collects pollutants that contaminate the stormwater and passes those contaminants into local water supplies. Contaminated stormwater runoff may contain oils, nutrients, and sediment. The oils, which usually come from leaking vehicles or car washing, are toxic to aquatic life. The nutrients that come from fertilizer and sewage overflow cause an unnatural increase in the growth of unwanted plant life, which depletes the oxygen in the body of water, causing aquatic life to die (EPA, 2012).

Sediment pollutants are found when land around the water body starts to erode, causing sediment to gather on aquatic life that lives close to the bottom of the water body, which prevents sunlight from getting to the plants (EPA, 2012).

In an effort to mitigate the impacts of stormwater runoff, municipalities may make land use changes, pass by-laws, and/or focus on public education. Municipalities mitigate the impacts of polluted stormwater runoff through Best Management Practices (BMP) and compliance with the MS4 permit, which we explain in section 2.4 below. When land use planners do not consider stormwater runoff, there can be serious environmental, aesthetic, and financial ramifications.

2.2.1 Environmental Impacts of Stormwater Runoff

Stormwater runoff is one of the top causes of water pollution in the U.S. today (Blair et al., 2014). Every two years, the USEPA releases a National Water Quality Inventory Report (NWQIR) on two groups of water bodies: rivers and streams, and lakes, reservoirs, and ponds. The NWQIR is the primary tool that the USEPA uses to keep the public, as well as Congress, informed about the quality of U.S. surface water. The USEPA monitors these bodies of water by regularly testing for various contaminants. These tests primarily look for contaminants such as fecal coliform, Escherichia Coli

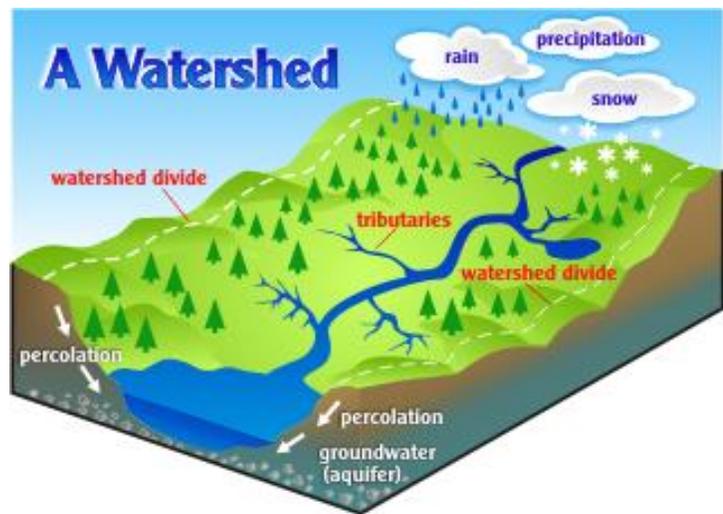


Figure 4. Watershed
(S. R. W. Coalition, 2014)

(E. coli), polychlorinated biphenyls (PCB) in fish tissue, total phosphorus, and examine the concentration of dissolved oxygen. Based on these indicators and scientifically determined established safe levels, the USEPA determines if the body of water is impaired (Council, 2008). The USEPA breaks up the different municipalities by watersheds when issuing these reports to the public.

A watershed is the area where all of the connected rivers and ponds merge into one body of water as we illustrate in Figure 4. The Blackstone Watershed encompasses towns around Worcester, Massachusetts and municipalities to the south east of Worcester. In the 2012 NWQIR, the USEPA assessed 28.3% of Rivers and Streams; in the Blackstone watershed, 63.8% were impaired. The majority of the impairment was due to a lack of total maximum daily load (TMDL) management. TMDL is the total maximum amount of pollutants that can be discharged into a body of water while remaining safe for the water's intended use such as swimming or fishing (USEPA, 2013b). Since stormwater has caused so much pollution to bodies of water, the USEPA requires municipalities to use TMDLs, which the state creates, to help restore water bodies from over-pollution (USEPA, 2013b).

As more areas become urbanized, the amount of impervious area increases. The U.S. is experiencing a urbanization trend of increased urban population; the urban population went from 79.0% in 2000 to 80.7%

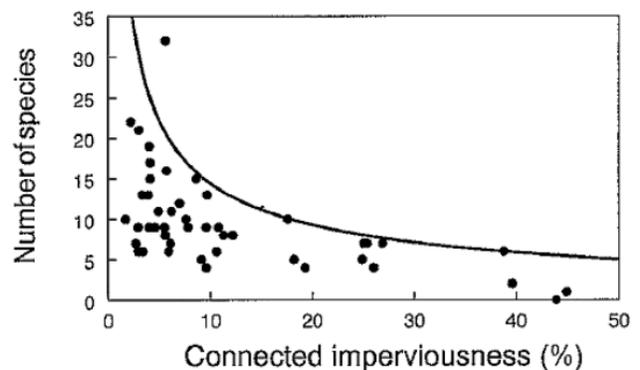


Figure 5: Species vs. EIA
(Council, 2008)

in 2010 (Bureau, 2012). This change would increase the Effective Impervious Area (EIA), causing more pollutants to run off into the local bodies of water.

The USEPA performed a study on surface water bodies, assessing, among other things, the amount of different fish species that inhabit that body of water. As Figure 5 illustrates, as the percent of imperviousness increases, the number of fish species in the area exponentially decreases. Figure 5 demonstrates a correlation between the amount of EIA and the presence of bio diverse aquatic system. This correlation is explained by an increase in pollution in the local area, causing the fish to either be poisoned by various pollutants or to suffocate on those same pollutants (Council, 2008).

In addition, in 2012, the USEPA evaluated 57% of lakes, reservoirs, and ponds in the Blackstone watershed area. In this study, the USEPA found that of the 57% evaluated, 97.5% of the lakes, reservoirs, and ponds were impaired. In this case, however,

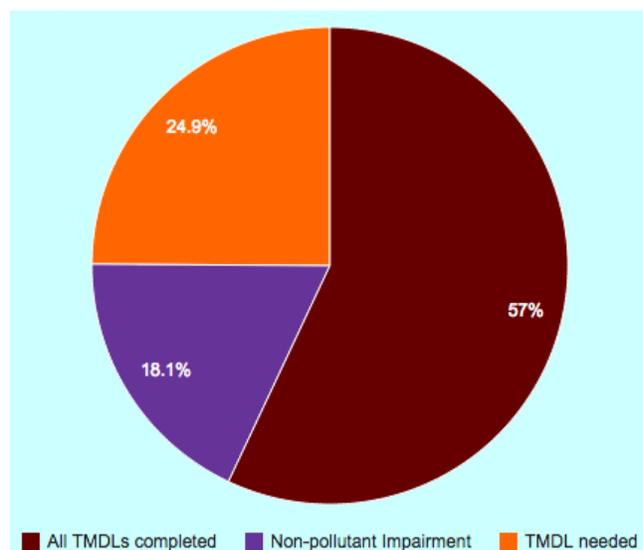


Figure 6. Causes of Lake Impairment
(USEPA, 2012)

only 24.9% of the lakes, reservoirs, and ponds needed a TMDL to be set in place (Council, 2008). THE USEPA also cited non-pollutant impairment as a problem in the lakes, reservoirs, and ponds in the Blackstone watershed, as seen in Figure 6. Non-stormwater pollutant impairment occurs when unregulated sources of non-stormwater pollution impair a body of water, such as turbidity (US EPA, 2014a).

The pollutants themselves are not the only problem with stormwater flowing into local water bodies untreated. Harmful algal blooms (HABs) are of great concern for aquatic life. HABs not only reduce water clarity, but they also deplete the oxygen in the water, which in turn can kill the natural life in the body of water. Since the HABs create a layer of colored algae on top of the water body, they also have a negative effect on the aesthetics of the water body. In addition, as the water becomes an eyesore, the tourism in the area also is likely to drop (Andersen, 2009).

2.2.2 Low Impact Designs

Low Impact Designs (LIDs) are a way to, “simulate natural hydrologic conditions, by gradually recharging groundwater and slowing runoff that flows to collection systems and receiving water systems” (MassDEP, 2014).



Figure 7. Bioswale
(Service, 2005)

Some of these methods include bioswales, green roofs, and infiltration or retention basins. People who design these areas usually create these designs as LIDs. A LID is a way that the designers try to address stormwater runoff by reducing the amount of impervious surface area and working with the natural landscape. LID includes stormwater BMPs, which we will explain in the next paragraph. LID can also be applied to redesigning areas; in that case, the LID would work more towards rebuilding the landscape rather than working with the existing area (Cahill, 2012).

BMPs are methods and designs that towns use to mitigate the effects of stormwater runoff. Some common BMPs include grassy swales, rain barrels, and vegetated roofs. *Grassy swales* are similar to the bio swales that we will discuss in the next paragraph, except the designers just use grass rather than other plant life. *Rain barrels* collect rainwater from roof runoff. Rather than dumping the runoff into the streets, the rain barrels allow the owner to use the water for watering plants or just dispersing on the ground so that the runoff naturally filters through the ground. *Vegetated roofs* are the same as extensive *green roofs*, which we will discuss later in this section.



Figure 8. Green Roof
(Division, 2014)

Bioswales can be an alternative method to using stormwater drains or simply to augment the drains. Workers place plants and foliage around an area, which is slightly lower than the area around it, as seen in Figure 7. The stormwater then flows into the bioswale, and the plants filter the stormwater for low flow storms. For larger storms, bioswales can direct the flow of stormwater into nearby drainage systems, however average bioswales can handle storms up to 4.3 inches per 24-hour period (Service, 2005). *Green Roofs* are a layer of dirt and plant life on the roof of a building. This layer above the roof provides shade to the roof, preventing it from reaching extremely hot temperatures; instead, the plant life absorbs most sunlight, which will normally heat the roof (Division, 2014). The layer of dirt also acts as a



Figure 9. Retention Basin
(USGS, 2004)

filtration system for light storms as seen in Figure 8. There are two types of green roofs, intensive and extensive. Intensive is similar to a roof garden, where the plant life is usually flowers, trees, and general garden plants in separate pots. Extensive roofs consist of a layer of dirt and rugged vegetation, which needs little to no maintenance (Division, 2014).



Figure 10. Infiltration Basin
(University, 2011)

Infiltration and retention basins filter stormwater in a similar manner. An infiltration basin takes stormwater from the surface, trickles it down slightly below the surface of the ground, and dissipates the stormwater over a larger area, as Figure 9 illustrates. A retention basin is similar to an infiltration system, but instead of keeping the stormwater underground, it turns the stormwater into an artificial lake or pond, which drains slowly, but at a fixed rate, as Figure 10 illustrates (Mays, 2001).

LID	Average Cost
Green Roof (Intensive)	\$10/ft ²
Green Roof (Extensive)	\$25/ft ²
Rain Barrels	\$216
Grassy Swales	\$30/ft ²
Bioswales	\$16.25/ft ²
Infiltration Basin	\$4,500
Retention Basin	\$7,500

Table 1. Comparison of LIDs

These methods of handling and filtering stormwater are just some of the ways that engineers and building planners handle the issue of stormwater runoff. Businesses work to mitigate stormwater runoff when it has an economic impact on their business. Below is Table 1¹, which compares the average costs of implementing each of the LIDs mention in this section. In the next section, we discuss the economic impacts of stormwater.

¹ (Brennan, 2014; Center, 2007; Division, 2014; PennsylvaniaDEP, 2006; USEPA, 2013a)

2.2.3 Economic Impacts of Stormwater Management

The goal of improved stormwater management raises questions about cost. Towns use many LID measures to effectively reduce the impact of stormwater runoff. The implementation of these LID measures, i.e. swales, permeable pavement, filter strips, and infiltration trenches, increases the cost of construction projects, as implementation requires careful planning and additional work. However, the economic benefits of these LIDs may in fact defray the cost of their implementation.

The BMPs, which towns use to comply with the requirements of the MS4 permit, can require a large initial financial input. For example, the town of Millbury, Massachusetts estimated that they spent about \$75,000 on street sweeping during the 2013 fiscal year (Spain, 2014). The towns must understand the expenditures related to stormwater management in order to effectively fulfill the requirements of the MS4 permit.

Despite the increased cost of construction projects, LIDs can actually save towns money over time. The use of these LIDs minimizes the extent to which stormwater runoff impairs water quality. If there are fewer impaired water bodies, then towns spend less money on treating the water bodies. LIDs may also reduce the effects of flood damage, and eliminate the need for water treatment facilities (Thurston & EnvironetBase, 2012). LID measures can also save money by reducing construction cost. For example, a parking garage can cost approximately \$20,000 per space to build. An open parking lot with non-impervious surfaces, however, can cost as little as \$2,000 per space to build (Cahill, 2014). In this case, the use of an LID does not just reduce the construction cost; it also reduces the amount of runoff that needs to be treated.

2.3 History of Stormwater Management

October 2012 marked the 40th anniversary of the 1972 Amendments to the Federal Water Pollution Control Act, better known as the Clean Water Act (CWA). Many decades of surface

water pollution preceded the CWA, and some of the causes of pollution are rooted in the industrial surge of the previous two centuries. Unsanitary conditions and polluted drinking water led to health issues, such as yellow fever and cholera (Andreen, 2003b). Even in rural areas, water pollution was a problem. Most towns simply integrated any stormwater management systems into their sewer system. Easy to implement as a combined system, these constructs only involved the conveyance of water away from highly populated areas (Robert B. Stegmaier, 1942). Due to their combined nature, these systems were highly prone to overflow, contaminating topsoil and surrounding water bodies with raw sewage waste (Joseph-Duran, Jung, Ocampo-Martinez, Sager, & Cembrano, 2014). In 1948, the conclusion of World War II allowed the federal congress to bring focus onto more domestic issues. The massive industrial output of the war had taxed rivers, and funding for wastewater treatment had dropped during the years of conflict (Andreen, 2003a).

2.3.1 Evolution of the Clean Water Act

The 1948 Federal Water Pollution Control Act (FWPCA) served as a precursor to the CWA, which would undergo many revisions before the federal government expanded the CWA in 1972. The National Pollution Discharge Elimination System (NPDES) is a permit system added into the FWPCA with the 1972 amendments. Created by the Subcommittee on Air and Water Pollution of the Senate Committee on Public Works, the permit specifies what pollutant discharges the towns must manage. The permitting program specifies that discharges of a pollutant from a point source into a navigable waterway are prohibited unless the discharger has a NPDES. Specifically, the NPDES permit regulates point source discharges of pollutants into surface waters. A point source is defined by the CWA as "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel [etc.] from which

pollutants are or may be discharged" (U.S.C § 1251, (2014)). Originally, the USEPA intended the NPDES to regulate industrial wastewater and municipal sewage as this was the most abundant sources of liquid pollution (Tyer, 1993). Legislative amendments to the FWPCA in 1977, 1983, and 1987 increased the pollutants regulated under the CWA. As these regulations expanded, the EPA decided to implement stormwater management through a separate permit. Under the 1987 amendments, the Municipal Separate Storm Sewer System (MS4) came into being (MINAN, 2005). The CWA has since then expanded to cover many more pollutants than in its original conception.

2.3.2 What is the NPDES Stormwater Program

One of the main reasons that the USEPA put NPDES permits in place was to regulate how many pollutants can be safely discharged into surface waters (USEPA, 2014d). Congress charged the USEPA with administering the NPDES permit program. Congress first established this program with the enactment of the 1972 amendments to the FWPCA. The USEPA can also authorize state and local governments the power to administer the requirements of the CWA by what is called primacy authority (USEPA, 2014h). Massachusetts, however, does not have primacy authority to enforce the CWA so Massachusetts created its own set of laws that mirror the USEPA's laws. Generally, only industrial, municipal, and commercial facilities have to comply with the NPDES permits since they are the primary dischargers of pollutants into surface waters via point sources. Individuals, generally, do not have to get NPDES permits since their wastewater flows through the sewage system or septic tank.

The types of material that NPDES permits regulate are discharged pollutants from point sources. The CWA defines a point source as a pipe, ditch, channel, tunnel, conduit, well, landfill, etc. (U.S.C § 1251, (pg. 214) (2014)). A point source is a source of runoff that only has a single

point of release. A good example of a point source is a chemical treatment plant that uses a chemical to treat their product and then pumps out any of the runoff from their process into a local river. That pipe, which takes the runoff out of the plant, would be a point-based source, as Figure 11 illustrates.

Conversely, the other source of pollution comes from non-point sources. Non-point sources are sources of water pollution, which do not have a point of release such as rainwater and snow melting. Once the stormwater runoff and the melting snow travel into the local MS4s, the runoff becomes a point source, therefore falling under the regulatory authority of the NPDES permit program. A good example of a point source and a non-point source of pollution is Figure 11.

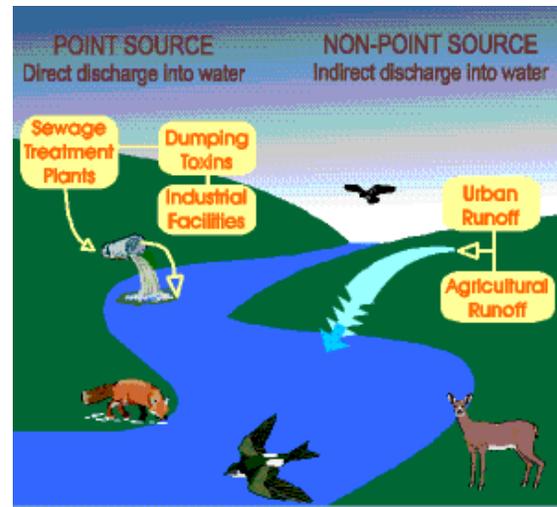


Figure 11. Point and Non Point Sources of Pollution

(College, 2014)

The USEPA and other government bodies, which have primacy authority, require companies and businesses to apply for these NPDES permits when they want to discharge any pollutant into a navigable surface water body through a point source (U.S.C § 1251, (2014))

2.4 The Municipal Separate Storm Sewer System Permit

As part of the CWA, the USEPA issued the MS4 permit in 1990 to reduce the impacts of storm water runoff. The government issues these permits with the sole purpose of addressing the large amounts of stormwater runoff that storms generate. These systems receive stormwater

runoff from the environment, and transport it into nearby bodies of water. These systems do not treat water; they only convey it from impermeable surfaces. With these permits, towns can regulate non-point discharges as point source discharges through the MS4, and create broad stormwater management programs. In 1990, at the inception of the MS4 permitting program, the USEPA issued phase-I MS4 permits on a per-city basis (USEPA, 2014h). These first permits contain measures tailored to individual municipalities, as many large cities had different requirements.

The primary requirement to qualify for a phase-I permit is that the town has a population of at least 100,000. In Massachusetts, there are 2 towns of this size: Boston and Worcester (Massachusetts, 2014b). The phase-II MS4 permit applies to smaller towns with a population of less than 100,000 and contains broad regulations so that it can be applicable to any small municipality. In total, the USEPA has issued approximately 7,450 MS4 permits across the United States from 1990 to 2014 (USEPA, 2014h) (USEPA, 2014b). At their core, these phase-II MS4 permits all integrate practices known as the six minimum control measures. The six minimum control measures are: Public Education, Public Involvement, Illicit Discharge Detection & Elimination, Construction, Post-Construction, and Pollution Prevention/Good Housekeeping.

Although the 2003 MS4 permit has expired, the six minimum control measures remain the primary focus of the 2014 MS4 permit draft. In the following sections, we outline the six minimum control measures and describe some of the BMPs that towns can use to comply with each control measure in the 2014 MS4 permit draft.

2.4.1 Public Education & Outreach

The first minimum control measure addresses the need for public education. Public education plays an important role in reducing pollution levels. Towns can meet the requirements through BMPs such as educational pamphlets, media campaigns, and workshops

The National Environmental Education and Training Foundation (NEETF) found that in 2005, 78% of Americans did not know that runoff from lawns, roads, and agricultural land is the most common source of water pollution. Of further concern, 47% of the public believes that industry accounts for most water pollution (USEPA, 2014b). In order to correct these misconceptions, this control measure requires municipalities to educate the public on the impacts of stormwater runoff and offer residents information on mitigation strategies they can implement at home.

2.4.2 Public Involvement and Participation

The second minimum control measure requires the municipality to form a working partnership with members of the community (USEPA, 2014b). A common way that municipalities fulfill the requirements of this control measure is to create volunteer programs, which engage the public in reducing the pollution caused by stormwater runoff. These programs offer opportunities for volunteers to mark storm drains and participate in cleanup and monitoring programs, as well as to create watershed groups and conservation corps teams (USEPA, 2014b). The officials of each municipality design these opportunities to integrate directly with stormwater programs. When towns implement and utilize this control measure correctly, they can involve the community and create self-monitoring environmental conservation groups.

2.4.3 Illicit Discharge Detection and Elimination

The third minimum control measure deals with the threat of stormwater contamination. Although the MS4 system carries stormwater, it does not treat the stormwater. The MS4 permit defines an illicit discharge as any discharge that is not entirely composed of stormwater. The MS4 stormwater drains are particularly vulnerable to foreign pollutants; the stormwater runoff in these MS4 systems may contain pathogens, nutrients, and various other pollutants. The phase-II MS4 permit requires four primary programs in this control measure, beginning with a full diagram of the MS4 system (USEPA, 2014b). The second program requires the municipality to create a legislative ordinance prohibiting discharges based on pollutant type (USEPA, 2014b). The third is the implementation of reporting techniques such as hotlines, onsite notifications, and outfall water tests (USEPA, 2014b). The fourth is an educational program on the dangers of these illicit discharges (USEPA, 2014b). When used effectively, these programs work to create a system that is both reactive in response to spills and proactive through prevention via education and enforcement.

2.4.4 Construction Site Stormwater Runoff Control

The fourth minimum control measure deals with construction-site stormwater runoff. Of the public works projects that adversely affect the health of a water system, construction site runoff is particularly detrimental. These effects stem from the sediment dissolved in the runoff, including dirt, sand, and other fine particles. When these concentrations of the sediment particles settle in waterways, they block sunlight, and can suffocate many forms of aquatic life (USEPA, 2014a). Phase-II MS4s require the municipalities they regulate to formulate a program to reduce pollutant stormwater runoff for construction exceeding one acre of land. This requirement is

comprised of six components. Collectively, they ensure that construction groups know of their management obligations for proper stormwater pollution management.

2.4.5 Post-Construction Stormwater Management

The fifth minimum control measure refers to post-construction stormwater management. In practice, this control measure is not a continuation of the previous control measure, but a different control measure to monitor BMP effectiveness, as well as the continued prevention of pollution. This control measure is implemented primarily through inspections of on-site facilities, and structures responsible for stormwater management. With these practices in place, areas with new development can continue to manage stormwater runoff pollution after construction has finished.

2.4.6 Pollution Prevention and Good Housekeeping

The final control measure is responsible for the housekeeping of a municipality's stormwater management program. In order for municipalities to maintain good operating conditions within municipal-owned facilities such as the Department of Public Works (DPW) and schools, they must construct a rigorous system of upkeep management. These components can consist of road maintenance and repairs, automobile fleet maintenance, landscape maintenance, as well as building upkeep. Pollution prevention practices can include activities such as street sweeping and storm drain system cleaning (USEPA, 2014e).

2.4.7 General Practices and Municipal Individuality

In order to account for thousands of different municipalities, the MS4 permit authors designed the six minimum control measures to be applicable to any possible situation. Independent of environmental conditions or area development, these measures have to be

comprehensive. Unfortunately, these phase-II MS4 permits rely on a large degree of self-reliance and proactive involvement by the municipalities, but there are resources available to help with this. In order to assist Massachusetts municipalities with MS4 permit compliance, the MassDEP has created a Stormwater Handbook, which contains resources about how a city or town can comply with the minimum control measures (MassDEP, 2014). Additionally, the Massachusetts Watershed Coalition, an organization dedicated to protecting and restoring Massachusetts watersheds, is able to provide many materials to their members, such as brochures and standard operating procedures (Coalition, 2014). However, the officials of each municipality must ultimately take responsibility to implement the practices in the six minimum control measures.

The MassDEP manages a system of computer checks and administering programs for stormwater management in Massachusetts. If the system flags a municipality for irregular readings or reports, inspection by MassDEP officials becomes necessary (Civian, Sept. 26, 2014). Implementation of these control measures requires the municipalities to spend a large amount of money, which raises budget concerns for the 2014 MS4 Draft permit.

2.5 The MassDEP and the Central Massachusetts Regional Stormwater Coalition

The MassDEP is the Massachusetts environmental agency charged with making sure Massachusetts has clean air and water (Massachusetts, 2014a). The central office of the MassDEP serves the entirety of Worcester County (MassDEP, 2013). The MassDEP assists the CMRSWC by providing them with numerous guidance documents, which teach the municipalities how to fulfill the requirements of the MS4 permit (CMRSWC, 2014b). In collaboration with the MassDEP, we sought to provide a cost analysis of implementing the new 2014 MS4 permit in three Massachusetts municipalities. During this project, we worked with

two primary contacts from the MassDEP: Frederick Civian, Statewide Stormwater Coordinator for the MassDEP, and Andrea Briggs, Deputy Regional Director of the Central MassDEP.

2.6 Central Massachusetts Regional Stormwater Coalition

Central Massachusetts is one of many regions in Massachusetts whose municipalities seek to effectively implement the 2014 MS4 permit. The CMRSWC helps its members achieve this goal. The CMRSWC, formed in 2012, initially consisted of 13 municipalities (Spain, 2014). Due to the success and utility of the CMRSWC, it has expanded to 30 municipalities by 2014. All of the municipalities within the CMRSWC are subject to regulations from the USEPA, which require the municipalities to mitigate the impacts of stormwater runoff (CMRSWC, 2014c).

The municipalities within the CMRSWC receive numerous benefits because of their collaboration. The municipalities can share stormwater management tools, such as Leica units and water quality testing kits, thus reducing cost (Coalition, 2014). Their collaboration also reduces redundancies in stormwater management projects, thus allowing the municipalities to use money more efficiently. Although the CMRSWC members try to collaborate as much as possible, the individual towns are ultimately responsible for utilizing the tools developed by the CMRSWC in order to comply with the MS4 permit (Spain, 2014).

2.6.1 Funding of the CMRSWC

The CMRSWC receives funding from the Community Innovation Challenge (CIC) Grant. Massachusetts Governor Deval Patrick started the CIC grant program in 2012 in order to ease the taxpayer burden of community improvements (Massachusetts, 2013a). The CMRSWC received \$310,000 in 2012 to help implement the 2003 MS4 permit (Massachusetts, 2013b). The CIC Grant provided the CMRSWC with \$105,000 for the 2013 fiscal year. This grant did not cover the total cost of the CMRSWC's efforts, thus each municipality had to provide \$2,800 in order to supplement the cost (Spain, 2014). For the 2014 fiscal year, the CIC Grant provided the

CMRSWC with \$80,000 (CMRSWC, 2014a). The grants are awarded in December, so at the current time the CMRSWC does not know if they have secured funding for next year.

2.6.2. Organizational Involvement in the CMRSWC

The CMRSWC operates with the help of various agencies and companies. The government agencies, which support the CMRSWC, include the MassDEP, the Massachusetts Department of Conservation and Recreation (DCR) and the USEPA. The CMRSWC also receives support from the private consulting firms of Tata & Howard and Verdant Water. The companies which provide services to the CMRSWC include Maine Technical Source, HACH Company Chemetrics, and People GIS (CMRSWC, 2014d).

2.6.3. Stormwater Consultants

The CMRSWC receives support from the private consulting firms of Tata & Howard and Verdant Water. Tata & Howard is an engineering firm which provides consulting for the management of wastewater, stormwater, and hazardous waste (Tata&Howard, 2014a). Tata & Howard also helped create a system which collects inspection data and maps runoff patterns within the CMRSWC (Tata&Howard, 2014b). Verdant Water operates from Scarborough, Maine, and focuses on industrial and municipal stormwater management. Verdant Water provides Stormwater Pollution Prevention Plans (SWPPPs), Illicit Discharge Detection and Elimination (IDDE) assistance and water quality screening.

The use of these private consulting services to fulfill components of the MS4 permit requires the municipalities to spend a large amount of money. We had to take the cost of these services into account in order to construct our cost analysis. In the next chapter of our report, we describe our methodology for creating our cost analysis.

2.7 Goals and Objectives

In collaboration with the MassDEP and the CMRSWC, we sought to provide the towns of Southbridge, Holden, and Millbury, Massachusetts with a comprehensive analysis of their cost of compliance with the new 2014 MS4 permit.

In order to achieve this goal, we:

1. Became educated on the details of the 2003 MS4 permit and the new 2014 MS4 permit
2. Assessed the degree to which Millbury, Holden, and Southbridge have met the requirements of the 2003 MS4 permit
3. Researched Millbury, Holden, and Southbridge's total current expenditures for stormwater management
4. Identified what changes each of the aforementioned towns will have to make to comply with the requirements of the new 2014 MS4 permit
5. Provided a detailed analysis of the complete costs each town will need to defray in order to comply with the requirements of the new permit.
6. Created an educational video to explain the costs of implementing the 2014 MS4 permit

We discuss our methodological approach to accomplishing these objectives in detail in chapter 3.

3.0 Methodology

3.1. Introduction

In collaboration with the Massachusetts Department of Environmental Protection (MassDEP) and the Central Massachusetts Regional Storm Water Coalition (CMRSWC), we provided the towns of Millbury, Holden, and Southbridge, Massachusetts with a comprehensive analysis of the cost of compliance with the new 2014 Municipal Separate Storm Sewer System (MS4) permit. We focused our project objectives on determining the current and future cost of stormwater management in the subject towns. The MassDEP and CMRSWC proposed this project to increase municipal and agency understanding of the cost of compliance with the MS4 permit; The MassDEP will not use this information for enforcement of the MS4 permit. The MassDEP recruited us to address this problem as independent consultants. The United States Environmental Protection Agency (USEPA) released the new 2014 draft MS4 permit on September 30, 2014. In order to accomplish our goal and objectives, we created the following methodology.

The main goal of our project was to gather information from the towns of Holden, Millbury, and Southbridge Massachusetts in order to help them identify the financial costs of implementing the 2014 MS4 permit draft when it eventually comes into effect. Below we discuss each of the objectives we achieved in order to accomplish our project goal.

3.2. Objective 1: Became educated on the details of the 2003 MS4 permit and the 2014 MS4 permit

In order to create a complete cost analysis of compliance with the 2014 Massachusetts draft MS4 permit, we first sought to understand the requirements of 2014 MS4 permit draft. Understanding the permit also involved an in-depth analysis of the expired 2003 MS4 permit that

the towns have to maintain compliance until the new permit goes into effect. The USEPA issued each of the towns a Phase II permit, as their populations do not exceed 100,000 people (US EPA, 2014).

We analyzed the content of the 2003 MS4 permit minimum control measures so that we would each become more familiar with the minimum control measures. We then contrasted the requirements of the 2003 MS4 permit with those of the 2014 MS4 Draft Permit. As we researched the requirements that are a part of the 2003 MS4 permit, we determined how the permit changed from the 2003 version to the 2014 version with the help of Fred Civian. In addition, we analyzed previous reports written by groups that have worked with the MS4 permit. We interviewed Worcester Polytechnic Institute (WPI) students Xinpeng Deng, Nicholas Houghton, Haoran Li, and Joseph Weiler, who completed the previous MS4 related project, to gain a better understanding of how to create a cost analysis and work with the towns. We also interviewed them to better understand the efforts that have gone into implementing the permit. After analyzing both permits and interviewing the past IQP group, we were better able to approach the task of creating a cost analysis for our subject towns, see Appendix A for a list of interview questions.

3.3. Objective 2: Assessed what Millbury, Holden, and Southbridge have done to meet the requirements of the 2003 MS4 permit

In order to achieve this objective, we reviewed annual stormwater reports, conducted interviews, and conducted fieldwork. Even though the 2003 MS4 permit expired, understanding what the towns have done to comply with the permit requirements helped us increase our understanding of the additional measures and costs the towns will need to take to maintain compliance once the USEPA implements the 2014 MS4 Draft permit.

In our subject towns, we interviewed Department of Public works (DPW) directors such as Heather Blakeley, John Woodsmall, and Rob McNeil. We also interviewed other municipal officials such as Mark DiFronzo Southbridge's fire chief, Isabel McCauley Holden's Town Engineer, a Conservation Commission member from Southbridge Ken Pickerin, and Pamela Harding Holden's Town Planner. We conducted these interviews to determine what each town currently does to comply with the 2003 MS4 permit. Through our sponsors at the MassDEP, we contacted these towns in order to set up interviews with the municipal officials that oversee compliance with MS4 permit requirements. We focused these interviews on each municipality's efforts to comply with the six minimum control measures. In addition, we asked the interviewees to provide us with any documentation of expenditures, which we used to determine their town's costs. See Appendix A for examples of the interview questions that we asked each of the towns.

The expense reports from the consultants, DPW, and highway department, which the officials provided to us, did not encompass all of the town's expenditures, so we also used these interviews and fieldwork to obtain a more complete understanding of the expenditures. We conducted this fieldwork in order to determine the man-hours needed to conduct sampling tests on site. We used this data for information regarding procedures, costs, and methods used to fulfill the 2003 MS4 permit.

3.4. Objective 3: Identified Millbury, Holden, and Southbridge's total current expenditures for stormwater management

Once we collected data detailing the practices that our subject towns use to manage their stormwater runoff, we aggregated our data to create a cost analysis. Millbury, Holden, and Southbridge are members of the CMRSWC, which utilizes the expertise of the environmental consulting firms Verdant Water and Tata & Howard. We analyzed cost data from any

expenditure that occurred before release of the 2014 draft MS4 permit, but after 2012 to get a general idea of expenses. We analyzed all expenditures from the experience reports mentioned in the previous objective because towns often do more than they report to manage stormwater but are not necessarily aware of the task coming under the rubric of one of the 2003 MS4 permit minimum control measures (Deng, Houghton, Li, & Weiler, 2014). These tasks could include street sweeping, public education, volunteer organizations, and hazardous waste cleanup.

Many municipalities hire construction contractors to make changes to existing Best Management Practices (BMP), if required, or to keep up with maintenance on the town's BMPs. These construction companies may not be a frequent cost, but towns may still face these costs, or similar as-needed costs, while they manage their stormwater. We spoke with stormwater consultants Matthew St. Pierre of Tata & Howard and Aubrey Strause of Verdant Water in order to get a better understanding of how much these municipalities have spent on stormwater management. We also interviewed the municipal officials that oversee the stormwater management programs such as the Directors of the DPW as mentioned in the previous objective. Andrea Briggs put us in contact with them during the course of the project. By interviewing both of these groups of people, we were able to assess stormwater management spending using multiple sources. Drawing on the research that we conducted in the previous objective, we analyzed the methods, which the towns used, and the cost of each method, in order to calculate a total amount that the towns spend on stormwater management.

To compile the data that we gathered from our subject towns, Ms. Strause and Mr. St. Pierre provided us with a chart that the previous IQP group had put together and that Ms. Strause and Mr. St. Pierre had updated, the chart can be seen in Appendix B. This chart had many common costs of towns and ways that towns pay for stormwater management. Once Ms. Strause

provided us with the chart, she was able to take the areas that we were looking at and add them to the chart. By using this chart, towns will be able to directly compare the data that we gathered with the data that the towns would gather from their own cost analyses.

Using the information that we gained from identifying Southbridge, Holden, and Millbury's current expenditures and the previous objective, we were able to compile data from all three municipalities and create a cost analysis.

3.5. Objective 4: Identified what changes each of the subject towns will have to make to comply with the requirements of the 2014 draft MS4 permit

In order to accomplish this objective, we used the knowledge gained in accomplishing objectives one, two, and three to begin calculating the cost of compliance with the 2014 MS4 permit. We performed research to determine the BMPs that the municipalities already have in place to comply with the 2003 MS4 permit. This research included a detailed analysis of the town's annual stormwater reports. In addition, we conducted interviews with town officials and stormwater consultants who have worked with the towns. Examples of the interview questions we used can be found in Appendix A. By identifying what Best Management Practices (BMPs) the towns already use, we were able to determine whether, and in what manner, our subject towns will need to expand their stormwater management efforts to meet the requirements of the 2014 MS4 permit.

In order to identify the necessary changes, we conducted interviews with municipal officials in each town. We also spoke with Frederick Civian; Regional Stormwater Coordinator of the MassDEP. These interviews provided us with insight into each town's level of preparedness toward meeting the requirements of the 2014 MS4 permit.

Ultimately, this objective helped us gain a comprehensive understanding of the financial cost of implementing the 2014 MS4 permit in each municipality. By understanding the BMPs each town uses, we were able to assess what changes they need to make, and by extension, the financial cost of implementing each change. We created a checklist of the common practices such as street sweeping, distribution of pamphlets, and outfall mapping that municipalities use to comply with stormwater permits, and combined this with a similar chart given to us by Mr. St. Pierre and Ms. Strause. We discuss our cost analysis in further detail in objective 5.

3.6. Objective 5: Provided a detailed analysis of the complete costs for each subject town to comply with the requirements of the 2014 draft MS4 permit

In order to complete this objective, we first determined the changes each town will need to make in order to comply with the 2014 draft MS4 permit, as we described in objective four. We then computed the financial cost of the implementation of these changes. In order to perform our cost analysis, we spoke with Mr. St. Pierre, Ms. Strause, and Mr. Civian. These people were able to provide us insight into the typical cost of implementing BMPs, which fulfill the MS4 permit. We were able to determine what equipment each town has, such as street sweepers, outfall mapping equipment, and signage, through interviews that we conducted with municipal officials. The CMRSWC possesses some of this equipment, which the municipalities can use, therefore eliminating the need for the towns to buy and maintain their own equipment. We also determined the human resources each municipality can provide to manage stormwater. This knowledge allowed us to determine the labor costs. This knowledge also allowed us to determine if the towns will need to hire contractors or additional personnel in order to supplement their workforce. Once we had a list of all of the costs of stormwater management from the subject

towns, we were able to estimate the total cost of meeting the requirements of the 2014 draft MS4 permit.

In order to assist us with our cost analysis, Mr. Civian provided us with a chart, which listed every regulation of the 2014 draft MS4 permit. This chart is utilized in Appendices D, E, and F where we used it for each of our three subject towns. We divided this chart into eight separate sheets. Seven of the sheets individually detail the requirements of the six minimum control measures, as well as miscellaneous requirements such as submitting a Notice of Intent (NOI). Within each of these sheets, we divided the costs into annual costs, one-time costs, and intermittent costs, and calculated a total for each. We then took the totals from each of the seven sheets and compiled them into an eighth master sheet. This chart allowed us to create a comprehensive analysis of implementing the 2014 draft MS4 permit in each of our subject towns.

3.7. Objective 6: Created an informational video to explain the costs of implementing the 2014 MS4 Draft permit

Over the course of the project term, we gathered photos, videos, and interviews from Fred Civian, Andrea Briggs, and John Woodsmall and compiled them into an informational video. By gathering this material, we were able to highlight the challenges and importance of stormwater management. These challenges include raising funds and garnering public support for stormwater management.

In order to create this video, we first created an outline. During the outlining process, we reached out to Frederick Civian, Andrea Briggs, Matthew St. Pierre, and Aubrey Strause in order to generate ideas for the content of our video. We then borrowed video recording equipment from WPI's Academic Technology Center (ATC). This equipment included a digital camera, monopod, tripod, GoPro, and a shotgun microphone. We used the GoPro to gather underwater

footage of the outfalls. The shotgun microphone allowed us to eliminate ambient noise from cars during our filming in the field. We also borrowed wireless clip-on interview microphones to get clear audio during our interviews. Once we acquired the equipment, we then began to create our video. We filmed our fieldwork, which included our use of the water sampling kits. We then conducted interviews with stormwater experts that we had contacted previously.

4.0 Cost Analysis

4.1 Introduction

One of our major findings details the benefits of regionalization to effectively implement the 2014 draft Municipal Separate Storm Sewer System (MS4) permit. Due to the high costs that we describe in this chapter, towns should consider joining an established coalition, such as the Central Massachusetts Regional Stormwater Coalition (CMRSWC), or starting a new coalition to serve their specific region.

After completing objectives one through four of our methodology, we were able to construct our cost analysis. In this cost analysis we detail both current stormwater expenditures for the towns of Southbridge, Holden, and Millbury, and potential costs of compliance with the new requirements of the 2014 MS4 Draft permit requirements.

After calculating the current expenditures of our towns, we sought to predict the cost of implementing the 2014 draft MS4 permit in our subject towns. In order to assist us with this portion of our cost analysis, Frederick Civian provided us with a spreadsheet, which lists each of

the requirements of the 2014 draft MS4 permit. We divided this table by the six minimum control measures of the MS4 permit, and then used the resulting spreadsheet to predict the cost of implementing each requirement in our subject towns. See the spreadsheets we used in Appendices D, E, and F.

In this chapter, we first provide some background information on the towns of Holden, Millbury, and Southbridge, Massachusetts. Then we discuss the results of our 2003 MS4 permit and 2014 draft MS4 permits cost analyses. We then explain the results of our comparative analysis of the three subject towns' current costs of implementing the 2003 permit requirements. Next, we describe the results of our comparative analysis of Holden, Millbury and Southbridge's estimated cost of compliance with the 2014 draft MS4 permit requirements.

4.2 Background Information on Millbury, Holden and Southbridge, Massachusetts

The three subject towns for the cost analysis are all located within Central Massachusetts. Despite their similar geographic location as seen in Figure 12, the subject towns vary in size, budget, and population. Southbridge, Massachusetts has a population of approximately 16,800, while Holden has a population of about 17,600, and Millbury has a population of about 13,300.

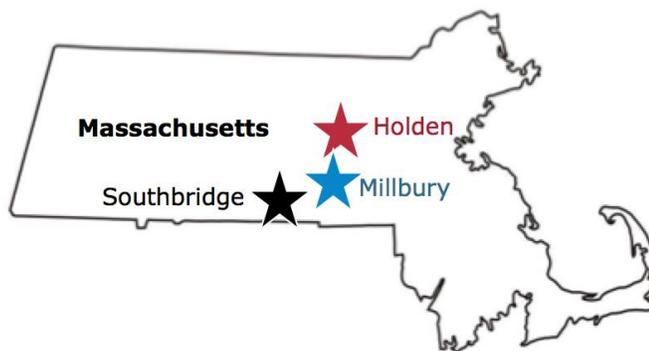


Figure 12: Town Locations in Massachusetts

The towns' geographic area and percentage of impervious surface area also varied.

With a higher impervious surface area comes a more expensive stormwater management program since there is more area for the stormwater runoff to run along. As the runoff runs along

impervious area it collects pollutants and the more polluted the runoff becomes. This requires the towns to take more of an effort to reduce the pollution, which leads to a high cost for stormwater management. As our subject towns cover more geographic area, their budget increases except in Southbridge, which has a larger budget than Holden even though Southbridge is significantly smaller. Millbury has the highest percentage of impervious surface area even though they have the smallest total area, which significantly increases their stormwater management costs.

The form of town government can have a large effect on how long towns take to implement the new draft requirements for stormwater management. Both Millbury and Holden have open town meetings as their primary form of government, whereas Southbridge has a Council and an Alderman as their government structure. When we spoke with Robert McNeil, he told us that having open town meetings could cause regulations to take longer to pass since the meetings are open to the public. This, however, does allow for much more public involvement and participation.

Town	Form of Government	Population	Town Budget	Area	Percent Impervious
Southbridge	Council and Alderman	16,799	56,739,257	20.9mi ²	8.69%
Holden	Open Town Meeting	17,636	52,774,844	36.2mi ²	7.04%
Millbury	Open Town Meeting	13,305	39,018,827	16.3mi ²	13.09%

Table 2: Town Information

4.2.1 Current Cost of Public Education and Outreach

The Public Education control measure requires towns to educate their population about the issues the town faces with regard to stormwater and to offer opportunities for the residents to participate in stormwater-related activities. In Table 3, we

Town	Population	Cost
Southbridge	16,799	\$10,952
Holden	17,636	\$1,000
Millbury	13,305	\$566

Table 3: Public Education Costs by Town

show how much Southbridge, Holden, and Millbury currently spend on the Public Education control measure.

A first glance at Table 3 may indicate that Southbridge does much more for this control measure than the other towns, but that is not entirely the case. Much of Southbridge's cost comes from the pamphlets and brochures that they create and distribute to their residents. Both Holden and Millbury have savings of about \$6,000 annually since they utilize the resources provided to them by the Central Massachusetts Regional Stormwater Coalition (CMRSWC). Holden also uses pamphlets and brochures comply with this control measure, but since they use materials from the CMRSWC, they only have to pay for distribution. Millbury distributes its public education material digitally through their Department of Public Works (DPW) website, saving on distribution and printing costs. Any town that is trying to maintain compliance with this control measure should utilize any already existing education materials, thereby saving money on design, especially if the town is part of the CMRSWC.

Southbridge also holds hazardous waste removal days in order to gather hazardous waste from households. This practice increases the amount Southbridge spends on this public education, but this helps prevent this waste from appearing in runoff, which in the end saves Southbridge money. This practice of preventative action is an example of what other towns can try as a cost-reduction effort.

4.2.2 Current Cost of Public Involvement and Participation

The next minimum control measure is Public Participation. Public Participation requires that towns comply with their own town meeting requirements. The United States Environmental Protection Agency (USEPA) designed this minimum control measure to allow the public to have a voice in the creation of town specific

Town	Cost
Southbridge	\$0
Holden	\$0
Millbury	\$0

Table 4: Public Participation Costs by Town

stormwater ordinances and regulations as required by the MS4 permit. In Table 4, we show the costs associated with maintaining compliance with the 2003 MS4 permit for each town.

The table has zero costs for each town, since this control measure only requires that the towns offer a place and time for people to comment and look at the regulations and ordinances before the town puts them into effect. Towns comply with most of this control measure by following basic town meeting requirements laid out outside of the MS4 permit.

4.2.3 Current Cost of Illicit Discharge Detection and Elimination (IDDE)

As illustrated by Table 5, the subject towns have a wide range of costs associated with implementing the 2003 MS4 permit IDDE control measure. Some of the requirements of the IDDE control measure include developing a storm sewer system map and creating a plan to detect and eliminate illicit discharges.

Town	Cost
Southbridge	\$2,452
Holden	\$3,520
Millbury	\$4,678

Table 5: IDDE Costs by Town

Southbridge, Holden, and Millbury have all completed the mapping requirements of the 2003 MS4 permit. Therefore, the towns have not had to map their town in a couple years. The current costs associated with the IDDE control measure in Southbridge reflects outfall sampling since outfall sampling accounts for 97% of the money the town spends on this control measure. Millbury complies with this requirement by using a Best Management Practice (BMP) that includes use of a closed circuit television (CCTV) system and vacuum truck to remove blockages from their storm drain system. This takes up about 86% of the combined cost for this control measure.

Holden also spends much of their money on use of the vacuum truck totaling about 64% of their total costs for this control measure. Isabel McCauley the senior civil engineer for Holden, and John Woodsmall, the director of the department of public works (DPW) for Holden,

estimate that Holden typically spends \$3,000-\$4,000 per occurrence on the removal of illicit discharges and had to remove one illicit discharge this past year.

We must note, however, that our costs for Holden were based only on data which Ms. McCauley and Mr. Woodsmall were able to provide to us. Environmental Partners Group (EPG) performs many of Holden’s costs associated with the IDDE control measure, including outfall mapping and water quality screening. Financial invoices from Holden detailed the town’s annual expenditures on EPG services since 2007 at \$119,000. However, the invoice descriptions do not specify exactly what service is associated with each line item. Therefore, it was difficult for us to discern between annual costs and one-time costs. We were unable to connect with EPG to obtain a more detailed cost breakdown.

4.2.4 Current Cost of Construction Site Runoff

As illustrated in Table 6, the costs associated with implementing the construction site runoff control measure of the 2003 MS4 permit in Southbridge, Holden, and Millbury is low. The 2003 MS4 permit requirements for this control measure include developing a plan to reduce the discharge of pollutants from construction sites.

Town	Cost
Southbridge	\$0
Holden	\$0
Millbury	\$350

Table 6: Construction Site Runoff Control Cost by Town

Our three subject towns implement this control measure using volunteers from their conservation commissions. The volunteers conduct most of the site inspections for the towns. The use of these volunteers is an excellent way to enforce this control measure without costing the towns any additional money. Another reason the cost of implementing this control measure is so low is that contractors must eliminate any violations at their own expense, as Pamela Harding

of Holden (Holden Senior Planner) and Ken Pickerin (Conservation Commission member) of Southbridge described to us in our interviews.

Our subject towns also already have sediment control ordinances in place. These ordinances do not cost any money to the towns as they are laws, which are already in place, and they do not need to be developed by town lawmakers. Although we did not learn of the particular details of these ordinances, they are similar in the fact that they require sediment and erosion control measures at construction sites.

4.2.5 Current Cost of Post-Construction

Differently from the previous control measure, the USEPA designed the Post Construction Site Stormwater Runoff control measure to ensure continuing pollution prevention, as well as BMP functionality, after construction has been completed. In the 2003 MS4 permit, this control measure states that the permittee must develop, implement, and enforce a program to address stormwater runoff from new development and

redevelopment projects that disturb land greater than one acre and discharge into the municipal system (US EPA, 2013).

Beyond this function, the control measure requires towns to have an ordinance addressing post-construction stormwater runoff, plans for BMP longevity, and that any control measure

the towns put in place will prevent or minimize impacts to water quality (US EPA, 2013).

In calculating the costs for each town, we sought to determine what funds the towns spent for stormwater management after they completed development projects. Based on the cost estimation sheets developed in *Cost Analysis For The MS4 Permits* (used in Appendices A, B,

Town	Cost
Southbridge	\$0
Holden	\$1,760
Millbury	\$0

Table 7: Post Construction Costs by Town

and C) we have found that the annual cost for this control measure is \$0 for Southbridge, \$1,760 for Holden, and \$0 for Millbury as illustrated in Table 7.

These costs can be explained by the ways in which each town implements the post construction site regulations. A representative from Southbridge, Ken Pickerin, is part of the local conservation commission. The Southbridge Conservation Commission (ConCom) is a group of volunteers who inspect construction sites, as well review construction site plans for construction projects. In Southbridge, the ConCom volunteers complete all of the Post-Construction Stormwater Management control measure requirements. Consequently, Southbridge's cost of compliance with the Post-Construction Stormwater Management control measure is zero (Ken Pickerin, 2014).

The town of Holden handles this differently, because they are within the Wachusett watershed and the Department of Conservation and Recreation (DCR) performs a number of the required elements of this control measure without any cost to the town (Robert Lowell, 2014). The \$1,760 annual cost is from collaborative efforts between the Department of Conservation and Recreation (DCR) (paid by their agency), and Holden DPW workers paid under Holden. Because of this, Holden does have a notable cost of \$1,760 to pay its workforce.

In Millbury, developers of a construction project handle the cost of the post construction control measure for that project. As part of the requirements for development within Millbury, a developer must pay for all required inspection programs themselves (Robert McNeil, 2014). This method is aligned with some of the innovative funding techniques Millbury utilizes, which we discuss in Section 5. Developers who secure the appropriate grants to fund the projects perform many of the projects in the town. As part of the grant, the developers pay for the costs of the post-construction control measures as well.

4.2.6 Current Cost of Good Housekeeping

The final requirement in the 2003 MS4 permit is Good Housekeeping. The USEPA designed this control measure to minimize or prevent the effects of stormwater runoff from municipal operations (US EPA, 2013). Generally, this means the towns must implement maintenance activities, inspection procedures for structural controls, employee training, and the upkeep of BMPs. In the implementation of this control measure, the towns have varying costs.

The annual cost for complying with this control measure for Southbridge is \$255,200, while the annual cost for Holden is \$180,246, and the annual cost for Millbury is \$555,123, as illustrated in Table 8. There is a large degree of variation between the towns on cost of current good housekeeping practices. However, this large variation in expenditures is not unique to these three towns.

Town	Cost
Southbridge	\$255,200
Holden	\$180,246
Millbury	\$555,123

Table 8: Good Housekeeping Costs by Town

In 2011, the USEPA conducted an analysis of the cost of complying with the good housekeeping control measure and found similar results. In this analysis the USEPA found that the Massachusetts towns of Bellingham, Franklin, and Milford, good housekeeping expenditures had a difference of \$791,000 between the highest and lowest costs for existing programs (Committee, 2011).

In the town of Southbridge, good housekeeping costs are primarily due to catch basin cleanings, salt and sand road management, a leaf collection program, and an employee training program. Of Southbridge's \$255,200, 85% is due to the salt and sand road management, BMP maintenance schedule, street sweepings, and the cleaning of catch basins and outfalls every two years.

In Millbury, the town maintains a schedule of yearly catch basin and outfall cleanings, as well as street sweeping, and the use of salt in their roadway management. Their roadway

management constitutes 83% of the cost for complying with this control measure in Millbury, and represents the largest cost in Millbury’s entire stormwater management program. While these costs are part of stormwater management, the actions are not for the stormwater management alone. A few of these procedures are part of other departments, such as the Highway Department (Robert McNeil, 2014), and so the costs do not accurately represent the total budget for a municipality.

4.2.7 Total Current Cost Comparison

When we combined the current costs of the control measure, we were able to obtain an estimation of the total costs of compliance for each town. In implementing their stormwater program, the town of Southbridge spends an estimated \$268,604 annually, as illustrated in Table 9. The town of Holden spends an annual \$186,526 to fund their stormwater management program, as we illustrate in Table 9. Our third town of Millbury annually spends \$584,960 on 2003 MS4 compliance as we illustrate in Table 9. We compiled these total costs from available information provided by the towns.

Town	Cost
Southbridge	\$268,604
Holden	\$186,526
Millbury	\$584,960

Table 9: Total Annual Costs by Town

Based on our research, each town appears to go above what is required for the 2003 MS4 permit, but the magnitude of this differs by town.

For example, Millbury cleans its catch basins and outfalls annually, while Holden cleans them every two years. Despite these differences, both towns maintain compliance with the permit, and do so through different methods. Between each municipality, there are differing divisions of stormwater management responsibility. In our experience interacting with each town, they divide their stormwater management programs amongst multiple departments. Because of this, there is a degree of reporting bias in our cost estimation for each town. These

biases are because different town representatives in different towns are all looking for or maintaining and providing different records. This means that towns may have over or underreported what their actual costs were, even with this, we hope that they can be used by towns in comparing the costs for different categories, if not the total costs.

4.3 Comparative Cost Analysis of 2014 MS4 Draft Permit

In this section, we analyze the cost of compliance with the 2014 draft MS4 permit. We discuss each of the minimum control measures and the costs associated with them on a town-by-town basis in the sections below. To complete the analysis we created a system of charts and created estimations with the assistance of Frederick Civian. The charts detail the costs of each of the requirements of the 2014 draft MS4 permit. There are columns in the charts for information about the control measure, the estimated cost of the specific requirement, the reference number to the MS4 Draft permit, and a justification for our estimation. Within the charts, and this section, we use three different frequencies of costs to describe when costs are applicable: annual, one-time, and intermittent.

Annual costs are costs that the towns will have to spend every year to maintain compliance, such as submitting an annual report, and yearly street sweeping. One-time costs include costs that towns have to pay for only once either in the beginning of the permit term or at some point during the permit term. One-time costs include mapping outfalls, submitting a notice of intent, and labeling outfalls. Finally, intermittent costs are costs that occur inconsistently, such as removing an illicit discharge. Appendices A, B, and C contain the completed cost sheets for Southbridge, Holden, and Millbury.

4.3.1 Future Public Education and Outreach Cost

In the 2014 MS4 Draft permit, requirements for the Public Education minimum control measure have increased. Specifically, in addition to the 2003 MS4 permit Public Education

requirements, the 2014 MS4 Draft permit requires towns to measure the effectiveness of their messages, such as educational materials released to the municipality public. Lawrence Pistrang, Environmental Analyst with the Wachusett Watershed DCR, explained that it will cost towns approximately \$8,820 to comply with the measuring effectiveness requirement under this control measure. In both Holden and Millbury, the additional cost of assessing the effectiveness of Public Education control measure would increase their cost by over eight times what they spend currently in this control measure. The increase in cost for would amount to double the town's present expenditures on Public Education. The Public Education minimum control measure has small low-cost administrative tasks, but the bulk of the cost comes from continuing the education efforts and adding an evaluative component to the program.

Town	Annual Cost	One-Time Cost	Intermittent Costs
Southbridge	\$19,242	\$0	\$0
Holden	\$9,908	\$0	\$0
Millbury	\$12,106	\$0	\$0

Table 10: Estimated Public Education Costs

Table 10 shows the cost of compliance of each of the towns, and as we can infer from the values present in the table, the annual costs have increased by 75.2% for Southbridge, 890% for Holden, and 2003% for Millbury. To save money on this control measure, the towns can reuse education materials that already exist within the town or the CMRSWC. The towns can also reduce costs by sharing the metrics and tools used to analyze the effectiveness of their education.

By regionalizing, and working with other towns, every town can save money since towns do not have to work complete these minimum control measures on their own.

4.3.2 Future Public Participation Cost

The Public Participation control measure changed little between the 2003 MS4 permit and the 2014 draft MS4 permit. Consequently, the towns will not have to expend any additional costs to maintain

compliance with this control measure. Table 11 shows the expected costs of this minimum control measure based on our estimated costs to update and maintain

Town	Annual Cost	One-Time Cost	Intermittent Costs
Southbridge	\$0	\$0	\$0
Holden	\$0	\$0	\$0
Millbury	\$0	\$0	\$0

Table 11: Estimated Public Participation Costs

compliance. The costs do not change for any of the

towns since the requirements changed only slightly, the changes that did occur were minor administrative tasks such as adding a section in the annual report, which describes this control measure, and requiring that towns comply with public notice requirements outside of the MS4 permit.

4.3.3 Future IDDE Cost

The IDDE control measure of the 2014 MS4 Draft permit represents a large portion of the cost associated with the permit. Much of this cost is due to more stringent requirements, including mapping, outfall sampling, and priority ranking outfalls. These requirements will

generate many material and labor costs, as the towns will have to sample all of their outfalls, while they currently only sample a small fraction of them.

As we show in Table 12, Millbury and Southbridge share similar annual costs on implementing the IDDE control measure of the 2014 draft MS4 permit. However, Holden’s cost is much lower. The main reason for this difference is the variation in number of outfalls between

Town	Annual Cost	One-Time Cost	Intermittent Costs	Number of Outfalls
Southbridge	\$19,242	\$304,006	\$50,440	206
Holden	\$7,872	\$314,494	\$50,440	144
Millbury	\$11,523	\$306,833	\$76,730	267

Table 12: Estimated IDDE Costs

the towns. Much of the annual cost for the IDDE control measure is due to the need for the towns to sample all of their outfalls. Southbridge and Millbury have 206 and 267 outfalls respectively, while Holden only has 144 outfalls.

The one-time cost of implementing the IDDE control measure is similar between our three subject towns. This similarity is because most of the one-time requirements are applicable to all of the towns. For example, all of the towns will be required to update their mapping system, which will cost approximately the same amount for all three towns, as they have a similar number of outfalls to map. The towns will also be required to develop an IDDE ordinance, as well as priority ranking catch basins based on conditions and other factors(US

EPA, 2014a). These requirements are of similar cost as the towns all have a similar number of catch basins, and similar resources from which to develop the ordinance.

The intermittent costs listed are very similar between the towns because many of these intermittent costs are indeterminable at this point.

Town	Annual Cost	One-Time Cost	Intermittent Costs
Southbridge	\$0	\$770	\$0
Holden	\$0	\$770	\$0
Millbury	\$350	\$858	\$0

Table 13: Estimated Construction Site Costs

Consequently, for comparison

purposes, we operated under the assumption that each town will have to treat one illicit discharge per year. We explain our assumptions in more detail in Appendices D, E, and F.

4.3.4 Future Construction Site Runoff Cost

As we demonstrate in Table 13, the towns are almost identical in the cost that will be required for them to implement the construction site runoff control measure of the 2014 draft MS4 permit. There is only one annual cost associated with this control measure, which is to continue implementing the construction ordinance from the 2003 MS4 permit. Because of this, the town's only have to spend a minimal amount of funds in maintaining this already-establish construction ordinance. Since Millbury is the only town that actually has to spend money to implement this requirement, they are the only town with a future cost associated with it.

The one-time costs of the construction site runoff control measure are all administrative tasks, which should take a similar amount of labor from each town to implement. There is no intermittent cost associated with implementing this measure in any of the towns, as there is only

one intermittent requirement of this control measure, which is to develop and implement a construction site runoff program. In all of the subject towns, the responsibility of this cost primarily falls on independent contractors working on town projects. We found that every town official we spoke informed us that when stormwater runoff issues are found on-site, the responsibility for correcting these issues falls to the developer.

4.3.5 Future Post-Construction Costs

The 2014 MS4 Draft permit, contains numerous additional requirements for the post-construction site runoff minimum control measure. Some of these new requirements include the development, implementation, and enforcement of a post-construction stormwater program for new developments and redevelopments (US EPA, 2014a). Frederick Civian assisted us in analyzing this control measure, and making estimations for the completion of individual items as we demonstrate in Appendices D, E, and F. For the town of Southbridge, we estimated that to implement the

requirements of the Post Construction control measure would require an annual cost of \$5,280, as we show in Table 14. This cost is joined by a \$1,496 cost to update from 2003 MS4 requirements, and an

Town	Annual Cost	One-Time Cost	Intermittent Costs
Southbridge	\$5,280	\$1,496	\$7,436
Holden	\$5,280	\$1,496	\$7,436
Millbury	\$5,280	\$1,496	\$7,480

Table 14: Estimated Post Construction Costs

estimated \$7,436 in intermittent costs as we show in Table 14. We have estimated that Holden will need to pay \$5,280 annually, \$1,496 in one-time costs, and \$7,436 in intermittent costs as we illustrate in Table 14. We estimate our third town, Millbury, will need to pay \$5,280 annually, \$1496 in one-time costs, and \$7,436 in intermittent costs as we show in Table 14. These are all estimated costs that each town should expect to pay, but they may be different depending on how the town plans to implement it. For example, Millbury could expect to reduce its costs by following its current grant funding system. If Millbury imparts these costs onto developers funded by grants, they will be significantly lower (Rob McNeil, 2014). Similarly, if Holden utilizes DCR services; they may be able to forgo some of these costs as well (Robert Lowell, 2014). This section needs some additional detail so we understand where each of the separate costs is coming from.

4.3.6 Future Good Housekeeping Costs

In the new 2014 draft MS4 permit, the Pollution Prevention and Good Housekeeping control measures represent an on average 20% increase in annual costs in comparison to the 2003 MS4 permit cost of compliance. This is because there are many new and specific requirements for this draft permit, where municipalities have to be far more specific in their practices to comply with the permit. We based these cost on our estimates provided in part by Mr. Civian.

We have estimated that the town of Southbridge will have an annual Good Housekeeping cost of \$283,458, a onetime cost of \$6,292, and an intermittent cost of \$0 as illustrated in Table 15. The town of Holden will need to expend an estimated \$220,562 annually, as well as \$6,292 in one-time costs, but similarly to Southbridge, Holden will have \$0 in intermittent costs as

illustrated in Table 15. We have estimated that the town of Millbury will need to pay an annual cost of \$693,578, a one-time cost of \$6,292, and no intermittent cost we illustrate in Table 15.

We deduce these costs based on what the towns currently expend in good housekeeping compliance for the 2003

MS4 permit. The 2003 MS4 permit costs, shown in Table 7, represent the current costs for compliance for the subject towns. In the case of annual costs, the

Town	Annual Cost	One-Time Cost	Intermittent Costs
Southbridge	\$283,458	\$6,292	\$0
Holden	\$220,562	\$6,292	\$0
Millbury	\$693,578	\$6,292	\$0

largest contributors for this value in each town

Table 15: Estimated Good Housekeeping Costs

were their current snow and ice road management. This is a requirement that the USEPA did not update from the 2003 MS4 permit to the 2014 MS4 permit draft.

The annual cost for Millbury is an estimated 275% increase from the average cost of Holden and Southbridge. As mentioned earlier in Section 2.4.7, such a large deviation should not come as a surprise. After being interviewed, DPW Director for Millbury Rob McNeil provided us with the costs of salt, the largest contributor to this control measure cost as seen in Appendix F, in the 2014 Fiscal Year.

4.3.7 Total Future Cost Comparison

Beyond the cost of compliance with each of the control measures, there are many miscellaneous requirements that are located elsewhere in the permit. These requirements include: the submission of a notice of intent, total maximum daily load requirements, and the development of a

stormwater management program. These costs are difficult to estimate, as some of them have not been performed before (such as meeting Total Maximum Daily Load

Town	Annual Cost	One-Time Cost	Intermittent Costs
Southbridge	\$15,168	\$2,376	\$0
Holden	\$15,168	\$2,376	\$0
Millbury	\$15,168	\$2,376	\$0

Table 16: Estimated Miscellaneous Costs

requirements), and are not

implemented as numbers in our cost sheets located in Appendices A (Southbridge 2003 Cost Analysis), B (Holden 2003 Cost Analysis), and C (Millbury 2003 Cost Analysis). The annual miscellaneous costs in each individual town are \$15,168, \$2,376 in one-time costs and \$0 in intermittent costs we illustrate in Table 16 and Appendices

A, B, and C. When all of the values in Tables 10 through 15 of this chapter have been summed up in Table 17, we estimate Southbridge’s annual cost of compliance with the 2014 Draft MS4 permit to be \$343,008 per year. We have also estimated their one-time cost for the 2014 MS4 permit to be \$314,940, which we included in Table 17. In terms of intermittent costs, we expect the towns of Southbridge and Holden to have to pay \$57,876 per year as we illustrate in Table 17. We estimate the town of Millbury to need to pay \$84,210, as indicated in Table 17. In the Town of Holden, their annual costs are \$258,790, their one-time costs are \$325,428, and their

intermittent costs are \$57,876 as we include in Table 17. In the Town of Millbury, we expect the annual costs to total \$753,173, their one-time costs to total \$320,231, and their intermittent costs to total \$84,210 per year, as illustrated in Table 17. These costs reflect the current stormwater management programs in each town that will continue, as well as a multitude of new requirements. We calculated these cost estimates in direct collaboration with Frederick Civian.

Town	Annual Cost	One-Time Cost	Intermittent Costs
Southbridge	\$343,008	\$314,940	\$57,876
Holden	\$258,790	\$325,428	\$57,876
Millbury	\$753,173	\$320,231	\$84,210

Table 17: Estimated Total Costs

5.0 Findings and Recommendations

5.1 Introduction

Having completed our goals, objectives, and cost analysis, we were able to develop many findings and recommendations for the towns of Southbridge, Holden, and Millbury, Massachusetts, the Central Massachusetts Regional Stormwater Coalition (CMRSWC), and other Massachusetts towns. In this chapter, we discuss the results of our research and recommendations for the CMRSWC and the towns so they can be adequately prepared for the 2014 Municipal Separate Storm Sewer System (MS4) draft permit. Our findings detail the cost of implementing the 2014 draft MS4 permit, as well as the difficulties associated with implementing the draft permit in our subject towns. Despite our rigorous methods, our research may not have revealed all potential costs of compliance with the new draft permit. Therefore, the towns should read our cost analysis as an estimate guideline or starting point. We believe, however, that our findings will be accurate and can help our towns effectively implement the 2014 draft MS4 permit.

5.2 Finding 1: The 2014 MS4 permit may cost too much for the towns to effectively implement

Southbridge, Holden, and Millbury, Massachusetts all struggle to finance elements of their stormwater management programs. Currently, Southbridge spends an estimated \$ 326,118 annually on their stormwater programs. Comparatively, the towns of Holden and Millbury spend approximately \$150,232 and approximately \$647,475 respectively on their annual stormwater budgets. We have compiled these reports from information that individual town representatives have provided us as well as our own observations. We also obtained financial information from town archives, such as 2014 annual stormwater reports from each town. In order to ensure the validity of each wage, capital cost, and reoccurring cost, we obtained each value from

representatives of their respective towns. In cases where we could not find specific details, we translated financial estimates for certain services and programs from one town to another and checked the numbers with Frederick Civian, Stormwater Coordinator for the Commonwealth of Massachusetts.

Based on the reports that each town has provided us, each of our subject towns are experiencing difficulties in meeting these requirements, both financially, and with enough workers. Heather Blakeley, the Director of the Southbridge Department of Public Works (DPW), has expressed concern for the town's ability to fund its stormwater management program. Southbridge is running into difficulty with Proposition 2.5, which prevents towns from increasing taxes by more than 2.5% per year, and citizens can vote to reject an increase in taxes. This issue makes compliance with new MS4 requirements more difficult (Heather Blakely, 2014). Based on our interview, Southbridge is especially concerned with the lack of available labor. There are a large number of new requirements in the current MS4 Draft permit, and Southbridge does not have the dedicated labor force to tackle so many new programs (Heather Blakely, 2014).

John Woodsmall, the Director of the DPW in Holden, has expressed similar concerns. He has stated, "A lot of it depends on what the final format of the permit will be, and what the magnitude is in the increase in costs. We're able to absorb some but not too much generally. If it's substantial then that's going to be a real concern." (John Woodsmall, 2014).

Millbury's DPW director Robert McNeil has also indicated a similar situation. He said, "Particularly since it's still in draft form, we have not made any effort to determine the cost of the changes. So I think part of this whole effort, the hope is to work through that. Either [our IQP team] Figure out where the gap is, or what's changing, or work through the [CMRSWC] to

determine what those costs are” (Robert McNeil, 2014). Mr. McNeil also stated in our interview that of all the preparations, funding lacks the most assistance, even though funding is the backbone for the whole system.

After collecting financial data from each town, we were able to create a cost estimate for each town’s stormwater management costs as we show in the Finding 1. These cost estimates represent their total costs of compliance with the 2003 MS4 based on currently available information. We were able to contact representatives in the Massachusetts Department of Conservation and Recreation (DCR) during our project. We interviewed Robert Lowell, Stormwater Manager for the DCR, and Lawrence Pistrang, Environmental Analyst for the DCR. They were able to provide us with cost estimates for educational programs, as well as guidelines for estimating the costs of certain requirements. With these resources, we were able to construct a separate cost estimation of complying with the 2014 MS4 Draft permit for Southbridge, Holden, and Millbury. Appendix H contains the blank cost sheets, Appendix D for contains the completed sheets for Southbridge, Appendix E contains the completed sheets for Holden, and Appendix F for Millbury. In total, we expect an annual cost increase of 28% for Southbridge, 39% for Holden, and 30% for Millbury. These costs do not take into account the one-time costs for each town to update mapping systems, ordinances, and other one-time programs. Based on these increases in cost and the current state of the stormwater management programs in each town, we believe that the requirements in the 2014 MS4 Draft permit may cost too much for towns to effectively implement.

5.3 Recommendation 1: Effective regionalization will allow towns to better implement their stormwater management programs

If towns can regionalize their stormwater management programs, they will be able to implement the 2014 MS4 permit more effectively and at a lower cost. In our findings, we have

determined that towns can more effectively manage and fund their stormwater programs if they are part of a regional organization. In our study, the CMRSWC unified 30 towns by providing them an effective and centralized stormwater management resource. With the CMRSWC, the members do not have to produce many of the materials required under the 2014 MS4 Draft permit. Our project did not involve municipalities that were not part of a Coalition. Based on our interviews with DCR representatives and Massachusetts Stormwater Coordinator Frederick Civian, a municipality not part of a regional organization would need to expend an excess of \$9,433 to develop these materials in house or hire a contractor. We discuss the benefits of regionalization further in finding 4 and recommendation 4.

5.4 Finding 2: Using innovative funding techniques can help the towns spend less from their general fund on stormwater management

With the new draft permit having so many new requirements, towns will have to use innovative funding techniques such as grants, stormwater taxes, or stormwater utilities to fund all of the necessary changes. When funding large construction projects, towns look outside of the town for assistance. Many towns, however, do not look for additional funding outside of their town for stormwater management. When we interviewed the directors of the DPW in Southbridge and Holden, Heather Blakely and John Woodsmall respectively, both said that they have a line item in the town's general fund that funds the stormwater management program. In addition, when we asked how they planned to fund the required changes, both said they would just seek additional funding from the town. However, our other subject town Millbury did not use the same funding strategy as Southbridge and Holden. Millbury uses a unique method of partially funding their stormwater management, which we learned about when we spoke with the Millbury's DPW director Robert McNeil.

As all towns do, Millbury has contractors bid for projects within the town, such as replacing pipes, building new municipal buildings, and repairing municipal buildings. As a part of this system, Millbury asks some of the contractors to write grant requests for the town. If the town gets the grant, then the town gives the project to the contractor. This is an innovative way for both the town and the contractor to benefit; the town has the project completed with all of, or some of the grant money, and the contractor gets the contract. Innovative ways of funding stormwater management are becoming increasingly necessary, as the Community Innovation Challenge (CIC) grant continues to decrease the amount of funds that the CMRSWC receives.

The CIC grant is an innovative way to get community projects off the ground, but the state government established the grant program to start the projects, not sustain the projects, so every year the funding decreases. The CMRSWC is in its 3rd year of CIC funding, and the funding decreased by 62.9% in the first year and 30.4% in the second year. Therefore, the Coalition should explore other ways to fund their efforts. The CMRSWC member towns help the CMRSWC continue to operate by contributing annual dues. Some towns in the CMRSWC are considering implementing a stormwater tax or a stormwater utility, and in some cases that will be necessary. However, by using innovative funding methods, towns can minimize the amount that their residents have to pay for these measures.

5.5 Recommendation 2: The towns should seek alternative sources of funding such as additional grants beyond the CIC

As we mentioned in Finding 2, towns should start to seek new ways of funding stormwater management. When the United States Environmental Protection Agency (USEPA) releases a new MS4 permit, towns are going to have to find ways to fund the permit, and their current method of funding stormwater management through the general fund can only work for a limited amount of time. Some towns in the CMRSWC have talked about implementing a

stormwater tax, but according to Southbridge's DPW director Heather Blakeley, town residents will be hesitant to vote for this tax. This reservation may be due to the citizens' lack of information of the need for and importance of stormwater management. Another method for funding the necessary changes to stormwater management is to create a stormwater utility. This is most likely the best option for many towns, since it is a small increase in cost to the property owners: \$11 per single-family household or some similar number. Gathering this money from all of the properties in the town would significantly help towns pay for stormwater management (USEPA, 2009). The stormwater utility allows the town to gather funding based on a factor such as impervious surface or total area, or just a flat rate. A utility would also not have to through the town approval process, so it may be easier for towns to implement.

As we mentioned in Finding 2, Millbury has contractors look for grants that the town could apply for and has the contractors do the application for the town as part of bidding for a project. This way, the towns can source funding for stormwater management outside of their town with little effort, according to Robert McNeil. When we interviewed Mr. McNeil, he told us that the contractor does almost all of the work in this process, which means that even if the town does not get the grant they did not spend much time and money applying for it. The contractor does most of the actual work and it pays off for them if they can manage to get the grant for the town, since the town is much more willing to fund the project with grant money.

A few examples of grants the towns could apply for is the 604(b) grant from the Massachusetts Department of Environmental Protection (MassDEP), Wastewater grants from the Massachusetts Environmental and Energy Agency (MassEEA), and River Revitalization Grants from the Massachusetts Department of Fish and Game (MassDFG). The 604(b) grant program through the MassDEP serves to help towns determine issues in their current stormwater

management systems. The River Revitalization grant from the MassDFG directs the grant at towns for revitalizing rivers in the towns. The towns should apply for funding as quickly as possible before these funds go away. The Coalition should also lobby for additional future funding from the USEPA and the MassDEP

5.6 Finding 3: Using innovative stormwater management techniques can help towns save money and thus implement the MS4 permit more effectively

Millbury utilizes many innovative methods of stormwater management, which helps them save money in implementing the MS4 permit. During our interview with Millbury's DPW director Robert McNeil, we learned about many of these innovative techniques. Millbury has begun the process of removing sump pump lines from their sewer system and directing them into the stormwater system. The town initiated this process in order to prevent combined sewer overflows (CSOs). In anticipation of the increased flow volume from this project, Millbury has begun installing larger drainpipes. These pipes are much larger than they need to be to handle the flow volume from the current project. The town has installed these larger pipes in case they ever decide to tie more discharges into the stormwater system. If Millbury had installed pipes that were only of adequate size to handle the flow volume from the current project, then they would need to perform additional construction if they ever decided to tie more discharges into the stormwater system. Since Millbury has installed these larger pipes, they have eliminated the need to perform additional construction in the event that they decide to increase the flow volume through the stormwater system. Therefore, by anticipating the need for future construction, Millbury will save money over time, thus reducing their costs for stormwater management.

Millbury also saves money by performing innovative public participation programs. The town promoted an art contest to raise awareness of stormwater management in both their middle school and high school. The middle school art contest involved the entire 5th and 6th grade classes

in Millbury's public schools. The high school art contest targeted about 25 students (Rob McNeil, 2014). However, Mr. McNeil expressed interest in targeting the entire high school, which holds students from 7th through 12th grades, in the future. The town rewarded some of the students by allowing them to paint their artwork on the town's snowplows. The art contest was an effective way to target a large number of people. In addition, the contest only involved about four hours of labor from the town DPW. By keeping the cost of fulfilling the public participation control measure low, the town can focus more of their monetary resources on implementing the Illicit Discharge Detection and Elimination (IDDE) control measure, anticipated to be the most costly requirement of the 2014 draft permit.

5.7 Recommendation 3: The towns should strive to utilize innovative stormwater management techniques

As we have discussed in finding 3, the towns can save money by using innovative stormwater management techniques. The 2014 draft MS4 permit allows for a degree of creativity when designing BMPs. The permit allows the permittee to add a Best Management Practice (BMP) to their Stormwater Management Program (SWMP) at any time. If the towns strive to generate creative ideas, they may end up creating a new BMP, which is far more effective than any BMP, which is currently in use. Therefore, generating innovative ideas can be a tremendously helpful way to reduce the cost of implementing the 2014 draft MS4 permit.

5.8 Finding 4: Towns that communicate with other towns, even to a small extent, can more effectively manage and fund their stormwater management programs

In gathering data for our financial report, we have found that there is a lack of communication and sharing of information between towns to improve their stormwater management programs. Within the municipalities of the CMRSWC, there is a group called the Steering Committee, which meets on a monthly basis to discuss stormwater management within their municipalities. During our IQP term, we were able to attend two of these meetings, and in

both of these meetings, we noted the attendance of DPW Director for Millbury, Robert McNeil, DPW Director for Holden, John Woodsmall, and Town Engineer from Holden, Isabel McCauley. In addition, we noted the attendance of ten other members. These members represented other towns within the Coalition, and from the roster of attendees, we noted representatives from Auburn, Leicester, Millbury, Northborough, Shrewsbury, and Spencer. Of the thirty towns in the CMRSWC, only about 25% of towns were represented. Although there are many new members to the CMRSWC, this still represents a low level of communication between towns on this topic, even among towns that are members of a dedicated stormwater coalition. Despite this, the collaboration within the CMRSWC has benefitted all members. Based on our cost analysis efforts seen in Appendices D, E, and F, towns can save approximately \$9,433, not including the thousands in a Global Positioning System (GPS) mapping tools such as a Leica, in the implementation of the new permit as members of the CMRSWC.

In our meetings with representatives within the towns of Millbury and Southbridge, we have found that some cost-saving practices of one town may not appear in another. For example, Southbridge prints and mails all of their public education materials, but Millbury uses digital materials from the CMRSWC. Using the materials from the CMRSWC and digitally distributing them, Millbury saves the \$6,500 that Southbridge spends on postage. Millbury also has undertaken a way to gather grant funding that was unique among our subject towns the municipalities. Even though both of these towns are part of the CMRSWC, they were unaware of these cost saving techniques that they could apply to their own stormwater management programs.

In working with these towns in the CMRSWC, we have found that even though they do not always communicate their own techniques, they are able to save money through CMRSWC

membership. There are some requirements within the 2014 MS4 draft that require significant investment within a town, but other requirements that will have little or no financial cost. We found this particularly evident in the Public Education minimum control measure. This control measure requires information materials, such as pamphlets, brochures, or information on a website. Additionally, there are requirements such as a sump pump discharge policy, a municipal Stormwater Pollution Prevention Plan (SWPPP), and various ordinances that do not necessarily need to be uniquely tailored to every municipality. The CMRWSWC has templates for these materials, and municipalities can save money by using these materials provided as opposed to developing their own.

5.9 Recommendation 4: Regionalization can help towns save money by sharing information and resources.

The CMRWSWC is a great example of towns working together to help each other with stormwater management. Not every town needs to join the same coalition, but towns should form coalitions with neighboring towns to share knowledge and tools. The small \$4,000 cost of membership to the CMRWSWC more than covers the amount that the towns would normally spend on consultants, testing kits, mapping tools, and educational messages. All towns have to map their MS4 system and test their outfalls. This mapping does not have to happen every year, so a single town buying this equipment would be highly inefficient. Additionally, having to purchase water quality testing kits individually would also be a financial burden, based on the seven different factors to test for in the 2014 MS4 permit draft (US EPA, 2014a).

In the CMRWSWC, there are monthly steering committee meetings where members talk about current issues in stormwater management as well as issues that they are facing in their town. This is a great place for the person who is in charge of stormwater to learn more from their peers and discuss the current methods of stormwater management. Towns looking to form their

own coalition should look to the CMRSWC as a model or if they are in the region, they should look into joining the CMRSWC.

5.10 Finding 5: In each of our subject towns, stormwater management information was divided amongst different departments

Since the USEPA released the 2014 draft MS4 permit, the towns recognized the increased importance of updating their stormwater management programs. However, some towns struggle to find all of their stormwater management data. Neither Millbury, Southbridge, nor Holden had a centralized source of stormwater management information. In Southbridge, Heather Blakeley knew some of the general costs of stormwater management, but had to send us to Ken Pickerin for information on the conservation commission and to the fire chief Mark DiFronzo for information on hazardous waste removal. Mr. Pickerin and Mr. DiFronzo both dealt with stormwater management indirectly, which led to some confusion as to what information we needed from them. In Holden, we spoke with Isabel McCauley and John Woodsmall, both of whom were knowledgeable on the stormwater management relating to their jobs, but had to send us to town planner Pamela Harding for information on the conservation commission. In our towns, we eventually received the data that we needed, but always after talking with many different people and looking at many different cost sheets. The people we interviewed were often located between different departments in the town.

In Millbury when we interviewed the director of the DPW, Robert McNeil, he had to check for some of the stormwater data, given that he is in charge of the whole department and there is not a single place for that information. However, the numbers he provided to us were from all from different parts of the town's records, which was the case for all three of our subject towns. Many requirements of the 2003 MS4 permit are likely to be performed by multiple departments, such as ordinance creation and street sweeping being two completely different

programs requiring completely different personnel. For all three of our subject towns, these records were not located in a single place, because the required tasks of stormwater management were handled by multiple departments.

5.11 Recommendation 5: Having a central source of stormwater management would allow for easier implementation of future MS4 permits and make continuous compliance easier for the towns.

Based on our previous finding, having a single person in charge of stormwater management, for example, a stormwater coordinator, would make compliance much easier for towns. According to the Department of Conservation and Recreation's (DCR) Stormwater Coordinator Robert Lowell, the USEPA classifies the Wachusett Watershed as a non-traditional MS4 system. Therefore, looking at the Wachusett Watershed DCR for stormwater management is not too different from looking at a town; there are just some different requirements. When interviewing Mr. Lowell, he was able to access information easily because of his position. Since Mr. Lowell is in charge of stormwater management for the Wachusett Watershed DCR, he had intimate knowledge of how many of the requirements the DCR are meeting and what their plans were for the future with the new 2014 draft MS4 permit. If towns were able to replicate what the Wachusett Watershed DCR does with a stormwater manager, then they would be in a much better position for the any future MS4 permits. We recommend that towns research the feasibility of either creating a full-time position to manage stormwater, or make it part of an already-existing position within the municipality. We realize that small towns may not be able to afford this option, and we suggest some towns research the potential of Regional Stormwater Coordinators. These could be Stormwater Managers for multiple municipalities, whose wages are paid in part by each municipality the manage stormwater for. This option may allow smaller

municipalities to be able to consolidate their stormwater management information within their municipal budget.

5.12 Finding 6: The IDDE control measure will be a significant contributor to the increase in cost between the 2003 and 2014 draft MS4 permits

The IDDE control measure of the 2014 draft MS4 permit will cause a significant increase in the cost of implementation in onetime costs. When researching the permits, we found that the IDDE control measure is much longer and has many more requirements in the 2014 draft MS4 permit than in the 2003 MS4 permit. These more stringent requirements will cause a significant increase in the cost of compliance with the

MS4 permit, as we illustrate in Table 18. For example, the town of Southbridge should anticipate a large increase in the cost of testing their outfalls. Southbridge has 206 outfalls. In the 2014 fiscal year, they sampled 25 outfalls. Under the 2003 permit, this effort is enough to fulfill the permit requirements. However, the 2014 draft MS4

Town	2003	2014 Draft
Southbridge	\$3,520	\$7,872
Holden	\$4,678	\$11,523
Millbury	\$2,452	\$19,242

Table 18: Annual Cost Comparison of IDDE

permit requires each town to sample all of their outfalls, which will result in an eightfold increase in cost for the town. Many of the other permittees will likely face the same challenge as Southbridge and have to increase their sampling work. Massachusetts’s towns should anticipate much higher costs in order to fulfill the new requirements of the IDDE measure.

5.13 Recommendation 6: The CMRSWC should have one person in charge of keeping track of and maintaining the field sampling kits.

One issue that we often faced during our project was with the field sampling kits. The kits often had disorganized and expired components. For example, there was one day we could not run the ammonia test in the field because of expired components. If town workers discover expired components while they sample in the field, this would delay their opportunity to run the test. The workers would have to take the time to find new components and return to their sampling locations. This delay would raise the labor costs for the towns. It was also difficult to find some of the kits. There was one day we had to travel to Oxford in order to find the Total Dissolved Solids (TDS) meter and the Turbidity test. As we discuss in finding 6, the condition of the sampling kits often made it difficult to perform the tests in the field. The kits often had expired components or were in many different locations. If one person was in charge of tracking and maintaining the kits, the CMRSWC would save time trying to find kits and would not have to perform repeat sampling days at outfalls. Therefore, having one person in charge of the kits will save the CMRSWC money.

5.14 Finding 7: The current Asus tablet in use by the CMRSWC is slow and ineffective

When we were in Holden doing outfall testing, we used the tablet from the CMRSWC, which towns use for mapping and data collection. The tablet was not able to connect to the Internet without Wi-Fi, which made it difficult to use in the field. The current solution to that issue is to have an AT&T wireless hotspot to create a mobile hotspot for the tablet. This was not always reliable since the mobile hot spot could be lost or be out of range of the tablet.

The next issue that we learned about with the tablet system was the software. According to Isabel McCauley, Holden's Town Engineer, the software was slow on the tablet and was hard

for the DPW workers to use. When we used the CMRSWC tools on the tablet in the field, we saw this delay. However, when we tried the same tools on one of our smart phones, an iPhone 5, the tools worked smoothly. The screen of the iPhone was smaller than that of the tablet, but the CMRSWC's software was clearly not the issue, the issue was with the tablet.

5.15 Recommendation 7: The towns should use software, which can collect data offline and then upload it to an online database later, as well as a tablet, which is more up to date. This would allow the DPW workers to work more efficiently, thus saving the town labor costs

There are many issues with using the current CMRSWC tablet. Sometimes there just is no cellular signal, which a new tablet could help with, but not be able to completely fix. For this issue, we recommend that the CMRSWC develop an offline mode for the tablet so that anyone using the tablet can collect data and save it so that when the tablet can connect to the network, either via Wi-Fi or via a cellular network, the tablet can upload any data it saved while in offline mode.

Since the tablet is almost three years old, and there are new tablets that would work better, we recommend that the CMRSWC buy a new tablet on which to use their software. Buying a tablet would decrease the amount of time that anyone using the tablet has to wait for loading and reloading when the tools crash. There are tablets that have built-in cell signal receptors, which may be better so the hot spot is not lost and there is a better signal. The combination of the mobile hotspot and the older tablet causes unnecessary frustration and loss of time. When buying the new tablet, the CMRSWC should invest in model that will be durable and will function well over time and with many different users.

For this purpose, we recommend that the CMRSWC purchase a low-end Apple iPad, since they run much better and have a much better life span compared to an Asus tablet. A low-end iPad would cost about \$530 for the lowest end full iPad with a diagonal screen size of 9.7in.

A cheaper option is an iPad Mini, which costs \$380 with a diagonal screen size of 7.87in. Either of those options would easily out-perform the current Asus tablet. The Asus tablet costs about \$250 with a screen size of about 7in and lasted probably two good years. With either iPad they would continue to function well into four years after they are purchased. While working on the current Asus tablet, we lost about four minutes per outfall having to wait for pages to load and reloading pages. If a town is paying a DPW employee \$22/hour to use this tablet and they lose four minutes per outfall, they are losing about \$2 per outfall. Since the town has to go to each outfall for some of the new requirements approximating 145 outfalls a town, the town is losing \$290 due to the cost of the inadequate technology. Just in that savings from one town, the CMRSCW is making the money back in timesaving, especially since the CMRSCW distributes the tablet to many different towns.

5.16 Other Recommendations

5.16.1 The Massachusetts Department of Environmental Protection should research the potential of providing standardized materials available to Massachusetts municipalities

Based on our findings, we believe the MassDEP should consider making available a collection of materials that municipalities could use for their permit compliance when administering the new 2014 MS4 permit. Within the requirements of the 2014 draft MS4 permit, there are many line items that municipalities must develop and implement. These materials primarily consist of those in the Public Education and Public Involvement control measures, such as pamphlets, brochures, and public notices. Beyond these two control measures there are still a number of material requirements, including Stormwater Pollution Prevention Plans (SWPPPs), outfall-screening procedures, and construction site stormwater plans. These materials will require a significant investment from municipalities to implement (See Appendices D, E, and F for cost estimations in our subject towns). In one case, Mr. Lowell provided our team with a high-end

cost estimate for complying with the Public Education requirement. Based on the requirements of the current MS4 Draft permit, a high-end public education program for a town of approximately 17,000 individuals costs an estimated \$19,787 annually (Robert Lowell, 2014). This cost can be different, depending on how the municipality chooses to implement certain requirements. Some towns like Millbury are working to abolish paper materials completely (Robert McNeil, 2014). In regards to the Central Massachusetts Regional Stormwater Coalition (CMRSWC), these materials are made by the CMRSWC for its member municipalities, and are available as part of the paid membership to the CMRSWC. Beyond this Coalition, there is also the Massachusetts Watershed Coalition. Formed in 1991, this Coalition works with community partners across Massachusetts in order to protect and restore watershed ecosystems across the state (Coalition, 2014). As part of its goal, the Mass Watershed Coalition also provides information and other services relating to stormwater to many communities in the state (Coalition, 2014). In the 2014 MS4 Draft permit, Most of the requirements are not specific to individual municipalities. The USEPA made the MS4 permit to be applicable to many different municipalities, and the materials that are required are similarly nonspecific to any municipality. With special attention paid to the success of Coalitions distributing materials, it may be highly beneficial for the MassDEP to develop certain materials in-house, as opposed to municipalities developing them themselves. These would be materials like standard operating procedures, ordinances, and other administrative tools that are required under the 2014 draft permit. The MassDEP should certainly not force municipalities to use these materials, but the materials should be available in electronic and physical forms. Even if only a few towns make use of these materials, they could potentially save tens of thousands of dollars.

5.16.2 The CMRSWC should streamline and update the digital forms. This practice would reduce the time needed to inspect outfalls, thus saving money

While we performed outfall sampling in Holden, we completed wet and dry weather sampling forms. We spent roughly ten minutes per outfall in order to complete these forms. As noted by Matthew St. Pierre of Tata & Howard, these forms have many additional categories. These categories include test results for pollutants that are not regulated by the MS4 permit. It is worth noting that, by having categories that go beyond the regulations of the MS4 permit, the CMRSWC can create a cleaner and less polluted environment. The detail of these forms illustrates the CMRSWC's admirable commitment to protecting the environment. However, the cost of implementing the 2014 draft MS4 permit is significant, and will likely strain many towns' budgets. If the CMRSWC updates these forms and removes the categories unrelated to the draft MS4 permit, it will save the town workers time, and thus streamline the process of outfall sampling. These time savings will also save the towns labor costs.

The CMRSWC should also utilize these updated forms on their digital system. Digital sampling forms are easy to upload to a database or the CMRSWC's website. When we were performing field work in Holden, Ms. McCauley demonstrated how to complete the dry and wet weather sampling forms on the CMRSWC tablet and then upload them to the CMRSWC website. Having a database of these forms makes it easy to see trends in pollution, both within a single town, and between towns, which have shared watersheds. Therefore, the database makes it much easier to perform outfall sampling and inspections, thus saving money. A previous IQP group detailed the efficiency of uploading digital forms to the People GIS database using the Leica tablet. This process circumvented the need to submit the forms outside of the field, and also prevented municipal employees from making repeated trips to outfalls in order to inspect

them (Barat, Chin, & Feraco, 2012). Therefore, the use of a digital database makes sampling and inspection easier and more efficient.

5.16.3 Recommendations for Future Research

In the future, we recommend project groups perform an assessment of the cost of implementing Total Maximum Daily Load (TMDL) measures. According to Frederick Civian, the cost of implementing TMDL measures could be overwhelmingly significant for the towns. Although not much research has been done on TMDL, the USEPA has shown the extent of these costs. The USEPA estimated the cost of implementing TMDL requirements in Bellingham, Franklin, and Milford Massachusetts at \$23,595,000, \$62,810,000, and \$67,363,000, respectively (Group, 2011). A proper assessment of these costs could prove to be valuable to the USEPA, as well as the towns, in the future.

We also recommend future project groups attempt to fill the gaps in our research. We received most of our data from the town officials, with few outside sources except for the DCR. We attempted to contact Environmental Partners Group for information about Holden, but we were unable to reach them. In addition, we had to estimate many of our costs. These factors made our cost numbers difficult to verify as being accurate. Because of this lack of verification, some of our data could have resulted in bias. We recommend that future research groups find a method to eliminate some of the biases in our data, such as by finding budget data from multiple sources.

6.0 Conclusion

Stormwater runoff is one of the leading contributors to water pollution in the United States. In order to combat this pollution, the United States Environmental Protection Agency

(USEPA) created the Municipal Separate Storm Sewer System (MS4) permit. On September 30, 2014, the USEPA released the 2014 draft MS4 permit. Once the USEPA releases the permit in full, towns throughout Massachusetts will have to comply with it, which will lead to substantial spending increases.

In our cost analysis chapter, we discuss the predicted annual costs of complying with the 2014 draft MS4 permit in our subject towns of Holden, Millbury, and Southbridge. From our cost analysis, we predict an annual cost of implementing the 2014 draft MS4 permit of \$258,790 for Holden, \$735,629 for Millbury, and \$343,008 for Southbridge. These costs represent an increase in the annual cost of implementation from the 2003 MS4 permit of 39% for Holden, 26% for Millbury, and 28% for Southbridge.

These cost increases are significant, and we propose several potential methods for defraying the cost increases of effectively implementing the 2014 Draft MS4 to individual towns. In addition, we recommend that towns reach out to the Massachusetts Department of Environmental Protection (MassDEP) for advice on implementing the permit. In our findings and recommendations chapter, we provide recommendations to towns, and the Central Massachusetts Regional Stormwater Coalition (CMRSWC) for effective implementation of the 2014 draft MS4 permit. Among our most important recommendations, we emphasize the benefits of regionalization, the use of innovative stormwater management and funding techniques, and centralization of stormwater management in each town.

The task of effective stormwater management is daunting. However, by implementing the proper procedures, the towns can plan effectively manage stormwater management, thus protecting human health and the environment.

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Appendix A

Public Education and Outreach	Materials			Consultant	Legal	Staff Labor								Total cost	
	Costs per unit	Multiplier	Total Materials Cost	Total	Total	Technician/ Equipment Operator		Foreman		Administrative		Director		Total Staff Labor	Total cost
						Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours		
Pamphlets/Brochures to residents	6500	1	\$6,500.00											\$0.00	\$6,500.00
Pamphlets/Brochures to businesses	0		\$0.00											\$0.00	\$0.00
Meetings	0		\$0.00											\$0.00	\$0.00
Poster	0		\$0.00											\$0.00	\$0.00
Video	0		\$0.00											\$0.00	\$0.00
Newspapers	500	1	\$500.00											\$0.00	\$500.00
Signs	0		\$0.00											\$0.00	\$0.00
Broadcasting	0		\$0.00											\$0.00	\$0.00
Develop collection program for hazardous waste	0		\$0.00							22	80	40	40	\$3,360.00	\$3,360.00
Develop school curriculum and distribute to schools	1		\$0.00			23	4							\$92.00	\$92.00
Educational training materials	0		\$0.00											\$0.00	\$0.00
Media campaign	500	1	\$500.00											\$0.00	\$500.00
Website	1		\$0.00											\$0.00	\$0.00
Total															\$10,952.00

IDDE Program	Materials			Consultant	Legal	Staff Labor								Total cost	
	Costs per unit	Multiplier	Total Materials Cost			Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours	Total Staff Labor	Total cost
Outfall mapping (Not Completed yearly)	20000	0	\$0.00											\$0.00	\$0.00
Catch basin mapping (Not completed yearly)	20000	0	\$0.00											\$0.00	\$0.00
Map structural BMPs	0		\$0.00											\$0.00	\$0.00
Illicit discharge prohibition ordinance	0		\$0.00											\$0.00	\$0.00
Incorporate information into public education	0		\$0.00											\$0.00	\$0.00
Identify department to take stormwater calls	0		\$0.00											\$0.00	\$0.00
Develop employee training program to identify discharges	0		\$0.00											\$0.00	\$0.00
Host IDDE communication meeting with other Town Departments	0		\$0.00											\$0.00	\$0.00
Water quality screening with field kits	30	25	\$750.00			23	52							\$1,196.00	\$1,946.00
"Sewage sniffing dogs"	0														
CCTV System (camera and equipment)	0														
Vac truck and equipment	0														
Elimination of identified illicit discharge	0		\$0.00											\$0.00	\$0.00
Bylaw prohibiting non storm water discharges into storm sewer system	0		\$0.00											\$0.00	\$0.00
Program to evaluate and report on cond. after illicit material removed	0		\$0.00											\$0.00	\$0.00
Develop stormwater management program web based GIS system	0		\$0.00											\$0.00	\$0.00
Retention Ponds	1		\$0.00											\$0.00	\$0.00
Disposal of Waste	0		\$0.00			23	22							\$506.00	\$506.00
IDDE plan and implementation activities	0		\$0.00											\$0.00	\$0.00
Total															\$2,452.00

Good House Keeping and Pollution Prevention	Materials			Consultant	Legal	Staff Labor								Total cost	
	Costs per unit	Multiplier	Total Materials Cost			Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours	Total Staff Labor	Total cost
Clean catch basins	1		\$2,500.00			23	672	32.5	120			50	24	\$20,556.00	\$23,056.00
Approach (circle one)	OWN EQUIPMENT	VENDOR	Include vendor costs or equipment maintenance costs, annual												
Number of basins cleaned, per year															
Street sweeping	1		\$5,000.00			23	1376	32.5	80	22	8	50	24	\$35,624.00	\$40,624.00
Approach (circle one)	OWN EQUIPMENT	VENDOR	Include vendor costs or equipment maintenance costs, annual												
Curb miles swept, per year															
Road salt/sand management	150000	1	\$150,000.00			23	40	32.5	40					\$2,220.00	\$152,220.00
Has equipment been calibrated?	yes														
Leaf collection program	1		\$2,500.00			23	1280	32.5	64					\$31,520.00	\$34,020.00
Approach (circle one)	OWN EQUIPMENT	VENDOR	Include vendor costs or equipment maintenance costs, annual												
Snow removal procedures	1		\$0.00					32.5	40			50	40	\$3,300.00	\$3,300.00
Develop an inspection and maintenance Plan	0		\$0.00											\$0.00	\$0.00
Evaluate alternative vehicle washing options	0		\$0.00											\$0.00	\$0.00
Develop and implement maintenance schedules for BMPs	0		\$0.00											\$0.00	\$0.00
Employee training program	1		\$0.00			23	40	32.5	8			50	16	\$1,980.00	\$1,980.00
Management program for fertilizer and pesticide application	0		\$0.00											\$0.00	\$0.00
Training: fertilizer and pesticide applicators	0		\$0.00											\$0.00	\$0.00
Training: Maintenance and repair for municipal vehicles	0		\$0.00											\$0.00	\$0.00
Sump pump discharge policy	0		\$0.00											\$0.00	\$0.00
Municipal SWPPP	0		\$0.00											\$0.00	\$0.00

Total **\$255,200.00**

Grand Total **\$268,604.00**

Appendix B

Public Education and Outreach	Materials			Consultant	Legal	Staff Labor								Total cost	
	Costs per unit	Multiplier	Total Materials Cost	Total	Total	Technician/ Equipment Operator		Foreman		Administrative		Director		Total Staff Labor	Total cost
						Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours		
Pamphlets/Brochures to residents	500	1	\$500.00											\$0.00	\$500.00
Pamphlets/Brochures to businesses	500	1	\$500.00											\$0.00	\$500.00
Meetings	0		\$0.00											\$0.00	\$0.00
Poster	0		\$0.00											\$0.00	\$0.00
Video	0		\$0.00											\$0.00	\$0.00
Newspapers	0		\$0.00											\$0.00	\$0.00
Signs	0		\$0.00											\$0.00	\$0.00
Broadcasting	0		\$0.00											\$0.00	\$0.00
Develop collection program for hazardous waste	0		\$0.00											\$0.00	\$0.00
Develop school curriculum and distribute to schools	0		\$0.00											\$0.00	\$0.00
Educational training materials	0		\$0.00											\$0.00	\$0.00
Media campaign	0		\$0.00											\$0.00	\$0.00
Website	0		\$0.00											\$0.00	\$0.00
Total															\$1,000.00

Public Involvement and Participation	Materials			Consultant	Legal	Staff Labor								Total cost	
	Costs per unit	Multiplier	Total Materials Cost			Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours	Total Staff Labor	Total cost
Mark storm drains			\$0.00											\$0.00	\$0.00
Stormwater telephone hotline	0		\$0.00											\$0.00	\$0.00
River, stream and pond cleanups	0		\$0.00											\$0.00	\$0.00
Native tree and shrub planting	0		\$0.00											\$0.00	\$0.00
Classroom education program	0		\$0.00											\$0.00	\$0.00
Prepare press releases	0		\$0.00											\$0.00	\$0.00
Develop and implement composting program	0		\$0.00											\$0.00	\$0.00
Coordinate Household Hazardous Waste collection events	0		\$0.00											\$0.00	\$0.00
Form citizen watch groups to identify polluters	0		\$0.00											\$0.00	\$0.00
Educational outreach materials	0		\$0.00											\$0.00	\$0.00
Roadside cleanup day	0		\$0.00											\$0.00	\$0.00
Catch basin stenciling/ medallion installation	0		\$0.00											\$0.00	\$0.00
Poster contest for students	0		\$0.00											\$0.00	\$0.00
Stormwater management committee	0		\$0.00											\$0.00	\$0.00
Public meeting to discuss stormwater management plan	0		\$0.00											\$0.00	\$0.00
Total															\$0.00

IDDE Program	Materials			Consultant	Legal	Staff Labor								Total cost	
	Costs per unit	Multiplier	Total Materials Cost			Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours	Total Staff Labor	Total cost
Outfall mapping	0		\$0.00											\$0.00	\$0.00
Catch basin mapping	0		\$0.00											\$0.00	\$0.00
Map structural BMPs	0		\$0.00											\$0.00	\$0.00
Illicit discharge prohibition ordinance	0		\$0.00											\$0.00	\$0.00
Incorporate information into public education	0		\$0.00											\$0.00	\$0.00
Identify department to take stormwater calls	0		\$0.00											\$0.00	\$0.00
Develop employee training program to identify discharges	0		\$0.00											\$0.00	\$0.00
Host IDDE communication meeting with other Town Departments	0		\$0.00											\$0.00	\$0.00
Water quality screening with field kits	0		\$0.00											\$0.00	\$0.00
"Sewage sniffing dogs"	0		0											0	0
CCTV System (camera and equipment)	0		0											0	0
Vac truck and equipment			0			22	160							3520	3520
Elimination of identified illicit discharge (last done in 2011)	4000	0	\$0.00											\$0.00	\$0.00
Bylaw prohibiting non storm water discharges into storm sewer system	0		\$0.00											\$0.00	\$0.00
Program to evaluate and report on cond. after illicit material removed	0		\$0.00											\$0.00	\$0.00
Develop stormwater management program web based GIS system	0		\$0.00											\$0.00	\$0.00
IDDE plan and implementation activities	0		\$0.00											\$0.00	\$0.00
Total															\$3,520.00

Construction Site Stormwater Runoff Control	Materials			Consultant	Legal	Staff Labor								Total cost	
	Costs per unit	Multiplier	Total Materials Cost			Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours	Total Staff Labor	Total cost
Develop erosion control regulations	0		\$0.00											\$0.00	\$0.00
Conduct inspections for erosion controls	0		\$0.00											\$0.00	\$0.00
Identify department to take stormwater calls	0		\$0.00											\$0.00	\$0.00
Inform public of upcoming projects	0		\$0.00											\$0.00	\$0.00
Develop and implementation site plan review process for sites	0		\$0.00											\$0.00	\$0.00
Implement construction inspection program with fines for violations	0		\$0.00											\$0.00	\$0.00
Develop construction inspection program and inspect	0		\$0.00											\$0.00	\$0.00
Implement pre construction review of SW plan for site	0		\$0.00											\$0.00	\$0.00
Develop and implement erosion and sediment control ordinances	0	1	\$0.00											\$0.00	\$0.00
Total															\$0.00

Post Construction Stormwater Management	Materials			Consultant	Legal	Staff Labor								Total cost	
	Costs per unit	Multiplier	Total Materials Cost			Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours		Total Staff Labor
Develop BMP regulation	0		\$0.00											\$0.00	\$0.00
Develop and implementation inspection program	0		\$0.00											\$0.00	\$0.00
review existing BMPs	0		\$0.00											\$0.00	\$0.00
Develop inspection program of installed BMPs	0		\$0.00											\$0.00	\$0.00
Zoning	0		\$0.00											\$0.00	\$0.00
Urban forestry	0		\$0.00											\$0.00	\$0.00
Eliminate curbs and gutters	0		\$0.00											\$0.00	\$0.00
Conduct inspections of BMPs within 1st year of operation	0		\$0.00			22	80							\$1,760.00	\$1,760.00
Develop operation and maintenance procedures for structural BMPs	0		\$0.00											\$0.00	\$0.00
Total															\$1,760.00

Good House Keeping and Pollution Prevention	Materials			Consultant	Legal	Staff Labor								Total cost	
	Costs per unit	Multiplier	Total Materials Cost			Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours	Total Staff Labor	Total cost
Clean catch basins	0		\$0.00			22	320							\$7,040.00	\$7,040.00
Approach (circle one)	OWN EQUIPMENT	VENDOR	Include vendor costs or equipment maintenance costs, annual												
Number of basins cleaned, per year															
Street sweeping	0		\$0.00			22	480							\$10,560.00	\$10,560.00
Approach (circle one)	OWN EQUIPMENT	VENDOR	Include vendor costs or equipment maintenance costs, annual												
Curb miles swept, per year															
Road salt/sand management	150000	1	\$150,000.00			23	40	32.5	40					\$2,220.00	\$152,220.00
Has equipment been calibrated?															
Leaf collection program	0		\$0.00											\$0.00	\$0.00
Approach (circle one)	OWN EQUIPMENT	VENDOR	Include vendor costs or equipment maintenance costs, annual												
Snow removal procedures	0		\$0.00											\$0.00	\$0.00
Develop an inspection and maintenance Plan	0		\$0.00											\$0.00	\$0.00
Evaluate alternative vehicle washing options	0		\$0.00											\$0.00	\$0.00
Develop and implement maintenance schedules for BMPs	5956.39	1	\$5,956.39											\$0.00	\$5,956.39
Employee training program	0		\$0.00											\$0.00	\$0.00
Management program for fertilizer and pesticide application	0		\$0.00											\$0.00	\$0.00
Training: fertilizer and pesticide applicators	0		\$0.00											\$0.00	\$0.00
Training: Maintenance and repair for municipal vehicles	0		\$0.00											\$0.00	\$0.00
Sump pump discharge policy	0		\$0.00											\$0.00	\$0.00
Municipal SWPPP	0		\$0.00											\$0.00	\$0.00
Audits	4470	1	\$4,470.00											\$0.00	\$4,470.00

Total **\$180,246.39**

Grand Total **\$186,526.39**

Appendix C

Public Involvement and Participation	Materials			Consultant	Legal	Staff Labor								Total cost	
	Costs per unit	Multiplier	Total Materials Cost			Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours	Total Staff Labor	Total cost
Mark storm drains	0	1	\$0.00											\$0.00	\$0.00
Stormwater telephone hotline	0	0	\$0.00											\$0.00	\$0.00
River, stream and pond cleanups	0	1	\$0.00							0	0			\$0.00	\$0.00
Native tree and shrub planting	0	0	\$0.00											\$0.00	\$0.00
Classroom education program	0	0	\$0.00											\$0.00	\$0.00
Prepare press releases	0	0	\$0.00											\$0.00	\$0.00
Develop and implement composting program	0	0	\$0.00											\$0.00	\$0.00
Coordinate Household Hazardous Waste collection events	0	0	\$0.00							22	3			\$66.00	\$66.00
Form citizen watch groups to identify polluters	0	0	\$0.00											\$0.00	\$0.00
Educational outreach materials	0	0	\$0.00											\$0.00	\$0.00
Roadside cleanup day	0	1	\$0.00											\$0.00	\$0.00
Catch basin stenciling/ medallion installation	0	1	\$0.00											\$0.00	\$0.00
Poster contest for students	3000	1	\$3,000.00							22	8			\$176.00	\$3,176.00
Stormwater management committee	0	0	\$0.00											\$0.00	\$0.00
Public meeting to discuss stormwater management plan	0	0	\$0.00											\$0.00	\$0.00
Total															\$3,242.00

IDDE Program	Materials			Consultant	Legal	Staff Labor								Total cost	
	Costs per unit	Multiplier	Total Materials Cost			Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours	Total Staff Labor	Total cost
Outfall mapping	0	1	\$0.00											\$0.00	\$0.00
Catch basin mapping	0	1	\$0.00											\$0.00	\$0.00
Map structural BMPs	0	1	\$0.00											\$0.00	\$0.00
Illicit discharge prohibition ordinance	0	1	\$0.00											\$0.00	\$0.00
Incorporate information into public education	0	0	\$0.00											\$0.00	\$0.00
Identify department to take stormwater calls	0	0	\$0.00											\$0.00	\$0.00
Develop employee training program to identify discharges	0	1	\$0.00											\$0.00	\$0.00
Host IDDE communication meeting with other Town Departments	0	0	\$0.00											\$0.00	\$0.00
Water quality screening with field kits	0	1	\$0.00											\$0.00	\$0.00
"Sewage sniffing dogs"	0	0													
Elimination of identified illicit discharge	0	1	\$0.00											\$0.00	\$0.00
Bylaw prohibiting non storm water discharges into storm sewer system	1	0	\$0.00	2500		22	20			20	20	50	20	\$1,840.00	\$4,340.00
Program to evaluate and report on cond. after illicit material removed	0	0	\$0.00			22	4							\$88.00	\$88.00
Develop stormwater management program web based GIS system	0	0	\$0.00											\$0.00	\$0.00
IDDE plan and implementation activities	250	1	\$250.00											\$0.00	\$250.00
Total															\$4,678.00

Construction Site Stormwater Runoff Control	Materials			Consultant	Legal	Staff Labor								Total cost	
	Costs per unit	Multiplier	Total Materials Cost			Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours	Total Staff Labor	Total cost
Develop erosion control regulations	0	1	\$0.00											\$0.00	\$0.00
Conduct inspections for erosion controls	0	1	\$0.00	350										\$0.00	\$350.00
Identify department to take stormwater calls	0		\$0.00											\$0.00	\$0.00
Inform public of upcoming projects	0		\$0.00											\$0.00	\$0.00
Develop and implement site plan review process for sites	0		\$0.00											\$0.00	\$0.00
Implement construction inspection program with fines for violations	0		\$0.00											\$0.00	\$0.00
Develop construction inspection program and inspect	0		\$0.00											\$0.00	\$0.00
Implement pre construction review of SW plan for site	0		\$0.00											\$0.00	\$0.00
Develop and implement erosion and sediment control ordinances	0		\$0.00											\$0.00	\$0.00
Total															\$350.00

Post Construction Stormwater Management	Materials			Consultant	Legal	Staff Labor								Total cost	
	Costs per unit	Multiplier	Total Materials Cost			Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours		Total Staff Labor
Develop BMP regulation	0	1	\$0.00											\$0.00	\$0.00
Develop and implementation inspection program			\$0.00											\$0.00	\$0.00
review existing BMPs			\$0.00											\$0.00	\$0.00
Develop inspection program of installed BMPs	0	1	\$0.00											\$0.00	\$0.00
Zoning			\$0.00											\$0.00	\$0.00
Urban forestry			\$0.00											\$0.00	\$0.00
Eliminate curbs and gutters			\$0.00											\$0.00	\$0.00
Conduct inspections of BMPs within 1st year of operation	0	1	\$0.00											\$0.00	\$0.00
Develop operation and maintenance procedures for structural BMPs			\$0.00											\$0.00	\$0.00
Total															\$0.00

Good House Keeping and Pollution Prevention	Materials			Consultant	Legal	Staff Labor								Total cost	
	Costs per unit	Multiplier	Total Materials Cost			Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours	Total Staff Labor	Total cost
Clean catch basins	21.5	610	\$13,115.00			22	610							\$13,420.00	\$26,535.00
Approach (circle one)	OWN EQUIPMENT	VENDOR	Include vendor costs or equipment maintenance costs, annual												
Number of basins cleaned, per year	1210														
Street sweeping	75	600	\$45,000.00			35	600							\$21,000.00	\$66,000.00
Approach (circle one)	OWN EQUIPMENT	VENDOR	Include vendor costs or equipment maintenance costs, annual												
Curb miles swept, per year	1210														
Road salt/sand management	105.76	4505	\$476,448.80											\$0.00	\$476,448.80
Has equipment been calibrated?															
Leaf collection program			\$0.00											\$0.00	\$0.00
Approach (circle one)	OWN EQUIPMENT	VENDOR	Include vendor costs or equipment maintenance costs, annual												
Snow removal procedures			\$0.00											\$0.00	\$0.00
Develop an inspection and maintenance Plan	2000	1	\$2,000.00											\$0.00	\$2,000.00
Evaluate alternative vehicle washing options			\$0.00											\$0.00	\$0.00
Develop and implement maintenance schedules for BMPs			\$0.00			22	120							\$2,640.00	\$2,640.00
Employee training program	0	0	\$0.00											\$0.00	\$0.00
Management program for fertilizer and pesticide application	1000	1	\$1,000.00											\$0.00	\$1,000.00
Training: fertilizer and pesticide applicators			\$0.00	500										\$0.00	\$500.00
Training: Maintenance and repair for municipal vehicles			\$0.00	1000										\$0.00	\$1,000.00
Sump pump discharge policy			\$0.00											\$0.00	\$0.00
Municipal SWPPP			\$0.00											\$0.00	\$0.00
CCTV System (camera and equipment)	8000	1													8000
Vac truck and equipment	0	1	0											0	0
Total															\$576,123.80

Grand Total

\$584,959.80

Appendix D

	<u>Control Measure</u>	Estimated Annual Costs	Estimated One-time Costs	Estimated Intermittent Costs
	Public Education and Outreach	\$19,860	\$0	\$0
	Public Involvement and Participation	\$0	\$0	\$0
	Illicit Discharge Detection and Elimination Program	\$19,242	\$304,006	\$50,440
	Construction Site Stormwater Runoff Control	\$0	\$770	\$0
	Post Construction Stormwater Management	\$5,280	\$1,496	\$7,436
	Good Housekeeping	\$283,458	\$6,292	\$0
	<u>Non-Control Measure</u>			
	Miscellaneous	\$15,168	\$2,376	\$0
	Totals	\$343,008	\$314,940	\$57,876

KEY:	
Yearly	No. = Reference Number
Once	BMP/Admin = Is the requirement completed with either a BMP or Administrative work
As Needed	X Requirement = The short name for a requirement
	Requirement = Section in the 2014 MS4 permit draft
	Cost = Cost of completing the requirement
	Justification = List of methods used to complete the requirement, as well supporting data from sources
	In Place (Y/N) = Is the requirement listed currently in place

No.	BMP/Admin	Public Education and Outreach Requirement	Reference	Cost	Justification	In Place (Y/N)
1	Admin	Continue public education program required by 2003 permit	2.3.2 a	\$10,952	Pamphlets (6500), Hazardous Waste Collection (3360), Newspaper Article (500), Media Campaign (500), Develop a curriculum for school system (92)	Yes
2	Admin	*Define goals, express specific messages define audience for each message	2.3.2 a	\$44	2hrs @ \$22/hr	No
3	Admin	*Identify parties responsible for each message	2.3.2 a	\$22	1hr @ \$22/hr, once a year for 8 years	No
4	Admin	*Develop and send out two separate messages for each of 4 different audiences	2.3.2 c	\$22	1hr @ \$22/hr	No
5	Admin	*Show evidence that messages are achieving results	2.3.2 e	\$8,820	DCR explanation for assessing effectiveness	No
6	Admin	*Identify method used to evaluate effectiveness of messages	2.3.2 e	\$0	Included in No. 5	No
7	Admin	*Put in annual report the methods of distribution and methods to assess effectiveness	2.3.2 g	\$0	See Miscellaneous No. 50	No

Estimated Annual Costs \$19,860

Estimated One-time Costs \$0

Estimated Intermittent Costs \$0

No.	BMP/Admin	Public Involvement and Participation Requirement	Reference	Cost	Justification	In Place (Y/N)
1	Admin	*Comply with state public Notice requirements	2.3.3 a	\$0	Minimal cost, can post on website	No
2	Admin	Provide annual opportunity for public to participate in review and implementation of SWMP	2.3.3 b	\$0	In compliance with public meeting requirement	Yes
3	Admin	*Put in annual report these public participation activities	2.3.3 c	\$0	See Miscellaneous No. 50	Yes

Estimated Annual Costs \$0

Estimated One-time Costs \$0

Estimated Intermittent Costs \$0

No.	BMP/Admin	Illicit Discharge Detection and Elimination Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP	*Eliminate any illicit discharge to the stormwater system as expeditiously as possible	2.3.4.2	\$25,000	Varies depending on severity of infraction average cost, actual cost may vary	Yes
2	BMP	*Identify who is responsible for any such discharges	2.3.4.2	\$0	Included in No. 1	Yes
3	Admin	*If elimination takes more than 60 days, establish an expeditious schedule for elimination	2.3.4.2	\$44	2hr @ \$22/hr for scheduling	Yes
4	Admin	*If more than 60 days, report dates of identification and schedules in annual report	2.3.4.2	\$0	See Miscellaneous No. 50	Yes
5	BMP	Implement measures to control non-stormwater discharges if they add significant pollution	2.3.4.3	\$25,000	Varies depending on severity of infraction around 25000-50000	No
6	Admin	*Identify all known locations where SSOs have discharged to the MS4 in last 5 years	2.3.4.4 b	\$44	2hrs @ \$22/hr if records are available	No
7	Admin	*For each such SSO discharge, include date and time, location, volume, suspected cause	2.3.4.4 b	\$44	2hrs @ \$22/hr to determine the information	No
8	Admin	*Also include whether each entered any surface water and what corrective actions were taken	2.3.4.4 b	\$0	Included in No. 7	No
9	Admin	*Also include corrective measures planned and implementation schedule	2.3.4.4 b	\$0	Included in No. 7	No
10	Admin	*Maintain the SSO inventory as part of the SWMP and the Annual Reports	2.3.4.4 b	\$0	See Miscellaneous No. 50	No
11	Admin	*Provide oral and written notice to EPA and MassDEP for any SSO occurrence	2.3.4.4 c	\$44	2hrs @ \$22/hr for informing EPA/MassDEP orally/written	Yes
12	BMP	*Develop an inventory of each MS4 outfall, including location, interconnections, and condition (different only in that it requires the condition of the outfall)	2.3.4.5	\$1,133	15min/outfall (includes travel), 206 outfalls, @ \$22/hr	No
13	Admin	*Update inventory annually to include monitoring program	2.3.4.5 b	\$0	See Miscellaneous No. 50	No
14	BMP	*Physically label all MS4 outfall pipes	2.3.4.5 b	\$1,183	10min/outfall (includes travel), 206 outfalls, @ \$22/hr, + materials (\$2 stick per outfall + spraypaint + sharpie)	No
15	Admin	*For each outfall list unique identifier, receiving water, date of most recent inspection	2.3.4.5 c	\$0	Included in No. 14	No
16	Admin	*Also include dimensions, shape, material, physical condition and indicators of non-SW discharges	2.3.4.5 c	\$0	Included in No. 14	Yes
17	BMP	*Revise existing map of stormwater system within 2 years of effective date of the permit	2.3.4.6	\$250,000	Enough new requirements to have to add new data elements, cost assuming outside contracting and implementation into GIS map	No
18	BMP	*Map shall include all outfalls, pipes, manholes, catch basins, interconnections, open channels	2.3.4.6 a i	\$0	Included in No. 17	No
19	BMP	*Also include all municipally-owned BMPs (e.g., retention basins, oil/water separators, etc.)	2.3.4.6 a i	\$0	Included in No. 17	No
20	BMP	*Also include catchment delineation and all waters listed on the 303(d) or 305 (b) list	2.3.4.6 a i	\$0	Included in No. 17	No
21	BMP	*Also include municipal sanitary sewers or combined sewer systems	2.3.4.6 a ii	\$0	Included in No. 17	No
22	BMP	*Include various recommended elements	2.3.4.6 a iii	\$0	Included in No. 17	No
23	BMP	*Update the map to reflect newly discovered information and corrections or modifications	2.3.4.6 b	\$1,144	1hr/week @ \$22/hr for continuous additions to stormwater systems	No
24	Admin	*Report on the progress toward completion of the map in each annual report	2.3.4.6 c	\$0	See Miscellaneous No. 50	Yes
25	BMP	*Write an Illicit Discharge Detection and Elimination (IDDE) program document (Discrete, specifically mentions the document must be written out)	2.3.4.7	\$10,000	Complete redevelopment of the program, review and upgrades	No
26	Admin	Adopt an IDDE ordinance	2.3.4.7 a	\$1,430	Change ordinance, 13 weeks @ 5hrs/week @ \$22/hr, has to go to different committees	Yes
27	Admin	*Program shall clearly identify IDDE responsibilities and provide description of areas of responsibility	2.3.4.7 b	\$0	Included in No. 25	No
28	BMP	*Assess and priority rank each catchment into one of 4 possible categories (souppd up from previous "priority" mark in 2003)	2.3.4.7 c i	\$13,200	Approx. 1200 catch basins, approx. 30 min/basin @ \$22/hr	No
29	Admin	*Priority rank each catchment within each category (except those "excluded") using 8 factors (souppd up from previous "priority" mark in 2003)	2.3.4.7 c ii	\$26,400	Approx. 1200 catch basins, approx. 1hr/basin @ \$22/hr	No
30	Admin	*Gather all information needed for the 8 screening factors (e.g., industrial areas > 40 years old)	2.3.4.7 c ii	\$0	Included in No. 29	No
31	Admin	*Complete ranking using existing information within 1 year; update in annual report	2.3.4.7 c iii	\$0	See Miscellaneous No. 50	No
32	Admin	*In annual report include summary of evidence of known/suspected illicit discharges by catchment	2.3.4.7 c iii	\$0	See Miscellaneous No. 50	No
33	Admin	*Also include corrective measures and schedule for correcting each illicit discharge	2.3.4.7 c iii	\$0	See Miscellaneous No. 50	No
34	Admin	*Develop written procedure for screening and sampling of outfalls	2.3.4.7 d	\$0	\$0 with CMRSWC Membership	Yes
35	Admin	*Include procedures for sample collection, use of field kits and storage and conveyance of samples	2.3.4.7 d i	\$0	Included in No. 34	Yes
36	BMP	*If outfall is inaccessible, report the first accessible upstream structure	2.3.4.7 d ii	\$0	Possible time extensions, no cost	Yes
37	BMP	*Perform dry weather screening when and how prescribed; identify in annual report any follow-up needed	2.3.4.7 d iii	\$2,266	206 outfalls, approximately 30min/outfall @ \$22/hr	Yes
38	BMP	*Perform wet weather screening when and how prescribed	2.3.4.7 d iv	\$0	Included in No. 39	Yes
39	BMP	*Sample at minimum for 7 listed factors	2.3.4.7 d v	\$15,656	206 outfalls, done by contractor, \$30/outfall, \$23/hr, 2hrs/outfall Testing Kits (0) b/c CMRSWC membership	Yes
40	Admin	*Catchments with specified septic or other results shall be listed as "High Priority" catchments	2.3.4.7 d vi	\$44	2hrs @ \$22/hr, if records are available	No
41	BMP	*Develop written Catchment Investigation Procedure including review of maps and historic records	2.3.4.7 e	\$352	16hrs @ \$22/hr	No
42	BMP	*Also include manhole investigation methodology and procedures to confirm sources of illicit discharges	2.3.4.7 e	\$0	Included in No. 41	No
43	BMP	*For each catchment review sanitary sewer and storm sewer construction plans; prior work on either	2.3.4.7 e i	\$88	Assuming 4 catchments, 1 hr/catchment @ \$22/hr	No
44	BMP	*Also review Health department records for septic system or sanitary sewer system failures or complaints	2.3.4.7 e i	\$0	Included in No.43	No
45	Admin	*Identify and record any of the 12 System Vulnerability Factors (e.g., infrastructure > 40 years old)	2.3.4.7 e i	\$0	Included in No.43	No
46	Admin	*Document and annually report presence or absence of the 12 System Vulnerability Factors for each catchment	2.3.4.7 e i	\$0	Assuming using WPI spreadsheet, otherwise about 10min per catchment	No
47	Admin	*Include these required elements of written manhole investigation and catchment investigation procedures	2.3.4.7 e ii	\$0	\$0 since CMRSWC Membership	No
48	Admin	*Include these required elements in written dry weather investigation procedure	2.3.4.7 e ii a	\$0	Included in No. 47	No
49	Admin	*Include these required elements in written wet weather investigation procedure	2.3.4.7 e ii b	\$0	Included in No. 47	No
50	Admin	*Develop procedures to isolate and confirm illicit sources (e.g., dye testing, smoke testing, caulk dams, etc.)	2.3.4.7 e iii	\$176	8hrs @ \$22/hr, for scheduling	Yes
51	Admin	*In annual report, for each illicit source list the location, its source, description of the discharge	2.3.4.7 f	\$0	See Miscellaneous No. 50	No
52	Admin	*Also list date and method of discovery, date of elimination, mitigation or enforcement action	2.3.4.7 f	\$0	Included in No. 51	No
53	Admin	*And estimate volume of flow reduced	2.3.4.7 f	\$0	Included in No. 51	No
54	BMP	*One year after illicit discharge removal, perform confirmatory screening; wet, dry or both	2.3.4.7 f	\$132	\$22/hr 30min/screening, approximately 1.5hr/illicit, assuming 3 illicit	Yes
55	BMP	*Schedule follow up screening within 5 years after confirmatory screening	2.3.4.7 g	\$132	\$22/hr 30min/screening, approximately 1.5hr/illicit, assuming 3 illicit	No
56	BMP	*Develop and implement procedures to prevent illicit discharges and SSOs	2.3.4.7 h	\$0	\$0 since CMRSWC Membership	No
57	Admin	*Complete and report dry weather screening and sampling of High and Low Priority outfalls within 3 years	2.3.4.8 a	\$0	Included in No. 37 and No. 38	No
58	Admin	*"All data shall be reported in each annual report . . ."	2.3.4.8 a	\$0	See Miscellaneous No. 50	No
59	Admin	*Begin implementation of 2.3.4.7 d work no later than 15 months	2.3.4.8 b	\$0	Deadlines, See No. 38 and 37	No
60	Admin	*Implement and report Catchment Investigation Procedure in every catchment . . .	2.3.4.8 c	\$0	Deadlines, See No. 28	No
61	Admin	*In a minimum of 80% of the MS4 area serviced by Problem Catchments within 3 years and 100% within 5 years	2.3.4.8 c i	\$0	Deadlines, See No. 28	No
62	Admin	*For all catchments where sampling indicates sewer input within 5 years	2.3.4.8 c ii	\$0	Deadlines, See No. 28	No
63	Admin	*In 40% of all area served by all MS4 catchments within 5 years and in 100% of 4 area in 10 years	2.3.4.8 c iii	\$0	Deadlines, See No. 28	No
64	Admin	*Track progress toward these milestones in each annual report	2.3.4.8 e	\$0	See Miscellaneous No. 50	No
65	Admin	*Define or describe indicators for tracking program success; demonstrate efforts to locate illicit discharges	2.3.4.9	\$176	8hrs @ \$22/hr	No
66	Admin	*Also include percent and area in acres evaluated; volume of sewage removed; place in annual report (more detailed, 2003 only asks to measure progress)	2.3.4.9	\$0	See Miscellaneous No. 50	No
67	Admin	provide annual training to employees involved in IDDE program	2.3.4.10	\$0	\$0 since CMRSWC Membership	Yes
68	Admin	*Include type and frequency of training in the annual report (2003 -> The program must include an employee training component)	2.3.4.10	\$0	See Miscellaneous No. 50	No

Estimated Annual Costs \$19,242

Estimated One-time Costs \$304,006

Estimated Intermittent Costs \$50,440

No. BMP/Admin	Construction Site Runoff Control Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP	*Continue to implement construction ordinance work from 2003 permit; expand to include 1 acre or more	2.3.5 a	\$0 Volunteer based program	Yes
2	BMP	Develop and implement a construction site runoff program	2.3.5 c	\$0 See No. 3-12	Yes
3	Admin	An ordinance that requires sediment and erosions controls and for other wastes at construction sites	2.3.5 c i	\$22 1hrs @ \$22/hr, for review of current document	No
4	Admin	Adopt written procedures for inspections and enforcement of the ordinance within 1 year (2003 -> [g.] Procedures for inspections and enforcement of control measures at construction sites.)	2.3.5 c ii	\$44 2hrs @ \$22/hr, for review of current document	No
5	Admin	*Document the procedures and responsibilities to implement in the SWMP	2.3.5 c ii	\$88 4hrs @ \$22/hr	No
6	Admin	*Include requirements for site operators to implement BMPs (e.g., reduce disturbed area, protect slopes, etc.)	2.3.5 c iii	\$88 4hrs @ \$22/hr	No
7	Admin	*Include requirements for site operators to control other wastes	2.3.5 c iv	\$88 4hrs @ \$22/hr	No
8	Admin	*Develop written procedures for site plan review and inspection and enforcement within 1 year (003 -> nearly same, now has time requirement)	2.3.5 c v	\$88 4hrs @ \$22/hr	No
9	Admin	*Include pre-construction review, consideration for protection of water quality impacts, LID components	2.3.5 c v	\$88 4hrs @ \$22/hr	No
10	Admin	*And receipt of information from the public, inspections during and after BMP installation (now covers post construction)	2.3.5 c v	\$88 4hrs @ \$22/hr	No
11	Admin	*And "qualifications necessary to perform the inspections"	2.3.5 c v	\$88 4hrs @ \$22/hr	No
12	Admin	*And procedure for tracking the number of site reviews, inspections and enforcement actions	2.3.5 c v	\$88 4hrs @ \$22/hr	No
13	Admin	*All to be included in the annual report	2.3.5 c v	\$0 See Miscellaneous No. 50	No

Estimated Annual Costs \$0

Estimated One-time Costs \$770

Estimated Intermittent Costs \$0

No.	BMP/Admin	Post Construction Site Runoff Control Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP	*develop implement and enforce a post-construction SW program for new developments and redevelopments	2.3.6 a	\$0	depends on previous program, should already be in place	Yes
2	Admin	*adopt or amend a local ordinance to control projects that disturb an acre or more	2.3.6 a ii	\$176	Already in place, but 8hrs @ \$22/hr if not	Yes
3	BMP	*retain and/or treat first inch of runoff; where technically feasible do retention first	2.3.6 a ii a	\$1,760	80hrs @ \$22/hr, assumes no controversy and 4 people working	No
4	BMP	**from all impervious surfaces on site"	2.3.6 a ii a	\$0	Included in No. 3	No
5	Admin	*sites with soil contamination problems or at industrial sites shall not include any infiltration BMPs	2.3.6 a ii b	\$0	Rule, does not require anything to be implemented, Possibly need Attorney	No
6	Admin	*infiltration systems near environmentally sensitive areas must include shutdown and containment systems	2.3.6 a ii c	\$0	Rule, does not require anything to be implemented	No
7	Admin	*all BMPs must be constructed in accordance with the MA Stormwater Handbook	2.3.6 a ii d	\$0	Rule, does not require anything to be implemented	Yes
8	Admin	*this system shall include development of a long term O&M plan to inspect and repair BMPs	2.3.6 a ii e	\$0	Rule, does not require anything to be implemented	No
9	Admin	*systems shall be designed "to avoid disturbance of areas susceptible to erosion and sediment loss"	2.3.6 a ii f	\$0	Rule, does not require anything to be implemented	Yes
10	BMP	*systems shall require submittal of as-built drawings that depict all on site controls	2.3.6 a iii	\$1,100	Submitted by construction company, 50hrs @ \$22/hr, if it's new	No
11	Admin	*shall have procedures to ensure O&M, such as dedicated funds, escrow accounts or management contracts	2.3.6 a iii	\$4,576	5hrs w/ an attorney, 208hrs @ 22/hr, legal authority adds complexity and cost	No
12	Admin	*may include annual self-certification program	2.3.6 a iii	\$0	Included in No. 11	No
13	Admin	*annual report shall include measures that the permittee has done to meet these requirements	2.3.6 a iii	\$0	See Miscellaneous No. 50	Yes
14	BMP	*w/in 3 years document current street design and parking rules that affect creation of impervious cover	2.3.6 b	\$1,320	60hrs @ \$22/hr	No
15	BMP	*shall be used by permittee to determine if changes "can be made to support low impact design options"	2.3.6 b	\$0	Included in No. 14	No
16	BMP	*if changes can be made, assessment shall include recommendations and proposed schedules to adopt changes	2.3.6 b	\$0	Included in No. 14	No
17	BMP	*permittee "shall implement all recommendations . . ."; assessment must be placed in the SWMP	2.3.6 b	\$0	Included in No. 14	No
18	Admin	*annual report shall contain an update on this requirement, including any planned or completed changes	2.3.6 b	\$0	See Miscellaneous No. 50	No
19	BMP	*w/in 4 years assess local rules to determine feasibility of allowing green roofs, water harvesting and LID BMPs	2.3.6 c	\$880	40hrs @ \$22/hr	No
20	Admin	*assessment shall indicate if and under what circumstances these practices are allowed	2.3.6 c	\$0	Included in No. 19	No
21	BMP	*if practices not allowed, determine what hinders use of these practices and what changes can be made	2.3.6 c	\$0	Included in No. 19	No
22	BMP	*provide a schedule of implementation of recommendations	2.3.6 c	\$0	Included in No. 19	No
23	BMP	**"permittee shall implement all recommendations, in accordance with the schedules . . ."	2.3.6 c	\$0	Included in No. 19	No
24	Admin	*annual report shall contain an update on this requirement, including any planned or completed changes	2.3.6 c	\$0	See Miscellaneous No. 50	Yes
25	Admin	*estimate the annual increase or decrease in Impervious Area and Directly Connected Impervious Area	2.3.6 d	\$1,760	80hr @ \$22/hr, a lot of data required	No
26	Admin	*tabulate results by sub-basins delineated per 2.3.4.6 a I	2.3.6 d i	\$0	See No. 17 in IDDE	No
27	Admin	*must include conventional pavements, driveways, parking lots and rooftops	2.3.6 d i	\$0	See No. 17 in IDDE	No
28	Admin	*starting with second annual report, estimate each sub-basin added or removed each year	2.3.6 d ii	\$0	See Miscellaneous No. 50	No
29	Admin	*break out those figures by development, redevelopment or retrofit by permittee, by others voluntarily	2.3.6 d ii	\$0	See Miscellaneous No. 50	No
30	Admin	*. . . or in compliance with the permittee's ordinances or bylaws	2.3.6 d ii	\$0	See Miscellaneous No. 50	No
31	Admin	*within 4 years complete inventory and ranking of Municipal property suitable for modification or retrofit to . . .	2.3.6 d iii	\$2,640	120hrs @ \$22/hrs, many properties to assess	No
32	Admin	*. . . reduce frequency, volume and pollutant loads of stormwater discharges by reduction of impervious area	2.3.6 d iii	\$0	Included in No. 32	No
33	Admin	*shall include both on site and off site reduction of IA and DCIA (e.g., parking lots, buildings, etc.)	2.3.6 d iii	\$0	Included in No. 32	No
34	Admin	*also include existing rights-of-way,	2.3.6 d iii	\$0	Included in No. 32	No
35	Admin	*for suitability the evaluation shall consider factors such as depth to water table; subsurface geology; access	2.3.6 d iii	\$0	Included in No. 32	No
36	Admin	*priority ranking shall consider factors such as CIP schedules; current storm sewer level of service, etc.	2.3.6 d iii	\$0	Included in No. 32	No
37	Admin	*starting with fifth year annual report, report on status of all such inventoried properties	2.3.6 d iii	\$0	See Miscellaneous No. 50	No

Estimated Annual Costs \$5,280

Estimated One-time Costs \$1,496

Estimated Intermittent Costs \$7,436

No.	BMP/Admin	Pollution Prevention and Good Housekeeping Requirement	Reference	Cost	Justification	In Place (Y/N)
1	Admin	*W/in 1 year develop or update written O&M procedures for listed municipal facilities	2.3.7 a i	\$176	8hrs @ \$22/hrs	No
2	Admin	*w/in 1 year inventory all permittee owned facilities in these "good housekeeping" categories	2.3.7 a ii	\$0	Included in No. 1	No
3	Admin	*For Parks and Open Space: procedures to address the use, storage and minimization of pesticides, fertilizers, etc	2.3.7 a ii a	\$2,640	120hrs @ \$22/hr, Large amount of spaces to review plans for	No
4	Admin	*to be reviewed annually and updated as necessary	2.3.7 a ii a	\$0	Included in No. 3	No
5	Admin	*evaluate lawn maintenance and landscaping activities to be protective of water quality	2.3.7 a ii a	\$0	Included in No. 3	No
6	Admin	*including reduced mowing, proper disposal of lawn clippings, use of drought resistant plantings	2.3.7 a ii a	\$0	Included in No. 3	No
7	Admin	*establish pet waste handling collection, disposal and signage at all parks and open spaces	2.3.7 a ii a	\$0	Included in No. 3	No
8	Admin	*establish procedures for scheduled cleaning and sufficient number of trash containers	2.3.7 a ii a	\$0	Included in No. 3	No
9	Admin	*For Buildings and Facilities, such as town offices, police and fire stations, municipal pools, etc	2.3.7 a ii b	\$1,760	80hrs @ \$22/hr	No
10	Admin	*evaluate the use. Storage and disposal of petroleum products and train employees on proper procedures	2.3.7 a ii b	\$0	Included in No. 9	No
11	Admin	*ensure that spill prevention is in place and coordinate with fire department	2.3.7 a ii b	\$0	Included in No. 9	No
12	Admin	*develop management procedures for dumpsters and other waste management equipment	2.3.7 a ii b	\$0	Included in No. 9	No
13	Admin	*For Vehicles and Equipment: establish procedures for storage of permittee vehicles, including inside storage	2.3.7 a ii c	\$176	4hrs @ \$22/hr	No
14	Admin	*establish procedures to ensure that vehicle wash water does not enter the SW system	2.3.7 a ii c	\$0	Included in No. 13	No
15	Admin	*evaluate fueling areas to minimize exposure	2.3.7 a ii c	\$0	Included in No. 13	No
16	Admin	*Infrastructure O&M: w/in 1 year develop and implement procedures to take care for the MS4 system	2.3.7 a iii a	\$0	See Below through No. 22	No
17	Admin	*optimize routine inspections (e.g., prioritize catch basins located near construction sites)	2.3.7 a iii b	\$0	Included in No. 16	No
18	BMP	*ensure that "no catch basin at anytime will be more than 50 percent full"	2.3.7 a iii b	\$440	2hrs/basin @ \$22/hr, assuming 10 basins/year	No
19	BMP	*if more than 50% full during two routine cleanings, investigate the cause for excessive sediment loading	2.3.7 a iii b	\$0	See No. 17 & Annual Report	No
20	Admin	*describe these actions in the annual report	2.3.7 a iii b	\$0	See Miscellaneous No. 50	No
21	Admin	*document in annual report the plan for optimizing catch basin cleaning, inspections or scheduling	2.3.7 a iii b	\$0	See Miscellaneous No. 50	No
22	Admin	*include metrics used to determine that the plan is optimal for the MS4	2.3.7 a iii b	\$0	Included in No. 17	No
23	Admin	*in each annual report list the total number of catch basins, number inspected and/or cleaned	2.3.7 a iii b	\$0	See Miscellaneous No. 50	No
24	Admin	*and "volume or mass of material removed from each catch basin draining to water quality limited waters"	2.3.7 a iii b	\$0	Included in No. 23	No
25	Admin	*and "total volume or mass of material removed from all catch basins"	2.3.7 a iii b	\$0	Included in No. 23	No
26	BMP	*Sweeping: develop and implement procedures for sweeping streets and municipal-owned lots	2.3.7 a iii c	\$40,624	Materials + Labor given by town	Yes
27	BMP	*sweep all streets (rural exceptions apply) a minimum of once a year in the spring	2.3.7 a iii c	\$0	Included in No. 26	Yes
28	BMP	*procedures shall include more frequent sweeping of targeted area based on various listed criteria	2.3.7 a iii c	\$0	Minimal Development Cost	No
29	BMP	*criteria include inspections, pollutant loads, catch basin cleanings, land use, TMDL or impaired waters	2.3.7 a iii c	\$0	Minimal Development Cost	No
30	Admin	*Each annual report shall include number of miles cleaned and volume or mass of material removed	2.3.7 a iii c	\$0	See Miscellaneous No. 50	No
31	Admin	*for rural exception areas, either sweep per usual or develop specific procedures and place in first annual report	2.3.7 a iii c	\$0	See Miscellaneous No. 50	No
32	BMP	*properly store catch basin cleanings so they do not discharge to receiving waters	2.3.7 a iii d	\$0	\$0 Since Southbridge owns their own landfill	Yes
33	BMP	*establish and implement procedures for winter road maintenance including storage of salt and sand	2.3.7 a iii e	\$0	Properly house materials in municipally owned properties	Yes
34	BMP	*minimize use of sodium chloride and other salts; evaluate opportunities for alternative materials	2.3.7 a iii e	\$176	8hrs @ \$22/hr	Yes
35	Admin	*ensure that snow is not disposed into surface waters	2.3.7 a iii e	\$0		Yes
36	Admin	*establish procedures for O&M or all permittee-owned stormwater BMPs (e.g., swales, retention basins etc.)	2.3.7 a iii f	\$176	8hrs @ \$22/hr	No
37	BMP	*inspect all such structures at least once annually	2.3.7 a iii f	\$11,000	Inspect each BMP, assuming 2000/year 15min/BMP @ 22/hr	No
38	Admin	*in annual report include status of work required in this part	2.3.7 a iv	\$0	See Miscellaneous No. 50	No
39	Admin	*permittees shall keep a written record of all required activities	2.3.7 a v	\$2,200	100hrs @ \$22/hr, based on templates from the CMRSWC	No
40	BMP	*develop and fully implement a SWPPP for each of the listed facilities no later than 2 years after effective date	2.3.7 b	\$1,540	4hrs to update existing SWPPPs, 10hrs for new SWPPPs, @ \$22/hr, assume 5 new facilities + 5 old facilities	No
41	BMP	*includes maintenance garages, public works yards, transfer stations, other waste handling facilities	2.3.7 b	\$0	Included in No. 40	No
42	BMP	*Identify name and title of staff of the Pollution Prevention Team for each facility	2.3.7 b ii a	\$0	Included in No. 40	No
43	BMP	*for each facility: include map, description of activities, outfall locations, receiving waters and structural controls	2.3.7 b ii b	\$0	Included in No. 40	No
44	BMP	*select, sign, install and implement the following 9 control measures to prevent or reduce discharge of pollutants	2.3.7 b ii c	\$10,000	Depends on variations of the extent of impaired waters varies about 10000-25000	No
45	BMP	*take all reasonable measure to address quality of discharges that may not originate at the facility	2.3.7 b ii c	\$0	Included in No. 44	No
46	Admin	*for areas that discharge to impaired waters, identify the control measures to address that issue	2.3.7 b ii c	\$0	Included in No. 44	No
47	BMP	*SWPP Required Elements: Minimize or Prevent Exposure (e.g., move activities or materials under cover)	2.3.7 d 1	\$0	Included in No. 44	No
48	BMP	*Good Housekeeping	2.3.7 d 2	\$189,540	Snow removal (3300), leaf collection (34020), salt/sand distribution (152220)	Yes
49	BMP	*Preventative Maintenance	2.3.7 d 3	\$23,056	Catchment cleaning (23056)	Yes
50	BMP	*Spill Prevention and Response	2.3.7 d 4	\$0	Included in No. 44	Yes
51	BMP	*Erosion and Sediment Control	2.3.7 d 5	\$0	Included in No. 44	Yes
52	BMP	*Management of Runoff	2.3.7 d 6	\$0	Included in No. 44	Yes
53	BMP	*Salt Storage or Piles Containing Salt	2.3.7 d 7	\$0	Included in No. 44	Yes
54	BMP	*Employee Training; document training date, title and duration; attendees; subjects covered during training	2.3.7 d 8	\$1,980	Given by town	Yes
55	BMP	*Maintenance of Control Measures	2.3.7 d 8	\$0	Included in No. 44	Yes
56	BMP	*Inspect all areas exposed to stormwater and all stormwater control measures at least every calendar quarter	2.3.7 b iii a	\$2,000	30min/inspection, assume 10 facilities with 4 areas each @ \$100/area	No
57	BMP	*at least one inspection shall occur when a stormwater discharge is occurring	2.3.7 b iii a	\$2,266	206 outfalls, approx. 30min/outfall @ \$22/hr	No
58	Admin	*document the date, time, name of inspector, weather, any control measures needing maintenance or repair, etc	2.3.7 b iii a	\$0	Included in No. 44	No
59	BMP	*permittee shall repair or replace any control measures needing repair before the next anticipated storm event	2.3.7 b iii a	\$0	Included in No. 44	No
60	Admin	*shall report the findings from the Site inspections in the annual report	2.3.7 b iii a	\$0	See Miscellaneous No. 50	No
61	Admin	*keep a written record of all required activities required in this section	2.3.7 b iv	\$0	See Miscellaneous No. 50	No

Estimated Annual Costs \$283,458

Estimated One-time Costs \$6,292

Estimated Intermittent Costs \$0

No.	BMP/Admin	Miscellaneous Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP	Submit an NOI	1.7.1	\$176	8hrs @ \$22/hour, historical properties or endangered species will increase this cost	No
2	Admin	*Document endangered species status (part of NOI)	1.9.1	\$0	Included under No. 1	No
3	BMP	*Implement measures to protect endangered species	1.9.1	\$0	Included under No. 1	No
4	Admin	Document Historic Properties Observation (part of NOI)	1.9.2	\$0	See Miscellaneous No. 50	No
5	BMP	*Describe effect of discharges on historic properties	1.9.2	Varies	Included under No. 1	No
6	Admin	*Report documents received re: such discharges	1.9.2	\$0	Included under No. 1	No
7	Admin	*Provide results of Appendix D historic property screening	1.9.2	\$0	Included under No. 1	No
8	BMP	Describe efforts to avoid or minimize impacts on such properties	1.9.2	Varies	Included under No. 1	No
9	BMP	Develop a SWMP	1.10	\$1,760	80hrs @ \$22/hr	Yes
10	BMP	Implement a SWMP	1.10	\$0	Included under No. 10	Yes
11	Admin	*Update/modify SWMP	1.10	\$440	20hrs @ \$22/hr	No
12	Admin	Provide SWMP "immediately" to various agencies and public	1.10.1	\$0	Included under No. 9	No
13	Admin	*Post SWMP online	1.10.1	\$0	Included under No. 9	No
14	Admin	Identify Names and titles of people implementing the SWMP	1.10.2	\$0	Included under No. 9	No
15	Admin	*Include status of 2003 permit requirements	1.10.2	\$0	Included under No. 9	Yes
16	Admin	*List all receiving water bodies, classifications, pollutants of concern	1.10.2	\$0	Included under No. 9	No
17	Admin	*List all applicable TMDLs, WLAs	1.10.2	\$0	Included under No. 9	No
18	Admin	*List all outfalls that discharge to each water body	1.10.2	\$0	Included under No. 9	No
19	Admin	*List all public water sources that may be affected by SW discharges	1.10.2	\$0	Included under No. 9	No
20	Admin	*List all interconnected MS4s and receiving water body	1.10.2	\$0	Included under No. 9	No
21	Admin	*Include applicable TMDLs, WLAs and pollutants of concern	1.10.2	\$0	Included under No. 9	No
22	Admin	*Document all new or increased discharges	1.10.2	\$0	Included under No. 9	No
23	Admin	*Include map of separate storm sewer system (Map must be improved)	1.10.2	\$0	Included under No. 9	No
24	Admin	List all discharges to impaired water and the response	1.10.2	\$0	Included under No. 9	No
25	Admin	*Describe BMPs proposed to meet TMDL requirements	1.10.2	\$0	Included under No. 9	No
26	Admin	For each BMP, list the milestone, timeframe and assessment measure	1.10.2	\$0	Included under No. 9	No
27	Admin	*For each BMP, list person or department responsible for implementation	1.10.2	\$0	Included under No. 9	No
28	Admin	*Describe BMPs proposed to meet impaired waters requirements	1.10.2	\$0	Included under No. 9	No
29	Admin	Describe BMPs used to meet the 6 minimum control measures	1.10.2	\$0	Included under No. 9	No
30	Admin	*List measures to avoid/minimize impacts to surface drinking waters	1.10.2	\$0	Included under No. 9	No
31	BMP	*Ensure that discharges "do not cause or contribute" to an exceedance of WQ standards	2.1	\$0	Included under No. 9	Yes
32	BMP	*For TMDL waters, meet requirements of Appendix F (NB: contains multiple add'l req'ts)	2.1.1 b	Varies	May range into millions of dollars, no one has estimated this yet	No
33	BMP	*For impaired waters meet requirements of Appendix H (NB: contains multiple add'l req'ts)	2.1.1 c	Varies	May range into millions of dollars, no one has estimated this yet	No
34	BMP	*For any exceedances of WQ standards to TMDL or impaired waters, eliminate it within 60 days	2.1.1 d	Varies	May range into millions of dollars, no one has estimated this yet	No
35	BMP	*For any increased discharge, comply with MassDEP's regulations at 314 CMR 4.04	2.1.2 a	Varies	Cost will vary	No
36	BMP	*Demonstrate no net increase in pollutants for discharges to any 303 (d) or 305(b) water (previously only had to identify if 303 d)	2.1.2 b	Varies	Cost will vary	No
37	Admin	*Identify all discharges to waters that are impaired or which have TMDLs (Both in SWMP and Annual report)	2.2	\$0	Varies depending on EPA interpretations	No
38	Admin	*Permittee shall annually self-evaluate and maintain the evaluation in its SWMP	4.1 a	\$0	Included in No. 9	No
39	Admin	*In evaluating the appropriateness of BMPs, permittees may add BMPs at any time	4.1 b	\$88	4hrs @ \$22/hrs, of paperwork for new BMP	Yes
40	Admin	Subtracting or replacing BMPs may only be done in limited circumstances, after showing the BMP is ineffective	4.1 b	Varies	Cost of replacement will depend on the BMP being used	No
41	Admin	*Each Annual shall include a brief explanation of any BMP modification	4.1 b	\$0	See Miscellaneous No. 50	No
42	Admin	EPA or MassDEP may require the permittee to add, modify, etc., any BMP to satisfy conditions of the permit	4.1 c	\$0	Minimal cost	No
43	Admin	*The permittee shall keep all record required by this permit for at least five years	4.2 a	\$880	40hrs @ \$22/hr, week of work annually	No
44	Admin	*"Records" includes "information used in the development of any written program . . . monitoring results, etc."	4.2 a	\$0	Record keeping, doesn't cost anything to implement	No
45	Admin	these records all be made available to the public	4.2 c	\$0	Record keeping, doesn't cost anything to implement	No
46	Admin	*the permittee "shall document all monitoring results each year in the annual report"	4.3 b	\$0	See Miscellaneous No. 50	No
47	Admin	*that shall include the date, outfall identifier, location, weather, precipitation and screening or analysis results	4.3 b	\$0	Part of annual report, see No. 46	No
48	Admin	*include all monitoring results for the current reporting period and for the entire permit term	4.3 b	\$0	Part of annual report, see No. 46	No
49	Admin	*permittee shall include "results from any other stormwater or receiving water quality monitoring or studies . . ."	4.3 c	\$0	Part of annual report, see No. 46	No
50	Admin	The annual report shall include a self-assessment of compliance; an assessment of the appropriateness of BMPs	4.4 b i	\$14,200	The Consultant fee for creating the annual report increased based off of the increase in requirements	Yes
51	Admin	*The status of any required plans	4.4 b iii	\$0	Part of annual report, see No. 50	No
52	Admin	*"Identification of all discharges determined to be causing or contributing to an exceedance" of WQ standards	4.4 b iii	\$0	Part of annual report, see No. 50	No
53	Admin	*For discharges to TMDLs, identify specific BMPs used to address those requirements	4.4 b iii	\$0	Part of annual report, see No. 50	No
54	Admin	*For discharges to impaired waters, "a description of each BMP required by Appendix H" and all deliverables	4.4 b iii	\$0	Part of annual report, see No. 50	No
55	Admin	*Assessment of the progress toward meeting the requirements for the 6 minimum control measures (see details)	4.4 b iv	\$0	Part of annual report, see No. 50	No
56	Admin	*"All outfall screening and monitoring data" for the reporting term and cumulative for the permit term	4.4 b v	\$0	Part of annual report, see No. 50	No
57	Admin	Description of activities for the next reporting cycle	4.4 b vi	\$0	Part of annual report, see No. 50	Yes
58	Admin	Description of any changes in identified BMPs or measurable goals	4.4 b vii	\$0	Part of annual report, see No. 50	Yes
59	Admin	*Description of activities undertaken by any entity contracted for achieving any requirement of the permit	4.4 b viii	\$0	Part of annual report, see No. 50	No

Estimated Annual Costs \$15,168

Estimated One-time Costs \$2,376

Estimated Intermittent Costs \$0

Appendix E

No.	BMP/Admin	Public Education and Outreach Requirement	Reference	Cost	Justification	In Place (Y/N)
1	Admin	Continue public education program required by 2003 permit	2.3.2 a	\$1,000	Pamphlets to homes, \$500 and businesses,\$500	Yes
2	Admin	*Define goals, express specific messages define audience for each message	2.3.2 a	\$44	2 hrs @ \$22/hr	No
3	Admin	*Identify parties responsible for each message	2.3.2 a	\$22	1 hr @ \$22/hr	No
4	Admin	*Develop and send out two separate messages for each of 4 different audiences	2.3.2 c	\$22	1 hr @ \$22/hr, once a year for 8 years	No
5	Admin	*Show evidence that messages are achieving results	2.3.2 e	\$8,820	DCR explanation for assessing effectiveness	No
6	Admin	*Identify method used to evaluate effectiveness of messages	2.3.2 e	\$0	Included in No. 5	No
7	Admin	*Put in annual report the methods of distribution and methods to assess effectiveness	2.3.2 g	\$0	See Miscellaneous No. 50	No

Estimated Annual Costs \$9,908

Estimated One-time Costs \$0

Estimated Intermittent Costs \$0

No.	BMP/Admin	Public Involvement and Participation Requirement	Reference	Cost	Justification	In Place (Y/N)
1	Admin	*Comply with state public Notice requirements	2.3.3 a	\$0	Minimal cost, can post on website	Yes
2	Admin	Provide annual opportunity for public to participate in review and implementation of SWMP	2.3.3 b	\$0	In compliance with public meeting requirement	No
3	Admin	*Put in annual report these public participation activities	2.3.3 c	\$0	See Miscellaneous No. 50	Yes

Estimated Annual Costs \$0

Estimated One-time Costs \$0

Estimated Intermittent Costs \$0

No.	BMP/Admin	Illicit Discharge Detection and Elimination Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP	*Eliminate any illicit discharge to the stormwater system as expeditiously as possible	2.3.4.2	\$25,000	Varies depending on severity of infraction average cost, actual cost may vary	Yes
2	BMP	*Identify who is responsible for any such discharges	2.3.4.2	\$0	Included in No. 1	Yes
3	Admin	*If elimination takes more than 60 days, establish an expeditious schedule for elimination	2.3.4.2	\$44	2hrs @ \$22/hr, for scheduling	Yes
4	Admin	*If more than 60 days, report dates of identification and schedules in annual report	2.3.4.2	\$0	See Miscellaneous No. 50	Yes
5	BMP	Implement measures to control non-stormwater discharges if they add significant pollution	2.3.4.3	\$25,000	Varies depending on severity of infraction, around \$25,000-\$50,000	No
6	Admin	*Identify all known locations where SSOs have discharged to the MS4 in last 5 years	2.3.4.4 b	\$44	2hrs @ \$22/hr, if records are available	No
7	Admin	*For each such SSO discharge, include date and time, location, volume, suspected cause	2.3.4.4 b	\$44	2hrs @ \$22/hr, to determine the information	No
8	Admin	*Also include whether each entered any surface water and what corrective actions were taken	2.3.4.4 b	\$0	Included in No. 7	No
9	Admin	*Also include corrective measures planned and implementation schedule	2.3.4.4 b	\$0	Included in No. 7	No
10	Admin	*Maintain the SSO inventory as part of the SWMP and the Annual Reports	2.3.4.4 b	\$0	See Miscellaneous No. 50	No
11	Admin	*Provide oral and written notice to EPA and MassDEP for any SSO occurrence	2.3.4.4 c	\$44	2hrs @ \$22/hr, for informing EPA/MassDEP orally/written	No
12	BMP	*Develop an inventory of each MS4 outfall, including location, interconnections, and condition (different only in that it requires the condition of the outfall)	2.3.4.5	\$792	15min/outfall (includes travel), 144 outfalls, @ \$22/hr	No
13	Admin	*Update inventory annually to include monitoring program	2.3.4.5 b	\$0	See Miscellaneous No. 50	No
14	BMP	*Physically label all MS4 outfall pipes	2.3.4.5 b	\$528	10min/outfall (includes travel), 144 outfalls, @ \$22/hr, + materials (\$2 stick per outfall + spraypaint+sharpie)	No
15	Admin	*For each outfall list unique identifier, receiving water, date of most recent inspection	2.3.4.5 c	\$0	Included in No. 14	No
16	Admin	*Also include dimensions, shape, material, physical condition and indicators of non-SW discharges	2.3.4.5 c	\$0	Included in No. 14	Yes
17	BMP	*Revise existing map of stormwater system within 2 years of effective date of the permit	2.3.4.6	\$250,000	Enough new requirements to have to add new data elements, cost assuming outside contracting and implementation into GIS map	No
18	BMP	*Map shall include all outfalls, pipes, manholes, catch basins, interconnections, open channels	2.3.4.6 a i	\$0	Included in No. 17	No
19	BMP	*Also include all municipally-owned BMPs (e.g., retention basins, oil/water separators, etc.)	2.3.4.6 a i	\$0	Included in No. 17	No
20	BMP	*Also include catchment delineation and all waters listed on the 303(d) or 305 (b) list	2.3.4.6 a i	\$0	Included in No. 17	No
21	BMP	*Also include municipal sanitary sewers or combined sewer systems	2.3.4.6 a ii	\$0	Included in No. 17	No
22	BMP	*Include various recommended elements	2.3.4.6 a iii	\$0	Included in No. 17	No
23	BMP	*Update the map to reflect newly discovered information and corrections or modifications	2.3.4.6 b	\$1,144	1hr/week @ \$22/hr, for continuous additions to stormwater systems	No
24	Admin	*Report on the progress toward completion of the map in each annual report	2.3.4.6 c	\$0	See Miscellaneous No. 50	Yes
25	BMP	*Write an Illicit Discharge Detection and Elimination (IDDE) program document (Discrete, specifically mentions the document must be written out)	2.3.4.7	\$10,000	Complete redevelopment of the program, review and upgrades	No
26	Admin	Adopt an IDDE ordinance	2.3.4.7 a	\$1,430	Change ordinance, 13 weeks @ 5 hrs/week @ \$22/hr, has to go to different committees	Yes
27	Admin	*Program shall clearly identify IDDE responsibilities and provide description of areas of responsibility	2.3.4.7 b	\$0	Included in No. 25	No
28	BMP	*Assess and priority rank each catchment into one of 4 possible categories	2.3.4.7 c i	\$17,028	Approx. 1548 catch basins, approx. 30 min/basin @ \$22/hr	No
29	Admin	*Priority rank each catchment within each category (except those "excluded") using 8 factors	2.3.4.7 c ii	\$34,056	Approx. 1548 catch basins, approx. 60min/basin @ \$22/hr	No
30	Admin	*Gather all information needed for the 8 screening factors (e.g., industrial areas > 40 years old)	2.3.4.7 c ii	\$0	Included in No. 29	No
31	Admin	*Complete ranking using existing information within 1 year; update in annual report	2.3.4.7 c iii	\$0	See Miscellaneous No. 50	No
32	Admin	*In annual report include summary of evidence of known/suspected illicit discharges by catchment	2.3.4.7 c iii	\$0	See Miscellaneous No. 50	No
33	Admin	*Also include corrective measures and schedule for correcting each illicit discharge	2.3.4.7 c iii	\$0	See Miscellaneous No. 50	No
34	Admin	*Develop written procedure for screening and sampling of outfalls	2.3.4.7 d	\$0	8hr @ \$22/hr, work day to complete process, (\$0 W/CMSWC Membership)	Yes
35	Admin	*Include procedures for sample collection, use of field kits and storage and conveyance of samples	2.3.4.7 d i	\$0	See No. 34	Yes
36	BMP	*If outfall is inaccessible, report the first accessible upstream structure	2.3.4.7 d ii	\$0	possible time extensions	Yes
37	BMP	*Perform dry weather screening when and how prescribed; identify in annual report any follow-up needed	2.3.4.7 d iii	\$1,584	144 outfalls, approx. 30min/outfall @ \$22/hr	Yes
38	BMP	*Perform wet weather screening when and how prescribed	2.3.4.7 d iv	\$0	Included in No. 39	Yes
39	BMP	*Sample at minimum for 7 listed factors	2.3.4.7 d v	\$4,968	144 outfalls, approx. 1.5hr/outfall @ \$23/hr, Paperwork for wet weather sampling (2,266), Testing Kits (0) b/c CMSWC membership	No
40	Admin	*Catchments with specified septic or other results shall be listed as "High Priority" catchments	2.3.4.7 d vi	\$44	2hrs @ \$22/hr, if records are available	No
41	BMP	*Develop written Catchment Investigation Procedure including review of maps and historic records	2.3.4.7 e	\$352	16hrs @ \$22/hr	No
42	BMP	*Also include manhole investigation methodology and procedures to confirm sources of illicit discharges	2.3.4.7 e	\$0	Included in No. 41	No
43	BMP	*For each catchment review sanitary sewer and storm sewer construction plans; prior work on either	2.3.4.7 e i	\$88	Assuming 4 catchments, 1 hr/catchment @ \$22/hr	No
44	BMP	*Also review Health department records for septic system or sanitary sewer system failures or complaints	2.3.4.7 e i	\$0	Included in No.43	No
45	Admin	*Identify and record any of the 12 System Vulnerability Factors (e.g., infrastructure > 40 years old)	2.3.4.7 e i	\$0	Included in No.43	No
46	Admin	*Document and annually report presence or absence of the 12 System Vulnerability Factors for each catchment	2.3.4.7 e i	\$0	Assuming using WPI spreadsheet, otherwise about 10min per catchment	No
47	Admin	*Include these required elements of written manhole investigation and catchment investigation procedures	2.3.4.7 e ii	\$0	\$0 since CMSWC Membership	No
48	Admin	*Include these required elements in written dry weather investigation procedure	2.3.4.7 e ii a	\$0	Included in No. 47	No
49	Admin	*Include these required elements in written wet weather investigation procedure	2.3.4.7 e ii b	\$0	Included in No. 47	No
50	Admin	*Develop procedures to isolate and confirm illicit sources (e.g., dye testing, smoke testing, caulk dams, etc.)	2.3.4.7 e iii	\$176	8hrs @ \$22/hr, for scheduling	Yes
51	Admin	*In annual report, for each illicit source list the location, its source, description of the discharge	2.3.4.7 f	\$0	See Miscellaneous No. 50	No
52	Admin	*Also list date and method of discovery, date of elimination, mitigation or enforcement action	2.3.4.7 f	\$0	Included in No. 51	No
53	Admin	*And estimate volume of flow reduced	2.3.4.7 f	\$0	Included in No. 51	No
54	BMP	*One year after illicit discharge removal, perform confirmatory screening; wet, dry or both	2.3.4.7 f	\$132	\$22/hr 30min/screening, 1.5hr/Illicit, 3 Illicit	No
55	BMP	*Schedule follow up screening within 5 years after confirmatory screening	2.3.4.7 g	\$132	\$22/hr 30min/screening, 1.5hr/Illicit, 3 Illicit	No
56	BMP	*Develop and implement procedures to prevent illicit discharges and SSOs	2.3.4.7 h	\$0	\$0 since CMSWC Membership	No
57	Admin	*Complete and report dry weather screening and sampling of High and Low Priority outfalls within 3 years	2.3.4.8 a	\$0	Included in No. 37 and No. 38	No
58	Admin	*All data shall be reported in each annual report . . ."	2.3.4.8 a	\$0	See Miscellaneous No. 50	No
59	Admin	*Begin implementation of 2.3.4.7 d work no later than 15 months	2.3.4.8 b	\$0	Deadlines, See No. 38 and 37	No
60	Admin	*Implement and report Catchment Investigation Procedure in every catchment . . .	2.3.4.8 c	\$0	Deadlines, See No. 28	No
61	Admin	*In a minimum of 80% of the MS4 area serviced by Problem Catchments within 3 years and 100% within 5 years	2.3.4.8 c i	\$0	Deadlines, See No. 28	No
62	Admin	*For all catchments where sampling indicates sewer input within 5 years	2.3.4.8 c ii	\$0	Deadlines, See No. 28	No
63	Admin	*In 40% of all area served by all MS4 catchments within 5 years and in 100% of 4 area in 10 years	2.3.4.8 c iii	\$0	Deadlines, See No. 28	No
64	Admin	*Track progress toward these milestones in each annual report	2.3.4.8 e	\$0	See Miscellaneous No. 50	No
65	Admin	*Define or describe indicators for tracking program success; demonstrate efforts to locate illicit discharges	2.3.4.9	\$176	8hrs @ \$22/hr	No
66	Admin	*Also include percent and area in acres evaluated; volume of sewage removed; place in annual report (more detailed, 2003 only asks to measure progress)	2.3.4.9	\$0	See Miscellaneous No. 50	No
67	Admin	provide annual training to employees involved in IDDE program	2.3.4.10	\$0	\$0 since CMSWC Membership	Yes
68	Admin	*Include type and frequency of training in the annual report (2003 -> The program must include an employee training component)	2.3.4.10	\$0	See Miscellaneous No. 50	No

Estimated Annual Costs \$7,872

Estimated One-time Costs \$314,494

Estimated Intermittent Costs \$50,440

No. BMP/Admin	Construction Site Runoff Control Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP *Continue to implement construction ordinance work from 2003 permit; expand to include 1 acre or more	2.3.5 a	\$0	Volunteer based program	Yes
2	BMP Develop and implement a construction site runoff program	2.3.5 c	\$0	See No. 3-12	Yes
3	Admin An ordinance that requires sediment and erosions controls and for other wastes at construction sites	2.3.5 c i	\$22	1 hr @ \$22/hr, for review of current document	Yes
4	Admin Adopt written procedures for inspections and enforcement of the ordinance within 1 year (2003 -> [g.] Procedures for inspections and enforcement of control measures at construction sites.)	2.3.5 c ii	\$44	2hrs @ \$22/hr, for review of current document	No
5	Admin *Document the procedures and responsibilities to implement in the SWMP	2.3.5 c ii	\$88	4hrs @ \$22/hr	No
6	Admin *Include requirements for site operators to implement BMPs (e.g., reduce disturbed area, protect slopes, etc.)	2.3.5 c iii	\$88	4hrs @ \$22/hr	No
7	Admin *Include requirements for site operators to control other wastes	2.3.5 c iv	\$88	4hrs @ \$22/hr	No
8	Admin *Develop written procedures for site plan review and inspection and enforcement within 1 year (003 -> nearly same, now has time requirement)	2.3.5 c v	\$88	4hrs @ \$22/hr	Yes
9	Admin *Include pre-construction review, consideration for protection of water quality impacts, LID components	2.3.5 c v	\$88	4hrs @ \$22/hr	No
10	Admin *And receipt of information from the public, inspections during and after BMP installation (now covers post construction)	2.3.5 c v	\$88	4hrs @ \$22/hr	No
11	Admin *And "qualifications necessary to perform the inspections"	2.3.5 c v	\$88	4hrs @ \$22/hr	No
12	Admin *And procedure for tracking the number of site reviews, inspections and enforcement actions	2.3.5 c v	\$88	4hrs @ \$22/hr	No
13	Admin *All to be included in the annual report	2.3.5 c v	\$0	See Miscellaneous No. 50	No

Estimated Annual Costs \$0

Estimated One-time Costs \$770

Estimated Intermittent Costs \$0

No.	BMP/Admin	Post Construction Site Runoff Control Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP	*develop implement and enforce a post-construction SW program for new developments and redevelopments	2.3.6 a	\$0	depends on previous program, should already be in place	Yes
2	Admin	*adopt or amend a local ordinance to control projects that disturb an acre or more	2.3.6 a ii	\$176	Already in place, but 8hrs @ \$22/hr minimum	Yes
3	BMP	*retain and/or treat first inch of runoff; where technically feasible do retention first	2.3.6 a ii a	\$1,760	80hrs @ \$22/hr, assumes no controversy and 4 people working	No
4	BMP	**from all impervious surfaces on site"	2.3.6 a ii a	\$0	See No. 3	No
5	Admin	*sites with soil contamination problems or at industrial sites shall not include any infiltration BMPs	2.3.6 a ii b	\$0	Rule, does not require anything to be implemented, Possibly need Attorney	No
6	Admin	*infiltration systems near environmentally sensitive areas must include shutdown and containment systems	2.3.6 a ii c	\$0	Rule, does not require anything to be implemented	No
7	Admin	*all BMPs must be constructed in accordance with the MA stormwater Handbook	2.3.6 a ii d	\$0	Rule, does not require anything to be implemented	Yes
8	Admin	*this system shall include development of a long term O&M plan to inspect and repair BMPs	2.3.6 a ii e	\$0	Rule, does not require anything to be implemented	No
9	Admin	*systems shall be designed "to avoid disturbance of areas susceptible to erosion and sediment loss"	2.3.6 a ii f	\$0	Rule, does not require anything to be implemented	Yes
10	BMP	*systems shall require submittal of as-built drawings that depict all on site controls	2.3.6 a iii	\$1,100	Submitted by construction company, 52hrs @ \$22/hr, if it's new	No
11	Admin	*shall have procedures to ensure O&M, such as dedicated funds, escrow accounts or management contracts	2.3.6 a iii	\$4,576	legal authority adds complexity and cost, 5hr w/ an attorney, 208hrs of labor @ \$22/hr	No
12	Admin	*may include annual self-certification program	2.3.6 a iii	\$0	Included in No. 11	No
13	Admin	*annual report shall include measures that the permittee has done to meet these requirements	2.3.6 a iii	\$0	See Miscellaneous No. 50	Yes
14	BMP	*w/in 3 years document current street design and parking rules that affect creation of impervious cover	2.3.6 b	\$1,320	60hrs @ \$22/hr	No
15	BMP	*shall be used by permittee to determine if changes "can be made to support low impact design options"	2.3.6 b	\$0	Included in No. 14	No
16	BMP	*if changes can be made, assessment shall include recommendations and proposed schedules to adopt changes	2.3.6 b	\$0	Included in No. 14	No
17	BMP	*permittee "shall implement all recommendations . . ."; assessment must be placed in the SWMP	2.3.6 b	\$0	Included in No. 14	No
18	Admin	*annual report shall contain an update on this requirement, including any planned or completed changes	2.3.6 b	\$0	See Miscellaneous No. 50	No
19	BMP	*w/in 4 years assess local rules to determine feasibility of allowing green roofs, water harvesting and LID BMPs	2.3.6 c	\$880	40 hrs @ \$22/hr	No
20	Admin	*assessment shall indicate if and under what circumstances these practices are allowed	2.3.6 c	\$0	Included in No. 19	No
21	BMP	*if practices not allowed, determine what hinders use of these practices and what changes can be made	2.3.6 c	\$0	Included in No. 19	No
22	BMP	*provide a schedule of implementation of recommendations	2.3.6 c	\$0	Included in No. 19	No
23	BMP	**"permittee shall implement all recommendations, in accordance with the schedules . . ."	2.3.6 c	\$0	Included in No. 19	No
24	Admin	*annual report shall contain an update on this requirement, including any planned or completed changes	2.3.6 c	\$0	See Miscellaneous No. 50	Yes
25	Admin	*estimate the annual increase or decrease in Impervious Area and Directly Connected Impervious Area	2.3.6 d	\$1,760	80 hrs @ \$22/hr, a lot of data required	No
26	Admin	*tabulate results by sub-basins delineated per 2.3.4.6 a I	2.3.6 d i	\$0	See No. 17 in IDDE	No
27	Admin	*must include conventional pavements, driveways, parking lots and rooftops	2.3.6 d i	\$0	See No. 17 in IDDE	No
28	Admin	*starting with second annual report, estimate each sub-basin added or removed each year	2.3.6 d ii	\$0	See Miscellaneous No. 50	No
29	Admin	*break out those figures by development, redevelopment or retrofit by permittee, by others voluntarily	2.3.6 d ii	\$0	See Miscellaneous No. 50	No
30	Admin	*. . . or in compliance with the permittee's ordinances or bylaws	2.3.6 d ii	\$0	See Miscellaneous No. 50	No
31	Admin	*within 4 years complete inventory and ranking of Municipal property suitable for modification or retrofit to . . .	2.3.6 d iii	\$2,640	120hrs @ \$22/hr, many properties to assess	No
32	Admin	*. . . reduce frequency, volume and pollutant loads of stormwater discharges by reduction of impervious area	2.3.6 d iii	\$0	Included in No. 32	No
33	Admin	*shall include both on site and off site reduction of IA and DCIA (e.g., parking lots, buildings, etc)	2.3.6 d iii	\$0	Included in No. 32	No
34	Admin	*also include existing rights-of-way,	2.3.6 d iii	\$0	Included in No. 32	No
35	Admin	*for suitability the evaluation shall consider factors such as depth to water table; subsurface geology; access	2.3.6 d iii	\$0	Included in No. 32	No
36	Admin	*priority ranking shall consider factors such as CIP schedules; current storm sewer level of service, etc.	2.3.6 d iii	\$0	Included in No. 32	No
37	Admin	*starting with fifth year annual report, report on status of all such inventoried properties	2.3.6 d iii	\$0	See Miscellaneous No. 50	No

Estimated Annual Costs \$5,280

Estimated One-time Costs \$1,496

Estimated Intermittent Costs \$7,436

No.	BMP/Admin	Pollution Prevention and Good Housekeeping Requirement	Reference	Cost	Justification	In Place (Y/N)
1	Admin	*W/in 1 year develop or update written O&M procedures for listed municipal facilities	2.3.7 a i	\$176	8hr @ \$22/hr	No
2	Admin	*w/in 1 year inventory all permittee owned facilities in these "good housekeeping" categories	2.3.7 a ii	\$0	Included in No. 1	No
3	Admin	*For Parks and Open Space: procedures to address the use, storage and minimization of pesticides, fertilizers, etc.	2.3.7 a ii a	\$2,640	120hrs @ \$22/hr, Large amount of spaces to review plans for	No
4	Admin	*to be reviewed annually and updated as necessary	2.3.7 a ii a	\$0	Included in No. 3	No
5	Admin	*evaluate lawn maintenance and landscaping activities to be protective of water quality	2.3.7 a ii a	\$0	Included in No. 3	No
6	Admin	*Including reduced mowing, proper disposal of lawn clippings, use of drought resistant plantings	2.3.7 a ii a	\$0	Included in No. 3	No
7	Admin	*establish pet waste handling collection, disposal and signage at all parks and open spaces	2.3.7 a ii a	\$0	Included in No. 3	No
8	Admin	*establish procedures for scheduled cleaning and sufficient number of trash containers	2.3.7 a ii a	\$0	Included in No. 3	No
9	Admin	*For Buildings and Facilities, such as town offices, police and fire stations, municipal pools, etc.	2.3.7 a ii b	\$1,760	80hrs @ \$22/hr	No
10	Admin	*evaluate the use. Storage and disposal of petroleum products and train employees on proper procedures	2.3.7 a ii b	\$0	Included in No. 9	No
11	Admin	*ensure that spill prevention is in place and coordinate with fire department	2.3.7 a ii b	\$0	Included in No. 9	No
12	Admin	*develop management procedures for dumpsters and other waste management equipment	2.3.7 a ii b	\$0	Included in No. 9	No
13	Admin	*For Vehicles and Equipment: establish procedures for storage of permittee vehicles, including inside storage	2.3.7 a ii c	\$176	8hrs @ \$22/hr	No
14	Admin	*establish procedures to ensure that vehicle wash water does not enter the SW system	2.3.7 a ii c	\$0	Included in No. 13	No
15	Admin	*evaluate fueling areas to minimize exposure	2.3.7 a ii c	\$0	Included in No. 13	No
16	Admin	*Infrastructure O&M: w/in 1 year develop and implement procedures to take care for the MS4 system	2.3.7 a iii a	\$0	See Below through No. 22	No
17	Admin	*optimize routine inspections (e.g., prioritize catch basins located near construction sites)	2.3.7 a iii b	\$0		No
18	BMP	*ensure that "no catch basin at anytime will be more than 50 percent full"	2.3.7 a iii b	\$440	2hrs/basin @ \$22/hr, assuming 10 basins /year	No
19	BMP	*If more than 50% full during two routine cleanings, investigate the cause for excessive sediment loading	2.3.7 a iii b	\$0	See No. 17/Annual Report	No
20	Admin	*describe these actions in the annual report	2.3.7 a iii b	\$0	See Miscellaneous No. 50	No
21	Admin	*document in annual report the plan for optimizing catch basin cleaning, inspections or scheduling	2.3.7 a iii b	\$0	See Miscellaneous No. 50	No
22	Admin	*include metrics used to determine that the plan is optimal for the MS4	2.3.7 a iii b	\$0	Included in No. 17	No
23	Admin	*in each annual report list the total number of catch basins, number inspected and/or cleaned	2.3.7 a iii b	\$0	See Miscellaneous No. 50	No
24	Admin	*and "volume or mass of material removed from each catch basin draining to water quality limited waters"	2.3.7 a iii b	\$0	included in No. 23	No
25	Admin	*and "total volume or mass of material removed from all catch basins"	2.3.7 a iii b	\$0	included in No. 23	No
26	BMP	*Sweeping: develop and implement procedures for sweeping streets and municipal-owned lots	2.3.7 a iii c	\$10,560	Materials + Labor	Yes
27	BMP	*sweep all streets (rural exceptions apply) a minimum of once a year in the spring	2.3.7 a iii c	\$0	See No. 26	Yes
28	BMP	*procedures shall include more frequent sweeping of targeted area based on various listed criteria	2.3.7 a iii c	\$0	Minimal Development Cost	No
29	BMP	*criteria include inspections, pollutant loads, catch basin cleanings, land use, TMDL or impaired waters	2.3.7 a iii c	\$0	Minimal Development Cost	No
30	Admin	*Each annual report shall include number of miles cleaned and volume or mass of material removed	2.3.7 a iii c	\$0	See Miscellaneous No. 50	No
31	Admin	*for rural exception areas, either sweep per usual or develop specific procedures and place in first annual report	2.3.7 a iii c	\$0	See Miscellaneous No. 50	No
32	BMP	*properly store catch basin cleanings so they do not discharge to receiving waters	2.3.7 a iii d	\$0	\$0 Since Southbridge owns their own landfill	Yes
33	BMP	*establish and implement procedures for winter road maintenance including storage of salt and sand	2.3.7 a iii e	\$0	Properly house materials in municipally owned properties	Yes
34	BMP	*minimize use of sodium chloride and other salts; evaluate opportunities for alternative materials	2.3.7 a iii e	\$176	8hrs @ \$22/hr	Yes
35	Admin	*ensure that snow is not disposed into surface waters	2.3.7 a iii e	\$0		Yes
36	Admin	*establish procedures for O&M or all permittee-owned stormwater BMPs (e.g., swales, retention basins etc.)	2.3.7 a iii f	\$176	8hrs @ \$22/hr	No
37	BMP	*inspect all such structures at least once annually	2.3.7 a iii f	\$11,000	Inspect each BMP, assuming 2000/year 15min/BMP @ \$22/hr	No
38	Admin	*in annual report include status of work required in this part	2.3.7 a iv	\$0	See Miscellaneous No. 50	No
39	Admin	*permittees shall keep a written record of all required activities	2.3.7 a v	\$2,200	100hrs @ \$22/hr, based on templates from the CMRSWC	No
40	BMP	*develop and fully implement a SWPPP for each of the listed facilities no later than 2 years after effective date	2.3.7 b	\$1,540	4hrs to update existing SWPPPs, 10hrs for new SWPPPs, @ 22/hr, assume 5 new facilities and 5 old facilities	No
41	BMP	*includes maintenance garages, public works yards, transfer stations, other waste handling facilities	2.3.7 b	\$0	Included in No. 40	No
42	BMP	*Identify name and title of staff of the Pollution Prevention Team for each facility	2.3.7 b ii a	\$0	Included in No. 40	No
43	BMP	*for each facility: include map, description of activities, outfall locations, receiving waters and structural controls	2.3.7 b ii b	\$0	Included in No. 40	No
44	BMP	*select, sign, install and implement the following 9 control measures to prevent or reduce discharge of pollutants	2.3.7 b ii c	\$10,000	depends on variations of the extent of impaired waters	No
45	BMP	*take all reasonable measure to address quality of discharges that may not originate at the facility	2.3.7 b ii c	\$0	Included in No. 44	No
46	Admin	*for areas that discharge to impaired waters, identify the control measures to address that issue	2.3.7 b ii c	\$0	Included in No. 44	No
47	BMP	*SWPP Required Elements: Minimize or Prevent Exposure (e.g., move activities or materials under cover)	2.3.7 d 1	\$0	Included in No. 44	No
48	BMP	*Good Housekeeping	2.3.7 d 2	\$180,246	\$7,040 catch basin cleaning, \$10,560 street sweeping, \$152,200 salt/sand, \$5,956 maintenance, \$4,470 audits	Yes
49	BMP	*Preventative Maintenance	2.3.7 d 3	\$0		Yes
50	BMP	*Spill Prevention and Response	2.3.7 d 4	\$0	Included in No. 44	Yes
51	BMP	*Erosion and Sediment Control	2.3.7 d 5	\$0	Included in No. 44	Yes
52	BMP	*Management of Runoff	2.3.7 d 6	\$0	Included in No. 44	Yes
53	BMP	*Salt Storage or Piles Containing Salt	2.3.7 d 7	\$0	Included in No. 44	Yes
54	BMP	*Employee Training; document training date, title and duration; attendees; subjects covered during training	2.3.7 d 8	\$1,980		Yes
55	BMP	*Maintenance of Control Measures	2.3.7 d 8	\$0	Included in No. 44	Yes
56	BMP	*inspect all areas exposed to stormwater and all stormwater control measures at least every calendar quarter	2.3.7 b iii a	\$2,200	30 minutes per inspection, assume 10 facilities with four areas each @ \$100/hr	No
57	BMP	*at least one inspection shall occur when a stormwater discharge is occurring	2.3.7 b iii a	\$1,584	144 outfalls, approx. 30min/outfall @ \$22/hr	No
58	Admin	*document the date, time, name of inspector, weather, any control measures needing maintenance or repair, etc.	2.3.7 b iii a	\$0	Included in No. 44	No
59	BMP	*permittee shall repair or replace any control measures needing repair before the next anticipated storm event	2.3.7 b iii a	\$0	Included in No. 44	No
60	Admin	*shall report the findings from the Site inspections in the annual report	2.3.7 b iii a	\$0	See Miscellaneous No. 50	No
61	Admin	*keep a written record of all required activities required in this section	2.3.7 b iv	\$0		No

Estimated Annual Costs \$220,562

Estimated One-time Costs \$6,292

Estimated Intermittent Costs \$0

No.	BMP/Admin	Miscellaneous Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP	Submit an NOI	1.7.1	\$176	8hrs at \$22/hr, historical properties or endangered species will increase this	No
2	Admin	*Document endangered species status (part of NOI)	1.9.1	\$0	Included under No. 1	No
3	BMP	*Implement measures to protect endangered species	1.9.1	Varies	Included under No. 1	No
4	Admin	Document Historic Properties Observation (part of NOI)	1.9.2	\$0	See Miscellaneous No. 50	No
5	BMP	*Describe effect of discharges on Historic properties	1.9.2	Varies	Included under No. 1	No
6	Admin	*Report documents received re: such discharges	1.9.2	\$0	Included under No. 1	No
7	Admin	*Provide results of Appendix D historic property screening	1.9.2	\$0	Included under No. 1	No
8	BMP	Describe efforts to avoid or minimize impacts on such properties	1.9.2	Varies	Included under No. 1	No
9	BMP	Develop a SWMP	1.1.0	\$1,760	80hrs at \$22/hr	Yes
10	BMP	Implement a SWMP	1.1.0	\$0		Yes
11	Admin	*Update/modify SWMP	1.1.0	\$440	20hrs at \$22/hr	No
12	Admin	Provide SWMP "immediately" to various agencies and public	1.10.1	\$0	Included under No. 9	No
13	Admin	*Post SWMP online	1.10.1	\$0	Included under No. 9	No
14	Admin	Identify Names and titles of people implementing the SWMP	1.10.2	\$0	Included under No. 9	No
15	Admin	*Include status of 2003 permit requirements	1.10.2	\$0	Included under No. 9	Yes
16	Admin	*List all receiving waterbodies, classifications, pollutants of concern	1.10.2	\$0	Included under No. 9	No
17	Admin	*list all applicable TMDLs, WLAs	1.10.2	\$0	Included under No. 9	No
18	Admin	*List all outfalls that discharge to each waterbody	1.10.2	\$0	Included under No. 9	No
19	Admin	*list all public water sources that may be affected by SW discharges	1.10.2	\$0	Included under No. 9	No
20	Admin	*List all interconnected MS4s and receiving waterbody	1.10.2	\$0	Included under No. 9	No
21	Admin	*Include applicable TMDLs, WLAs and pollutants of concern	1.10.2	\$0	Included under No. 9	No
22	Admin	*Document all new or increased discharges	1.10.2	\$0	Included under No. 9	No
23	Admin	*Include map of separate storm sewer system (Map must be improved)	1.10.2	\$0	Included under No. 9	No
24	Admin	List all discharges to impaired water and the response	1.10.2	\$0	Included under No. 9	No
25	Admin	*Describe BMPs proposed to meet TMDL requirements	1.10.2	\$0	Included under No. 9	No
26	Admin	For each BMP, list the milestone, timeframe and assessment measure	1.10.2	\$0	Included under No. 9	No
27	Admin	*For each BMP, list person or department responsible for implementation	1.10.2	\$0	Included under No. 9	No
28	Admin	*Describe BMPs proposed to meet impaired waters requirements	1.10.2	\$0	Included under No. 9	No
29	Admin	Describe BMPs used to meet the 6 minimum control measures	1.10.2	\$0	Included under No. 9	No
30	Admin	*List measures to avoid/minimize impacts to surface drinking waters	1.10.2	\$0	Included under No. 9	No
31	BMP	*Ensure that discharges "do not cause or contribute" to an exceedance of WQ standards	2.1	\$0	Included under No. 9	Yes
32	BMP	*For TMDL waters, meet requirements of Appendix F (NB: contains multiple add'l req'ts)	2.1.1 b	Varies	May range into millions of dollars, no one has estimated this yet	No
33	BMP	*For impaired waters meet requirements of Appendix H (NB: contains multiple add'l req'ts)	2.1.1 c	Varies	May range into millions of dollars, no one has estimated this yet	No
34	BMP	*For any exceedances of WQ standards to TMDL or impaired waters, eliminate it within 60 days	2.1.1 d	Varies	May range into millions of dollars, no one has estimated this yet	No
35	BMP	*For any increased discharge, comply with MassDEP's regulations at 314 CMR 4.04	2.1.2 a	Varies	Cost will vary	No
36	BMP	*Demonstrate no net increase in pollutants for discharges to any 303 (d) or 305(b) water (previously only had to identify if 303 d)	2.1.2 b	Varies	Cost will vary	No
37	Admin	*Identify all discharges to waters that are impaired or which have TMDLs (Both in SWMP and Annual report)	2.2	\$0	Varies depending on EPA interpretations	No
38	Admin	*Permittee shall annually self-evaluate and maintain the evaluation in its SWMP	4.1 a	\$0	Included under No. 9	No
39	Admin	*In evaluating the appropriateness of BMPs, permittees may add BMPs at any time	4.1 b	\$88	4hrs @ \$22/hr, paperwork for new BMP	Yes
40	Admin	Subtracting or replacing BMPs may only be done in limited circumstances, after showing the BMP is ineffective	4.1 b	Varies	Cost of replacement will depend on the BMP being used	No
41	Admin	*Each Annual shall include a brief explanation of any BMP modification	4.1 b	\$0	See No. 50	No
42	Admin	EPA or MassDEP may require the permittee to add, modify, etc., any BMP to satisfy conditions of the permit	4.1 c	\$0	Minimal cost	No
43	Admin	*The permittee shall keep all record required by this permit for at least five years	4.2 a	\$880	Week of work annually, 40hrs at \$22/hr	No
44	Admin	*"Records" includes "information used in the development of any written program . . . monitoring results, etc."	4.2 a	\$0	Record keeping, doesn't cost anything to implement	No
45	Admin	these records all be made available to the public	4.2 c	\$0	Record keeping, doesn't cost anything to implement	No
46	Admin	*the permittee "shall document all monitoring results each year in the annual report"	4.3 b	\$0	See No. 50	No
47	Admin	*that shall include the date, outfall identifier, location, weather, precipitation and screening or analysis results	4.3 b	\$0	Part of annual report, see No. 46	No
48	Admin	*include all monitoring results for the current reporting period and for the entire permit term	4.3 b	\$0	Part of annual report, see No. 46	No
49	Admin	*permittee shall include "results from any other stormwater or receiving water quality monitoring or studies . . ."	4.3 c	\$0	Part of annual report, see No. 46	No
50	Admin	The annual report shall include a self-assessment of compliance; an assessment of the appropriateness of BMPs	4.4 b i	\$14,200	Consulting fee for annual report	No
51	Admin	*The status of any required plans	4.4 b iii	\$0	Part of annual report, see No. 50	No
52	Admin	*"Identification of all discharges determined to be causing or contributing to an exceedance" of WQ standards	4.4 b iii	\$0	Part of annual report, see No. 50	No
53	Admin	*For discharges to TMDLs, identify specific BMPs used to address those requirements	4.4 b iii	\$0	Part of annual report, see No. 50	No
54	Admin	*For discharges to impaired waters, "a description of each BMP required by Appendix H" and all deliverables	4.4 b iii	\$0	Part of annual report, see No. 50	No
55	Admin	*Assessment of the progress toward meeting the requirements for the 6 minimum control measures (see details)	4.4 b iv	\$0	Part of annual report, see No. 50	No
56	Admin	*"All outfall screening and monitoring data" for the reporting term and cumulative for the permit term	4.4 b v	\$0	Part of annual report, see No. 50	No
57	Admin	Description of activities for the next reporting cycle	4.4 b vi	\$0	Part of annual report, see No. 50	Yes
58	Admin	Description of any changes in identified BMPs or measurable goals	4.4 b vii	\$0	Part of annual report, see No. 50	Yes
59	Admin	*Description of activities undertaken by any entity contracted for achieving any requirement of the permit	4.4 b viii	\$0	Part of annual report, see No. 50	No

Estimated Annual Costs \$15,168

Estimated One-time Costs \$2,376

Estimated Intermittent Costs \$0

Appendix F

<u>Control Measure</u>	Estimated Annual Costs	Estimated One-time Costs	Estimated Intermittent Costs
Public Education and Outreach	\$12,106	\$0	\$0
Public Involvement and Participation	\$0	\$0	\$0
Illicit Discharge Detection and Elimination Program	\$11,347	\$306,481	\$76,972
Construction Site Stormwater Runoff Control	\$350	\$858	\$0
Post Construction Stormwater Management	\$5,280	\$1,496	\$7,480
Good Housekeeping	\$693,578	\$6,292	\$0
<u>Non-Control Measure</u>			
Miscellaneous	\$12,968	\$2,376	\$0
Totals	\$735,629	\$317,503	\$84,452
KEY:			
Yearly	No. = Reference Number		
Once	BMP/Admin = Is the requirement completed with either a BMP or Administrative work		
As Needed	X Requirement = The short name for a requirement		
	Requirement = Section in the 2014 MS4 permit draft		
	Cost = Cost of completing the requirement		
	Justification = List of methods used to complete the requirement, as well supporting data from sources		
	In Place (Y/N) = Is the requirement listed currently in place		

No.	BMP/Admin	Public Education and Outreach Requirement	Reference	Cost	Justification	In Place (Y/N)
1	Admin	Continue public education program required by 2003 permit	2.3.2 a	\$3,176	Art Contest (3000) for materials, 8 hr(s) @ \$22/hr	Y
2	Admin	*Define goals, express specific messages define audience for each message	2.3.2 a	\$44	2hrs @ \$22/hr, a minor administrative cost	N
3	Admin	*Identify parties responsible for each message	2.3.2 a	\$44	2hrs @ \$22/hr, a minor administrative cost	N
4	Admin	*Develop and send out two separate messages for each of 4 different audiences	2.3.2 c	\$22	1hr @ \$22/hr, a minor administrative cost, once a year for 8 years	N
5	Admin	*Show evidence that messages are achieving results	2.3.2 e	\$8,820	DCR explanation for assessing effectiveness	N
6	Admin	*Identify method used to evaluate effectiveness of messages	2.3.2 e	\$0	No significant cost	N
7	Admin	*Put in annual report the methods of distribution and methods to assess effectiveness	2.3.2 g	\$0	See Miscellaneous No. 50	N

Estimated Annual Costs \$12,106

Estimated One-time Costs \$0

Estimated Intermittent Costs \$0

No.	BMP/Admin	Public Involvement and Participation Requirement	Reference	Cost	Justification	In Place (Y/N)
1	Admin	*Comply with state public Notice requirements	2.3.3 a	\$0	No significant cost, website hosting	Y
2	Admin	Provide annual opportunity for public to participate in review and implementation of SWMP	2.3.3 b	\$0	No significant cost	Y
3	Admin	*Put in annual report these public participation activities	2.3.3 c	\$0	See Miscellaneous No. 50	N

Estimated Annual Costs \$0

Estimated One-time Costs \$0

Estimated Intermittent Costs \$0

No.	BMP/Admin	Illicit Discharge Detection and Elimination Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP	*Eliminate any illicit discharge to the stormwater system as expeditiously as possible	2.3.4.2	\$25,000	[Varies depending on infraction, ranges from [50-50,000] provided by DCR Director Larry Pistrang]	Y
2	BMP	*Identify who is responsible for any such discharges	2.3.4.2	\$0	See No. 1, part of identification process	Y
3	Admin	*If elimination takes more than 60 days, establish an expeditious schedule for elimination	2.3.4.2	\$44	2hrs @ \$22/hr, for scheduling	N
4	Admin	*If more than 60 days, report dates of identification and schedules in annual report	2.3.4.2	\$0	See Miscellaneous No. 50	N
5	BMP	Implement measures to control non-stormwater discharges if they add significant pollution	2.3.4.3	\$25,000	[Varies depending on infraction, ranges from [50-50,000] provided by DCR Director Larry Pistrang]	Y
6	Admin	*Identify all known locations where SSOs have discharged to the MS4 in last 5 years	2.3.4.4 a	\$44	2hrs @ \$22/hr, assuming records are easily available	N
7	Admin	*For each such SSO discharge, include date and time, location, volume, suspected cause	2.3.4.4 b	\$44	2hrs @ \$22/hr, to determine the information	N
8	Admin	*Also include whether each entered any surface water and what corrective actions were taken	2.3.4.4 b	\$0	Included under No. 7	N
9	Admin	*Also include corrective measures planned and implementation schedule	2.3.4.4 b	\$0	Included under No. 7	N
10	Admin	*Maintain the SSO inventory as part of the SWMP and the Annual Reports	2.3.4.4 b	\$0	See Miscellaneous No. 50	N
11	Admin	*Provide oral and written notice to EPA and MassDEP for any SSO occurrence	2.3.4.4 c	\$44	2hrs @ \$22/hr, informing EPA/MassDEP orally/written	N
12	BMP	*Develop an inventory of each MS4 outfall, including location, interconnections, and condition (different only in that it requires the condition of the outfall)	2.3.4.5	\$1,469	2hrs @ \$22/hr, about 15min/outfall, 267 outfalls	N
13	Admin	*Update inventory annually to include monitoring program	2.3.4.5 b	\$0	See Miscellaneous No. 50	N
14	BMP	*Physically label all MS4 outfall pipes	2.3.4.5 b	\$2,003	2hrs @ \$22/hr, about 10min/outfall, 267 outfalls, materials included (\$2 stick per outfall + spraypaint+sharpie)	N
15	Admin	*For each outfall list unique identifier, receiving water, date of most recent inspection	2.3.4.5 c	\$0	Included under No. 14, materials are available from the Coalition	N
16	Admin	*Also include dimensions, shape, material, physical condition and indicators of non-SW discharges	2.3.4.5 c	\$0	Included under No. 14, materials are available from the Coalition	N
17	BMP	*Revise existing map of stormwater system within 2 years of effective date of the permit	2.3.4.6	\$250,000	Will likely require complete redevelopment of the map system, this numbers based on Millbury estimations for People GIS	N
18	BMP	*Map shall include all outfalls, pipes, manholes, catch basins, interconnections, open channels	2.3.4.6 a i	\$0	Included under No. 17	N
19	BMP	*Also include all municipally-owned BMPs (e.g., retention basins, oil/water separators, etc.)	2.3.4.6 a i	\$0	Included under No. 17	N
20	BMP	*Also include catchment delineation and all waters listed on the 303(d) or 305 (b) list	2.3.4.6 a i	\$0	Included under No. 17	N
21	BMP	*Also include municipal sanitary sewers or combined sewer systems	2.3.4.6 a ii	\$0	Included under No. 17	N
22	BMP	*Include various recommended elements	2.3.4.6 a iii	\$0	Included under No. 17	N
23	BMP	*Update the map to reflect newly discovered information and corrections or modifications	2.3.4.6 b	\$1,144	1hr/week @ \$22/hr, for continuous developments and additions to stormwater systems	N
24	Admin	*Report on the progress toward completion of the map in each annual report	2.3.4.6 c	\$0	See Miscellaneous No. 50	N
25	BMP	*Write an Illicit Discharge Detection and Elimination (IDDE) program document (Discrete, specifically mentions the document must be written out)	2.3.4.7	\$10,000	A complete redevelopment of the program, smaller towns can expect a cost of 10,000	N
26	Admin	*Develop a map	2.3.4.7 a	\$1,430	5hr @ \$22/hr, we have to change ordinance and allow a representative to go to different committees	N
27	Admin	*Program shall clearly identify IDDE responsibilities and provide description of areas of responsibility	2.3.4.7 b	\$0	Included under No. 25	N
28	BMP	*Assess and priority rank each catchment into one of 4 possible categories	2.3.4.7 c i	\$13,310	1210 catch basins, about 30min/basin @ \$22/hr	N
29	Admin	*Priority rank each catchment within each category (except those "excluded") using 8 factors	2.3.4.7 c ii	\$26,620	1210 catch basins, about 1hr/basin @ \$22/hr	N
30	Admin	*Gather all information needed for the 8 screening factors (e.g., industrial areas > 40 years old)	2.3.4.7 c ii	\$0	Included under No. 29	N
31	Admin	*Complete ranking using existing information within 1 year; update in annual report	2.3.4.7 c iii	\$0	See Miscellaneous No. 50	N
32	Admin	*In annual report include summary of evidence of known/suspected illicit discharges by catchment	2.3.4.7 c iii	\$0	See Miscellaneous No. 50	N
33	Admin	*Also include corrective measures and schedule for correcting each illicit discharge	2.3.4.7 c iii	\$0	See Miscellaneous No. 50	N
34	Admin	*Develop written procedure for screening and sampling of outfalls	2.3.4.7 d	\$0	No cost with Coalition Membership	N
35	Admin	*Include procedures for sample collection, use of field kits and storage and conveyance of samples	2.3.4.7 d i	\$0	Included under No. 34	N
36	BMP	*If outfall is inaccessible, report the first accessible upstream structure	2.3.4.7 d ii	\$0	Minimal cost, possible time extensions to test applicable outfalls	N
37	BMP	*Perform dry weather screening when and how prescribed; identify in annual report any follow-up needed	2.3.4.7 d iii	\$979	267 outfalls, about 10min/outfall @ \$22/hr	N
38	BMP	*Perform wet weather screening when and how prescribed	2.3.4.7 d iv	\$1,469	267 outfalls, about 15min/outfall @ \$22/hr	N
39	BMP	*Sample at minimum for 7 listed factors	2.3.4.7 d v	\$8,811	267 outfalls, about 1.5hr/outfall @ \$22/hr, along with applicable water quality testing kit costs (none with Coalition)	N
40	Admin	*Catchments with specified septic or other results shall be listed as "High Priority" catchments	2.3.4.7 d vi	\$44	2hrs @ \$22/hr, if files readily available	N
41	BMP	*Develop written Catchment Investigation Procedure including review of maps and historic records	2.3.4.7 e	\$352	16hrs @ \$22/hr, for development of procedure	N
42	BMP	*Also include manhole investigation methodology and procedures to confirm sources of illicit discharges	2.3.4.7 e	\$0	Included under No. 41	N
43	BMP	*For each catchment review sanitary sewer and storm sewer construction plans; prior work on either	2.3.4.7 e i	\$26,620	1210 catchments, 1 hr/catchment @ \$22/hr	N
44	BMP	*Also review Health department records for septic system or sanitary sewer system failures or complaints	2.3.4.7 e i	\$0	Included under No. 43	N
45	Admin	*Identify and record any of the 12 System Vulnerability Factors (e.g., infrastructure > 40 years old)	2.3.4.7 e i	\$0	Included under No. 43	N
46	Admin	*Document and annually report presence or absence of the 12 System Vulnerability Factors for each catchment	2.3.4.7 e i	\$0	See Miscellaneous No. 50	N
47	Admin	*Include these required elements of written manhole investigation and catchment investigation procedures	2.3.4.7 e ii	\$0	No cost with Coalition Membership	N
48	Admin	*Include these required elements in written dry weather investigation procedure	2.3.4.7 e ii a	\$0	Included under No. 47	N
49	Admin	*Include these required elements in written wet weather investigation procedure	2.3.4.7 e ii b	\$0	Included under No. 47	N
50	Admin	*Develop procedures to isolate and confirm illicit sources (e.g., dye testing, smoke testing, caulk dams, etc.)	2.3.4.7 e iii	\$22	1hr @ \$22/hr, for scheduling	Y
51	Admin	*In annual report, for each illicit source list the location, its source, description of the discharge	2.3.4.7 f	\$88	4hrs @ \$22/hr, for scheduling	N
52	Admin	*Also list date and method of discovery, date of elimination, mitigation or enforcement action	2.3.4.7 f	\$0	Included under No. 51	N
53	Admin	*And estimate volume of flow reduced	2.3.4.7 f	\$0	Included under No. 51	N
54	BMP	*One year after illicit discharge removal, perform confirmatory screening; wet, dry or both	2.3.4.7 f	\$132	\$22/hr 30min/screening, approximately 1.5hr/illicit, assuming 3 illicit	N
55	BMP	*Schedule follow up screening within 5 years after confirmatory screening	2.3.4.7 g	\$132	\$22/hr 30min/screening, approximately 1.5hr/illicit, assuming 3 illicit	N
56	BMP	*Develop and implement procedures to prevent illicit discharges and SSOs	2.3.4.7 h	\$0	8hrs @ \$22/hr, one work day to complete process, no cost with Coalition membership	N
57	Admin	*Complete and report dry weather screening and sampling of High and Low Priority outfalls within 3 years	2.3.4.8 a	\$0	Included under No. 37 and No. 38	N
58	Admin	*All data shall be reported in each annual report . . .	2.3.4.8 a	\$0	See Miscellaneous No. 50	N
59	Admin	*Begin implementation of 2.3.4.7 d work no later than 15 months	2.3.4.8 b	\$0	Included under No. 37 and No. 38, deadlines	N
60	Admin	*Implement and report Catchment Investigation Procedure in every catchment . . .	2.3.4.8 c	\$0	Included under No. 28, deadlines	N
61	Admin	*In a minimum of 80% of the MS4 area serviced by Problem Catchments within 3 years and 100% within 5 years	2.3.4.8 c i	\$0	Included under No. 28, deadlines	N
62	Admin	*For all catchments where sampling indicates sewer input within 5 years	2.3.4.8 c ii	\$0	Included under No. 28, deadlines	N
63	Admin	*In 40% of all area served by all MS4 catchments within 5 years and in 100% of 4 area in 10 years	2.3.4.8 c iii	\$0	Included under No. 28, deadlines	N
64	Admin	*Track progress toward these milestones in each annual report	2.3.4.8 e	\$0	See Miscellaneous No. 50	N
65	Admin	*Define or describe indicators for tracking program success; demonstrate efforts to locate illicit discharges	2.3.4.9	\$0	8hrs @ \$22/hr, administrative work	N
66	Admin	*Also include percent and area in acres evaluated; volume of sewage removed; place in annual report (more detailed, 2003 only asks to measure progress)	2.3.4.9	\$0	See Miscellaneous No. 50	N
67	Admin	provide annual training to employees involved in IDDE program	2.3.4.10	\$0	No cost with Coalition membership	Y
68	Admin	*Include type and frequency of training in the annual report (2003 -> The program must include an employee training component)	2.3.4.10	\$0	See Miscellaneous No. 50	N

Estimated Annual Costs \$11,347

Estimated One-time Costs \$306,481

Estimated Intermittent Costs \$76,972

No. BMP/Admin	Construction Site Runoff Control Requirement	Reference	Cost	Justification	In Place (Y/N)	
1	BMP	*Continue to implement construction ordinance work from 2003 permit; expand to include 1 acre or more	2.3.5 a	\$350	Compare to previous cost, Millbury cost provided by Laurie Connors	Y
2	BMP	Develop and implement a construction site runoff program	2.3.5 c	\$0	as provided by Laurie Connors, Town planner	Y
3	Admin	An ordinance that requires sediment and erosions controls and for other wastes at construction sites	2.3.5 c i	\$22	1hr @ \$22/hr, included under No. 2	Y
4	Admin	Adopt written procedures for inspections and enforcement of the ordinance within 1 year (2003 -> (g.) Procedures for inspections and enforcement of control measures at construction sites.)	2.3.5 c ii	\$44	2hrs @ \$22/hr, for review of the established document included under No. 2	Y
5	Admin	*Document the procedures and responsibilities to implement in the SWMP	2.3.5 c ii	\$176	4hrs @ \$22/hr, included under No. 2	N
6	Admin	*Include requirements for site operators to implement BMPs (e.g., reduce disturbed area, protect slopes, etc.)	2.3.5 c iii	\$88	4hrs @ \$22/hr, included under No. 2	N
7	Admin	*Include requirements for site operators to control other wastes	2.3.5 c iv	\$88	4hrs @ \$22/hr, included under No. 2	N
8	Admin	*Develop written procedures for site plan review and inspection and enforcement within 1 year (003 -> nearly same, now has time requirement)	2.3.5 c v	\$88	4hrs @ \$22/hr, included under No. 2	N
9	Admin	*Include pre-construction review, consideration for protection of water quality impacts, LID components	2.3.5 c v	\$88	4hrs @ \$22/hr, included under No. 2	N
10	Admin	*And receipt of information from the public, inspections during and after BMP installation (now covers post construction)	2.3.5 c v	\$88	4hrs @ \$22/hr, included under No. 2	N
11	Admin	*And "qualifications necessary to perform the inspections"	2.3.5 c v	\$88	4hrs @ \$22/hr, included under No. 2	N
12	Admin	*And procedure for tracking the number of site reviews, inspections and enforcement actions	2.3.5 c v	\$88	4hrs @ \$22/hr, included under No. 2	N
13	Admin	*All to be included in the annual report	2.3.5 c v	\$0	See Miscellaneous No. 50	N

Estimated Annual Costs \$350

Estimated One-time Costs \$858

Estimated Intermittent Costs \$0

No.	BMP/Admin	Post Construction Site Runoff Control Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP	*develop implement and enforce a post-construction SW program for new developments and redevelopments	2.3.6 a	\$0	depends on previous program, should already be in place	Y
2	Admin	*adopt or amend a local ordinance to control projects that disturb an acre or more	2.3.6 a ii	\$176	Already in place, amendment would be 8 hr(s) @ 22/hr minimum	N
3	BMP	*retain and/or treat first inch of runoff; where technically feasible do retention first	2.3.6 a ii a	\$1,760	80hrs @ \$22/hr, difficult to assess cost, assumes no controversies or unresolved issues and four people working	N
4	BMP	**from all impervious surfaces on site"	2.3.6 a ii a	\$0	Included under No. 3	N
5	Admin	*sites with soil contamination problems or at industrial sites shall not include any infiltration BMPs	2.3.6 a ii b	\$0	Rule, does not require anything to be implemented, Possibly need Attorney	N
6	Admin	*infiltration systems near environmentally sensitive areas must include shutdown and containment systems	2.3.6 a ii c	\$0	Rule, does not require anything to be implemented	N
7	Admin	*all BMPs must be constructed in accordance with the MA Stormwater Handbook	2.3.6 a ii d	\$0	Rule, does not require anything to be implemented	N
8	Admin	*this system shall include development of a long term O&M plan to inspect and repair BMPs	2.3.6 a ii e	\$0	Rule, does not require anything to be implemented	N
9	Admin	*systems shall be designed "to avoid disturbance of areas susceptible to erosion and sediment loss"	2.3.6 a ii f	\$0	Rule, does not require anything to be implemented	N
10	BMP	*systems shall require submittal of as-built drawings that depict all on site controls	2.3.6 a iii	\$1,144	52hrs @ \$22/hr and submitted by construction company if it is new	N
11	Admin	*shall have procedures to ensure O&M, such as dedicated funds, escrow accounts or management contracts	2.3.6 a iii	\$4,576	208hrs @ \$22/hr, Submitted by construction company, legal authority and complexity add costs, including maybe 5 people inc/attorney	N
12	Admin	*may include annual self-certification program	2.3.6 a iii	\$0	Included under No. 11	N
13	Admin	*annual report shall include measures that the permittee has done to meet these requirements	2.3.6 a iii	\$0	See Miscellaneous No. 50	N
14	BMP	*w/in 3 years document current street design and parking rules that affect creation of impervious cover	2.3.6 b	\$1,320	60hrs @ \$22/hr, including fire chief	N
15	BMP	*shall be used by permittee to determine if changes "can be made to support low impact design options"	2.3.6 b	\$0	Included under No. 14	N
16	BMP	*if changes can be made, assessment shall include recommendations and proposed schedules to adopt changes	2.3.6 b	\$0	Included under No. 14	N
17	BMP	*permittee "shall implement all recommendations . . ."; assessment must be placed in the SWMP	2.3.6 b	\$0	Included under No. 14	N
18	Admin	*annual report shall contain an update on this requirement, including any planned or completed changes	2.3.6 b	\$0	See Miscellaneous No. 50	N
19	BMP	*w/in 4 years assess local rules to determine feasibility of allowing green roofs, water harvesting and LID BMPs	2.3.6 c	\$880	40hrs @ \$22/hr	N
20	Admin	*assessment shall indicate if and under what circumstances these practices are allowed	2.3.6 c	\$0	Included under No. 19	N
21	BMP	*if practices not allowed, determine what hinders use of these practices and what changes can be made	2.3.6 c	\$0	Included under No. 19	N
22	BMP	*provide a schedule of implementation of recommendations	2.3.6 c	\$0	Included under No. 19	N
23	BMP	*permittee shall implement all recommendations, in accordance with the schedules . . ."	2.3.6 c	\$0	Included under No. 19	N
24	Admin	*annual report shall contain an update on this requirement, including any planned or completed changes	2.3.6 c	\$0	See Miscellaneous No. 50	N
25	Admin	*estimate the annual increase or decrease in Impervious Area and Directly Connected Impervious Area	2.3.6 d	\$1,760	80hrs @ \$22/hr, data intensive, devising system and updating yearly, assumes 4 people working	N
26	Admin	*tabulate results by sub-basins delineated per 2.3.4.6 a i	2.3.6 d i	\$0	Included in IDDE No. 17	N
27	Admin	*must include conventional pavements, driveways, parking lots and rooftops	2.3.6 d i	\$0	Included in IDDE No. 17	N
28	Admin	*starting with second annual report, estimate each sub-basin added or removed each year	2.3.6 d ii	\$0	See Miscellaneous No. 50	N
29	Admin	*break out those figures by development, redevelopment or retrofit by permittee, by others voluntarily	2.3.6 d ii	\$0	See Miscellaneous No. 50	N
30	Admin	*. . . or in compliance with the permittee's ordinances or bylaws	2.3.6 d ii	\$0	See Miscellaneous No. 50	N
31	Admin	*within 4 years complete inventory and ranking of Municipal property suitable for modification or retrofit to . . .	2.3.6 d iii	\$2,640	120hrs @ \$22/hr, involving schools, DPW, fire, police etc. assume 13 weeks work time	N
32	Admin	*. . . reduce frequency, volume and pollutant loads of stormwater discharges by reduction of impervious area	2.3.6 d iii	\$0	Included under No. 31	N
33	Admin	*shall include both on site and off site reduction of IA and DCIA (e.g., parking lots, buildings, etc.)	2.3.6 d iii	\$0	Included under No. 31	N
34	Admin	*also include existing rights-of-way,	2.3.6 d iii	\$0	Included under No. 31	N
35	Admin	*for suitability the evaluation shall consider factors such as depth to water table; subsurface geology; access	2.3.6 d iii	\$0	Included under No. 31	N
36	Admin	*priority ranking shall consider factors such as CIP schedules; current storm sewer level of service, etc.	2.3.6 d iii	\$0	Included under No. 31	N
37	Admin	*starting with fifth year annual report, report on status of all such inventoried properties	2.3.6 d iii	\$0	See Miscellaneous No. 50	N

Estimated Annual Costs \$5,280

Estimated One-time Costs \$1,496

Estimated Intermittent Costs \$7,480

No.	BMP/Admin	Pollution Prevention and Good Housekeeping Requirement	Reference	Cost	Justification	In Place (Y/N)
1	Admin	*W/in 1 year develop or update written O&M procedures for listed municipal facilities	2.3.7 a i	\$176	8hrs @ \$22/hr,	N
2	Admin	*w/in 1 year inventory all permittee owned facilities in these "good housekeeping" categories	2.3.7 a ii	\$0	included under No. 1	N
3	Admin	*For Parks and Open Space: procedures to address the use, storage and minimization of pesticides, fertilizers, etc.	2.3.7 a ii a	\$2,640	120hrs @ \$22/hr, Large amount of spaces to review plans for	N
4	Admin	*to be reviewed annually and updated as necessary	2.3.7 a ii a	\$0	included under No. 3	N
5	Admin	*evaluate lawn maintenance and landscaping activities to be protective of water quality	2.3.7 a ii a	\$0	included under No. 3	N
6	Admin	*including reduced mowing, proper disposal of lawn clippings, use of drought resistant plantings	2.3.7 a ii a	\$0	included under No. 3	N
7	Admin	*establish pet waste handling collection, disposal and signage at all parks and open spaces	2.3.7 a ii a	\$0	included under No. 3	N
8	Admin	*establish procedures for scheduled cleaning and sufficient number of trash containers	2.3.7 a ii a	\$0	included under No. 3	N
9	Admin	*For Buildings and Facilities, such as town offices, police and fire stations, municipal pools, etc.	2.3.7 a ii b	\$1,760	80hrs @ \$22/hr, to write procedures	N
10	Admin	*evaluate the use. Storage and disposal of petroleum products and train employees on proper procedures	2.3.7 a ii b	\$0	included under No. 1	N
11	Admin	*ensure that spill prevention is in place and coordinate with fire department	2.3.7 a ii b	\$0	included under No. 1	N
12	Admin	*develop management procedures for dumpsters and other waste management equipment	2.3.7 a ii b	\$0	included under No. 1	N
13	Admin	*For Vehicles and Equipment: establish procedures for storage of permittee vehicles, including inside storage	2.3.7 a ii c	\$176	8hrs @ \$22/hr,	N
14	Admin	*establish procedures to ensure that vehicle wash water does not enter the SW system	2.3.7 a ii c	\$0	Included under No. 13	N
15	Admin	*evaluate fueling areas to minimize exposure	2.3.7 a ii c	\$0	Included under No. 13	N
16	Admin	*Infrastructure O&M: w/in 1 year develop and implement procedures to take care for the MS4 system	2.3.7 a iii a	\$0	See Below through No. 22, will likely require significant investment	N
17	Admin	*optimize routine inspections (e.g., prioritize catch basins located near construction sites)	2.3.7 a iii b	\$0	See below	N
18	BMP	*ensure that "no catch basin at anytime will be more than 50 percent full"	2.3.7 a iii b	\$440	2hrs/catch basin, for example put 10 catch basins assume only 10 more than 50% each year	N
19	BMP	*if more than 50% full during two routine cleanings, investigate the cause for excessive sediment loading	2.3.7 a iii b	\$0	See No. 17/Annual Report	N
20	Admin	*describe these actions in the annual report	2.3.7 a iii b	\$0	See No. 17/Annual Report	N
21	Admin	*document in annual report the plan for optimizing catch basin cleaning, inspections or scheduling	2.3.7 a iii b	\$0	See No. 17/Annual Report	N
22	Admin	*include metrics used to determine that the plan is optimal for the MS4	2.3.7 a iii b	\$0	See No. 17/Annual Report	N
23	Admin	*in each annual report list the total number of catch basins, number inspected and/or cleaned	2.3.7 a iii b	\$0	See No. 17/Annual Report	N
24	Admin	*and "volume or mass of material removed from each catch basin draining to water quality limited waters"	2.3.7 a iii b	\$0	See No. 17/Annual Report	N
25	Admin	*and "total volume or mass of material removed from all catch basins"	2.3.7 a iii b	\$0	See No. 17/Annual Report	N
26	BMP	*Sweeping: develop and implement procedures for sweeping streets and municipal-owned lots	2.3.7 a iii c	\$0	Included under No. 27, already in place, Based on Estimations for one annual sweep	Y
27	BMP	*sweep all streets (rural exceptions apply) a minimum of once a year in the spring	2.3.7 a iii c	\$165,000	Already implemented, Based on Estimations provided by Rob McNeil	Y
28	BMP	*procedures shall include more frequent sweeping of targeted area based on various listed criteria	2.3.7 a iii c	\$0	Minimal Developmental cost	N
29	BMP	*criteria include inspections, pollutant loads, catch basin cleanings, land use, TMDL or impaired waters	2.3.7 a iii c	\$0	Minimal Developmental cost	N
30	Admin	*Each annual report shall include number of miles cleaned and volume or mass of material removed	2.3.7 a iii c	\$0	See Miscellaneous No. 50	N
31	Admin	*for rural exception areas, either sweep per usual or develop specific procedures and place in first annual report	2.3.7 a iii c	\$0	Included under No. 28	N
32	BMP	*properly store catch basin cleanings so they do not discharge to receiving waters	2.3.7 a iii d	\$33,200	400tons @ \$83/ton, based on numbers provided by Rob McNeil	Y
33	BMP	*establish and implement procedures for winter road maintenance including storage of salt and sand	2.3.7 a iii e	\$476,449	Properly house materials in municipally owned properties, performed yearly	Y
34	BMP	*minimize use of sodium chloride and other salts; evaluate opportunities for alternative materials	2.3.7 a iii e	\$176	8hrs @ \$22/hr	N
35	Admin	*ensure that snow is not disposed into surface waters	2.3.7 a iii e	\$0	Announcement to DPW workers involved with snow procedures	N
36	Admin	*establish procedures for O&M or all permittee-owned stormwater BMPs (e.g., swales, retention basins etc.)	2.3.7 a iii f	\$176	8hrs @ \$22/hr,	N
37	BMP	*inspect all such structures at least once annually	2.3.7 a iii f	\$11,000	Assuming 2000 per year, 15 minutes per structure	N
38	Admin	*in annual report include status of work required in this part	2.3.7 a iv	\$0	See Miscellaneous No. 50	N
39	Admin	*permittees shall keep a written record of all required activities	2.3.7 a v	\$2,200	100hrs @ \$22/hr,	N
40	BMP	*develop and fully implement a SWPPP for each of the listed facilities no later than 2 years after effective date	2.3.7 b	\$1,540	Assume 4 hrs to update existing SWPPPs, 10hrs for new SWPPPs, 70 hr(s) @ 22/hr, assume 5 new facilities a	N
41	BMP	*includes maintenance garages, public works yards, transfer stations, other waste handling facilities	2.3.7 b	\$0	Included under No. 40	N
42	BMP	*Identify name and title of staff of the Pollution Prevention Team for each facility	2.3.7 b ii a	\$0	Included under No. 40	N
43	BMP	*for each facility: include map, description of activities, outfall locations, receiving waters and structural controls	2.3.7 b ii b	\$0	Included under No. 40	N
44	BMP	*select, sign, install and implement the following 9 control measures to prevent or reduce discharge of pollutants	2.3.7 b ii c	\$0	Implementation of a number of control measures, cost will depend upon type of enforcement	N
45	BMP	*take all reasonable measure to address quality of discharges that may not originate at the facility	2.3.7 b ii c	\$0	extra work, depends on variations of the extent of impaired waters	N
46	Admin	*for areas that discharge to impaired waters, identify the control measures to address that issue	2.3.7 b ii c	\$0	Included under No. 44	N
47	BMP	*SWPP Required Elements: Minimize or Prevent Exposure (e.g., move activities or materials under cover)	2.3.7 d 1	\$0	Included under No. 44	N
48	BMP	*Good Housekeeping	2.3.7 d 2	\$0	Included under No. 44	N
49	BMP	*Preventative Maintenance	2.3.7 d 3	\$0	Included under No. 44	N
50	BMP	*Spill Prevention and Response	2.3.7 d 4	\$0	Included under No. 44	N
51	BMP	*Erosion and Sediment Control	2.3.7 d 5	\$0	Included under No. 44	N
52	BMP	*Management of Runoff	2.3.7 d 6	\$0	Included under No. 44	N
53	BMP	*Salt Storage or Piles Containing Salt	2.3.7 d 7	\$0	Included under No. 44	N
54	BMP	*Employee Training; document training date, title and duration; attendees; subjects covered during training	2.3.7 d 8	\$0	Included under No. 44	N
55	BMP	*Maintenance of Control Measures	2.3.7 d 8	\$0	Included under No. 44	N
56	BMP	*Inspect all areas exposed to stormwater and all stormwater control measures at least every calendar quarter	2.3.7 b iii a	\$2,000	20hrs @ \$100/hr, assume 30min/inspection and 10 facilities with four areas each	N
57	BMP	*at least one inspection shall occur when a stormwater discharge is occurring	2.3.7 b iii a	\$2,937	267 outfalls, about 30min/area @ \$22/hr	N
58	Admin	*document the date, time, name of inspector, weather, any control measures needing maintenance or repair, etc.	2.3.7 b iii a	\$0	Already included as operating costs, should be green	N
59	BMP	*permittee shall repair or replace any control measures needing repair before the next anticipated storm event	2.3.7 b iii a	\$0	costs for maintenance procedures	N
60	Admin	*shall report the findings from the Site inspections in the annual report	2.3.7 b iii a	\$0	See Miscellaneous No. 50	N
61	Admin	*keep a written record of all required activities required in this section	2.3.7 b iv	\$0	Minimal investment for records keeping	N

Estimated Annual Costs \$693,578

Estimated One-time Costs \$6,292

Estimated Intermittent Costs \$0

No.	BMP/Admin	Miscellaneous Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP	Submit an NOI	1.7.1	\$176	8hrs @ \$22/hr, historical properties or endangered species will increase this cost	Y
2	Admin	*Document endangered species status (part of NOI)	1.9.1	\$0	Included under No. 1	N
3	BMP	*Implement measures to protect endangered species	1.9.1	\$0	cost varies. included under No. 1	N
4	Admin	Document Historic Properties Observation (part of NOI)	1.9.2	\$0	minimal cost, included under No. 50	N
5	BMP	*Describe effect of discharges on Historic properties	1.9.2	\$0	Varies, included under No. 1	N
6	Admin	*Report documents received re: such discharges	1.9.2	\$0	Included under No. 1	N
7	Admin	*Provide results of Appendix D historic property screening	1.9.2	\$0	Included under No. 1	N
8	BMP	Describe efforts to avoid or minimize impacts on such properties	1.9.2	Varies	Included under No. 1	Y
9	BMP	Develop a SWMP	1.1.0	\$1,760	80hrs @ \$22/hr,	Y
10	BMP	Implement a SWMP	1.1.0	\$0	Included under No. 9	Y
11	Admin	*Update/modify SWMP	1.1.0	\$440	20hrs @ \$22/hr,	N
12	Admin	Provide SWMP "immediately" to various agencies and public	1.10.1	\$0	Included under No. 9	Y
13	Admin	*Post SWMP online	1.10.1	\$0	Included under No. 9	Y
14	Admin	Identify Names and titles of people implementing the SWMP	1.10.2	\$0	Included under No. 9	N
15	Admin	*Include status of 2003 permit requirements	1.10.2	\$0	Included under No. 9	Y
16	Admin	*List all receiving water bodies, classifications, pollutants of concern	1.10.2	\$0	Included under No. 9	N
17	Admin	*list all applicable TMDLs, WLAs	1.10.2	\$0	Included under No. 9	N
18	Admin	*List all outfalls that discharge to each water body	1.10.2	\$0	Included under No. 9	N
19	Admin	*list all public water sources that may be affected by SW discharges	1.10.2	\$0	Included under No. 9	N
20	Admin	*List all interconnected MS4s and receiving water body	1.10.2	\$0	Included under No. 9	N
21	Admin	*Include applicable TMDLs, WLAs and pollutants of concern	1.10.2	\$0	Included under No. 9	N
22	Admin	*Document all new or increased discharges	1.10.2	\$0	Included under No. 9	N
23	Admin	*Include map of separate storm sewer system (Map must be improved)	1.10.2	\$0	Included under No. 9	N
24	Admin	List all discharges to impaired water and the response	1.10.2	\$0	Included under No. 9	Y
25	Admin	*Describe BMPs proposed to meet TMDL requirements	1.10.2	\$0	Included under No. 9	N
26	Admin	For each BMP, list the milestone, timeframe and assessment measure	1.10.2	\$0	Included under No. 9	Y
27	Admin	*For each BMP, list person or department responsible for implementation	1.10.2	\$0	Included under No. 9	N
28	Admin	*Describe BMPs proposed to meet impaired waters requirements	1.10.2	\$0	Included under No. 9	N
29	Admin	Describe BMPs used to meet the 6 minimum control measures	1.10.2	\$0	Included under No. 9	Y
30	Admin	*List measures to avoid/minimize impacts to surface drinking waters	1.10.2	\$0	Included under No. 9	N
31	BMP	*Ensure that discharges "do not cause or contribute" to an exceedance of WQ standards	2.1	\$0	Included under No. 9	N
32	BMP	*For TMDL waters, meet requirements of Appendix F (NB: contains multiple add'l req'ts)	2.1.1 b	Varies	May range into millions of dollars, no one has estimated this yet	N
33	BMP	*For impaired waters meet requirements of Appendix H (NB: contains multiple add'l req'ts)	2.1.1 c	Varies	May range into millions of dollars, no one has estimated this yet	N
34	BMP	*For any exceedances of WQ standards to TMDL or impaired waters, eliminate it within 60 days	2.1.1 d	Varies	May range into millions of dollars, no one has estimated this yet	N
35	BMP	*For any increased discharge, comply with MassDEP's regulations at 314 CMR 4.04	2.1.2 a	Varies	Cost will vary	N
36	BMP	*Demonstrate no net increase in pollutants for discharges to any 303 (d) or 305(b) water (previously only had to identify if 303 d)	2.1.2 b	Varies	Cost will vary	N
37	Admin	*Identify all discharges to waters that are impaired or which have TMDLs (Both in SWMP and Annual report)	2.2	\$0	Varies depending on EPA interpretations	N
38	Admin	*Permittee shall annually self-evaluate and maintain the evaluation in its SWMP	4.1 a	\$0	Included under No. 9	N
39	Admin	*In evaluating the appropriateness of BMPs, permittees may add BMPs at any time	4.1 b	\$88	4hrs @ \$22/hr, paperwork for new BMP	Y
40	Admin	Subtracting or replacing BMPs may only be done in limited circumstances, after showing the BMP is ineffective	4.1 b	Varies	Cost of replacement will depend on the BMP being used	N
41	Admin	*Each Annual shall include a brief explanation of any BMP modification	4.1 b	\$0	Included under Public Education No. 7	N
42	Admin	EPA or MassDEP may require the permitte to add, modify, etc., any BMP to satisfy conditions of the permit	4.1 c	\$0	Minimal cost	Y
43	Admin	*The permittee shall keep all record required by this permit for at least five years	4.2 a	\$880	40hrs at \$22/hr	N
44	Admin	*"Records" includes "information used in the development of any written program . . . monitoring results, etc."	4.2 a	\$0	Record keeping, doesn't cost anything to implement	N
45	Admin	these records all be made available to the public	4.2 c	\$0	Record keeping, doesn't cost anything to implement	Y
46	Admin	*the permittee "shall document all monitoring results each year in the annual report"	4.3 b	\$0	Included under Public Education No. 7	N
47	Admin	*that shall include the date, outfall identifier, location, weather, precipitation and screening or analysis results	4.3 b	\$0	Included under No. 46	N
48	Admin	*include all monitoring results for the current reporting period and for the entire permit term	4.3 b	\$0	Included under No. 46	N
49	Admin	*permittee shall include "results from any other stormwater or receiving water quality monitoring or studies . . ."	4.3 c	\$0	Included under No. 46	N
50	Admin	The annual report shall include a self-assessment of compliance; an assessment of the appropriateness of BMPs	4.4 b i	\$12,000	Consulting fee for annual report, increased from \$3000 based on Matt's estimated	Y
51	Admin	*The status of any required plans	4.4 b iii	\$0	Included under No. 50	N
52	Admin	**Identification of all discharges determined to be causing or contributing to an exceedance" of WQ standards	4.4 b iii	\$0	Included under No. 50	N
53	Admin	*For discharges to TMDLs, identify specific BMPs used to address those requirements	4.4 b iii	\$0	Included under No. 50	N
54	Admin	*For discharges to impaired waters, "a description of each BMP required by Appendix H" and all deliverables	4.4 b iii	\$0	Included under No. 50	N
55	Admin	*Assessment of the progress toward meeting the requirements for the 6 minimum control measures (see details)	4.4 b iv	\$0	Included under No. 50	N
56	Admin	**"All outfall screening and monitoring data" for the reporting term and cumulative for the permit term	4.4 b v	\$0	Included under No. 50	N
57	Admin	Description of activities for the next reporting cycle	4.4 b vi	\$0	Included under No. 50	Y
58	Admin	Description of any changes in identified BMPs or measurable goals	4.4 b vii	\$0	Included under No. 50	Y
59	Admin	*Description of activities undertaken by any entity contracted for achieving any requirement of the permit	4.4 b viii	\$0	Included under No. 50	N

Estimated Annual Costs \$12,968

Estimated One-time Costs \$2,376

Estimated Intermittent Costs \$0

Appendix G

Appendix G

Sample Interview Material

Preamble

We are a group of students from Worcester Polytechnic Institute (WPI). We are conducting this interview in order to learn more about the cost of implementing the new 2014 MS4 permit. By participating in this interview, you will help us assess the total cost of compliance for _____(Town Name). If you want, we are able to keep your responses anonymous so you cannot be identified in this report. Your participation in this interview is completely voluntary and you can abstain from answering any question or stop the interview at any point. If you would like, we can provide you with a copy of the results at the end of our project. This project is a collaboration between the Massachusetts Department of Environmental Protection (MassDEP) and WPI, and all of us appreciate your participation.

Sample Interview Questions

1. Does your municipality use a contractor for stormwater management?
 - a. If so, may we have their contact information?
2. How much does your municipality spend on public education?
 - a. Does your municipality provide pamphlets?
 - b. Does your municipality have public access television programs about stormwater management?
 - c. How much do you spend on posting signage?

- d. Do you use social media to provide information? If so, how much does it cost?
3. How much does your municipality spend on public participation?
 - a. Do you hold town meetings about stormwater management?
4. How much does your municipality spend on illicit discharge and elimination?
 - a. Does your municipality use the database?
 - b. How much does it cost you to map your catchment basins?
 - c. Does your municipality have retention ponds for stormwater? If so, do you maintain them?
 - d. How often does your municipality street sweep?
 - e. How much does it cost you to remove illicit discharges?
 - f. How much does it cost you to train municipal employees to use the detection equipment?
5. How much does your municipality spend on construction site runoff control?
 - a. How much does it cost to notify municipal residents about impending construction projects?
 - b. How much does it cost you to inspect construction sites?
6. How much does your municipality spend on post-construction site runoff control?
 - a. How much does it cost for you to inspect the construction sites after completion of the construction?
7. How much does your municipality spend on good housekeeping?
 - a. How much does it cost your municipality to maintain stormwater management BMPs every year?
 - b. How much does it cost to train your employees to maintain BMPs?

- c. How much does it cost you to inspect your best management practices?
 - d. How much does it cost you per year to street sweep?
- 8. Could you provide us with a cost report for your municipality?
 - a. Itemized report stormwater spending?
- 9. Do you believe that your town effectively implemented the requirements of the 2003 MS4 permit?
- 10. To what extent do you believe your town is prepared to implement the requirements of the new MS4 permit?
 - a. What challenges do you foresee in implementing the new MS4 permit?
 - b. How do you plan to provide additional funding for implementing the new permit?

Appendix H

<u>Control Measure</u>		Estimated Annual Costs	Estimated One-time Costs	Estimated Intermittent Costs
Public Education and Outreach		\$0	\$0	\$0
Public Involvement and Participation		\$0	\$0	\$0
Illicit Discharge Detection and Elimination Program		\$0	\$0	\$0
Construction Site Stormwater Runoff Control		\$0	\$0	\$0
Post Construction Stormwater Management		\$0	\$0	\$0
Good Housekeeping		\$0	\$0	\$0
<u>Non-Control Measure</u>				
Miscellaneous		\$0	\$0	\$0
Totals		\$0	\$0	\$0

KEY:	
Yearly	No. = Reference Number
Once	BMP/Admin = Is the requirement completed with either a BMP or Administrative work
As Needed	X Requirement = The short name for a requirement
	Requirement = Section in the 2014 MS4 permit draft
	Cost = Cost of completing the requirement
	Justification = List of methods used to complete the requirement, as well supporting data from sources
	In Place (Y/N) = Is the requirement listed currently in place

No.	BMP/Admin	Public Education and Outreach Requirement	Reference	Cost	Justification	In Place (Y/N)
1	Admin	Continue public education program required by 2003 permit	2.3.2 a			
2	Admin	*Define goals, express specific messages define audience for each message	2.3.2 a			
3	Admin	*Identify parties responsible for each message	2.3.2 a			
4	Admin	*Develop and send out two separate messages for each of 4 different audiences	2.3.2 c			
5	Admin	*Show evidence that messages are achieving results	2.3.2 e			
6	Admin	*Identify method used to evaluate effectiveness of messages	2.3.2 e			
7	Admin	*Put in annual report the methods of distribution and methods to assess effectiveness	2.3.2 g			

Estimated Annual Costs \$0

Estimated One-time Costs \$0

Estimated Intermittent Costs \$0

No.	BMP/Admin	Public Involvement and Participation Requirement	Reference	Cost	Justification	In Place (Y/N)
1	Admin	*Comply with state public Notice requirements	2.3.3 a			
2	Admin	Provide annual opportunity for public to participate in review and implementation of SWMP	2.3.3 b			
3	Admin	*Put in annual report these public participation activities	2.3.3 c			

Estimated Annual Costs \$0

Estimated One-time Costs \$0

Estimated Intermittent Costs \$0

No.	BMP/Admin	Illicit Discharge Detection and Elimination Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP	*Eliminate any illicit discharge to the stormwater system as expeditiously as possible	2.3.4.2			
2	BMP	*Identify who is responsible for any such discharges	2.3.4.2			
3	Admin	*If elimination takes more than 60 days, establish an expeditious schedule for elimination	2.3.4.2			
4	Admin	*If more than 60 days, report dates of identification and schedules in annual report	2.3.4.2			
5	BMP	Implement measures to control non-stormwater discharges if they add significant pollution	2.3.4.3			
6	Admin	*Identify all known locations where SSOs have discharged to the MS4 in last 5 years	2.3.4.4 b			
7	Admin	*For each such SSO discharge, include date and time, location, volume, suspected cause	2.3.4.4 b			
8	Admin	*Also include whether each entered any surface water and what corrective actions were taken	2.3.4.4 b			
9	Admin	*Also include corrective measures planned and implementation schedule	2.3.4.4 b			
10	Admin	*Maintain the SSO inventory as part of the SWMP and the Annual Reports	2.3.4.4 b			
11	Admin	*Provide oral and written notice to EPA and MassDEP for any SSO occurrence	2.3.4.4 c			
12	BMP	*Develop an inventory of each MS4 outfall, including location, interconnections, and condition (different only in that it requires the condition of the outfall)	2.3.4.5			
13	Admin	*Update inventory annually to include monitoring program	2.3.4.5 b			
14	BMP	*Physically label all MS4 outfall pipes	2.3.4.5 b			
15	Admin	*For each outfall list unique identifier, receiving water, date of most recent inspection	2.3.4.5 c			
16	Admin	*Also include dimensions, shape, material, physical condition and indicators of non-SW discharges	2.3.4.5 c			
17	BMP	*Revise existing map of stormwater system within 2 years of effective date of the permit	2.3.4.6			
18	BMP	*Map shall include all outfalls, pipes, manholes, catch basins, interconnections, open channels	2.3.4.6 a i			
19	BMP	*Also include all municipally-owned BMPs (e.g., retention basins, oil/water separators, etc.)	2.3.4.6 a i			
20	BMP	*Also include catchment delineation and all waters listed on the 303(d) or 305 (b) list	2.3.4.6 a i			
21	BMP	*Also include municipal sanitary sewers or combined sewer systems	2.3.4.6 a ii			
22	BMP	*Include various recommended elements	2.3.4.6 a iii			
23	BMP	*Update the map to reflect newly discovered information and corrections or modifications	2.3.4.6 b			
24	Admin	*Report on the progress toward completion of the map in each annual report	2.3.4.6 c			
25	BMP	*Write an Illicit Discharge Detection and Elimination (IDDE) program document (Discrete, specifically mentions the document must be written out)	2.3.4.7			
26	Admin	Adopt an IDDE ordinance	2.3.4.7 a			
27	Admin	*Program shall clearly identify IDDE responsibilities and provide description of areas of responsibility	2.3.4.7 b			
28	BMP	*Assess and priority rank each catchment into one of 4 possible categories (souped up from previous "priority" mark in 2003)	2.3.4.7 c i			
29	Admin	*Priority rank each catchment within each category (except those "excluded") using 8 factors (souped up from previous "priority" mark in 2003)	2.3.4.7 c ii			
30	Admin	*Gather all information needed for the 8 screening factors (e.g., industrial areas > 40 years old)	2.3.4.7 c ii			
31	Admin	*Complete ranking using existing information within 1 year; update in annual report	2.3.4.7 c iii			
32	Admin	*In annual report include summary of evidence of known/suspected illicit discharges by catchment	2.3.4.7 c iii			
33	Admin	*Also include corrective measures and schedule for correcting each illicit discharge	2.3.4.7 c iii			
34	Admin	*Develop written procedure for screening and sampling of outfalls	2.3.4.7 d			
35	Admin	*Include procedures for sample collection, use of field kits and storage and conveyance of samples	2.3.4.7 d i			
36	BMP	*If outfall is inaccessible, report the first accessible upstream structure	2.3.4.7 d ii			
37	BMP	*Perform dry weather screening when and how prescribed; identify in annual report any follow-up needed	2.3.4.7 d iii			
38	BMP	*Perform wet weather screening when and how prescribed	2.3.4.7 d iv			
39	BMP	*Sample at minimum for 7 listed factors	2.3.4.7 d v			
40	Admin	*Catchments with specified septic or other results shall be listed as "High Priority" catchments	2.3.4.7 d vi			
41	BMP	*Develop written Catchment Investigation Procedure including review of maps and historic records	2.3.4.7 e			
42	BMP	*Also include manhole investigation methodology and procedures to confirm sources of illicit discharges	2.3.4.7 e			
43	BMP	*For each catchment review sanitary sewer and storm sewer construction plans; prior work on either	2.3.4.7 e i			
44	BMP	*Also review Health department records for septic system or sanitary sewer system failures or complaints	2.3.4.7 e i			
45	Admin	*Identify and record any of the 12 System Vulnerability Factors (e.g., infrastructure > 40 years old)	2.3.4.7 e i			
46	Admin	*Document and annually report presence or absence of the 12 System Vulnerability Factors for each catchment	2.3.4.7 e i			
47	Admin	*Include these required elements of written manhole investigation and catchment investigation procedures	2.3.4.7 e ii			
48	Admin	*Include these required elements in written dry weather investigation procedure	2.3.4.7 e ii a			
49	Admin	*Include these required elements in written wet weather investigation procedure	2.3.4.7 e ii b			
50	Admin	*Develop procedures to isolate and confirm illicit sources (e.g., dye testing, smoke testing, caulk dams, etc.)	2.3.4.7 e iii			
51	Admin	*In annual report, for each illicit source list the location, its source, description of the discharge	2.3.4.7 f			
52	Admin	*Also list date and method of discovery, date of elimination, mitigation or enforcement action	2.3.4.7 f			
53	Admin	*And estimate volume of flow reduced	2.3.4.7 f			
54	BMP	*One year after illicit discharge removal, perform confirmatory screening; wet, dry or both	2.3.4.7 f			
55	BMP	*Schedule follow up screening within 5 years after confirmatory screening	2.3.4.7 g			
56	BMP	*Develop and implement procedures to prevent illicit discharges and SSOs	2.3.4.7 h			
57	Admin	*Complete and report dry weather screening and sampling of High and Low Priority outfalls within 3 years	2.3.4.8 a			
58	Admin	*"All data shall be reported in each annual report . . ."	2.3.4.8 a			
59	Admin	*Begin implementation of 2.3.4.7 d work no later than 15 months	2.3.4.8 b			
60	Admin	*Implement and report Catchment Investigation Procedure in every catchment . . .	2.3.4.8 c			
61	Admin	*In a minimum of 80% of the MS4 area serviced by Problem Catchments within 3 years and 100% within 5 years	2.3.4.8 c i			
62	Admin	*For all catchments where sampling indicates sewer input within 5 years	2.3.4.8 c ii			
63	Admin	*In 40% of all area served by all MS4 catchments within 5 years and in 100% of 4 area in 10 years	2.3.4.8 c iii			
64	Admin	*Track progress toward these milestones in each annual report	2.3.4.8 e			
65	Admin	*Define or describe indicators for tracking program success; demonstrate efforts to locate illicit discharges	2.3.4.9			
66	Admin	*Also include percent and area in acres evaluated; volume of sewage removed; place in annual report (more detailed, 2003 only asks to measure progress)	2.3.4.9			
67	Admin	provide annual training to employees involved in IDDE program	2.3.4.10			
68	Admin	*Include type and frequency of training in the annual report (2003 -> The program must include an employee training component)	2.3.4.10			

Estimated Annual Costs \$0

Estimated One-time Costs \$0

Estimated Intermittent Costs \$0

No. BMP/Admin	Construction Site Runoff Control Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP *Continue to implement construction ordinance work from 2003 permit; expand to include 1 acre or more	2.3.5 a			
2	BMP Develop and implement a construction site runoff program	2.3.5 c			
3	Admin An ordinance that requires sediment and erosions controls and for other wastes at construction sites	2.3.5 c i			
4	Admin Adopt written procedures for inspections and enforcement of the ordinance within 1 year (2003 -> [g.] Procedures for inspections and enforcement of control measures at construction sites.)	2.3.5 c ii			
5	Admin *Document the procedures and responsibilities to implement in the SWMP	2.3.5 c ii			
6	Admin *Include requirements for site operators to implement BMPs (e.g., reduce disturbed area, protect slopes, etc.)	2.3.5 c iii			
7	Admin *Include requirements for site operators to control other wastes	2.3.5 c iv			
8	Admin *Develop written procedures for site plan review and inspection and enforcement within 1 year (003 -> nearly same, now has time requirement)	2.3.5 c v			
9	Admin *Include pre-construction review, consideration for protection of water quality impacts, LID components	2.3.5 c v			
10	Admin *And receipt of information from the public, inspections during and after BMP installation (now covers post construction)	2.3.5 c v			
11	Admin *And "qualifications necessary to perform the inspections"	2.3.5 c v			
12	Admin *And procedure for tracking the number of site reviews, inspections and enforcement actions	2.3.5 c v			
13	Admin *All to be included in the annual report	2.3.5 c v			

Estimated Annual Costs \$0

Estimated One-time Costs \$0

Estimated Intermittent Costs \$0

No.	BMP/Admin	Post Construction Site Runoff Control Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP	*develop implement and enforce a post-construction SW program for new developments and redevelopments	2.3.6 a			
2	Admin	*adopt or amend a local ordinance to control projects that disturb an acre or more	2.3.6 a ii			
3	BMP	*retain and/or treat first inch of runoff; where technically feasible do retention first	2.3.6 a ii a			
4	BMP	*"from all impervious surfaces on site"	2.3.6 a ii a			
5	Admin	*sites with soil contamination problems or at industrial sites shall not include any infiltration BMPs	2.3.6 a ii b			
6	Admin	*infiltration systems near environmentally sensitive areas must include shutdown and containment systems	2.3.6 a ii c			
7	Admin	*all BMPs must be constructed in accordance with the MA Stormwater Handbook	2.3.6 a ii d			
8	Admin	*this system shall include development of a long term O&M plan to inspect and repair BMPs	2.3.6 a ii e			
9	Admin	*systems shall be designed "to avoid disturbance of areas susceptible to erosion and sediment loss"	2.3.6 a ii f			
10	BMP	*systems shall require submittal of as-built drawings that depict all on site controls	2.3.6 a iii			
11	Admin	*shall have procedures to ensure O&M, such as dedicated funds, escrow accounts or management contracts	2.3.6 a iii			
12	Admin	*may include annual self-certification program	2.3.6 a iii			
13	Admin	*annual report shall include measures that the permittee has done to meet these requirements	2.3.6 a iii			
14	BMP	*w/in 3 years document current street design and parking rules that affect creation of impervious cover	2.3.6 b			
15	BMP	*shall be used by permittee to determine if changes "can be made to support low impact design options"	2.3.6 b			
16	BMP	*if changes can be made, assessment shall include recommendations and proposed schedules to adopt changes	2.3.6 b			
17	BMP	*permittee "shall implement all recommendations . . ."; assessment must be placed in the SWMP	2.3.6 b			
18	Admin	*annual report shall contain an update on this requirement, including any planned or completed changes	2.3.6 b			
19	BMP	*w/in 4 years assess local rules to determine feasibility of allowing green roofs, water harvesting and LID BMPs	2.3.6 c			
20	Admin	*assessment shall indicate if and under what circumstances these practices are allowed	2.3.6 c			
21	BMP	*if practices not allowed, determine what hinders use of these practices and what changes can be made	2.3.6 c			
22	BMP	*provide a schedule of implementation of recommendations	2.3.6 c			
23	BMP	*"permittee shall implement all recommendations, in accordance with the schedules . . ."	2.3.6 c			
24	Admin	*annual report shall contain an update on this requirement, including any planned or completed changes	2.3.6 c			
25	Admin	*estimate the annual increase or decrease in Impervious Area and Directly Connected Impervious Area	2.3.6 d			
26	Admin	*tabulate results by sub-basins delineated per 2.3.4.6 a i	2.3.6 d i			
27	Admin	*must include conventional pavements, driveways, parking lots and rooftops	2.3.6 d i			
28	Admin	*starting with second annual report, estimate each sub-basin added or removed each year	2.3.6 d ii			
29	Admin	*break out those figures by development, redevelopment or retrofit by permittee, by others voluntarily	2.3.6 d ii			
30	Admin	*. . . or in compliance with the permittee's ordinances or bylaws	2.3.6 d ii			
31	Admin	*within 4 years complete inventory and ranking of Municipal property suitable for modification or retrofit to . . .	2.3.6 d iii			
32	Admin	*. . . reduce frequency, volume and pollutant loads of stormwater discharges by reduction of impervious area	2.3.6 d iii			
33	Admin	*shall include both on site and off site reduction of IA and DCIA (e.g., parking lots, buildings, etc.)	2.3.6 d iii			
34	Admin	*also include existing rights-of-way,	2.3.6 d iii			
35	Admin	*for suitability the evaluation shall consider factors such as depth to water table; subsurface geology; access	2.3.6 d iii			
36	Admin	*priority ranking shall consider factors such as CIP schedules; current storm sewer level of service, etc.	2.3.6 d iii			
37	Admin	*starting with fifth year annual report, report on status of all such inventoried properties	2.3.6 d iii			

Estimated Annual Costs \$0

Estimated One-time Costs \$0

Estimated Intermittent Costs \$0

No.	BMP/Admin	Pollution Prevention and Good Housekeeping Requirement	Reference	Cost	Justification	In Place (Y/N)
1	Admin	*W/in 1 year develop or update written O&M procedures for listed municipal facilities	2.3.7 a i			
2	Admin	*w/in 1 year inventory all permittee owned facilities in these "good housekeeping" categories	2.3.7 a ii			
3	Admin	*For Parks and Open Space: procedures to address the use, storage and minimization of pesticides, fertilizers, etc	2.3.7 a ii a			
4	Admin	*to be reviewed annually and updated as necessary	2.3.7 a ii a			
5	Admin	*evaluate lawn maintenance and landscaping activities to be protective of water quality	2.3.7 a ii a			
6	Admin	*including reduced mowing, proper disposal of lawn clippings, use of drought resistant plantings	2.3.7 a ii a			
7	Admin	*establish pet waste handling collection, disposal and signage at all parks and open spaces	2.3.7 a ii a			
8	Admin	*establish procedures for scheduled cleaning and sufficient number of trash containers	2.3.7 a ii a			
9	Admin	*For Buildings and Facilities, such as town offices, police and fire stations, municipal pools, etc	2.3.7 a ii b			
10	Admin	*evaluate the use. Storage and disposal of petroleum products and train employees on proper procedures	2.3.7 a ii b			
11	Admin	*ensure that spill prevention is in place and coordinate with fire department	2.3.7 a ii b			
12	Admin	*develop management procedures for dumpsters and other waste management equipment	2.3.7 a ii b			
13	Admin	*For Vehicles and Equipment: establish procedures for storage of permittee vehicles, including inside storage	2.3.7 a ii c			
14	Admin	*establish procedures to ensure that vehicle wash water does not enter the SW system	2.3.7 a ii c			
15	Admin	*evaluate fueling areas to minimize exposure	2.3.7 a ii c			
16	Admin	*Infrastructure O&M: w/in 1 year develop and implement procedures to take care for the MS4 system	2.3.7 a iii a			
17	Admin	*optimize routine inspections (e.g., prioritize catch basins located near construction sites)	2.3.7 a iii b			
18	BMP	*ensure that "no catch basin at anytime will be more than 50 percent full"	2.3.7 a iii b			
19	BMP	*if more than 50% full during two routine cleanings, investigate the cause for excessive sediment loading	2.3.7 a iii b			
20	Admin	*describe these actions in the annual report	2.3.7 a iii b			
21	Admin	*document in annual report the plan for optimizing catch basin cleaning, inspections or scheduling	2.3.7 a iii b			
22	Admin	*include metrics used to determine that the plan is optimal for the MS4	2.3.7 a iii b			
23	Admin	*in each annual report list the total number of catch basins, number inspected and/or cleaned	2.3.7 a iii b			
24	Admin	*and "volume or mass of material removed from each catch basin draining to water quality limited waters"	2.3.7 a iii b			
25	Admin	*and "total volume or mass of material removed from all catch basins"	2.3.7 a iii b			
26	BMP	*Sweeping: develop and implement procedures for sweeping streets and municipal-owned lots	2.3.7 a iii c			
27	BMP	*sweep all streets (rural exceptions apply) a minimum of once a year in the spring	2.3.7 a iii c			
28	BMP	*procedures shall include more frequent sweeping of targeted area based on various listed criteria	2.3.7 a iii c			
29	BMP	*criteria include inspections, pollutant loads, catch basin cleanings, land use, TMDL or impaired waters	2.3.7 a iii c			
30	Admin	*Each annual report shall include number of miles cleaned and volume or mass of material removed	2.3.7 a iii c			
31	Admin	*for rural exception areas, either sweep per usual or develop specific procedures and place in first annual report	2.3.7 a iii c			
32	BMP	*properly store catch basin cleanings so they do not discharge to receiving waters	2.3.7 a iii d			
33	BMP	*establish and implement procedures for winter road maintenance including storage of salt and sand	2.3.7 a iii e			
34	BMP	*minimize use of sodium chloride and other salts; evaluate opportunities for alternative materials	2.3.7 a iii e			
35	Admin	*ensure that snow is not disposed into surface waters	2.3.7 a iii e			
36	Admin	*establish procedures for O&M or all permittee-owned stormwater BMPs (e.g., swales, retention basins etc.)	2.3.7 a iii f			
37	BMP	*inspect all such structures at least once annually	2.3.7 a iii f			
38	Admin	*in annual report include status of work required in this part	2.3.7 a iv			
39	Admin	*permittees shall keep a written record of all required activities	2.3.7 a v			
40	BMP	*develop and fully implement a SWPPP for each of the listed facilities no later than 2 years after effective date	2.3.7 b			
41	BMP	*includes maintenance garages, public works yards, transfer stations, other waste handling facilities	2.3.7 b			
42	BMP	*Identify name and title of staff of the Pollution Prevention Team for each facility	2.3.7 b ii a			
43	BMP	*for each facility: include map, description of activities, outfall locations, receiving waters and structural controls	2.3.7 b ii b			
44	BMP	*select , sign, install and implement the following 9 control measures to prevent or reduce discharge of pollutants	2.3.7 b ii c			
45	BMP	*take all reasonable measure to address quality of discharges that may not originate at the facility	2.3.7 b ii c			
46	Admin	*for areas that discharge to impaired waters, identify the control measures to address that issue	2.3.7 b ii c			
47	BMP	*SWPP Required Elements: Minimize or Prevent Exposure (e.g., move activities or materials under cover)	2.3.7 d 1			
48	BMP	*Good Housekeeping	2.3.7 d 2			
49	BMP	*Preventative Maintenance	2.3.7 d 3			
50	BMP	*Spill Prevention and Response	2.3.7 d 4			
51	BMP	*Erosion and Sediment Control	2.3.7 d 5			
52	BMP	*Management of Runoff	2.3.7 d 6			
53	BMP	*Salt Storage or Piles Containing Salt	2.3.7 d 7			
54	BMP	*Employee Training: document training date, title and duration; attendees; subjects covered during training	2.3.7 d 8			
55	BMP	*Maintenance of Control Measures	2.3.7 d 8			
56	BMP	*Inspect all areas exposed to stormwater and all stormwater control measures at least every calendar quarter	2.3.7 b iii a			
57	BMP	*at least one inspection shall occur when a stormwater discharge is occurring	2.3.7 b iii a			
58	Admin	*document the date, time, name of inspector, weather, any control measures needing maintenance or repair, etc	2.3.7 b iii a			
59	BMP	*permittee shall repair or replace any control measures needing repair before the next anticipated storm event	2.3.7 b iii a			
60	Admin	*shall report the findings from the Site inspections in the annual report	2.3.7 b iii a			
61	Admin	*keep a written record of all required activities required in this section	2.3.7 b iv			

Estimated Annual Costs \$0

Estimated One-time Costs \$0

Estimated Intermittent Costs \$0

No.	BMP/Admin	Miscellaneous Requirement	Reference	Cost	Justification	In Place (Y/N)
1	BMP	Submit an NOI	1.7.1			
2	Admin	*Document endangered species status (part of NOI)	1.9.1			
3	BMP	*Implement measures to protect endangered species	1.9.1			
4	Admin	Document Historic Properties Observation (part of NOI)	1.9.2			
5	BMP	*Describe effect of discharges on Historic properties	1.9.2			
6	Admin	*Report documents received re: such discharges	1.9.2			
7	Admin	*Provide results of Appendix D historic property screening	1.9.2			
8	BMP	Describe efforts to avoid or minimize impacts on such properties	1.9.2			
9	BMP	Develop a SWMP	1.10			
10	BMP	Implement a SWMP	1.10			
11	Admin	*Update/modify SWMP	1.10			
12	Admin	Provide SWMP "immediately" to various agencies and public	1.10.1			
13	Admin	*Post SWMP online	1.10.1			
14	Admin	Identify Names and titles of people implementing the SWMP	1.10.2			
15	Admin	*Include status of 2003 permit requirements	1.10.2			
16	Admin	*List all receiving water bodies, classifications, pollutants of concern	1.10.2			
17	Admin	*list all applicable TMDLs, WLAs	1.10.2			
18	Admin	*List all outfalls that discharge to each water body	1.10.2			
19	Admin	*list all public water sources that may be affected by SW discharges	1.10.2			
20	Admin	*List all interconnected MS4s and receiving water body	1.10.2			
21	Admin	*Include applicable TMDLs, WLAs and pollutants of concern	1.10.2			
22	Admin	*Document all new or increased discharges	1.10.2			
23	Admin	*Include map of separate storm sewer system (Map must be improved)	1.10.2			
24	Admin	List all discharges to impaired water and the response	1.10.2			
25	Admin	*Describe BMPs proposed to meet TMDL requirements	1.10.2			
26	Admin	For each BMP, list the milestone, timeframe and assessment measure	1.10.2			
27	Admin	*For each BMP, list person or department responsible for implementation	1.10.2			
28	Admin	*Describe BMPs proposed to meet impaired waters requirements	1.10.2			
29	Admin	Describe BMPs used to meet the 6 minimum control measures	1.10.2			
30	Admin	*List measures to avoid/minimize impacts to surface drinking waters	1.10.2			
31	BMP	*Ensure that discharges "do not cause or contribute" to an exceedance of WQ standards	2.1			
32	BMP	*For TMDL waters, meet requirements of Appendix F (NB: contains multiple add'l req'ts)	2.1.1 b			
33	BMP	*For impaired waters meet requirements of Appendix H (NB: contains multiple add'l req'ts)	2.1.1 c			
34	BMP	*For any exceedances of WQ standards to TMDL or impaired waters, eliminate it within 60 days	2.1.1 d			
35	BMP	*For any increased discharge, comply with MassDEP's regulations at 314 CMR 4.04	2.1.2 a			
36	BMP	*Demonstrate no net increase in pollutants for discharges to any 303 (d) or 305(b) water (previously only had to identify if 303 d)	2.1.2 b			
37	Admin	*Identify all discharges to waters that are impaired or which have TMDLs (Both in SWMP and Annual report)	2.2			
38	Admin	*Permittee shall annually self-evaluate and maintain the evaluation in its SWMP	4.1 a			
39	Admin	*In evaluating the appropriateness of BMPs, permittees may add BMPs at any time	4.1 b			
40	Admin	Subtracting or replacing BMPs may only be done in limited circumstances, after showing the BMP is ineffective	4.1 b			
41	Admin	*Each Annual shall include a brief explanation of any BMP modification	4.1 b			
42	Admin	EPA or MassDEP may require the permittee to add, modify, etc., any BMP to satisfy conditions of the permit	4.1.c			
43	Admin	*The permittee shall keep all record required by this permit for at least five years	4.2 a			
44	Admin	*"Records" includes "information used in the development of any written program . . . monitoring results, etc."	4.2 a			
45	Admin	these records all be made available to the public	4.2 c			
46	Admin	*the permittee "shall document all monitoring results each year in the annual report"	4.3 b			
47	Admin	*that shall include the date, outfall identifier, location, weather, precipitation and screening or analysis results	4.3 b			
48	Admin	*include all monitoring results for the current reporting period and for the entire permit term	4.3 b			
49	Admin	*permittee shall include "results from any other stormwater or receiving water quality monitoring or studies . . ."	4.3 c			
50	Admin	The annual report shall include a self-assessment of compliance; an assessment of the appropriateness of BMPs	4.4 b i			
51	Admin	*The status of any required plans	4.4 b iii			
52	Admin	*"Identification of all discharges determined to be causing or contributing to an exceedance" of WQ standards	4.4 b iii			
53	Admin	*For discharges to TMDLs, identify specific BMPs used to address those requirements	4.4 b iii			
54	Admin	*For discharges to impaired waters, "a description of each BMP required by Appendix H" and all deliverables	4.4 b iii			
55	Admin	*Assessment of the progress toward meeting the requirements for the 6 minimum control measures (see details)	4.4 b iv			
56	Admin	*"All outfall screening and monitoring data" for the reporting term and cumulative for the permit term	4.4 b v			
57	Admin	Description of activities for the next reporting cycle	4.4 b vi			
58	Admin	Description of any changes in identified BMPs or measurable goals	4.4 b vii			
59	Admin	*Description of activities undertaken by any entity contracted for achieving any requirement of the permit	4.4 b viii			

Estimated Annual Costs \$0

Estimated One-time Costs \$0

Estimated Intermittent Costs \$0