

MDOT Storm Water Management Plan Module 2: Best Management Practices

**Together... Better Roads,
Cleaner Streams**



As part of MDOT's National Pollution Discharge Elimination System's (NPDES) Phase I Storm Water Permits, all municipal separate storm sewer systems (MS4s) serving populations of 100,000 or more must acquire a storm water permit. In Michigan there are 6 phase I municipalities, which include Ann Arbor, Flint, Grand Rapids, Sterling Heights, Warren, and Livonia.

The Michigan Department of Transportation has separate storm sewer systems on state roads within these cities and is required to hold a NPDES Storm Water Permit for each city. As required by the Storm Water NPDES Permit, MDOT has developed a storm water management plan for MDOT facilities within those cities. A portion of the storm water management plan states that MDOT will educate its employees and contractors about storm water management and how to reduce storm water pollution. This series of training modules address the NPDES permit requirements and provides concise and valuable information on storm water management.

The project theme, "Together... Better Roads, Cleaner Streams", was developed in planning discussions with MDOT environmental, communications, and policy staff, with assistance from Tetra Tech MPS. It complements the overall Michigan Department of Transportation Mission Statement.

This is Module 2 of a four part series of short presentations intended to inform staff and contractors about the MDOT Storm Water Program. The topics of the training modules are:

- Module 1- Introduction to Storm Water Management
- Module 2- Best Management Practices
- Module 3- Maintenance Considerations
- Module 4- Illicit Discharge Elimination Program

Module 2: Best Management Practices (BMPs)

- NPDES Requirements
- MDOT's Drainage Manual
- BMP Definition
- Structural, Vegetative, & Managerial BMPs
- MDOT Approved BMPs
- Maintenance Considerations for BMPs

Module 2 will introduce MDOT employees to Best Management Practices (BMPs) and how these practices will be incorporated into many aspects of MDOT's work. The presentation will review NPDES Requirements, define what BMPs are, describe Structural, Vegetative, & Managerial BMPs, and give a brief description of MDOT approved BMPs and how these will be incorporated in MDOT's new Drainage Manual.

There will be a survey questionnaire at the end of this presentation.

National Pollutant Discharge Elimination System (NPDES) Program

- Three Parts to NPDES Program
 1. Municipal Program (i.e. MDOT's Stormwater Program)
 2. Construction Program- Notice of Coverage
 - Phase I regulated 5 acres and larger
 - Phase II regulates any construction over 1 acre
 3. Industrial Program-Not applicable to MDOT



NPDES is more than just soil erosion sedimentation control it also includes a much broader scope of storm water management.

There are three main components of the Federal National Pollutant Discharge Elimination (NPDES) Program pertaining to storm water.

1. Municipal Program- Phase I and II – Discussed in this module, more detail on the next slide, MDOT Stormwater Management Program.
2. Construction Program- Phase I and II – This program is primarily focused on soil erosion and sedimentation control. You are familiar with this in your routine projects involving earth disturbance requiring weekly inspections.
3. Industrial Program- Phase I – This program does not impact MDOT

MDOT's NPDES Municipal Program

- Phase I - Six MDOT Phase I Storm Water NPDES permits
- Phase II - Applied for Statewide Permit March 10, 2003, over 300 cities in MI
- MDOT is actively participating with watershed groups including the Rouge River Watershed.



- According to the USEPA, storm water pollutants may affect:
 - water quality
 - recreational activities
 - aesthetic value (appearance, odor, etc.)
 - wildlife habitat
 - normal life-cycle of organisms and animals
- To address this concerns, in 1990, USEPA developed rules establishing Phase I of the National Pollutant Discharge Elimination System. Under the Phase I program, MDOT was required to apply for an NPDES Phase I Storm Water Permit. MDOT then developed a Stormwater Management Plan (SWMP) for each permit it holds.
- MDOT currently has six Phase I permits in Ann Arbor, Flint, Grand Rapids, Livonia, Sterling Heights, and Warren.
- The USEPA developed the Storm Water Phase II Program to further protect, preserve and improve public waters from storm water runoff. Phase II like Phase I requires MS4s, including MDOT, to apply and receive a Phase II storm water permit and then develop a storm water management plan.
- MDOT will also be required to have coverage in all MS4 Municipalities where state roads and storm sewers exist. There are approximately 300 such communities in the State of Michigan.

Municipal NPDES Permit Requirements

6 Minimum Measures

1. Public Education and Outreach
2. Public Involvement
3. Illicit Discharge Elimination Program
4. Pollution Prevention and Good Housekeeping
5. Construction Site Runoff Control
6. Post-Construction Runoff Control

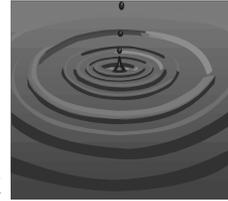


MDOT, under the existing and the up coming urbanized area permit requirements, must address and include 6 minimum control measures in its storm water management plan.

1. Public Education and Outreach- requires the permittee to have a public education program to promote, publicize, and facilitate watershed education for the purpose of encouraging the public to reduce the discharge of pollutants in storm water.
2. Public Involvement/Participation- requires the permittee to encourage public input in all aspects of the storm water management program.
3. Illicit Discharge Elimination Program-requires the permittee to develop an illicit discharge elimination program that will prohibit and eliminate illicit discharges to the permittee's drainage system.
4. Pollution Prevention and Good Housekeeping- MDOT has developed operation and maintenance practices which seeks to reduce pollutant runoff from roadway facilities and maintenance operations. It also includes the development of a training program and the selection of appropriate BMPs that address typical pollutants sources.
5. Construction Site Runoff Control- The permittee is required to revise, as necessary, implement and enforce a program to address storm water runoff from areas of construction activity that discharge into the permittee's drainage system. Currently, MDOT has APA Status and a manual approved by MDEQ.
6. Post Construction Runoff Control- requires the permittee to implement and enforce a program to address storm water runoff from new development and redevelopment projects that discharge into the drainage system.

MDOT's New Drainage Manual

- Three Key Areas with a Water Quality Focus
 - Policy
 - Design Procedures
 - Design Criteria
- Chapter 9: Stormwater Best Management Practices
- Contact Molly Lameroux or Kristin Schuster for additional assistance or questions



Three key areas with a water quality focus are presented in the Drainage Manual, which include, Policy, Design Procedures, and Design Criteria. A key feature of the manual is the chapter on BMPs.

What is a Best Management Practice (BMP)?

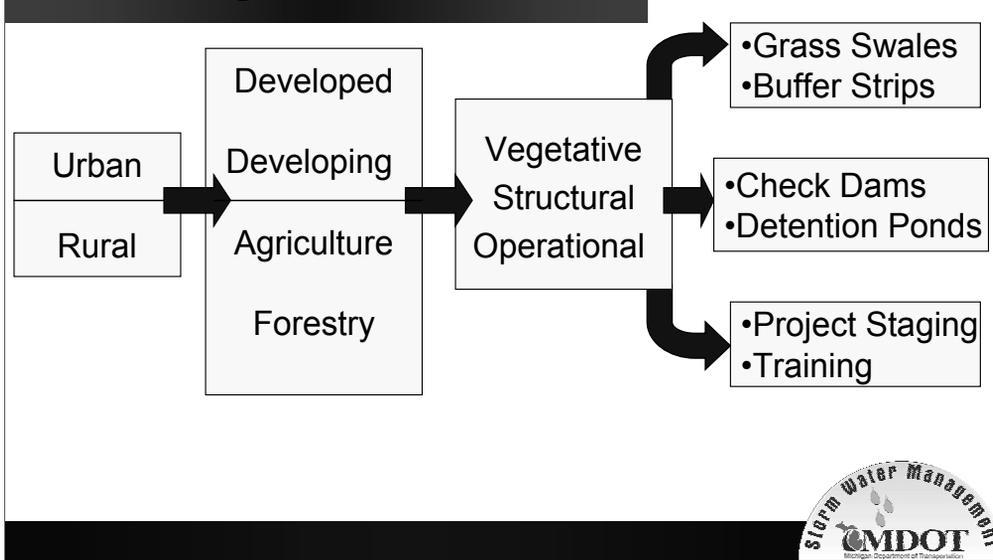
- BMPs are structural, operational, or vegetative practices used to treat, prevent, or reduce water pollution.



BMPs are structural, operational, or vegetative practices used to treat, prevent, or reduce water pollution.

This picture shows a turbidity curtain being used on M-27 in Downtown Cheboygan, Michigan. The project involved a slope stabilization and a widening of the road. Notice the difference of color of the water on either side of the turbidity curtain. This BMP has prevented a large sedimentation problem from occurring.

Categories and Examples of Best Management Practices (BMPs)



- BMPs can serve both urban and rural applications. The BMPs may differ within an urban landscape depending on whether the landscape is in the process of being developed. Rural BMPs can also differ based on the type of land use (i.e. agricultural vs. forestry).
- There are three main categories of BMPs, vegetative, structural, and operational. These categories of BMPs apply for both urban and rural applications. Under each of these categories exists a large inventory of BMP options for implementation.
- In trying to develop an approach to move from inventory to implementation, categorizing BMPs by appropriate land use, pollutant(s) addressed by each, etc, can help in prioritization and selection.
- BMPs should also be selected based on the “treatment train” concept. For example, what series of BMPs will work best with each other to produce the most cost effective and efficient method to remove pollutants and/or protect resources.
- Be aware that many of these BMPs may have secondary impacts of their own and that the overall goal is to avoid detrimental impacts/changes to the natural systems and processes - avoidance is preferred over methods that simply mitigate impacts.

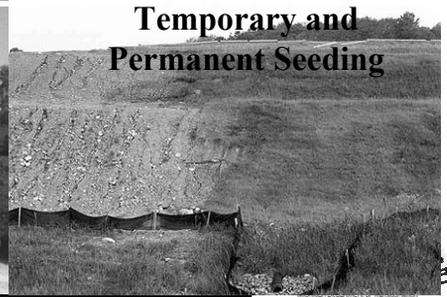
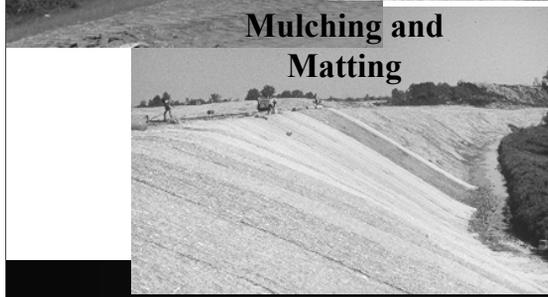
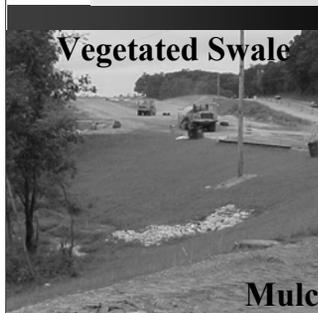
Vegetative BMPs

- Vegetative Controls – reduce the amount of pollution at the source
 - Vegetative Filter Strip
 - Vegetated Swale
 - Temporary Seeding for Erosion Control
 - Permanent Seeding for Stabilization
 - Use of Mulching and Matting to Establish Vegetation



- Vegetative controls reduce the amount of pollution at the source by preserving existing vegetation or re-establishing vegetation.
- Vegetative BMPs allow for storm water to infiltrate, reduce erosion, and filter sediments and other pollutants.
- In the urban landscape vegetative BMPs are most easily applied to developing land. Utilizing Vegetative BMPs in existing highly developed areas can be difficult because of the need for space.

Vegetative BMP Examples



Highlight examples of vegetative BMPs

- Vegetative Filter Strip are a specified width of buffer between construction sites and adjacent watercourses. The buffer helps acts as a filter to reduce soil erosion and sedimentation from entering the watercourse.
- Vegetated Swales are vegetated shallow channels with a dense stand of vegetation covering the side slopes and channel bottom that treat concentrated flows. As storm water runoff flows through these channels, it is treated through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils.
- Temporary Seeding and Permanent Seeding for Erosion Control is an inexpensive, yet effective, method of stabilizing flat areas and slopes.
- Use of Mulching and Matting to Establish Vegetation covers exposed soil areas with straw mulch, mulch blankets, or high velocity mulch blankets.

Refer to Chapter 9 of MDOT's Drainage Manual for more information.

Structural BMPs (Permanent)

- Structural Controls – physical structures that trap runoff and remove pollutants.

- Detention Ponds (Basin)
- Check Dams
- Infiltration Basins/Trenches
- Filter Berms
- Diversion Ditches

Check Dam



- Structural BMPs are physical structures that trap runoff and filter or treat pollutants.
- Structural BMPs can be used in most situations and have a wide range of costs.
- The check dam in the picture shows a new design for a check dam called a “permeable runoff device”. It is used to eliminate the need for stone check dams and can be both installed and removed by one person instead of heavy machinery. It can also be recycled when finished and used on a different project.
- Review example list on next slide.

Structural BMP Examples



Review Examples

- Check Dam is a device constructed across ditch lines used to reduce velocity of concentrated flows in the ditch and to protect vegetation.
- Geotextile Silt Fences are a permeable barrier used to capture sediment from sheet flow. This BMP must be maintained on a regular basis or when sediment has accumulated to half the height of the silt fence.
- Gravel filter berms are used to clean water as it flows through. Gravel filter berms are to be placed wherever a concentrated water flow requires filtering before leaving the construction site.
- Ponds (Basins) are designed to capture a storm water runoff volume, hold this volume and infiltrate it into the ground over a period of days. Basins are typically not designed to retain a permanent pool of water.
- Drop Inlet Structures are a temporary or permanent device used to trap sediment from stormwater before it enters the storm sewer system. This BMP must be maintained on a regular basis or when sediment has accumulated to half the height of the inlet.

Refer to Chapter 9 of MDOT's Drainage Manual for more information.

Operational BMPs

- Operational Controls – plans and maintenance operations that treat the pollutant source.
 - Riparian Buffer Zone
 - Street Sweeping
 - Catch Basin Cleaning
 - Spill Response and Prevention Plan
 - BMP Inspection and Maintenance Plan
 - Staff Training



Operational Controls are best management practices that seek to plan work to minimize negative impacts on water quality. Making sure the soil erosion BMPs are on plans and reviewing maintenance operations to reduce runoff potential are both examples of operational BMPs. Also street sweeping during dry weather can remove significant amounts of pollutant laden street dirt and trash while preventing its travel to the nearest water body. Catch Basins should be cleaned at least 1-2 times per year to keep them from building up large amounts of sediments. Delay of catch basin cleanout leads to improperly operating catch basins. It is also important to follow the Spill Response and Prevention Plan to avoid and treat spills when necessary. Make sure you know where to access your workplace's plan if you deal with hazardous chemicals. Finally, all BMPs will need to be maintained to some level after construction. This can vary widely depending on the type of BMP.

Operational BMPs

BMP Inspection and Maintenance



Spill Response and Prevention Plan



A person works to prevent a spill from entering a storm sewer (DAWG, 2000)

Street Sweeping



Here are some photos of the BMPs discussed the in last slide.

Refer to Chapter 9 of MDOT's Drainage Manual for more information.

Examples of MDOT Approved BMPs

Non-Structural BMPs

Employee Training
 Litter Control/Street Sweeping
 Identify & Prohibit Illicit Discharges to Storm Drains
 Clean and Maintain Storm Drain Channels, Storm Inlet, and Catch Basins
 Snow and Ice Control Operations
 Following Spill Response and Prevention Plan
 Used Oil Recycling Program

Structural BMPs

Biofilters
 Check Dam
 Catch Basin Inlet Devices
 Diversion Dike
 Energy Dissipators
 Geotextile Silt Fence
 Gravel Filter Berms
 Infiltration Trench /Drain Fields
 Pond (Basin)
 Sediment Basin/Traps
 Mulching and Matting



This is a list of examples of MDOT Approved BMPs: Details and additional BMPs will soon be available in the Drainage Manual, Chapter 9.

Structural BMPs

- **Biofilters** are of two types: swales and strips. Vegetated Swales are vegetated shallow channels with a dense stand of vegetation covering the side slopes and channel bottom that treat concentrated flows. Infiltration (Vegetative Filter) Strips are densely vegetated, uniformly graded areas that intercept sheet flow and are usually placed parallel to the contributing surface.
- **Check Dam** is a device constructed across ditch lines used to reduce velocity of concentrated flows in the ditch and to protect vegetation.
- **Concrete Grid Pavements** are lattice grid structures with grassed or pervious material placed in the grid openings. Their use, however, is generally restricted to parking areas and driveways.
- **Catch Basin Inlet Devices** are devices that are inserted into storm drain inlets to filter, or absorb sediment, pollutants, and oil and grease. These devices are typically placed at locations with a high potential for contamination.
- **Dry Detention Basins** are basins that are dry between storms. During a storm the basin fills. A bottom outlet releases the storm water slowly to provide time for sediments to settle.
- **Diversion Dike** is a temporary or permanent ridge of compacted earth constructed across sloping land to protect work or sensitive areas from upslope runoff by diverting flow away.
- **Energy Dissipators** are used to control erosion in a channel or conduit by reducing the velocity of flow and dissipate energy at outlets of channels or conduits.
- **Geotextile Silt Fences** are a permeable barrier used to capture sediment from sheet flow.
- **Gravel filter berms** are used to clean water as it flows through. Gravel filter berms are to be placed wherever a concentrated water flow requires filtering before leaving the construction site.
- **Infiltration Drainfields** are infiltration systems that capture a volume of runoff and infiltrate it into the ground. The system consists of a pretreatment structure, a manifold system, and a drainfield.
- **Infiltration Trench** is a gravel-filled trench designed to infiltrate storm water into the ground. Typically infiltration trenches can only capture a small amount of runoff, and therefore, may be designed to capture the first flush of the runoff event. For this reason, they are typically used with other BMPs, such as detention basins to control peak flows.
- **Ponds (Basins)** are designed to capture a storm water runoff volume, hold this volume and infiltrate it into the ground over a period of days. Basins are typically not designed to retain a permanent pool of water.
- **Sediment Basin/Traps** (Size greater than 5 cubic yards) are used to trap sediments from an upstream construction site. Provides a pool for velocities to slow down and sediment to drop out of traveling water.
- **Mulching and Matting** is used to provide immediate stabilization on a site after earth disturbing activities. Seeding should be included in the mulch or spread prior to mulching and matting.

Non-Structural

- Employee Training
- Litter Control/Street Sweeping
- Identify & Prohibit Illicit Discharges to Storm Drains
- Clean and Maintain Storm Drain Channels, Storm Inlet, and Catch Basins
- Snow and Ice Control Operations
- Following Spill Response and Prevention Plan/Used Oil Recycling Program

Maintenance Considerations for BMPs

- Regular maintenance required on BMPs
- Documentation required for maintenance and inspections
- Annual Reporting to MDEQ
- Reporting Process under construction



Once a BMP is installed, it will always require regular maintenance and routine inspections. Documentation on maintenance activities and inspections should be kept in a log book.

A reporting mechanism should be in place to assure inspections and maintenance are being kept up to date, this will be implemented by following the MDEQ issued permits and submitting annual reports describing the maintenance activities and inspections.

For More Information on BMPs

- MDOT Public Website

<http://www.michigan.gov/stormwater>

- 141 BMPs Fact Sheets
available at:

[http://cfpub.epa.gov/npdes/stormwater/
menuofbmps/menu.cfm](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/menu.cfm)



More information can be seen on yet another example of MDOT's Internal Training Program, the MDOT public web site. This site is found by first going to MDOT's web page: <http://www.michigan.gov/stormwater> going to the bottom of the page and clicking "here" to go to MDOT's Storm Water Management Web site. MDOT's Phase I Storm Water Management Plan and Annual Report for July 2001 through June 2002 are available to download on MDOT's public website.

Additionally the USEPA has developed fact sheets on a large number of BMPs which are described based on Phase II's six minimum control measures. The web site shows the Phase II requirements for that minimum measure and the BMPs which could be used to implement the measure.

- Public education and outreach on storm water impacts.
- Public involvement/participation.
- Illicit discharge detection and elimination.
- Construction site storm water runoff control.
- Post-construction storm water management in new development and redevelopment.
- Pollution prevention/good housekeeping for municipal operations.

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Please contact the following individuals in the region for more information on MDOT's Storm Water Management Program.