



Municipal Stormwater Infrastructure Operation and Maintenance Plan

Sherborn, Massachusetts

2019



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Introduction

This Operation and Maintenance (O&M) Plan has been prepared by Sherborn to address stormwater infrastructure O&M requirements¹ of the United States Environmental Protection Agency's (USEPA's) 2016 National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) in Massachusetts, hereafter referred to as the "2016 Massachusetts MS4 Permit" or "MS4 Permit." This Plan and attached Standard Operating Procedures (SOPs) are based on a template provided by Central Massachusetts Stormwater Coalition that was created with grant funding for use in municipalities across the state.

This O&M Plan addresses Minimum Control Measure 6, Good Housekeeping and Pollution Prevention for Permittee Owned Operations, by describing the activities and procedures the Town will implement so that the MS4 infrastructure is maintained in a timely manner to reduce the discharge of pollutants from the MS4. The O&M Plan outlines inspection and maintenance procedures for catch basins, municipally-owned streets and parking lots, and structural stormwater Best Management Practices (BMPs).

The Department of Public Works (DPW) is responsible for inspection and maintenance of the stormwater infrastructure. An interactive map of the existing stormwater infrastructure in Sherborn is provided online at the following address:

<https://www.mapsonline.net/sherbornma/>

In order to access the map from this website click the 'Layers' tab then check 'Stormwater'. You can then scroll around and zoom in to view the stormwater infrastructure map.

Applicable Operations

The O&M Plan covers the following Town operations:

- Planning considerations, procedures, storage and disposal, reuse options, and log for catch basin cleanings.
- Planning considerations, procedures, storage and disposal, reuse operations, and log for street sweeping.
- Planning considerations, procedures, alternative materials, storage and disposal for winter road maintenance. Winter road maintenance includes snow disposal and salt/sand operations and disposal.
- Procedures for frequency of type of maintenance for all types of BMP's, BMP waste disposal, and inspection log for BMP's.

¹ See Part 2.3.7.a.iii of the 2016 MS4 Permit for Infrastructure Operation and Maintenance program requirements.

Catch Basins

The DPW performs routine inspections, cleaning, and maintenance of the approximately 700 catch basins that are located within the MS4 regulated area. The Town will implement the following catch basin inspection and cleaning procedures to reduce the discharge of pollutants from the MS4:

- Routine inspection and cleaning of catch basins. Catch basins should be cleaned such that they are no more than 50 percent full² at any time. The Town has initially inspected all catch basins within the regulated area to evaluate sediment or debris accumulation and will establish optimal inspection and maintenance frequencies to meet the “50 percent” goal. A catch basin inspection/cleaning procedure, inspection form, and log of catch basins cleaned or inspected are included in **Appendix A**. Sherborn will also use an online database called PeopleGIS to record the inspection results. If a tablet is accessible with PeopleGIS software installed, then this information can be directly entered into the database from the field.
- If a catch basin sump is more than 50 percent full during two consecutive routine inspections or cleaning events, the finding will be documented, the contributing drainage area will be investigated for sources of excessive sediment loading, and to the extent practicable, contributing sources will be addressed. If no contributing sources are found, the inspection and cleaning frequency will be increased.
- Catch basins located near construction activities (roadway construction, residential, commercial, or industrial development or redevelopment) will be inspected and cleaned more frequently if inspection and maintenance activities indicate excessive sediment or debris loadings (i.e., catch basins more than 50 percent full). Priority will also be given to catch basins that discharge to impaired waters.
- The following information will be included in each annual report:
 - Any action taken in response to excessive sediment or debris loadings
 - Total number of catch basins
 - Number of catch basins inspected
 - Number of catch basins cleaned
 - Total volume or mass of material removed from catch basins.

² A catch basin sump is more than 50 percent full if the contents within the sump exceed one half the distance between the bottom interior of the catch basin to the invert of the deepest outlet of the catch basin

Streets and Parking Lot Sweeping

Streets and municipally-owned parking lots are swept twice annually. Sherborn has established and implemented street sweeping procedures that are adapted to reduce pollutants to waterways. Street sweeping of roadways in the regulated area is performed by Town staff at least twice yearly, in the spring and fall, and when necessary after storm events. Sweeping multiple times annually is part of the Phosphorus Control Plan, which is mandated by the Charles River Phosphorus TMDL. The operation plan includes a focus on roads that have drainage infrastructure that discharges near or directly to waterways.

The Town will implement the following street and parking lot sweeping procedures to reduce the discharge of pollutants from the MS4:

- All streets with the exception of rural uncurbed roads with no catch basins or high speed limited access highways will be swept and/or cleaned a minimum of once in the spring (following winter activities such as sanding) and once in the fall following the times when most leaves have fallen. This will occur no later than December 1st of each year.
- More frequent sweeping will be considered for targeted areas based on pollutant load reduction potential, inspections, pollutant loads, catch basin cleaning or inspection results, land use, impaired waters, or other factors.
- For rural uncurbed roadways with no catch basins and limited access highways, the Town will either meet the minimum frequencies above, or develop and implement an inspection, documentation, and targeted sweeping plan outlining reduced frequencies within two (2) years of the effective date of the permit, and submit such plan with its year one annual report.
- It is recommended to sweep in the range of 3 to 7 mph, depending on specific conditions.
- It is recommended to implement and enforce parking restrictions where parked cars are making it difficult to reach the curb.
- The following information will be included in each annual report:
 - Number of miles cleaned or the volume or mass of material removed (see sweeping log in **Appendix B**).

Catch Basin Cleanings and Street Sweepings

Catch basin cleanings (i.e., solid materials such as leaves, sand and twigs removed from stormwater collection systems during cleaning operations) and street sweepings will be managed in compliance with current Massachusetts Department of Environmental Protection policies:

- Catch Basin Cleanings
<http://www.mass.gov/eea/agencies/massdep/recycle/regulations/management-of-catch-basin-cleanings.html>
- Street Sweepings
<http://www.mass.gov/eea/docs/dep/recycle/laws/stsweep.pdf>

Prior to disposal or reuse, catch basin cleanings and street sweepings will be stored indoors or using proper controls such that they do not discharge to receiving waters. Sweepings may be disposed in either lined or unlined permitted solid waste landfills without prior approval from the department. The following sections describe procedures for storage of street sweepings prior to either reuse or disposal.

Temporary storage sites include sites that are used for less than one year, unless the MassDEP regional office in the region where the sweepings are stored grants a written extension. The following conditions must be met in order for sweepings to be temporarily stored:

- Storage must be at a site where the sweepings are generated or at a location, including the DPW yard, which is under the control of a governmental entity which is doing or has contracted the sweeping.
- The sweepings shall be protected from wind and rain to the extent necessary to prevent dust, erosion and off-site migration.
- The sweepings should not be stored within the 100-foot buffer zone of a wetland or wetland resource area, including bordering vegetative wetlands and riverfront area.
- The sweepings should not be stored within 500-feet of a ground or surface drinking water supply.
- Storage should incorporate good management practice and result in no public nuisance.

Sweepings that are not reused should be stored in a permanent solid waste disposal facility and inside a building or have a tarp covering the pile. It is recommended that a barrier or berm be used to contain stormwater runoff.

Sweeping and Catch Basin Cleaning Reuse

The following section reviews possibilities for reuse of catch basin cleanings in Massachusetts.

Preparation

Solid waste, such as trash and paper, should be removed from the sweepings prior to use. Leaves and other organic matter should also be removed when good engineering practice indicates it is necessary to produce a material that is suitable for the intended use.

Testing

It has been shown that sweepings from all areas, excluding urban center roads, had main pollutants of concern including total petroleum hydrocarbons (TPH) and polynuclear

aromatic hydrocarbons (PAHs). These test results indicated that sweepings contain levels of contamination that is unsuitable for unrestricted use. However, not including urban center roads, the levels of contamination were consistent and low enough to allow the use of sweepings in restricted applications without requiring testing or pre-approval as long as certain conditions were met. Also, because sweepings from urban center roads are not approved for all uses, they should be kept separate from other sweepings if the intended purpose is for reuse.

Uses

Landfills: Street sweepings may be used for daily cover at lined and unlined permitted solid waste landfills and do not need MassDEP approval if the sweepings satisfy requirements for daily cover material specified at 310 CMR 19.130(15).

Additive to Restricted Use Compost: Street sweepings shall be used as an additive to compost without prior MassDEP approval only if the conditions and restrictions listed below are followed:

- The sweepings have not been collected from urban center roads.
- The compost is only used in public ways.
- The compost is not used in residential areas.
- The compost is kept above the groundwater level.
- The compost is not used in designated "No Salt Areas".
- The compost is not used within the 100-foot buffer zone of a wetland or within wetland resource areas including bordering vegetative wetlands and riverfront areas.
- The compost is not used within 500-feet of a ground or surface water drinking supply.

Fill in Public Ways: Street sweepings can be used for fill in public ways without prior MassDEP approval only if the conditions and restrictions listed below are followed:

- The sweepings have not been collected from urban center roads.
- The sweepings are used under the road surface or as fill along the side of the road within the public way.
- The sweepings are not used in residential areas.
- The sweepings are kept above the level of the groundwater.
- The sweepings are not used in designated "No Salt Areas".
- The sweepings are not used within the 100-foot buffer zone of a wetland or within wetland resource areas including bordering vegetative wetlands and riverfront areas.
- The sweepings are not used within 500-feet of a ground or surface water drinking supply.

Other Uses: Any use not pre-approved in the preceding section requires MassDEP approval under the Beneficial Use provisions of the Solid Waste Management Facility Regulations at 310 CMR 19.060. A Beneficial Use Determination (BUD) can be made after the submission of an application characterizing the waste and describing the proposed beneficial use.

Winter Road Maintenance

The Town performs a variety of maintenance activities to ensure safe winter driving conditions on its roads and parking lots. The DPW uses approximately 60% sand and 40% NaCl in road treatment. Manual control spreaders are used. All of the salt is kept in a storage shed.

The Town will implement the following winter maintenance procedures to reduce the discharge of pollutants from the MS4:

- Minimize the use and optimize the application of sodium chloride and other salt³ (while maintaining public safety) and consider opportunities for use of alternative materials.
- Optimize sand and/or chemical application rates through the use, where practicable, of automated application equipment (e.g., zero velocity spreaders), anti-icing and pre-wetting techniques, implementation of pavement management systems, and alternate chemicals. Maintain records of the application of sand, anti-icing and/or de-icing chemicals to document the reduction of chemicals to meet established goals.
- Prevent exposure of deicing product (salt, sand, or alternative products) storage piles to precipitation by enclosing or covering the storage piles. Implement good housekeeping, diversions, containment or other measures to minimize exposure resulting from adding to or removing materials from the pile. Store piles in such a manner as not to impact surface water resources, groundwater resources, recharge areas, and wells.
- The MS4 Permit prohibits snow disposal into waters of the United States. Snow disposal activities, including selection of appropriate snow disposal sites, will adhere to the Massachusetts Department of Environmental Protection Snow Disposal Guidance, Guideline No. BWR G2015-01 (Effective Date: December 21, 2015), located at:
<http://www.mass.gov/eea/agencies/massdep/water/regulations/snow-disposal-guidance.html>
- Provide training for municipal employees on winter roadway maintenance procedures.

Winter Road Maintenance Procedures

The following section describes SOPs and recommendations for BMPs to be used during winter maintenance activities, including plowing and sand/salt application.

³ For purposes of the MS4 Permit, salt means any chloride-containing material used to treat paved surfaces for deicing, including sodium chloride, calcium chloride, magnesium chloride, and brine solutions.

Snow Plowing

- Identify snow storage areas prior to plowing. As previously discussed, areas should be selected based on availability of impervious surfaces and location of the 100-year floodplain, for protection against surface water contamination.
- Avoid plowing, pushing, blowing, or storing excess snow or other debris into storm drains. Do not hose down sidewalks or parking lots except where wash water will only enter grassy or graveled areas where it can infiltrate into the ground.
- Avoid plowing, pushing, blowing, or storing excess snow or other debris into storm drains.

Sanding

- Only use clean sand for winter road maintenance.
- Use the lowest possible application rate that will be effective.
- Make sure to sweep roads and parking lots after winter sanding operations.

Salt/Deicer Application

- Hand apply salt and/or chemical deicers only on sidewalks where required for pedestrian safety.
- Use the lowest amount of product that will be effective.
- Avoid applying salt and/or chemical deicers near storm drains where possible.
- Be aware of Low salt/No salt areas; sensitive watershed areas.

Alternative Materials

Salt and sand are the most common and cheapest methods for winter road maintenance. However, there are alternative products that can be used to better manage the roadways during the winter months. Table 4-1 presents a few options, and list the cost and general characteristics of the product. Use of these products should be considered prior to performing winter road maintenance.

Table 1. Deicing Alternatives

Substance	Cost	Characteristics
Calcium Chloride (CaCl_2)	Flake \$290/ton, pellet \$340/ton	Melts ice at temperatures of -25°F If used as recommended, will not harm vegetation
Magnesium Chloride (MgCl_2)	Flake \$260/ton, pellet \$300/ton	Lowest practical temperature: 5°F If used as recommended, will not harm vegetation; however, MgCl_2 , on a percentage basis, contains 17-56% more chloride ion than other salt-type deicers
Potassium Chloride (KCl)	\$240/ton	Lowest practical temperature: 12°F Will not harm vegetation

Substance	Cost	Characteristics
Urea	\$280/ton	Lowest practical temperature: 15 ° F Will not harm vegetation
Calcium Magnesium Acetate (CMA)	\$2,000/ton	Will work below 0 ° F Low toxicity and biodegradable

Source: Keating, Janis. (2004). Stormwater. Deicing Salt: Still on the Table. Retrieved from:

<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=106&minmeasure=61>

Structural Stormwater BMPs

As of March 2019 Sherborn owns one structural stormwater Best Management Practice (BMP) and it is currently under construction. An inventory of structural BMPs owned and/or maintained by the Town will be provided in **Appendix C** when BMPs are constructed. Information about these BMPs will be entered into Sherborn's stormwater geodatabase and the interactive stormwater infrastructure map at <https://www.mapsonline.net/sherbornma/> will show the locations of the structural BMPs once constructed.

Once constructed, structural stormwater BMPs will be inspected annually at a minimum. In anticipation of constructed BMPs, recommended inspection procedures and checklists have been provided for typical BMPs in **Appendix D**. The results of these inspections can be recorded in Sherborn's stormwater geodatabase in PeopleGIS. If Operations and Management practices are already developed for specific BMPs, and they are at least as stringent as the procedures in Appendix D then they should be used.

Appendix A

Catch Basin Inspection and Cleaning Procedure

Catch Basin Inspection Form

Catch Basin Cleaning Log

CATCH BASIN INSPECTION AND CLEANING STANDARD OPERATING PROCEDURE

Introduction

Catch basins help minimize flooding and protect water quality by removing trash, sediment, decaying debris, and other solids from stormwater runoff. These materials are retained in a sump below the invert of the outlet pipe. Catch basin cleaning reduces foul odors, prevents clogs in the storm drain system, and reduces the loading of suspended solids, nutrients, and bacteria to receiving waters.

During regular cleaning and inspection procedures, data can be gathered related to the condition of the physical basin structure and its frame and grate and the quality of stormwater conveyed by the structure. Observations such as the following can indicate sources of pollution within the storm drain system:

- Oil sheen
- Discoloration
- Trash and debris

Both bacteria and petroleum can create a sheen on the water surface. The source of the sheen can be differentiated by disturbing it, such as with a pole. A sheen caused by an oil will remain intact and move in a swirl pattern; a sheen caused by bacteria will separate and appear "blocky". Bacterial sheen is not a pollutant, but should be noted.

Observations such as the following can indicate a potential connection of a sanitary sewer to the storm drain system, which is an illicit discharge.

- Indications of sanitary sewage, including fecal matter or sewage odors
- Foaming, such as from detergent
- Optical enhancers, fluorescent dye added to laundry detergent

Each catch basin should be cleaned and inspected at least annually. Catch basins in high-use areas may require more frequent cleaning. Performing street sweeping on an appropriate schedule will reduce the amount of sediment, debris, and organic matter entering the catch basins, which will in turn reduce the frequency with which structures need to be cleaned.

Cleaning Procedure

Catch basin inspection cleaning procedures should address both the grate opening and the basin's sump. Document any and all observations about the condition of the catch basin structure and water quality on the Catch Basin Inspection Form (attached). Sherborn will also use an online database called PeopleGIS to record the inspection results. If a tablet is

accessible with PeopleGIS software installed, then this inspection information can be directly entered into the database from the field.

An excessive sediment or debris loading is assumed to be a catch basin sump more than 50 percent full. A catch basin sump is more than 50 percent full if the contents within the sump exceed one half of the distance between the bottom interior of the catch basin to the invert of the deepest outlet of the catch basin.

Catch basin inspection and cleaning procedures include the following:

1. Work upstream to downstream.
2. Clean sediment and trash off grate.
3. Visually inspect the outside of the grate.
4. Visually inspect the inside of the catch basin to determine cleaning needs.
5. Inspect catch basin for structural integrity.
6. Determine the most appropriate equipment and method for cleaning each catch basin.
 - a. Manually use a shovel to remove accumulated sediments, or
 - b. Use a bucket loader to remove accumulated sediments, or
 - c. Use a high pressure washer to clean any remaining material out of catch basin while capturing the slurry with a vacuum.
 - d. If necessary, after the catch basin is clean, use the rodder of the vacuum truck to clean downstream pipe and pull back sediment that might have entered downstream pipe.
7. If contamination is suspected, chemical analysis will be required to determine if the materials comply with the Massachusetts DEP Hazardous Waste Regulations, 310 CMR 30.000 (<http://www.mass.gov/dep/service/regulations/310cmr30.pdf>). Chemical analysis required will depend on suspected contaminants. Note the identification number of the catch basin on the sample label, and note sample collection on the Catch Basin Inspection Form.
8. Properly dispose of collected sediments. See the following section for guidance.
9. If fluids collected during catch basin cleaning are not being handled and disposed of by a third party, dispose of these fluids to a sanitary sewer system, with permission of the system operator.
10. If illicit discharges are observed or suspected, notify the appropriate Department (see the IDDE Plan for procedures).
11. At the end of each day, document location and number of catch basins cleaned, amount of waste collected, and disposal method for all screenings.
12. Report additional maintenance or repair needs to the appropriate department.

Disposal of Screenings

The discharge of decant wastewater and/or any other wastewater associated with catch basin maintenance to a watercourse or wetland, or returned to a catch basin or storm drain system, is prohibited. However, catch basin cleanings from storm water-only drainage systems may be disposed at any landfill that is permitted by MassDEP to accept solid waste. MassDEP usually does not require stormwater-only catch basin cleanings to be tested before disposal, unless there is evidence of contamination. Contaminated catch basin cleanings must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000, and handled as Hazardous Waste if appropriate. Any cleanings from combined sewers may be required to be tested before disposal

Screenings may need to be placed in a drying bed to allow water to evaporate before proper disposal. In this case, ensure that the screenings are managed to prevent pollution.

In Massachusetts, the only option for reuse of catch basin cleanings is at landfills. As discussed previously, catch basin cleanings must be sufficiently dry and free of decant liquid prior to re-use. Otherwise, the material will need to undergo a Paint Filter Liquids Test. This test consists of placing a predetermined amount of material in a paint filter, and if any material passes through the filter within a five minute period, the material is considered to contain free liquids (EPA, 2004). Once catch basin cleanings are sufficiently dry or have passed the Paint Filter Liquids Test, they may be used as grading and shaping material at landfills undergoing closure. Catch basin cleanings may also be used as a daily cover or grading material at active landfills, but only with specific MassDEP approval of the proposed use.

MassDEP 310 CMR19.130 (7) prohibits Massachusetts landfills from accepting materials with free draining liquids. The agency will generally be satisfied that the material is sufficiently dry if there is no free water in a truck used to transport the catch basin cleanings. Otherwise, the material will need to undergo a Paint Filter Liquids Test. However, catch basin cleanings can be used as grading and shaping material at landfills undergoing closure. The cleanings may be used as a daily cover or grading material at active landfills only with specific MassDEP approval of the proposed use.

Attachments

1. Catch Basin Inspection Form (To be used if a PeopleGIS tablet is not being used in the field)

Note: This SOP and form are based on a template that was created by Central Massachusetts Regional Stormwater Coalition for use in municipalities across the state.

Job No.:

Town:

Sherborn, Ma

Inspector:

Date:

CATCH BASIN INSPECTION FORM (Use if PeopleGIS is not available)

Catch Basin I.D.		Final Discharge from Structure? Yes <input type="checkbox"/> No <input type="checkbox"/> If Yes, Discharge to Outfall No: _____	
Catch Basin Label:	Stencil <input type="checkbox"/> Ground Inset <input type="checkbox"/> Sign <input type="checkbox"/> None <input type="checkbox"/> Other _____		
Basin Material:	Concrete <input type="checkbox"/> Corrugated metal <input type="checkbox"/> Stone <input type="checkbox"/> Brick <input type="checkbox"/> Other: _____ <input type="checkbox"/>	Catch Basin Condition:	Good <input type="checkbox"/> Poor <input type="checkbox"/> Fair <input type="checkbox"/> Crumbling <input type="checkbox"/>
Pipe Material:	Concrete <input type="checkbox"/> HDPE <input type="checkbox"/> PVC <input type="checkbox"/> Clay Tile <input type="checkbox"/> Other: _____ <input type="checkbox"/>	Pipe Measurements:	Inlet Dia. (in): d= _____ Outlet Dia. (in): D= _____
<div> <div> Required Maintenance/ Problems (check all that apply): <input type="checkbox"/> Tree Work Required <input type="checkbox"/> New Grate is Required <input type="checkbox"/> Pipe is Blocked <input type="checkbox"/> Frame Maintenance is Required <input type="checkbox"/> Remove Accumulated Sediment <input type="checkbox"/> Pipe Maintenance is Required <input type="checkbox"/> Basin Undermined or Bypassed </div> <div> <input type="checkbox"/> Cannot Remove Cover <input type="checkbox"/> Ditch Work <input type="checkbox"/> Corrosion at Structure <input type="checkbox"/> Erosion Around Structure <input type="checkbox"/> Remove Trash & Debris <input type="checkbox"/> Need Cement Around Grate Other: _____ </div> </div>			
Catch Basin Grate Type : Bar: <input type="checkbox"/> Cascade: <input type="checkbox"/> Other: _____ Properly Aligned: Yes <input type="checkbox"/> No <input type="checkbox"/>	Sediment Buildup Depth : 0-6 (in): _____ 6-12(in): _____ 12-18 (in): _____ 18-24 (in): _____ 24 + (in): _____	Description of Flow: Heavy <input type="checkbox"/> Moderate <input type="checkbox"/> Slight <input type="checkbox"/> Trickling <input type="checkbox"/>	Street Name/ Structure Location:
*If the outlet is submerged check yes and indicate approximate height of water above the outlet invert. h above invert (in):__		Yes <input type="checkbox"/>	No <input type="checkbox"/>
<input type="checkbox"/> Flow <input type="checkbox"/> Standing Water (check one or both)	Observations: Color: _____ Odor: _____		Circle those present: <div> <div> Foam Sanitary Waste Orange Staining Excessive sediment Other:_____ </div> <div> Oil Sheen Bacterial Sheen Floatables Pet Waste Optical Enhancers </div> </div>
Weather Conditions :		Dry > 24 hours <input type="checkbox"/>	Wet <input type="checkbox"/>
Sample of Screenings Collected for Analysis? Yes <input type="checkbox"/> No <input type="checkbox"/>			
Comments:			

Appendix B

Street and Parking Lot Sweeping Log

Street and Parking Lot Sweeping Log

Page # _____

Date	Operator	Weather Conditions	Streets/parking lots swept	Number of miles swept	Volume or mass of material removed	Corrective action taken or recommended

Appendix C

Inventory of Structural Stormwater Best Management Practices

Inventory of Structural Stormwater Best Management Practices (BMPs)
Sherborn, Massachusetts (This can be replaced by an export table from PeopleGIS)

BMP ID or Description	Location	BMP Type	Inspection Frequency	Date of Last Inspection	Additional Notes

Appendix D

Structural Stormwater BMP Inspection Procedures and Checklists

STANDARD OPERATING PROCEDURE FOR INSPECTING CONSTRUCTED BEST MANAGEMENT PRACTICES

Best Management Practices (BMPs) are policies, procedures and structures designed to reduce stormwater pollution, prevent contaminant discharges to natural water bodies, and reduce stormwater facility maintenance costs. Constructed BMPs are permanent site features designed to treat stormwater before infiltrating it to the subsurface or discharging it to a surface water body.

This Standard Operating Procedure (SOP) provides a general summary of inspection procedures for eight common constructed BMPs, including:

1. Bioretention Areas and Rain Gardens
2. Constructed Stormwater Wetlands
3. Extended Dry Detention Basins
4. Proprietary Media Filters
5. Sand and Organic Filters
6. Wet Basins
7. Dry Wells
8. Infiltration Basins

This SOP and attached inspection forms are based on a template that was created by Central Massachusetts Regional Stormwater Coalition for use in municipalities across the state. This SOP is based on the Massachusetts Stormwater Handbook and is not intended to replace that document. This SOP is also not intended to replace the Stormwater BMP Operation and Maintenance (O&M) Plan required by the Massachusetts Wetlands Protection Act, Order of Conditions.

Bioretention Areas and Rain Gardens

Bioretention areas and rain gardens are shallow depressions filled with sandy soil, topped with a thick layer of mulch and planted with dense native vegetation. There are two types of bioretention cells:

1. Filtering bioretention area: Areas that are designed solely as an organic filter; and
2. Exfiltration bioretention area: Areas that are configured to recharge groundwater in addition to acting as a filter.

Inspection & Maintenance

Regular inspection and maintenance are important to prevent against premature failure of bioretention areas or rain gardens. Regular inspection and maintenance of pretreatment devices and bioretention cells for sediment buildup, structural damage and standing water can extend the life of the soil media.

Maintenance Schedule: Bioretention Areas and Rain Gardens

Activity	Time of Year	Frequency
Inspect for soil erosion and repair	Year round	Monthly
Inspect for invasive species and remove if present	Year round	Monthly
Remove trash	Year round	Monthly
Mulch Void Areas	Spring	Annually
Remove dead vegetation	Fall and Spring	Bi-Annually
Replace dead vegetation	Spring	Annually
Prune	Spring or Fall	Annually
Replace all media and vegetation	Late Spring/Early Summer	As Needed

When failure is discovered, excavate the bioretention area, scarify the bottom and sides, replace the filter fabric and soil, replant vegetation and mulch the surface.

Never store snow within a bioretention area or rain garden. This would prevent required water quality treatment and the recharge of groundwater.

Constructed Stormwater Wetlands

Constructed stormwater wetlands maximize the pollutant removal from stormwater through the use of wetland vegetation uptake, retention and settling. Constructed storm water wetlands must be used in conjunction with other BMPs, such as sediment forebays.

Inspection & Maintenance

Regular inspection and maintenance are important to prevent against premature failure of bioretention areas or rain gardens. Regular inspection and maintenance of pretreatment devices and bioretention cells for sediment buildup, structural damage and standing water can extend the life of the soil media.

Maintenance Schedule, Constructed Stormwater Wetlands: Years 0-3

Activity	Time of Year	Frequency
Inspect for invasive species and remove if present	Year round	Monthly
Record and Map:	Year round	Annually
Types and distribution of dominant wetland plants	Year round	Bi-Annually
Presence and distribution of planted wetland species	Spring	Annually
Presence and distribution of invasive species	Fall and Spring	Bi-Annually
Indications other species are replacing planted wetland species	Spring	Annually
Percent of standing water that is not vegetated	Spring or Fall	Annually
Replace all media and vegetation	Late Spring/Early Summer	As Needed
Stability of original depth zones and micro-topographic features		
Accumulation of sediment in the forebay and micropool and survival rate of plants		

Maintenance Schedule, Constructed Stormwater Wetlands: Years 4-Lifetime

Activity	Time of Year	Frequency
Inspect for invasive species and remove if present	Year round	Monthly
Clean forebays	Year round	Annually
Clean sediment in basin/wetland system	Year round	Once every 10 years
Mulch Void Areas	Spring	Annually
Remove dead vegetation	Fall and Spring	Bi-Annually
Replace dead vegetation	Spring	Annually
Prune	Spring or Fall	Annually
Replace all media and vegetation	Late Spring/Early Summer	As Needed

When failure is discovered, excavate the bioretention area, scarify the bottom and sides, replace the filter fabric and soil, replant vegetation and mulch the surface.

Never store snow within a constructed stormwater wetland. This would prevent required water quality treatment and the recharge of groundwater.

Extended Dry Detention Basins

Extended dry detention basins are designed to control both stormwater quantity and quality. These BMPs are designed to hold stormwater for at least 24 hours, allowing solids to settle and to reduce local and downstream flooding. Pretreatment is required to reduce the potential for overflow clogging. The outflow may be designed as either fixed or adjustable. Additional nutrient removal may be achieved by a micropool or shallow marsh.

Inspection & Maintenance

Annual inspection of extended dry detention basins is required to ensure that the basins are operating properly. Potential problems include: erosion within the basin and banks, tree growth on the embankment, damage to the emergency spillway and sediment accumulation around the outlet. Should any of these problems be encountered, necessary repairs should be made immediately.

Maintenance Schedule: Extended Dry Detention Basins

Activity	Time of Year	Frequency
Inspect basins	Spring and Fall	Bi-Annually, and during and after major storms
Examine outlet structure for clogging or high outflow release velocities	Spring and Fall	Bi-Annually
Mow upper stage, side slopes, embankment and emergency spillway	Spring through Fall	Bi-Annually
Remove trash and debris	Spring	Bi-Annually
Remove sediment from basin	Year round	At least once every 5 years

Proprietary Media Filters

Media Filters are designed to reduce total suspended solids and other target pollutants, such as organics, heavy metals or nutrients, which are absorbed onto the filter media, which is contained in a concrete structure. The substrate used as filter media depends on the target pollutants, and may consist of leaf compost, pleated fabric, activated charcoal, perlite, amended sand in combination with perlite, and zeolite. Two types of Media Filters are manufactured: Dry Media Filters, which are designed to dewater within 72 hours; and Wet Media Filters, which maintain a permanent pool of water as part of the treatment system.

Inspection & Maintenance

Maintenance in accordance with the manufacturer's requirements is necessary to ensure stormwater treatment. Inspection or maintenance of the concrete structure may require OSHA confined space training. Dry Media Filters are required to dewater in 72 hours, thus preventing mosquito and other insect breeding. Proper maintenance is essential to prevent clogging. Wet Media Filters require tight fitting seals to keep mosquitoes and other insects from entering and breeding in the permanent pools. Required maintenance includes routine inspection and treatment.

Maintenance Schedule: Proprietary Media Filters

Activity	Time of Year	Frequency
Inspect for standing water, trash, sediment and clogging	Per manufacturer's schedule	Bi-Annually (minimum)
Remove trash and debris	N/A	Each Inspection
Examine to determine if system drains in 72 hours	Spring, after large storm	Annually
Inspect filtering media for clogging	Per manufacturer's schedule	Per manufacturer's schedule

Sand and Organic Filters

Sand and organic filters, also known as filtration basins, are intended for quality control rather than quantity control. These filters improve water quality by removing pollutants through a filtering media and settling pollutants on top of the sand bed and/or in a pretreatment basin. Pretreatment is required to prevent filter media from clogging. Runoff from the filters is typically discharged to another BMP for additional treatment.

Inspection & Maintenance

If properly maintained, sand and organic filters have a long design life. Maintenance requirements include raking the sand and removing sediment, trash and debris from the surface of the BMP. Over time, fine sediments will penetrate deep into the sand requiring replacement of several inches or the entire sand layer. Discolored sand is an indicator of the presence of fine sediments, suggesting that replacement of the sand should be completed.

Maintenance Schedule: Proprietary Media Filters

Activity	Frequency
Inspect filters and remove debris	After every major storm for the first 3 months after construction completion. Every 6 months thereafter.

Wet Basins

Wet basins are intended to treat stormwater quality through the removal of sediments and soluble pollutants. A permanent pool of water allows sediments to settle and removes the soluble pollutants, including some metals and nutrients. Additional dry storage is required to control peak discharges

during large storm events, and if properly designed and maintained wet basins can add fire protection, wildlife habitat and aesthetic values to a property.

Inspection & Maintenance

To ensure proper operation, wet basin outfalls should be inspected for evidence of clogging or excessive outfall releases. Potential problems to investigate include erosion within the basin and banks, damage to the emergency spillway, tree growth on the embankment, sediment accumulation around the outlet and the emergence of invasive species. Should any of these problems be encountered, perform repairs immediately. An on-site sediment disposal area will reduce sediment removal costs.

Maintenance Schedule: Wet Basins

Activity	Time of Year	Frequency
Inspect wet basins	Spring and/or Fall	Annually (Minimum)
Mow upper stage, side slopes, embankment and emergency spillway	Spring through Fall	Bi-Annually (Minimum)
Remove sediment, trash and debris	Spring through Fall	Bi-Annually (Minimum)
Remove sediment from basin	Year round	As required, but at least once every 10 years

Dry Wells

Dry wells are used to infiltrate uncontaminated runoff. These BMPs should never be used to infiltrate stormwater or runoff that has the potential to be contaminated with sediment and other pollutants. Dry wells provide groundwater recharge and can reduce the size and cost required of downstream BMPs or storm drains. However, they are only applicable in drainage areas of less than one acre and may experience high failure rates due to clogging.

Inspection & Maintenance

Proper dry well function depends on regular inspection. Clogging has the potential to cause high failure rates. The water depth in the observation well should be measured at 24 and 48 hour intervals after a storm and the clearance rate calculated. The clearance rate is calculated by dividing the drop in water level (inches) by the time elapsed (hours).

Maintenance Schedule: Dry Wells

Activity	Frequency
Inspect dry wells	After every major storm for the first 3 months after construction completion. Annually thereafter.

Infiltration Basins

Infiltration basins are designed to contain stormwater quantity and provide groundwater recharge. Pollution prevention and pretreatment are required to ensure that contaminated stormwater is not infiltrated. Infiltration basins reduce local flooding and preserve the natural water balance of the site, however high failure rates often occur due to improper siting, inadequate pretreatment, poor design and lack of maintenance.

Inspection & Maintenance

Regular maintenance is required to prevent clogging, which results in infiltration basin failure. Clogging may be due to upland sediment erosion, excessive soil compaction or low spots. Inspections should include signs of differential settlement, cracking, erosion, leakage in the embankments, tree growth on the embankments, riprap condition, sediment accumulation and turf health.

Maintenance Schedule: Infiltration Basins

Activity	Time of Year	Frequency
Preventative maintenance	Spring and Fall	Bi-Annually
Inspection	Spring and Fall	After every major storm for the first 3 months after construction completion. Bi-annually thereafter and discharges through the high outlet orifice.
Mow/rake buffer area, side slopes and basin bottom	Spring and Fall	Bi-Annually
Remove trash, debris and organic matter	Spring and Fall	Bi-Annually

INSPECTION OF BIORETENTION AREAS / RAIN GARDENS

General Information

BMP Description	Bioretention Area / Rain Garden		
BMP Location			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular <input type="checkbox"/> Pre-Storm Event <input type="checkbox"/> During Storm Event <input type="checkbox"/> Post-Storm Event <input type="checkbox"/>			
Describe the weather conditions at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
Inspect for soil erosion and repair	Monthly	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Inspect for invasive species and remove if present	Monthly	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Remove trash	Monthly	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Mulch void areas	Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Remove dead vegetation	Bi-Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Replace dead vegetation	Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Prune	Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Replace all media and vegetation	As Needed	Yes <input type="checkbox"/> No <input type="checkbox"/>	

INSPECTION OF CONSTRUCTED STORMWATER WETLANDS

Years 0-3 of Operation

General Information

BMP Description	Constructed Stormwater Wetland		
BMP Location			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular <input type="checkbox"/> Pre-Storm Event <input type="checkbox"/> During Storm Event <input type="checkbox"/> Post-Storm Event <input type="checkbox"/>			
Describe the weather conditions at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
Inspect for invasive species and remove if present	Monthly	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Replace all media and vegetation	As Needed	Yes <input type="checkbox"/> No <input type="checkbox"/>	

In addition, the following information should be recorded and mapped at least once per year:

- Types and distribution of dominant wetland plants
- Presence and distribution of planted wetland species
- Presence and distribution of invasive species
- Indications other species are replacing planted wetland species
- Percent of standing water that is not vegetated
- Replace all media and vegetation
- Stability of original depth zones and micro-topographic features
- Accumulation of sediment in the forebay and micropool and survival rate of plants

INSPECTION OF CONSTRUCTED STORMWATER WETLANDS
Year 4 - Lifetime of Operation

General Information

BMP Description	Constructed Stormwater Wetland		
BMP Location			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular <input type="checkbox"/> Pre-Storm Event <input type="checkbox"/> During Storm Event <input type="checkbox"/> Post-Storm Event <input type="checkbox"/>			
Describe the weather conditions at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
Inspect for invasive species and remove if present	Monthly	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Clean forebays	Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Clean sediment in basin/wetland system	Once every 10 years	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Mulch void areas	Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Remove dead vegetation	Bi-Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Replace dead vegetation	Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Prune	Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Replace all media and vegetation	As Needed	Yes <input type="checkbox"/> No <input type="checkbox"/>	

INSPECTION OF EXTENDED DRY DETENTION BASINS

Inspections should be conducted bi-annually, and during and after major storm events.

General Information

BMP Description	Extended Dry Detention Basin		
BMP Location			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular <input type="checkbox"/> Pre-Storm Event <input type="checkbox"/> During Storm Event <input type="checkbox"/> Post-Storm Event <input type="checkbox"/>			
Describe the weather conditions at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
Examine outlet structure for clogging or high outflow release velocities	Bi-Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Mow upper stage, side slopes, embankment and emergency spillway	Bi-Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Remove trash and debris	Bi-Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Remove sediment from basin	At least once every 5 years	Yes <input type="checkbox"/> No <input type="checkbox"/>	

INSPECTION OF PROPRIETARY MEDIA FILTERS

General Information

BMP Description	Media Filter		
BMP Location			
Media Type			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular <input type="checkbox"/> Pre-Storm Event <input type="checkbox"/> During Storm Event <input type="checkbox"/> Post-Storm Event <input type="checkbox"/>			
Describe the weather conditions at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
Inspect for standing water, trash, sediment and clogging	Bi-Annually (minimum)	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Remove trash and debris	Each Inspection	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Examine to determine if system drains in 72 hours	Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Inspect filtering media for clogging	Per manufacturer's schedule	Yes <input type="checkbox"/> No <input type="checkbox"/>	

INSPECTION OF SAND AND ORGANIC FILTERS

Inspections should be conducted after every major storm event for the first 3 months following completion, then every 6 months thereafter.

General Information

BMP Description	Sand/Organic Filter		
BMP Location			
Media Type			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular <input type="checkbox"/> Pre-Storm Event <input type="checkbox"/> During Storm Event <input type="checkbox"/> Post-Storm Event <input type="checkbox"/>			
Describe the weather conditions at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
Remove sediment, trash, and debris	Every 6 months	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Rake sand	Every 6 months	Yes <input type="checkbox"/> No <input type="checkbox"/>	

INSPECTION OF DRY WELLS

Regular inspections should be conducted after every major storm event for the first 3 months following completion, then annually thereafter.

General Information

BMP Description	Dry Well		
BMP Location			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular <input type="checkbox"/> Pre-Storm Event <input type="checkbox"/> During Storm Event <input type="checkbox"/> Post-Storm Event <input type="checkbox"/>			
Describe the weather conditions at time of inspection			
Describe condition of dry well at time of inspection			

After a major storm event, the water depth in the observation well should be measured at 24 and 48 hour intervals and the clearance rate calculated.

INSPECTION OF WET BASINS

Inspections should be conducted after every major storm event for the first 3 months following completion, then biannually thereafter.

General Information

BMP Description	Wet Basin		
BMP Location			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular <input type="checkbox"/> Pre-Storm Event <input type="checkbox"/> During Storm Event <input type="checkbox"/> Post-Storm Event <input type="checkbox"/>			
Describe the weather conditions at time of inspection			
Describe condition of wet basin at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
Preventative maintenance	Bi-Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Mow/rake buffer area, side slopes and basin bottom	Bi-Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Remove trash, debris and organic matter	Bi-Annually	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Inspect and clean pretreatment devices	Every other month and after every major storm event	Yes <input type="checkbox"/> No <input type="checkbox"/>	

INSPECTION OF OTHER BMP

General Information

BMP Description			
BMP Location			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular <input type="checkbox"/> Pre-Storm Event <input type="checkbox"/> During Storm Event <input type="checkbox"/> Post-Storm Event <input type="checkbox"/>			
Describe the weather conditions at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
		Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Yes <input type="checkbox"/> No <input type="checkbox"/>	