Chapter 11 - Operation and Maintenance

The long-term operation and maintenance of a stormwater management structure is as critical to its performance as its design and construction. Proper operation and maintenance ensures that the BMP continues to remove pollutants effectively over the long-term, decreases the risk of re-suspending sediment; and therefore improves water quality. Without proper maintenance, BMPs are likely to fail and no longer provide the treatment of stormwater. Common maintenance issues that are encountered include:

- A single family residential lot draining to buffer which is eliminated because the owners are unaware of the importance of their buffer;
- Too infrequent maintenance;
- Financial burden for the maintenance of a costly system is too great to the owner;
- Lack of maintenance easement or mean for access and difficulty in cleaning without complete renovation;
- Problems with owner knowledge of the system and its maintenance needs, and
- Inability to back-charge owner if municipality must do the work.

Design Considerations: Cleaning and maintenance should be given serious consideration during the design process to set up realistic maintenance expectations (for example, a high maintenance system such as an underdrained subsurface sand filter should not be installed where routine inspection and maintenance will be inconsistent as in a residential development).

- *Pretreatment:* Pretreatment devices should be provided for each BMP which may consist of a sediment forebay, filter strip, a swale, a catch basin, a subsurface pre-treatment structure, etc. They will all require more frequent maintenance than the stormwater treatment structure.
- *Sediment Removal Schedule:* All pretreatment devices should be designed to accommodate a minimum of one year's worth of sediment. The estimated annual sediment accumulation must be provided as part of the design calculations.
- *Size for Anticipated Sediment Loading:* Sediment loadings from both pervious and impervious areas must be considered and units should be sized to hold a year's worth of sediment.
  - *Pervious Areas:* The Universal Soil Loss Equation (USLE) should be used to calculate sediment deposits that would occur from pervious areas adjacent to a BMP.
  - *Roadways and Parking Areas:* Sand deposits from winter storm applications should be accounted for when designing a pre-treatment system. Sanding rates and numbers of storms may need to be adjusted based on specific application rates in a community.

IMPORTANT:
Pretreatment devices must be provided for all BMPs and should be sized to hold a minimum of one-year worth of sediment. Designs need to consider reasonable, cost-effective maintenance frequencies, as well as provide access for ease of maintenance. To obtain an annual sediment volume, perform the following calculation assuming an average of 10 storm events per year:

$$\underset{\text{per year}}{10\ \text{storms}} \times \underset{\text{(acres)}}{\text{Sanded Area}} \times \frac{500\ \text{lbs.}}{\underset{\text{per acre-storm}}{}} : \frac{90\ \text{lbs.}}{\text{ft}^3} = \underset{\text{of collected sediment}}{\text{annual cubic feet}}$$

- *Make Maintenance Needs Apparent:* BMPs must be designed to alert the owner when it is failing and maintenance is required. Bypasses should not be used unless there is risk to public health or safety.
- *Design for Anticipated Pollutants:* Pretreatment devices must be designed to capture anticipated pollutants, such as oil and grease.

- *Sediment Marker:* A sediment marker should be provided to enable the inspectors to get an accurate and consistent depth of sediment under the current conditions.
- *Accessibility:* All devices must be designed and located to be easily accessible for inspection and for the appropriate equipment needed for maintenance. Formal access must be provided.
- *Easements:* Permanent maintenance easements must be provided to the entity responsible for maintenance when that entity does not own the property.

Operation and Maintenance Plan: The proper operation and maintenance of a device must be laid out in an operation and maintenance plan that clearly identifies required inspection activities, the maintenance schedule and provides a method for determining when maintenance is necessary. The operations and maintenance plan must also outline manpower and budget needs to perform maintenance. Specific maintenance needs for each type of BMP are provided in their respective sections. A summary table of the inspection and maintenance needs of each BMP type is included in the following table.

INSPECTION AND MAINTENANCE PLAN FOR STORMWATER MANAGEMENT STRUCTURES (BMPS)

	INSPECTION SCHEDULE	CORRECTIVE ACTIONS
VEGETATED AREAS	Annually early spring and after heavy rains	Inspect all slopes and embankments and replant areas of bare soil or with sparse growth
		Armor rill erosion areas with riprap or divert the runoff to a stable area
		Inspect and repair down-slope of all spreaders and turn-outs for erosion
		Mow vegetation as specified for the area
DITCHES, SWALES AND OPEN STORMWATER CHANNELS	Annually spring and late fall and after heavy rains	Remove obstructions, sediments or debris from ditches, swales and other open channels
		Repair any erosion of the ditch lining
		Mow vegetated ditches
		Remove woody vegetation growing through riprap
		Repair any slumping side slopes
		Repair riprap where underlying filter fabric or gravel is showing or if stones have dislodge
CULVERTS	Spring and late fall and after heavy rains	Remove accumulated sediments and debris at the inlet, outlet, or within the conduit
		Remove any obstruction to flow
		Repair any erosion damage at the culvert's inlet and outlet
CATCH BASINS	Annually in the spring	Remove sediments and debris from the bottom of the basin and inlet grates
		Remove floating debris and oils (using oil absorptive pads) from any trap
ROADWAYS AND PARKING AREAS	Annually in the spring or as needed	Clear and remove accumulated winter sand in parking lots and along roadways
		Sweep pavement to remove sediment
		Grade road shoulders and remove accumulated winter sand
		Grade gravel roads and gravel shoulders
		Clean out the sediment within water bars or open-top culverts
		Ensure that stormwater runoff is not impeded by false ditches of sediment in the shoulder
RESOURCE AND TREATMENT BUFFERS	Annually in the spring	Inspect buffers for evidence of erosion, concentrated flow, or encroachment by development
		Manage the buffer's vegetation with the requirements in any deed restrictions
		Repair any sign of erosion within a buffer
		Inspect and repair down-slope of all spreaders and turn-outs for erosion
		Install more level spreaders, or ditch turn-outs if needed for a better distribution of flow
		Clean out any accumulation of sediment within the spreader bays or turnout pools
		Mow non-wooded buffers no shorter than six inches and less than three times per year
WETPONDS AND DETENTION BASINS	Annually in fall and after heavy rains	Inspect the embankments for settlement, slope erosion, piping, and slumping
		Mow the embankment to control woody vegetation
		Inspect the outlet structure for broken seals, obstructed orifices, and plugged trash racks
		Remove and dispose of sediments and debris within the control structure
		Repair any damage to trash racks or debris guards
		Replace any dislodged stone in riprap spillways
		Remove and dispose of accumulated sediments within the impoundment and forebay
FILTRATION AND INFILTRATION BASINS	Annually in the spring and late fall	Clean the basin of debris, sediment and hydrocarbons
		Provide for the removal and disposal of accumulated sediments within the basin
		Renew the basin media if it fails to drain within 72 hours after a one inch rainfall event
		Till, seed and mulch the basin if vegetation is sparse
		Repair riprap where underlying filter fabric or gravel is showing or where stones have dislodged
PROPRIETARY DEVICES	As specified by manufacturer	Contract with a third-party for inspection and maintenance
		Follow the manufacturer's plan for cleaning of devices
OTHER PRACTICES	As specified for devices	Contact the department for appropriate inspection and maintenance requirements for other drainage control and runoff treatment measures.