CITY OF MONESSEN

Stormwater Management and MS4 Program

Public Education and Outreach

August 2020

SUMMARY

• **Post-Construction Runoff Control** – Increased impervious surfaces, like parking lots, driveways, and rooftops, interrupt the natural cycle of gradual percolation of water through vegetation and soil. Instead, water is collected from surfaces such as asphalt and concrete and routed to drainage systems where large volumes of runoff quickly flow to the nearest receiving water. The effects of this process can include stream bank scouring and downstream flooding, which often lead to a loss of aquatic life and damage to property. Ordinances and other regulations are required to determine the appropriate best management practices and to ensure adequate long-term operation and maintenance of storm water controls.

• **Pollution Prevention/ Good Housekeeping** – This measure involves recognizing the benefits of pollution prevention practices and includes the development and implementation of an operation and maintenance program. Reducing pollutant runoff from municipal operations into the storm sewer system can include employee training on how to incorporate pollution prevention/good housekeeping techniques into municipal operations. These controls could also include programs that promote recycling (to reduce litter), minimize pesticide use and ensure the proper disposal of animal waste.

How To Report An Illicit Discharge

An illicit discharge is defined as any discharge to the municipal separate storm sewer system (MS4) that is not composed entirely of storm water. These non-stormwater discharges occur due to illegal connections to the storm drain system from business or commercial establishments. As a result of these illicit connections, contaminated wastewater enters into storm drains or directly into streams before receiving treatment from a wastewater treatment plant. Illicit connections may be intentional or may be unknown to the business owner and often are due to the connection of floor drains to the storm sewer system. Additional sources of illicit discharges can be failing septic systems, illegal dumping practices, and the improper disposal of sewage from recreational practices such as boating or camping.

Illicit discharge detection and elimination programs are designed to prevent contamination of ground and surface water supplies by monitoring, inspection and removal of illegal non-stormwater discharges. Call City Hall at (724) 684-9400 to report an illicit discharge and complete the *Illicit Discharge Reporting Form*.

What Can You Do?

We need everyone to do their share in maintaining a safe and healthy environment. Anything that goes into the storm inlets flows directly into the streams untreated. The most important thing to consider is that what you dump into the storm inlet not only affects you, but it affects your neighbors and other communities that the streams flow through. Please be cautious and keep the following things in mind to prevent pollution.

• Dumping used motor oil or other toxic wastes down the storm inlets eventually finds its way into streams thus killing wildlife and polluting stream beds. Do not dump these hazardous wastes into the inlets. Instead they should be taken to recycling centers which dispose of the substances properly.

• Don’t litter. Always dispose of trash and other debris in the proper receptacles.

• When using fertilizers and pesticides, follow the label for use and storage methods.

• Help prevent erosion by planting steep slopes and planting bare spots. Loose soil will erode the stream bank and harm fish and wildlife.

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MS4 REFERENCES

COMMON ACRONYMS

303(d) list	Clean Water Act Section 303(d) List of Water Quality Limited Segments
ACOE	Army Corps of Engineers
BMP	Best Management Practice
CBPRP	Chesapeake Bay Pollutant Reduction Plan
CCD	County Conservation District
CFR	Code of Federal Regulations
COMID	National Hydrography Dataset common identifier code for waterbodies
CWA	Federal Water Pollution Control Act (also known as the Clean Water Act)
ESA	Environmentally Sensitive Area
GI	Green Infrastructure
GIS	Geographic Information System
HHW	Household Hazardous Waste
HOA	Home Owners Association
IDD&E	Illicit Discharge Detection and Elimination
LA	Load Allocation
LID	Low Impact Development
MCM	Minimum Control Measure
MEP	Maximum Extent Practicable
MOS	Margin of Safety
MS3	Municipal Separate Storm Sewershed
MS4	Municipal Separate Storm Sewer System
NOI	Notice of Intent
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NWI	National Wetlands Inventory
O&M	Operation and Maintenance
PADEP	Pennsylvania Department of Environmental Protection
PCM	Pollutant Control Measure
PCSM	Post Construction Stormwater Management
PennDOT	Pennsylvania Department of Transportation
PEOP	Public Education and Outreach Plan
PIPP	Public Involvement and Participation Plan
PRP	Pollutant Reduction Plan
QAPP	Quality Assurance Project Plan
QLP	Qualifying Local Program
SOP	Standard Operating Procedure

SSO	Sanitary Sewer Overflow
SWMP	Stormwater Management Program
SWPPP	Stormwater Pollution Prevention Plan
TAG	Target Audience Group
TMDL	Total Maximum Daily Load
UA	Urbanized Area
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WLA	Waste Load Allocation
WQ	Water Quality

IMPORTANT DEFINITIONS

Illicit Discharge Any discharge to an MS4 that is not composed entirely of stormwater, except authorized non-stormwater discharges. Examples of illicit discharges include dumping of motor vehicle fluids, grass clippings and landscape debris, animal wastes, industrial waste/discharges, restaurant wastes, or any other non-stormwater waste. Illicit discharges can be accidental or intentional.

Load Allocation The portion of a surface water's loading capacity that is assigned or allocated to existing and future nonpoint sources and natural quality.

Municipal Separate Storm Sewer

A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters; (ii) Designed or used for collecting or conveying stormwater; (iii) Which is not a combined sewer; and (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

Municipal Separate Storm Sewershed (MS3)

The land area draining to an individual MS4 outfall.

Municipal Separate Storm Sewer System (MS4)

All separate storm sewers that are defined as "large" or "medium" or "small" municipal separate storm sewer systems pursuant to 40 CFR §§ 122.26(b)(4), (b)(7), and (b)(16), respectively, or designated under 40 CFR § 122.26(a)(1)(v).

Outfall A point source as defined by 40 CFR § 122.2 at the point where a municipal separate storm sewer discharges to surface waters and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels or other conveyances which connect segments of the same stream or other surface waters and are used to convey surface waters.

Point Source A discernible, confined, and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, Concentrated Aquatic Animal Production Facility (CAAP), Concentrated Animal Feeding Operation (CAFO), landfill leachate collection system, or vessel or other floating craft from which pollutants are or may be discharged.

Small Municipal Separate Storm Sewer System (Small MS4)
An MS4 that is not a large or medium MS4 pursuant to 40 CFR §§ 122.26(b)(4) and 122.26(b)(7). The term small MS4 includes systems similar to separate storm sewer systems in municipalities, such as systems at military bases, large hospital or prison complexes, and highways and other thoroughfares. The term does not include separate storm sewers in very discrete areas, such as individual buildings.

Stormwater Management Program (SWMP)
The SWMP document is the foundational program management tool for MS4 Permit facilitation; capturing the developed process, procedure, and implementation strategies for described elements (including MCMs). The primary purpose of the document is to present an integrated approach for reducing the discharge of pollutants from the MS4 to the Maximum Extent Practicable (MEP), to protect and improve the quality of water bodies, and adhere to the appropriate water quality standards requirements in the CWA.

Surface Waters* Perennial and intermittent streams, rivers, lakes, reservoirs, ponds, wetlands, springs, natural seeps and estuaries, excluding water at facilities approved for wastewater treatment such as wastewater treatment impoundments, cooling water ponds and constructed wetlands used as part of a wastewater treatment process.

Total Maximum Daily Load (TMDL)
The sum of individual waste load allocations for point sources, load allocations for nonpoint sources and natural quality and a margin of safety expressed in terms of mass per time, toxicity or other appropriate measures.

Waste Load Allocation (WLA)
The portion of a surface water's loading capacity that is allocated to existing and future point source discharges.

* This is PADEP's definition in the MS4 Permit. It is appropriate to consider the CWA definition for Waters of the United States (see below).

USEPA/ACOE CLEAN WATER RULE (PARTIAL)

Clean Water Rule: Definition of "Waters of the United States" 40 CFR 230.3

§230.3 Definitions.
* * * * *

(o) The term waters of the United States means:
(1) For purposes of the Clean Water Act, 33 U.S.C. 1251 et. seq. and its implementing regulations, subject to the exclusions in paragraph (o)(2) of this section, the term ''waters of the United States'' means:

(i) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

(ii) All interstate waters, including interstate wetlands;

(iii) The territorial seas;

(iv) All impoundments of waters otherwise identified as waters of the United States under this section;

(v) All tributaries, as defined in paragraph (o)(3)(iii) of this section, of waters identified in paragraphs (o)(1)(i) through (iii) of this section;

(vi) All waters adjacent to a water identified in paragraphs (o)(1)(i) through (v) of this section, including wetlands, ponds, lakes, oxbows, impoundments, and similar waters;

(vii) All waters in paragraphs (o)(1)(vii)(A) through (E) of this section where they are determined, on a case-specific basis, to have a significant nexus to a water identified in paragraphs (o)(1)(i) through (iii) of this section. The waters identified in each of paragraphs (o)(1)(vii)(A) through (E) of this section are similarly situated and shall be combined, for purposes of a significant nexus analysis, in the watershed that drains to the nearest water identified in paragraphs (o)(1)(i) through (iii) of this section. Waters identified in this paragraph shall not be combined with waters identified in paragraph (o)(1)(vi) of this section when performing a significant nexus analysis. If waters identified in this paragraph are also an adjacent water under paragraph (o)(1)(vi), they are an adjacent water and no case-specific significant nexus analysis is required.

(A) Prairie potholes. Prairie potholes are a complex of glacially formed wetlands, usually occurring in depressions that lack permanent natural outlets, located in the upper Midwest.

(B) Carolina bays and Delmarva bays. Carolina bays and Delmarva bays are ponded, depressional wetlands that occur along the Atlantic coastal plain.

(C) Pocosins. Pocosins are evergreen shrub and tree dominated wetlands found predominantly along the Central Atlantic coastal plain.

(D) Western vernal pools. Western vernal pools are seasonal wetlands located in parts of California and associated with topographic depression, soils with poor drainage, mild, wet winters and hot, dry summers.

(E) Texas coastal prairie wetlands. Texas coastal prairie wetlands are freshwater wetlands that occur as a mosaic of depressions, ridges, intermound flats, and mima mound wetlands located along the Texas Gulf Coast.

(viii) All waters located within the 100-year floodplain of a water identified in paragraphs (o)(1)(i) through (iii) of this section and all waters located within 4,000 feet of the high tide line or ordinary high water mark of a water identified in paragraphs (o)(1)(i) through (v) of this section where they are determined on a case-specific basis to have a significant nexus to a water identified in paragraphs (o)(1)(i) through (iii) of this section. For waters determined to have a significant nexus, the entire water is a water of the United States if a portion is located within the 100-year floodplain of a water identified in paragraphs (o)(1)(i) through (iii) of this section or within 4,000 feet of the high tide line or ordinary high water mark. Waters identified in this paragraph shall not be combined with waters identified in paragraph (o)(1)(vi) of this section when performing a significant nexus analysis. If waters identified in this paragraph are also an adjacent water under paragraph (o)(1)(vi), they are an adjacent water and no case-specific significant nexus analysis is required.

(2) The following are not "waters of the United States" even where they otherwise meet the terms of paragraphs (o)(1)(iv) through (viii) of this section.

(i) Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the Clean Water Act are not waters of the United States.

(ii) Prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other Federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.

(iii) The following ditches:

(A) Ditches with ephemeral flow that are not a relocated tributary or excavated in a tributary.

(B) Ditches with intermittent flow that are not a relocated tributary, excavated in a tributary, or drain wetlands.

(C) Ditches that do not flow, either directly or through another water, into a water identified in paragraphs (o)(1)(i) through (iii) of this section.

(iv) The following features:

(A) Artificially irrigated areas that would revert to dry land should application of water to that area cease;

(B) Artificial, constructed lakes and ponds created in dry land such as farm and stock watering ponds, irrigation ponds, settling basins, fields flooded for rice growing, log cleaning ponds, or cooling ponds;

(C) Artificial reflecting pools or swimming pools created in dry land;

(D) Small ornamental waters created in dry land;

(E) Water-filled depressions created in dry land incidental to mining or construction activity, including pits excavated for obtaining fill, sand, or gravel that fill with water;

(F) Erosional features, including gullies, rills, and other ephemeral features that do not meet the definition of tributary, non-wetland swales, and lawfully constructed grassed waterways; and

(G) Puddles.

(v) Groundwater, including groundwater drained through subsurface drainage systems.

(vi) Stormwater control features constructed to convey, treat, or store stormwater that are created in dry land.

(vii) Wastewater recycling structures constructed in dry land; detention and retention basins built for wastewater recycling; groundwater recharge basins; percolation ponds built for wastewater recycling; and water distributary structures built for wastewater recycling.

STORMWATER MANAGEMENT

What is Storm Water?

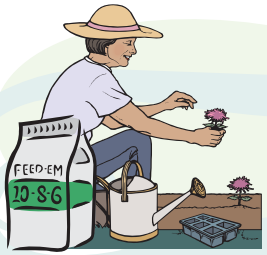
Storm water is water from precipitation that flows across the ground and pavement when it rains or when snow and ice melt. The water seeps into the ground or drains into what we call storm sewers. These are the drains you see at street corners or at low points on the sides of streets. Collectively, the draining water is called storm water runoff.

Why is Storm Water "Good Rain Gone Wrong?"

Storm water becomes a problem when it picks up debris, chemicals, dirt, and other pollutants as it flows or when it causes flooding and erosion of stream banks. Storm water travels through a system of pipes and roadside ditches that make up storm sewer systems. It eventually flows directly to a lake, river, stream, wetland, or coastal water. All of the pollutants storm water carries along the way empty into our waters, too, because storm water does not get treated!

Pet wastes left on the ground get carried away by storm water, contributing harmful bacteria, parasites and viruses to our water.

Vehicles drip fluids (oil, grease, gasoline, antifreeze, brake fluids, etc.) onto paved areas where storm water runoff carries them through our storm drains and into our water.



Chemicals used to grow and maintain beautiful lawns and gardens, if not used properly, can run off into the storm drains when it rains or when we water our lawns and gardens.

Waste from chemicals and materials used in construction can wash into the storm sewer system when it rains. Soil that erodes from construction sites causes environmental degradation, including harming fish and shellfish populations that are important for recreation and our economy.

Where To Go To Continue the Information Flow

Your community is preventing storm water pollution through a storm water management program. This program addresses storm water pollution from construction, new development, illegal dumping to the storm sewer system, and pollution prevention and good housekeeping practices in municipal operations. It will also continue to educate the community and get everyone involved in making sure the only thing that storm water contributes to our water is . . . water! Contact your community's storm water management program coordinator or the Pennsylvania Department of Environmental Protection for more information about storm water management.

Pennsylvania Department of Environmental Protection
www.dep.state.pa.us

Answers to Test Your Storm Sewer System Savvy:

1. Ditch – Part of the storm sewer system. Most people think that the system is just a series of underground pipes. It can also include ditches used to convey storm water from the land to a receiving lake, river, or stream.

2. Fire Hydrant – Not part of the storm sewer system. Water sprayed from fire hydrants is not storm water, but is allowed by law to enter the storm sewer system.

3. Curb with Storm Drain Inlet – Part of the storm sewer system. Many people do not realize that this is an opening leading to the storm sewer system. Anything going into this inlet (e.g., trash, leaves, improperly disposed of hazardous materials) travel directly to a receiving lake, river, or stream without being treated first. Many communities stencil storm drains with "Do Not Dump" messages to let people know.

4. Storm Sewer Outfall – Part of the storm sewer system. An outfall is where storm water drains from the storm sewer system into a receiving lake, stream, or river. If there is a flow from an outfall when it isn't raining, there could be a problem with the system or someone has used a storm drain for illegally disposing of materials.

5. Toilet – Not part of the storm sewer system. Wastewater from sinks and toilets in houses and businesses travel through a sewer system constructed to carry sanitary wastes. In some instances, older communities may have a combined sewer system designed to carry both storm water and sanitary waste.

6. Septic System – Not part of the storm sewer system. Homeowners use septic tanks to manage sanitary wastes on-site. Improperly maintained septic systems can leak and contribute pollutants to the storm sewer system, as well as directly to lakes, rivers, and streams.

7. Roads and Other Paved Areas – Not part of the storm sewer system. Roads and other hardened surfaces such as parking lots and sidewalks can accumulate pollutants (e.g., oil, grease, dirt, leaves, trash, pet wastes) that storm water eventually washes into the storm sewer system.

8. Storm Drain Inlet – Part of the storm sewer system. This is another example of what a storm drain may look like. Like the storm drain inlet shown in picture #3, anything that enters this drain will go directly to streams, rivers, and lakes without being treated first. It is important to recognize this as a storm drain to prevent it from being used as a trash can.

When It Rains, It Drains

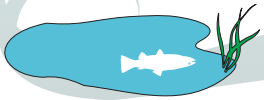
Understanding Storm Water and How It can Affect Your Money, Safety, Health, and the Environment

What Happens When It Rains?

Rain is an important part of nature's water cycle, but there are times it can do more damage than good. Problems related to storm water runoff can include:

Flooding caused by too much storm water flowing over hardened surfaces such as roads and parking lots, instead of soaking into the ground.

Increases in spending on maintaining storm drains and the storm sewer system that become clogged with excessive amounts of dirt and debris.



Decreases in sportfish populations because storm water carries sediment and pollutants that degrade important fish habitat.

More expensive treatment technologies to remove harmful pollutants carried by storm water into our drinking water supplies.

Closed beaches due to high levels of bacteria carried by storm water that make swimming unsafe.

We can help rain restore its good reputation while protecting our health and environment while saving money for ourselves and our community. Keep reading to find out how. . .

Test Your Storm Sewer System Savvy!

What does the storm sewer system look like in your community? See if you can identify which pictures are part of the storm sewer system. (Answers are on the back.)

Restoring Rain's Reputation: What Everyone Can Do To Help

Rain by nature is important for replenishing drinking water supplies, recreation, and healthy wildlife habitats. It only becomes a problem when pollutants from our activities like car maintenance, lawn care, and dog walking are left on the ground for rain to wash away. Here are some of the most important ways to prevent storm water pollution:

- Properly dispose of hazardous substances such as used oil, cleaning supplies and paint—never pour them down any part of the storm sewer system and report anyone who does.
- Use pesticides, fertilizers, and herbicides properly and efficiently to prevent excess runoff.
- Look for signs of soil and other pollutants, such as debris and chemicals, leaving construction sites in storm water runoff or tracked into roads by construction vehicles. Report poorly managed construction sites that could impact storm water runoff to your community. (See the back of this brochure for contact information.)
- Install innovative storm water practices on residential property, such as rain barrels or rain gardens, that capture storm water and keep it on site instead of letting it drain away into the storm sewer system.
- Report any discharges from storm water outfalls during times of dry weather—a sign that there could be a problem with the storm sewer system.
- Pick up after pets and dispose of their waste properly. No matter where pets make a mess—in a backyard or at the park—storm water runoff can carry pet waste from the land to the storm sewer system to a stream.
- Store materials that could pollute storm water indoors and use containers for outdoor storage that do not rust or leak to eliminate exposure of materials to storm water.

Introduction to Stormwater Management

WATER RESOURCE CENTER

FACT SHEET

Southwestern Pennsylvania Commission

Water Resource Center

For more information contact:

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(412) 391-5590 x374
ekepple@spcregion.org

Sarah Koenig
Water Resource Planner
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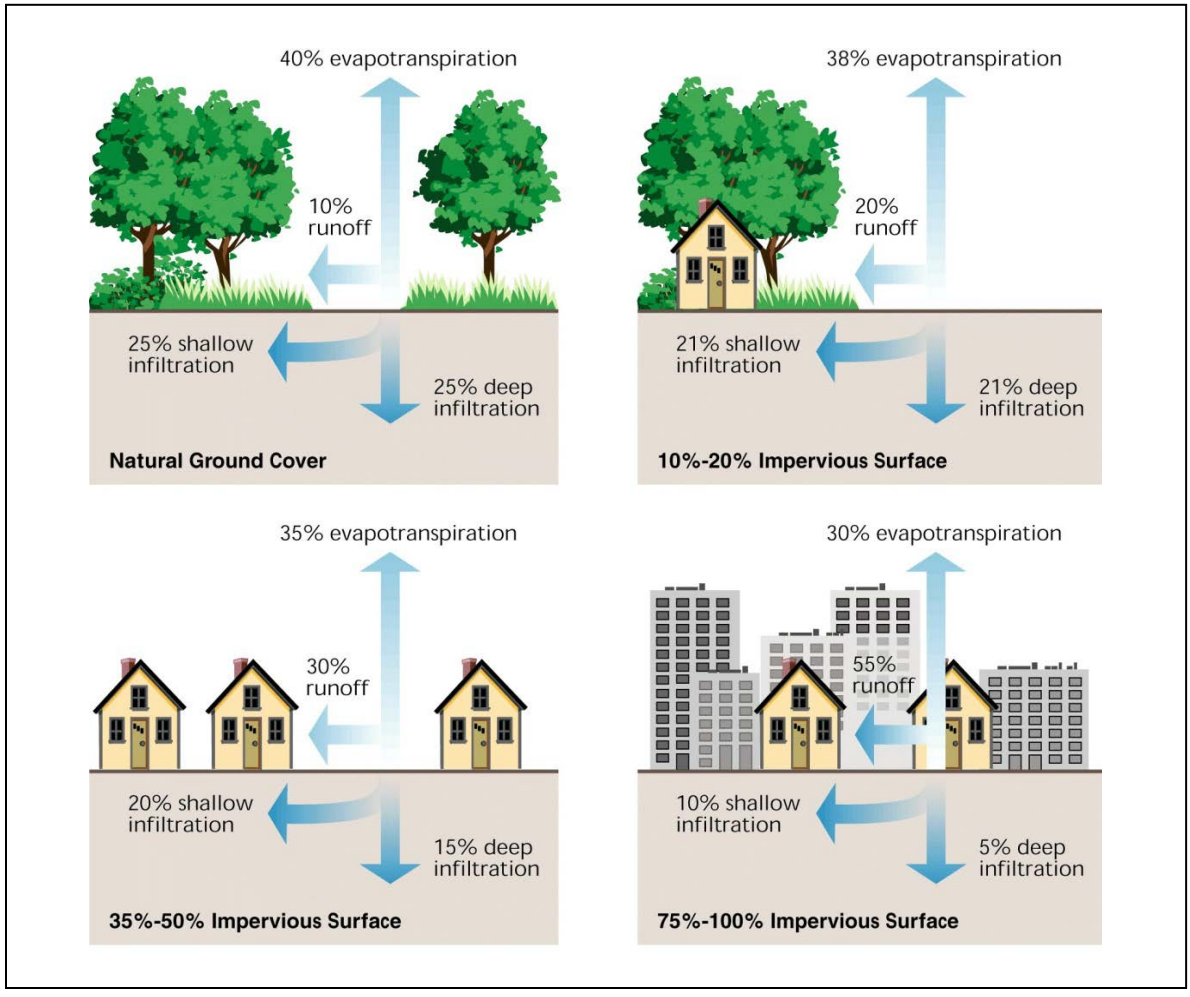
KEY CONCEPTS

STORMWATER occurs when it rains or when snow melts.

STORMWATER RUNOFF is a term used to describe rain and snow melt that is unable to infiltrate into the ground.

IMPERVIOUS SURFACES, such as roads, parking lots, roof tops, and compacted land, do not allow for any infiltration into the ground. The presence of impervious surfaces results in an increase in the amount of stormwater runoff.

NON-POINT SOURCE POLLUTION is pollution that comes from many sources. As stormwater makes its way across the surface and into our local waterways, it brings with it non-point source pollution. Causes of non-point source pollution include oils, fertilizer, pesticides, animal waste, trash, and organic matter.



As illustrated in the diagram above, the amount of stormwater runoff increases as the amount of impervious surfaces increases. Poorly managed stormwater runoff can cause a variety of problems such as environmental degradation and localized flooding.

Image: NRCS

(OVER)

IMPACTS OF STORMWATER

Stormwater runoff, when managed improperly, can impact land owners and the environment. Some examples of stormwater-related problems are listed below.

Poorly managed stormwater can lead to stream bank erosion. This can affect stream quality and habitat and cause property damage.
Photo: enviroloknw.com

Land Owner / Economic Consequences

- Localized flooding damages
- Land destabilization
- Loss of recreation and tourism income
- Transportation infrastructure and sewer system damage

Environmental Consequences

- Erosion
- Polluted waterways through non-point sources such as oils, pesticides, trash, fertilizers, etc.
- Loss of aquatic habitat
- Lack of groundwater recharge
- Elevated concentrations of nutrients such as phosphorus

Stormwater is usually not treated before entering our waterways. Therefore, pollutants that enter storm drains have direct environmental impacts on our waterbodies. *Photo: Wilmingtonnc.gov*

Did you know that…

- Stormwater is the primary cause of water pollution nationally.
- As little as 10% of impervious cover in a watershed can cause degraded stream conditions.
- Public and private drinking water sources can be affected by poorly managed stormwater.

Source: EPA

For More Information

To learn more about stormwater problems and solutions, visit the following websites:

- EPA.gov
- depweb.state.pa.us
- pacd.org
- bmpdatabase.org
- spcwater.org

STORMWATER SOLUTIONS: BEST MANAGEMENT PRACTICES

Best Management Practices (BMPs) refer to the suite of options available to avoid and/or minimize damages associated with stormwater. BMPs can include the installation of stormwater management controls as well as practices that prevent stormwater pollution. See below for some examples of effective BMPs for common land use types.

Residential BMPs

- Rain gardens
- Rain barrels
- Pervious walkways and patios
- Landscaping with native plants
- Minimization of pesticide and fertilizer use
- Proper disposal of hazardous chemicals, electronics, and pharmaceuticals

Commercial Development BMPs

- Vegetated swales
- Pervious pavement
- Preservation of existing undeveloped land
- Constructed wetlands
- Capture and reuse of stormwater for irrigation
- Detention basin
- Street sweeping
- Erosion and sediment control during construction

Rain gardens are relatively simple to construct and can be designed to fit a variety of land use types. In addition to managing stormwater, rain gardens improve aesthetics, support pollinators, and more.
Photo: afbeducation.org

WATER RESOURCE CENTER

FACT SHEET

BEST MANAGEMENT PRACTICES
STORMWATER MANAGEMENT

Best Management Practices (BMPs) are used in stormwater management to prevent and mitigate problems related to stormwater. BMPs include mechanisms that control the volume, rate, and quality of stormwater. BMPs also include practices that prevent the creation of stormwater runoff and stormwater pollution. BMPs used in stormwater management are classified as either non-structural or structural.

Southwestern Pennsylvania Commission

WATER RESOURCE CENTER

Mission

To promote regional collaboration on water topics; be a leader in facilitating coordination and education; and provide technical assistance to its member governments.

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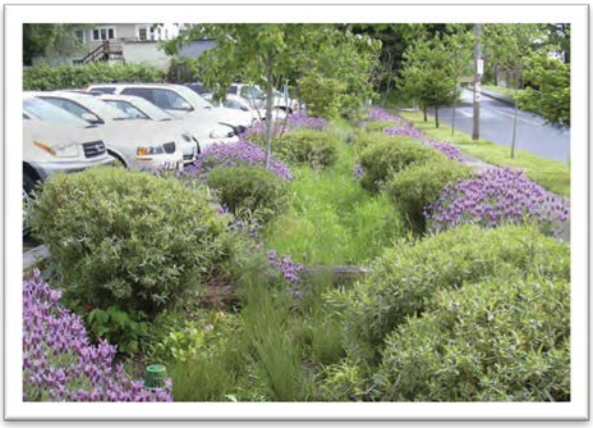
Non-Structural BMPs

Non-structural BMPs include design approaches and practices that are used for their ability to prevent the occurrence of stormwater runoff. A majority of non-structural BMPs must be incorporated during site development.

Principle Groups of Non-Structural BMPs

- Protect Sensitive & Special Value Features
- Cluster & Concentrate
- Minimize Disturbance & Maintenance
- Reduce Impervious Cover
- Disconnect / Distribute / Decentralize
- Source Control

Preserving important natural features with special value for managing stormwater, such as floodplains and wetlands, is a key non-structural BMP for use when developing land. *Photo: naturalheritage.state.pa.us*



Vegetated swales are a structural BMP that manage stormwater volume and rate, while also improving water quality. *Photo: lowimpactdevelopment.org*

Structural BMPs

Structural BMPs are stormwater management techniques that have to be constructed and are typically used to mitigate the effects of stormwater runoff. Structural BMPs can be implemented during site development and in retrofit situations.

Principle Groups of Structural BMPs

- Volume / Peak Rate Reduction by Infiltration
- Volume / Peak Rate Reduction
- Runoff Quality / Peak Rate BMPs
- Restoration BMPs
- Other BMPs & Related Structural Measures

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

GREEN STORMWATER INFRASTRUCTURE
STORMWATER MANAGEMENT

WATER RESOURCE CENTER

FACT SHEET

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www.spcwater.org

Green Stormwater Infrastructure (GSI) refers to a suite of techniques that rely on natural processes associated with vegetation, soil and the hydrologic cycle, to manage stormwater quantity and quality. Utilizing GSI for stormwater management can provide a multitude of benefits beyond traditional approaches, which simply pipe the untreated water to the nearest body of water. Benefits of GSI include improved water quality and air quality, increased property values*, enhanced wildlife habitat, and much more.

Types of GSI

The suite of options to use for Green Stormwater Infrastructure is quite diverse. Varieties of GSI are chosen based on a number of considerations such as site conditions and performance goals. Examples of types of GSI are listed below:

- Rain Gardens
- Rain Barrels
- Stormwater Planters
- Pervious Pavement
- Green Roofs
- Trees
- Vegetated & Dry Swales
- Riparian Buffers
- Cisterns
- Downspout Disconnection
- Curb Bump-outs

Rain Gardens (above) are one type of green stormwater infrastructure that work exceptionally well in residential settings. Rain gardens provide flood storage, filter pollutants, provide wildlife habitat, and beautify the neighborhood. *Photo: afbeducation.org*

For More Information

- SPCWater.org
- dcnr.state.pa.us
- water.epa.gov
- depweb.state.pa.us

Stormwater planters (left) manage flow from impervious surfaces, allowing stormwater to infiltrate into the ground instead of the sewer system. The vegetation also filters pollution and reduces temperature. *Photo: Oregon Environmental Services*

Benefits of GSI

Environmental

- Filters water & air pollution
- Mitigates flooding through reductions of peak flows
- Provides wildlife habitat
- Reduces soil erosion
- Protects drinking water supply through groundwater recharge

Social

- Reduces Heat Island Effect
- Provides Recreational Opportunities
- Improves neighborhood aesthetics
- Public education
- Reduces noise pollution

Economic

- Decreases pressure on existing stormwater or combined sewer system
- Increases property values*
- Creation of green jobs
- Reduces energy consumption costs

*Source: EPA (http://water.epa.gov/infrastructure/greeninfrastructure/gi_why.cfm)

STRUCTURAL BMP'S

STRUCTURAL BMPS
STORMWATER MANAGEMENT

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Structural Stormwater Best Management Practices (BMPs) are engineered systems that are designed to mitigate the impacts of stormwater. Structural BMPs are effective tools for stormwater management in both development and retrofit situations.

Structural BMPs include systems that rely on the natural processes of soil and vegetation (e.g. vegetated swale) as well as systems that rely on manufactured components (e.g. water quality filters). Structural BMPs can be utilized to reduce volume and peak flows, and to improve water quality.

The Pennsylvania Best Management Practices Manual divides Structural BMPs into the following groups:

- Volume & Peak Rate Reduction by Infiltration BMPs
- Volume & Peak Rate Reduction BMPs
- Runoff Quality & Peak Rate Control BMPs
- Restoration BMPs
- Other BMPs & Related Structural Measures

Volume & Peak Rate Reduction by Infiltration BMPs

- Infiltration Basin
- Subsurface Infiltration Bed
- Infiltration Trench
- Rain Garden / Bioretention
- Dry well / Seepage Pit
- Constructed Filter
- Vegetated Swale
- Vegetated Filter Strip
- Infiltration Berm & Retentive Grading
- Pervious Pavement with Infiltration Bed

Volume & Peak Rate Reduction BMPs

- Vegetated Roof
- Runoff Capture & Reuse

Other BMPs & Related Structural Measures

- Level Spreader
- Special Detention Areas

Constructed wetlands (above) and vegetated swales (top right) remove pollutants, and reduce peak flow rates and runoff volume.

Restoration BMPs

- Riparian Buffer Restoration
- Landscape Restoration
- Soil Amendment & Restoration
- Floodplain Restoration

Runoff Quality & Peak Rate Control BMPs

- Constructed Wetland
- Wet Pond / Retention Basin
- Dry Extended Detention Basin
- Water Quality Filters & Hydrodynamic Devices

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photos: lowimpactdevelopment.org & ashmedia.org

RAIN GARDENS
STRUCTURAL STORMWATER BMPS

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Rain Gardens are excavated shallow depressions, planted with native vegetation that can withstand dry and wet periods. Stormwater is collected in the rain garden and is both infiltrated into the ground and evapotranspired by the vegetation. Rain gardens serve a variety of stormwater management functions, including improving water quality, recharging groundwater, and reducing volume and peak runoff rate.

Rain gardens are highly adaptable and relatively easy to construct. They can be incorporated into a variety of land use settings, including residential, commercial, ultra urban, industrial, highways/roads, parking lots, and various retrofit situations.

BMP Profile	
Name	Rain Garden
Type	Structural
Grouping	Volume and Peak Rate Reduction by Infiltration
Stormwater Management Benefits	♦ Water Quality ♦ Groundwater Recharge ♦ Volume Reduction ♦ Peak Rate Control
Potential Applications	♦ Residential ♦ Commercial ♦ Ultra Urban ♦ Industrial ♦ Retrofit ♦ Highway/Road

Rain gardens can be incorporated into most landscapes, including ultra urban retrofits (above left, Pittsburgh, PA) and residential areas (above right, Puyallup, WA). Rain gardens can serve a variety of stormwater management functions, including improving water quality, recharging groundwater, and reducing volume and peak runoff rate.

Key Considerations for Rain Gardens

- Soil may need to be amended with compost to improve water holding capability
- Gravel bed below the rain garden can increase storage capacity
- Native plants, trees, and shrubs should be used
- Maintenance plan is essential
- Landscape can be modified to direct stormwater flow to rain garden (example: curb cuts or downspout disconnection)
- Through reduced maintenance costs and stormwater conveyance costs, rain gardens can be more cost effective than traditional landscaping

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photo: cahnrs.wsu.edu

CONSTRUCTED WETLANDS
STRUCTURAL STORMWATER BMPS

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Constructed Wetlands (CWs), also known as stormwater wetlands, are shallow aquatic systems planted with emergent vegetation. They are highly effective at removing pollutants from stormwater; they also mitigate peak flow rates and reduce runoff volume. Beyond stormwater management, CWs provide wildlife habitat and aesthetic value. Design and maintenance is critical for the ability of this BMP to function and be sustainable over time.

Detention Basins, a basic BMP that temporarily stores stormwater, are often retrofitted into CWs in order to maximize stormwater management function of the space and obtain the added benefits.

BMP Profile	
Name	Constructed Wetland
Type	Structural
Grouping	Runoff Quality and Peak Rate BMP
Stormwater Management Benefits	♦ Water Quality ♦ Peak Rate Control ♦ Groundwater Recharge ♦ Flow Rate Reduction
Potential Applications	♦ Residential ♦ Commercial ♦ Industrial ♦ Retrofit

Constructed wetlands improve water quality, control peak flows, provide wildlife habitat, and much more. They can be used in a variety of land use situations, including retrofit (above right) and recreational spaces (above left).

Types of Constructed Wetlands

CWs can be designed as either online (hydrologically connected to existing waterway) or offline (not hydrologically connected to an existing waterway). They are often used in conjunction with other stormwater BMPs that mitigate flow and sediment. They are grouped into the following categories:

- Shallow Wetlands
- Extended Detention Shallow Wetlands
- Pocket Wetlands
- Pond/Wetland Systems

Water Quality Improvement

CWs improve water quality through a variety of mechanisms that include settling, filtration, biological de-composition, and more. They are effective at removing many common stormwater pollutants such as phosphorus, nitrogen, suspended solids, and petroleum products.

Pollutant removal capacity can be affected by seasonal variations. Performance is typically highest during the growing season and lowest during the winter months.

(OVER)

DESIGN AND MAINTENANCE CONSIDERATIONS

Proper design and maintenance are critical for the long-term viability of constructed wetlands. Key considerations are listed below.

Hydrology Water conditions associated with CWs, including flow, depth, drainage area, etc.	• Flow contributions from rain, runoff, and groundwater are essential for long term performance • Deeper areas should have a permanent water surface except during intense drought • Drainage area should be 5 acres for pocket wetlands or 10 acres for other types of constructed wetlands • A constant source of inflow can improve the health and functioning of constructed wetlands as well as reduce the drainage area requirements
Underlying Soils Existing soils below CWs	• Underlying soils must be identified, tested, and amended if necessary • Synthetic or highly-compacted soil liners may be needed to avoid excessive infiltration
Planting Soil Soils used to plant vegetation	• Soils with very high organic content should be used due to their ability to serve as a sink for pollutants, retain high amounts of water, and support plant growth
Vegetation Plants in CWs that provide many functions such as slowing water velocity & evapotranspiring water	• Vegetation serves many functions, including reduction of flow velocity, promoting settling of suspended solids, limiting erosion, promoting filter, and much more • A diverse variety of tough, non-invasive perennial plants should be used • Several zones of vegetation are necessary; see table 6.6.1-1* in PA Stormwater BMP Manual for details
Configuration Design and placement considerations	• Ideal length to width ratio is at least 2:1 • Construction should occur at least 10 feet from property lines and at least 50 feet from private wells • Critical components include forebay/inflows, vegetation and open water zones, outlets, and safety benches; see Chapter 6.6.1* in PA Stormwater BMP Manual for more detail
Buffer Undeveloped area around CWs	• Including a 25-foot buffer around the CW will improve habitat value, aesthetics, and wetland health • Buffer should include trees, shrubs, and native ground covers; existing trees should be preserved
Maintenance Access	• Stabilized and permanent maintenance access is needed at the forebay, outlet, and embankment
Maintenance Vegetation and engineered systems need to be inspected and maintained to sustain CWs performance over time	• A maintenance plan is necessary • Private facilities may require an easement, deed restriction, and/or legal measures to prevent neglect or removal • Vegetation inspections should occur every 2 to 3 weeks during the first growing season • Full inspections should occur 4x/year and after major storms during the first 2 years • Vegetation and sediment problems should be promptly corrected • Once established, inspections should occur semiannually and after major storms

A variety of tough, non-invasive plants should be used in the various vegetation zones. Joe Pye Weed (above) and Grass Leaf Arrowhead (below) are native plants that thrive in a variety of the vegetation zones required for optimal performance of constructed wetlands.

Constructed wetlands can be sited in a variety of conditions, including residential, commercial, industrial, and retrofit situations. The design and maintenance considerations should be followed in each of these applications.

This information was adapted from the Pennsylvania Stormwater Best Practices Manual.
Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.
*Available for download at: http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305

Photo Credits: rail.org, equionoxenvironmental.com, adaptationstories.com, phillywatersheds.org, nymphheadstrib.com, & daisydeadair.blogspot.com

VEGETATED SWALE
STRUCTURAL STORMWATER BMPS

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Vegetated Swales are shallow channels, planted densely with vegetation, designed to reduce the rate of stormwater and encourage infiltration. Additional stormwater management benefits of vegetated swales include improved water quality and volume reduction.

Vegetated swales can be incorporated into a variety of landscapes, including residential, commercial, industrial, and highways/roads. In areas with steep slopes, check dams can increase the effectiveness of vegetated swales by further slowing the rate of stormwater and therefore increasing opportunities for infiltration.

BMP Profile	
Name	Vegetated Swale
Type	Structural
Grouping	Volume and Peak Rate Reduction by Infiltration
Stormwater Management Benefits	♦ Water Quality ♦ Peak Rate Control ♦ Volume Reduction ♦ Groundwater Recharge
Potential Applications	♦ Residential ♦ Commercial ♦ Industrial ♦ Retrofit ♦ Highway/Road

Vegetated swales can be incorporated into a variety of landscapes, including retrofit situations. Above is an example of a parking lot that was retrofitted with a vegetated swale to perform on-site stormwater management and improve aesthetics.

In areas with steep slopes, check dams can be included in the design of a vegetated swale to increase stormwater management performance. The check dams attenuate the water, slowing the peak rate and allowing more time for infiltration.

Key Considerations for Vegetated Swales

- Better alternative to conventional conveyance systems due to ability to remove some pollutants and reduce speed of stormwater
- Utilize minimum of 24" of permeable soil beneath plants
- 12" – 24" of base rock layer should be placed below soil layer
- Plant with native vegetation that is tolerant of wet and dry conditions
- Maintenance plan is essential for long term success
- Can be designed to aesthetically enhance surroundings
- Should discharge to additional stormwater BMP or traditional stormwater infrastructure

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photos: lacreekfreak.files.wordpress.com & oseh.umich.edu

RUNOFF CAPTURE & REUSE
STRUCTURAL STORMWATER BMPS

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Runoff Capture and Reuse refers to the variety of techniques that are used to capture precipitation, store it for period of time, and reuse the water. Devices used to capture and store stormwater include rain barrels, cisterns, vertical storage mechanisms, and below-ground storage systems. These BMPs are most effective for use in controlling small, frequent storm events.

Stormwater management benefits of runoff capture and reuse devices include volume reduction, water quality improvements, peak rate control, and groundwater recharge. The ability of this BMP to perform each of these functions is dependent upon design and maintenance. This BMP can be applied in a variety of settings, including urban, residential, and commercial.

BMP Profile	
Name	Runoff Capture & Reuse
Type	Structural
Grouping	Volume and Peak Rate Reduction BMP
Stormwater Management Benefits	• Volume Reduction • Water Quality Improvements • Peak Rate Control • Groundwater Recharge
Potential Applications	• Residential • Commercial • Ultra Urban • Industrial • Retrofit

Some of the variations of runoff capture and reuse include underground storage (above left), rain barrels (above middle), and cisterns (above right). These systems are often implemented with other BMPs such as vegetated swales, rain gardens, and/or pervious pavement to maximize stormwater management performance.

Key Considerations for Runoff Capture Reuse

- Most effective for use in small, frequent storm events
- Systems must bypass for large storm events
- Water should not be reused for potable purposes
- Captured water can be reused for irrigation or greywater needs such as flushing toilets
- Systems must be winterized to avoid damage from freezing
- Devices should be protected from light in order to avoid algae growth

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photo credits: ecoartsoffla.org, 3.bp.blogspot.com, and consultant.archicadd.com

VEGETATED ROOFS
STRUCTURAL STORMWATER BMPS

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Vegetated Roofs are roofs that are covered with specialized media and planted with vegetation; this enables the roof to hydrologically perform in a manner similar to vegetated surfaces. The media holds water, which is eventually evapotranspired by the plants. They can be installed on flat and/or pitched roofs with a slope of </= 30% in a variety of settings.

Vegetated roofs' primary function in stormwater management is volume reduction. Additional stormwater benefits include water quality improvements and some peak rate control. Environmental benefits beyond stormwater control include building temperature moderation and wildlife habitat.

BMP Profile	
Name	Vegetated Roof
Type	Structural
Grouping	Volume and Peak Rate Reduction BMP
Stormwater Management Benefits	♦ Volume Reduction ♦ Water Quality Improvements ♦ Peak Rate Control
Potential Applications	♦ Residential ♦ Commercial ♦ Ultra Urban ♦ Industrial ♦ Retrofit

The 1st green roof (above) in Westmoreland County is located at the County Conservation District's office. This installation was part of extensive sustainable stormwater retrofit solutions across the site. *Photo: wcdpa.com*

A green roof was installed on the Allegheny County Office Building (above) in 2010 as a demonstration project. There are four types of green roof technologies and extensive monitoring equipment in place. *Photo: eislerlandscapes.com*

Key Considerations for Vegetated Roofs

- Structural competency must be verified for both dead loads (when dry) and live loads (with rainfall retention)
- Require optimal waterproofing system to protect against biological and root damage
- Should not be fertilized or irrigated in order to achieve maximum benefits
- Performance is improved when coupled with ground infiltration measures
- Internal building drainage should be designed to manage large rainfall events without inundating the cover

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Riparian Buffer Restoration

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Riparian Buffer Restoration (RBR) is the restoration of the area surrounding streams, lakes, ponds, and wetlands. The restoration of these areas provides numerous stormwater management benefits, including water quality improvement, volume reduction, groundwater recharge, and peak rate control. Benefits beyond stormwater management are numerous, including providing wildlife habitat and providing aesthetic value.

RBR can be applied in a variety of settings, including forested landscapes, agricultural areas, suburban/developing sites, and urban areas. Design guidelines are available for these various landscapes in the PA Stormwater Best Management Practices Manual.

BMP Profile	
Name	Riparian Buffer Restoration
Type	Structural
Grouping	Restoration BMP
Stormwater Management Benefits	♦ Water Quality ♦ Volume Reduction ♦ Groundwater Recharge ♦ Peak Rate Control
Potential Applications	♦ Residential ♦ Commercial ♦ Ultra Urban ♦ Industrial ♦ Retrofit

Portions of Nine Mile Run (City of Pittsburgh) were restored in 2006. The photo to the left shows a portion of the restored riparian buffer area in 2014. Stormwater management functions of riparian buffer restoration projects become increasingly effective as the restoration vegetation grows.

Key Considerations for Riparian Buffer Restoration

- Land owner permission and support is critical
- Buffer width of 100' is preferred; 35' is considered the minimum width
- Forested buffers are the most effective for stormwater management and supporting wildlife
- Establish a plan for short term and long term maintenance and monitoring
- Use native trees, shrubs, and plants
- Buffers can be restored along perennial (flowing year-round), intermittent (seasonal / flows part of year), and ephemeral (flows after precipitation events) streams
- In addition to buffers around streams and rivers, riparian buffers around lakes, ponds, and wetlands are also very important. They can be restored with guidelines available in the PA Stormwater BMP Manual.

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Floodplain Restoration

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Floodplain Restoration aims to restore a floodplain to conditions present prior to development. It is a system-based BMP that strives to mimic undisturbed conditions between stream system elements: groundwater, stream surface flow, soils, and root systems of vegetation. This BMP has the ability to address problems on many scales, from the site level to the watershed level.

BMP Profile	
Name	Floodplain Restoration
Type	Structural
Grouping	Restoration BMP
Stormwater Management Benefits	♦ Water Quality ♦ Peak Rate Control ♦ Volume Reduction ♦ Groundwater Recharge
Potential Applications	♦ Residential ♦ Commercial ♦ Industrial ♦ Highway/Road ♦ Ultra Urban

Stormwater management benefits of floodplain restoration include substantial water quality improvements, peak rate control, groundwater recharge, and volume reduction. Additional benefits of floodplain restoration include but are not limited to: increased aquatic and terrestrial habitats; increased wetland areas and native plants in floodplain; reduction of invasive plants; increased riparian areas; and, thermal cooling of stream baseflow.

Floodplain restoration is very effective for stormwater management, provides habitat, and much more. Shown above is Saucon Creek pre-restoration (left) and post-restoration (right) at locations in close proximity.

Key Considerations for Floodplain Restoration

- Effectively reduces flooding damage
- Greatly reduces or stops streambank and channel erosion
- Easily integrated into site planning process
- Maintenance and monitoring plans are important
- Must follow local, state, and federal floodplain requirements
- Floodplain restoration can be used as a BMP on-site or downstream from a development site
- Existing watershed conservation plans and inventories can help guide the selection of restoration areas
- Potential for incorporation of greenways and/or trails with floodplain restoration project

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photos: landstudies.com

Dry Extended Detention Basin

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Dry Extended Detention Basins (DEDBs) are detention basins which are designed to provide temporary stormwater storage and water quality benefits. The temporary storage of stormwater prevents downstream flooding. Water quality benefits are achieved through sediment settling out of the stormwater while held in the DEDB. DEDBs are often used in conjunction with other BMPs to maximize stormwater management benefits on site.

The DEDB is a design enhancement from the Dry Detention Basin, which has been popular since the 1970s. The extended detention of stormwater maximizes water quality benefits.

BMP Profile	
Name	Dry Extended Detention Basin
Type	Structural
Grouping	Runoff Quality and Peak Rate BMP
Stormwater Management Benefits	♦ Peak Rate Control ♦ Water Quality ♦ Volume Reduction
Potential Applications	♦ Residential ♦ Commercial ♦ Ultra Urban ♦ Industrial ♦ Retrofit ♦ Highway/Road

The primary stormwater management benefit of dry extended detention basins (left and right) is peak rate control. Water quality benefits can also be achieved when water is held for an extended period.

Fun Fact: Detention basins and retention basins are often confused. A detention basin is designed to temporarily hold water, thus *detaining* it for a specific design period. A retention basin is designed as to hold water until it eventually evaporates or infiltrates into the ground, thus *retaining* the water.

Key Considerations for Dry Extended Detention Basins

- Require periodic sediment removal
- Primary function is peak rate control, although some water quality and volume reduction benefits can be achieved
- Minimum DEDB width is 10 feet
- Minimum length-to-width ratio is 2:1
- Forebays are required and should be vegetated
- Diverse native plants, trees, and shrubs should be used for basin bottom
- Outlet should be designed to detain stormwater for extended periods

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photo Credits: unce.unr.edu & stormwaterpa.org

Landscape Restoration

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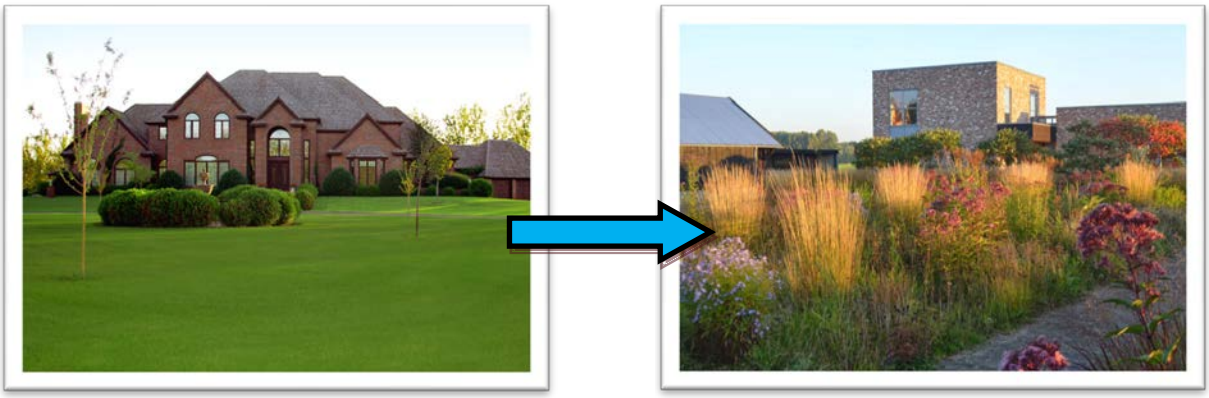
Landscape Restoration describes the use of sustainable landscaping practices in areas beyond riparian buffers and other specially protected areas. Landscape restoration includes the conversion of turf to meadow; the restoration of meadow areas; and, the reforestation of forested areas. Landscape restoration is exceptionally effective at improving water quality. Other stormwater management functions of landscape restoration can include groundwater recharge, volume reduction, and peak rate control. Landscape restoration can be used in a variety of land use settings, including residential, commercial, industrial, highway areas, and more.

BMP Profile	
Name	Landscape Restoration
Type	Structural
Grouping	Restoration BMP
Stormwater Management Benefits	♦ Water Quality ♦ Volume Reduction ♦ Groundwater Recharge ♦ Peak Rate Control
Potential Applications	♦ Residential ♦ Commercial ♦ Industrial ♦ Retrofit ♦ Highway/Road ♦ Ultra Urban



Converting turf grass into meadow is one type of landscape restoration. Landscape restoration is a stormwater management BMP that greatly increases water quality and can also provide peak rate control, volume reduction, and recharge groundwater. *Photos: 2.bp.blogspot.com & countrylawn.webs.com*

Key Considerations for Landscape Restoration

- Use native plants for restoration areas and landscaped areas
- Minimize or eliminate use of pesticides and fertilizers
- During development process, avoid soil compaction, establish erosion controls, and minimize disturbance
- Restored meadows and forests require minimal maintenance in comparison to formal landscape
- Stormwater management benefits increase as native plants and trees become more established
- Soil, geology, terrain, history of site, existing native and non-native vegetation, and sensitive habitats should be carefully considered during planning and planting
- Planting should not be done during drought

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Wet Pond / Retention Basin
STRUCTURAL STORMWATER BMPS

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Wet Ponds (WPs), also called Retention Basins, are stormwater basins that include a permanent pool of water as well as additional capacity for temporary storage of stormwater. They are effective at controlling peak stormwater rates and also provide water quality benefits. Beyond stormwater management, WPs can also provide aesthetic and wildlife benefits. WPs can be used in a variety of land use settings, including residential, commercial, ultra urban, industrial, retrofit, and highways/roads.

WPs can be designed as either online (hydrologically connected to existing waterway) or offline (not hydrologically connected to an existing waterway). They are often used in conjunction with other stormwater BMPs that mitigate sediment accumulation. Existing dry detention basins can be retrofitted into a WP in order to achieve additional benefits.

BMP Profile	
Name	Wet Pond / Retention Basin
Type	Structural
Grouping	Runoff Quality and Peak Rate BMP
Stormwater Management Benefits	♦ Peak Rate Control ♦ Water Quality ♦ Volume Reduction ♦ Groundwater Recharge
Potential Applications	♦ Residential ♦ Commercial ♦ Ultra Urban ♦ Industrial ♦ Retrofit ♦ Highway/Road

Wet ponds are relatively easy to construct and maintain. Their stormwater management functions include peak rate control and water quality improvement. *Photo: rwmwd.org*

Including a 25-foot vegetated buffer around the wet pond (above) can greatly enhance pond health, mediate water temperature, provide habitat, and aesthetics. *Photo: utahkoi.com*

Key Considerations for Wet Ponds

- Require sufficient source of inflow to maintain permanent pool and biological health
- Need high groundwater table
- Should include a forebay for sediment collection and removal
- Typically cover 1% - 3% of the total drainage area
- Vegetation is a key element of the functioning and health of a WP
- Should be surrounded by dense emergent wetland vegetation
- Can discharge warm water; must be used with caution near temperature-sensitive waterbodies
- Minimum length to width ratio 2:1

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

NON-STRUCTURAL BMP'S

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NON-STRUCTURAL BMPs

STORMWATER MANAGEMENT

Non-Structural Stormwater Best Management Practices (BMPs) focus on the prevention of stormwater generation, therefore effectively reducing runoff volume, and decreasing development costs while increasing property value and marketability.

Non-structural BMPs refer to the suite of options available to avoid and/or minimize damages associated with stormwater volumes and runoff from development. The most effective way to manage stormwater begins with the prevention of problems. It is much more efficient and cost-effective than attempting to correct problems after development has occurred. Utilizing non-structural BMPs is the most important step in managing runoff.

The Pennsylvania Best Management Practices Manual divides Non-Structural BMPs into the following groups:

- Protect Sensitive and Special Value Resources
- Cluster and Concentrate
- Minimize Disturbance and Minimize Maintenance
- Reduce Impervious Cover
- Disconnect / Distribute / Decentralize
- Source Control

Protect Sensitive and Special Value Resources

- Protect Sensitive / Special Value Features
- Protect / Conserve / Enhance Riparian Areas
- Protect / Utilize Natural Flow Pathways in Overall Stormwater Planning and Design

Cluster and Concentrate

- Cluster Uses at Each Site; Build on Smallest Area Possible
- Concentrate Uses Area-wide through Smart Growth Practices

Reduce Impervious Cover

- Reduce Street Imperviousness
- Reduce Parking Imperviousness

Disconnect / Distribute / Decentralize

- Rooftop Disconnection
- Disconnection from Storm Sewers

Protection of sensitive areas, such as this riparian area and steep slopes (top right) and forested wetland (bottom right) are examples of non-structural BMPs. *Photos : summitpost.org & Erin Kepple*

Minimize Disturbance and Minimize Maintenance

- Minimize Total Disturbed Area
- Minimize Soil Compaction in Disturbed Areas
- Re-Vegetate and Re-Forest Disturbed Areas Using Native Species

Source Control

- Streetsweeping

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Benefits of Non-Structural BMPs

There are environmental, economic, and social benefits associated with incorporating non-structural BMPs into site planning and development. These benefits may include but are not limited to:

Environmental

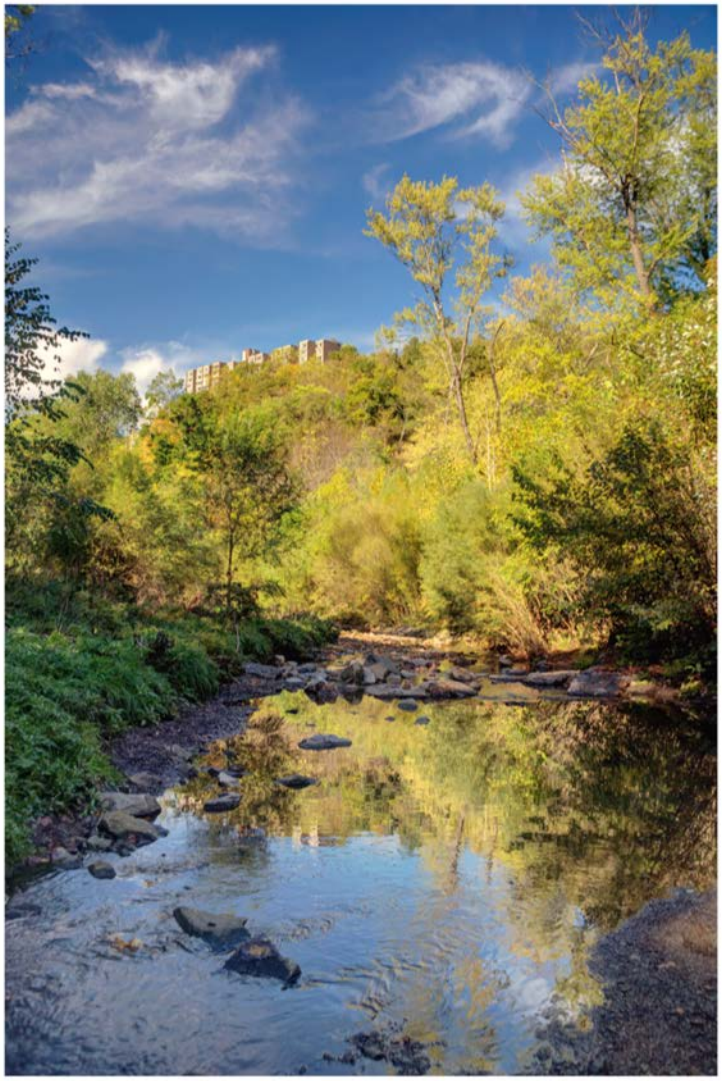
- Maintains a more natural and functional landscape
- Promotes harmony between development and existing natural systems
- Mitigates flooding through reductions of peak flows
- Retains wildlife habitat and supports biodiversity
- Reduces soil erosion
- Protects drinking water supply through groundwater recharge
- Encourages decentralized treatment, infiltration, and evaporation of precipitation, helping to prevent negative consequences associated with stormwater
- Protects water quality and aquatic habitat
- Protects and improves air quality

Economic

- Reduction in stormwater infrastructure costs
- Disconnection of impervious surfaces to infiltration areas decreases pressure on existing stormwater or combined sewer system
- May help to increase community marketability and property values
- Reduces development cost
- Rooftop disconnection and use of rain barrels can save money for landscape irrigation

Social

- Preserves open space
- Reduces heat island effect
- Provides recreational opportunities
- Improves neighborhood aesthetics
- Reduces noise pollution



Protecting, conserving, and enhancing riparian areas is an important non-structural BMP. Riparian areas are very effective at protecting and improving water quality. This non-structural BMP has many additional stormwater management benefits, including but not limited to: volume reduction, groundwater recharge, and peak rate control.

For More Information

To learn more about non-structural BMPs, stormwater management, and more, visit the following websites:

- http://water.epa.gov/infrastructure/greure/index.cfm
- http://spcwater.org/ed_bmp_specnonstruct.shtml
- http://www.stormwaterpa.org/non-structural-bmps.html
- http://www.bmpdatabase.org/
- http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305

This information was adapted from the Pennsylvania Stormwater Best Practices Manual.
Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

CLUSTER USES AT EACH SITE
NON-STRUCTURAL STORMWATER BMPS

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Cluster Uses at Each Site; Build on Smallest Area Possible (CUES/BSAP) is a design and development strategy which reduces site disturbance through clustering proposed uses together, building vertically, and moving uses closer together. CUES/BSAP is highly effective at preventing the generation of and managing stormwater. Stormwater management benefits of CUES/BSAP include water quality protection and improvement, runoff volume reduction, groundwater recharge, and peak rate control. Benefits beyond stormwater management include the preservation of open space, wildlife habitat, improved aesthetics, increased recreation opportunities, air quality, temperature moderation, and more.

BMP Profile	
Name	Cluster Uses at Each Site; Build on Smallest Area Possible
Type	Non-Structural
Grouping	Cluster and Concentrate
Stormwater Management Benefits	♦ Water Quality ♦ Volume Reduction ♦ Groundwater Recharge ♦ Peak Rate Control
Potential Applications	♦ Residential ♦ Commercial ♦ Retrofit ♦ Industrial ♦ Ultra Urban

Clustering uses and building on the smallest area possible (above right) generates significantly less stormwater quantity and quality challenges than conventional development (above left).

Key Considerations of Cluster Uses at Each Site; Build on Smallest Area Possible

- Links with other non-structural BMPs such as reducing imperviousness associated with parking and streets, utilizing natural flow pathways, and preserving sensitive and special value features
- Maximizes sense of place design qualities for residents
- Zoning and municipal ordinances may affect the ability to cluster
- Can reduce development costs
- Maintenance costs of undisturbed open space are typically lower
- Can reduce infrastructure maintenance costs associated with street sweeping, sewer, water, etc.

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photos: lakecountyil.gov

MINIMIZE DISTURBED AREA
NON-STRUCTURAL STORMWATER BMPS

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Minimize Disturbed Area – Grading (MDA-G) is a non-structural best management practice (BMP) that focuses on minimizing grading and site disturbance while maximizing soil restoration and the conservation of existing site vegetation. MDA-G includes practices such as modifying the alignment of roads and disturbance areas to minimize necessary grading. MDA-G can be applied to any site development; however, it is most effective when coupled with other non-structural BMPs such as the protection of sensitive (e.g., steep slopes) and special value features (e.g., riparian areas and wetlands). Stormwater management benefits of MDA-G include runoff volume reduction, groundwater recharge, peak rate control, and the protection and improvement of water quality.

BMP Profile	
Name	Minimize Disturbed Area - Grading
Type	Non-Structural
Grouping	Minimize Disturbance and Minimize Grading
Stormwater Management Benefits	♦ Peak Rate Control ♦ Volume Reduction ♦ Water Quality ♦ Groundwater Recharge
Potential Applications	♦ Residential ♦ Commercial ♦ Industrial ♦ Retrofit ♦ Ultra Urban ♦ Highway/Road

Areas that are disturbed during grading (above) are prone to soil erosion and compaction.

Protection of special value resources, such as woodlands (above), can help to prevent the generation of stormwater-related problems.

Key Considerations of Minimize Disturbed Area - Grading

- Minimize construction-traffic locations
- Minimize stockpiling and storage areas during construction
- Restore soil permeability (ability of soil to infiltrate water) through soil restoration efforts
- Does not generate additional maintenance needs
- Municipal zoning and ordinances can be used to encourage non-structural BMPs in site planning and development, including MDA-G
- Areas that have been compacted during development become semi-impervious, therefore, it is critical that disturbed soils are restored

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photos: raydartist.files.wordpress.com & o.static.wix.com

MINIMIZE IMPERVIOUS AREA

NON-STRUCTURAL STORMWATER BMPS

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Reducing Street Imperviousness (RSI) and **Reducing Parking Imperviousness (RPI)** are two non-structural best management practices (BMPs) that can be highly effective for stormwater management when incorporated into site design and development. RSI includes minimizing street widths and lengths; RPI includes reducing the impervious area associated with parking through practices such as designating overflow parking on an area that is pervious. Specific stormwater management functions of reducing impervious cover include runoff volume reduction, peak rate control, groundwater recharge, and improved water quality.

BMP Profile	
Name	Reduce Street Imperviousness and Reduce Parking Imperviousness
Type	Non-Structural
Grouping	Reduce Impervious Cover
Stormwater Management Benefits	♦ Peak Rate Control ♦ Groundwater Recharge ♦ Volume Reduction ♦ Water Quality
Potential Applications	♦ Residential ♦ Commercial ♦ Industrial

The PA Stormwater BMP Manual groups RSI and RPI into the overall category of *Reduce Impervious Cover.*

Reducing the impervious area associated with streets and parking can be done through a variety of innovative ways such as installing curb bump-outs (left) or using permeable pavers for parking areas.

Key Considerations for Reducing Street and Parking Imperviousness

- RSI can be achieved through alternative street layouts, on-street parking restrictions, minimizing radii of cul-de-sacs, and using permeable pavers
- Consult local fire code standards, construction codes, and ADA requirements
- Preventative stormwater management
- RPI can be achieved through narrowing traffic lanes, using slanted parking stalls, and utilizing pervious materials in the primary and/or overflow parking areas
- Reduction in paved area can significantly reduce costs
- RSI and RPI are components of Low Impact Development

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photo: phillywatersheds.org

PROTECT RIPARIAN AREAS

NON-STRUCTURAL STORMWATER BMPS

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Protect / Conserve / Enhance Riparian Areas (PCERA) is a non-structural best management practice (BMP) that preserves and enhances vegetated areas that are adjacent to streams and rivers. While this BMP focuses on stream and river riparian areas, it should be noted that riparian buffers around other waterbodies such as lakes, ponds, and wetlands are also very valuable. Riparian areas perform important stormwater and ecosystem functions. Stormwater management functions of riparian areas include water quality protection and improvement, runoff volume reduction, groundwater recharge, stream bank and channel stabilization, and some peak runoff rate control. Ecosystem functions include providing a food supply, habitat, and thermal protection for fish and other wildlife.

BMP Profile	
Name	Protect / Conserve / Enhance Riparian Areas
Type	Non-Structural
Grouping	Protect Sensitive and Special Value Resources
Stormwater Management Benefits	♦ Water Quality ♦ Volume Reduction ♦ Groundwater Recharge ♦ Peak Rate Control
Potential Applications	♦ Residential ♦ Commercial ♦ Industrial ♦ Retrofit ♦ Highway/Road

Preserving and enhancing riparian areas is one of the most effective ways to manage stormwater and protect Pennsylvania's waterways.

Key Considerations of Protect / Conserve / Enhance Riparian Areas

- Maximize buffer widths to maximize stormwater and ecosystem benefits
- In Pennsylvania, riparian areas are forested under undisturbed conditions
- Forested buffers are the most effective for stormwater management and wildlife habitat
- When enhancing a riparian area that has been degraded by past practices, native trees, shrubs and plants should be used
- Municipal zoning and ordinances can be used to establish riparian buffer requirements

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photo: forcechangecom.c.presscdn.com

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PROTECT SPECIAL VALUE FEATURES
NON-STRUCTURAL STORMWATER BMPS

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Protect Sensitive and Special Value Features (PSSVF) is a non-structural best management practice (BMP) that protects areas with stormwater impact sensitivities as well as areas that hold important stormwater functional values. Areas with stormwater impact sensitivities include but are not limited to: steep slopes, historical and natural resources, and adjoining properties. Areas with special stormwater functional values include but are not limited to: floodplains, riparian areas, wetlands, woodlands, and natural flow pathways. Stormwater management functions of PSSVF include runoff volume reduction, groundwater recharge, peak runoff rate control, and protection and improvement of water quality. Benefits beyond stormwater management can include protection of open space and wildlife habitat, as well as the potential to increase property values and improve aesthetics.

BMP Profile	
Name	Protect Sensitive and Special Value Features
Type	Non-Structural
Grouping	Protect Sensitive and Special Value Resources
Stormwater Management Benefits	♦ Peak Rate Control ♦ Volume Reduction ♦ Water Quality ♦ Groundwater Recharge
Potential Applications	♦ Residential ♦ Commercial ♦ Industrial ♦ Retrofit ♦ Highway/Road ♦ Ultra Urban

Protecting areas with special stormwater functional values, such as wetlands (above left), woodlands (above right), and riparian areas is a highly effective tool for stormwater management.

Key Considerations of Protecting Sensitive and Special Value Features

- Disturbing areas with important stormwater functional values, such as floodplains, may double or triple the amount of site runoff
- Sensitive and special value features should be identified and mapped to guide the site design process
- Clustering (building on the smallest area possible) is an effective way to achieve the stormwater benefits associated with PSSVF, as well as reduce construction costs associated with land clearing, grading, sidewalks, utility infrastructure, etc.

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photos: egtischler.files.wordpress.com & sourcewaterpa.org

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PROTECT NATURAL FLOW PATHWAYS

NON-STRUCTURAL STORMWATER BMPS

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Protect / Utilize Natural Flow Pathways in Overall Stormwater Planning and Design is a non-structural best management practice (BMP) that can minimize stormwater impacts associated with site development. Protecting natural drainage features such as swales, depressions, and ephemeral streams during site development can provide a variety of stormwater management functions, including reducing peak runoff, improving water quality, and reducing runoff volume. Benefits beyond stormwater management can include protection of open space and wildlife habitat, as well as the potential to increase property values and improve aesthetics.

BMP Profile	
Name	Protect / Utilize Natural Flow Pathways in Overall Stormwater Planning and Design
Type	Non-Structural
Grouping	Protect Sensitive and Special Value Resources
Stormwater Management Benefits	♦ Peak Rate Control ♦ Volume Reduction ♦ Water Quality
Potential Applications	♦ Residential ♦ Commercial ♦ Industrial ♦ Retrofit ♦ Highway/Road

Utilizing natural flow pathways for stormwater management can greatly reduce the need for engineered stormwater systems. Natural flow pathways typically require little maintenance as long as they are incorporated properly into a site design (e.g., protected from erosive stormwater flows).

Preserving and utilizing natural features such as depressions (left) and ephemeral streams (right) during site development can minimize stormwater impacts associated with site development.

Key Considerations for Protecting/Utilizing Natural Flow Pathways

- Natural drainage features should guide site design
- Planting native vegetation buffers around natural drainage features can enhance their stormwater management performance
- Natural flow pathways should be protected from disturbance (such as clearing or filling) during construction
- Performance of natural drainage features may be enhanced through a variety of ways, such as planting a native vegetation buffer to slow flow, improve water quality, and increase evapotranspiration; installing check dams to slow flow; and/or creating berms around the features to increase storage capacity

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photos: townhall.townofchapelhill.org & sciencenordic.com

MS4: PROGRAM OVERVIEW*

STORMWATER MANAGEMENT

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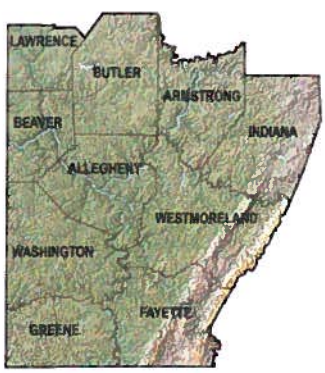

What is the MS4 Program?

Certain stormwater regulations associated with the Federal Clean Water Act are administered under the Municipal Separate Storm Sewer System (MS4) Program. In Pennsylvania, the MS4 program is managed by the Pennsylvania Department of Protection.

What is an MS4?

The Environmental Protection Agency defines an MS4 as "a conveyance or system of conveyances that is:

- Not part of a Publicly Owned Treatment Works (sewage treatment plant);
- Owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.;
- Designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.); and

  Not a combined sewer."

Who is an MS4?

MS4 regulations were rolled out in two phases:

- Phase I, issued in 1990, requires *medium* and *large* cities or certain counties with populations of 100,000 or more to obtain National Pollutant Discharge Elimination System (NPDES) permit coverage for their stormwater discharges.
- Phase II, issued in 1999, requires regulated small MS4s in urbanized areas, as well as some small MS4s outside the urbanized areas, to obtain NPDES permit coverage for their stormwater discharges.

What is required under the MS4 Program?

Operators of a small MS4 must obtain a NPDES permit and develop and implement a Stormwater Management Plan (SWMP) according to the details of their specific permit. Mandatory elements of the SWMP include six (6) Minimum Control Measures (MCMs). Each MCM has a number of associated Best Management Practices (BMPs) that explain in more detail how the MCM can be carried out.

The MCMs are:

1. Public Education and Outreach on Stormwater Impacts
2. Public Involvement / Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Stormwater Runoff Control
5. Post-Construction Stormwater Management in New and Re-Development Activities
6. Pollution Prevention / Good Housekeeping for Municipal Operations

MS4s in the SPC Region

As of December 2014, there were 207 municipalities within the 10-county SPC Region that hold an MS4 permit.

MS4 PROGRAM OVERVIEW

PUBLIC EDUCATION & OUTREACH

Small MS4 Program: Minimum Control Measure #1

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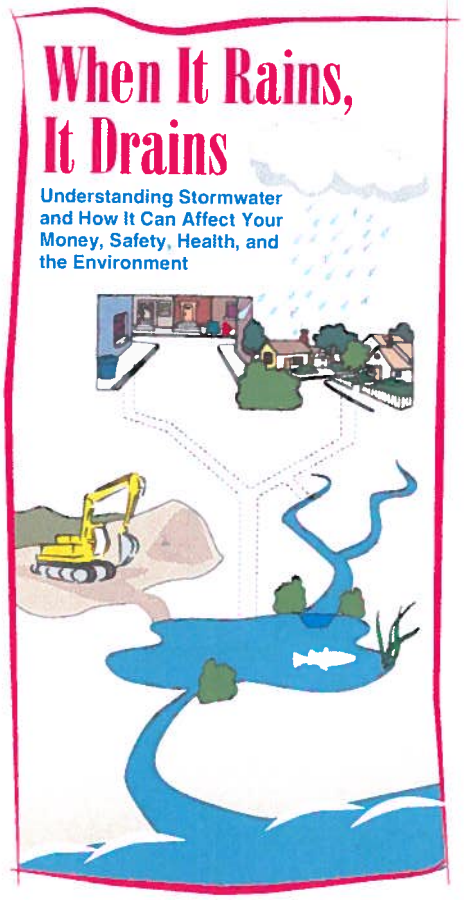
Public Education and Outreach is one of the six (6) Minimum Control Measures (MCMs) required of small MS4s under the MS4 program*. The goal of the Public Education and Outreach MCM is to build greater support for the stormwater management program (SWMP), increase compliance, and ultimately increase environmental awareness amongst members of the community.

Federal EPA Regulations specifically require the following under this MCM:
"Implement a public education program to distribute educational materials to the community or conduct equivalent outreach activities about the impacts of stormwater discharges on water bodies and the steps that the public can take to reduce pollutants in stormwater runoff."

There are four (4) Best Management Practices (BMPs) required under this MCM. Keep reading to learn more about their requirements, resources to help meet these requirements, and more.

BMP #1 – Develop, implement, and maintain a Public Education and Outreach program. The plan should include goals, strategies, a timeline, and provisions for reviewing and updating annually. This plan can be relatively simple and is an easy way to ensure that you are meeting all the requirements of the Public Education and Outreach MCM. EPA's "Getting in Step, A Guide for Conducting Watershed Outreach Campaigns" (EPA 841-B-03-002, December 2003) is an exceptionally helpful resource for meeting this BMP requirement.

One of the goals of the Public Education and Outreach MCM is to protect our waterways by increasing environmental awareness amongst the community. *Photo: planning.co.wayne.pa.us*



Many sources, such as the EPA and PA DEP have a variety of materials and templates available on their websites for use in MCM #1. This pamphlet is available under "MS4 Resources" at www.portal.state.pa.us.

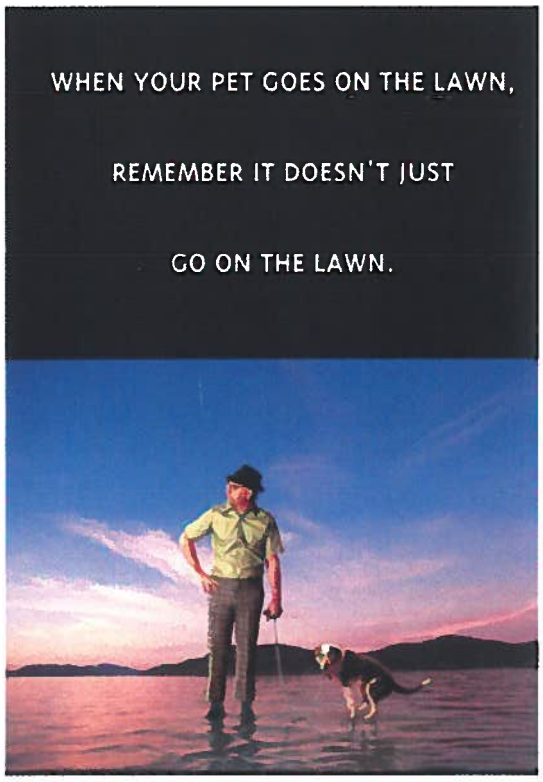
(OVER)

BMP #2 – Develop and maintain lists of target audience groups that are present within the areas served by your small Ms4. Target audiences typically include residents, businesses, developers, schools, and municipal employees. Remember to modify this list based on the characteristics of your municipality. For example, be sure to include agricultural entities if these exist within your municipality.

BMP #3 – Annually publish at least one issue of a newsletter, a pamphlet, a flyer, or a website that includes general stormwater educational information, a general description of your SWMP, and/or information about your stormwater management activities. One of the following must be done: 1) Publish and distribute in printed form a newsletter, pamphlet, or flyer containing information consistent with this BMP; or 2) Publish educational and informational items including links to DEP's and EPA's stormwater websites on your municipal website.

BMP #4 – Distribute educational materials and/or information to the target audiences (identified in BMP #2) using a variety of distribution methods, including but not limited to: displays, posters, signs, pamphlets, booklets, brochures, radio, local cable TV, newspaper articles, posters, bill stuffers, presentations, conferences, meetings, fact sheets, giveaways, or storm drain stenciling. All permittees shall utilize at least two (2) of these methods to conduct outreach a year.

Many people don't realize that stormwater isn't treated before it ends up in our local waterways. Storm drain stenciling (above) is a great way to raise awareness that storm drains are connected to waterways. It is also a one of the ways to meet BMP #4 required under the Public Education and Outreach MCM. *Photo: gannett-cdn.com*



Outreach efforts, such as the poster to the right, can help your target audiences understand their role in stormwater management, pollution prevention, and keeping our waterways clean. These efforts can help you meet requirements under BMP #4.
Photo: upperdublin.net

Developers are often on the list of target audience groups that is required under BMP #2. Educating developers and their contractors on the importance of and regulatory requirements associated with stormwater management can have a big impact.
Photo: bluewaterbaltimore.org

For more information, please visit:

- www.spcwater.org
- http://www.portal.state.pa.us/portal/server.pt/community/municipal_stormwater/21380/ms4_resources/1489647
- http://cfpub.epa.gov/npstbx/index.html
- http://water.epa.gov/polwaste/npdes/stormwater/Municipal-Separate-Storm-Sewer-System-MS4-Main-Page.cfmPAG

*Please note that this information is not intended to replace regulatory requirements. Actual individual and/or general permits issued by PADEP should be followed to ensure that MS4 regulatory requirements are met.
This information was adapted from Appendix A of PADEP's Stormwater Management Program & EPA's Stormwater Fact Sheet Series).

PUBLIC PARTICIPATION / INVOLVEMENT

Small MS4 Program: Minimum Control Measure #2

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Public Participation/Involvement is one of the six (6) Minimum Control Measures (MCMs) required under the MS4 program*. The goal of the Public Participation/Involvement MCM is to facilitate successful implementation of your Stormwater Management Program (SWMP) through a number of means, including: garnering broad public support; utilizing expertise and local knowledge; shortening implementation schedules; and building partnerships with other community and government programs.

There are three (3) Best Management Practices (BMPs) required under this MCM.

BMP #1 – Develop, implement, and maintain a Public Involvement and Participation Program (PIPP) which describes various types of possible participation activities and describes methods of encouraging the public's involvement and soliciting of public's input. The PIPP should be developed the first year of permit coverage and re-evaluated annually. PIPP should include, but not be limited to: 1) opportunities for the public to participate in your SWMP; 2) regular communication methods to organizations such as watershed groups, environmental advisory committees, etc.; and 3) making MS4 reports available to the public.

BMP #2 – Prior to the adoption of any ordinance required by the permit, provide adequate public notice and opportunities for public review, input, and feedback. Public comments that are received should be documented and responded to.

Getting the public involved through river and stream cleanups (above and below) is a great way to achieve multiple water quality goals, including: educating and engaging the public, removing trash from local waterways, and meeting some requirements of the Public Participation/Involvement MCM.
Photos: popcitymedia.com & wvwa.org

BMP #3 – Regularly solicit public involvement and participation from the target audience groups. This should include an effort to solicit public reporting of suspected illicit discharges. Assist the public in their efforts to help implement your SWMP. Conduct public meetings to discuss the ongoing implementation of your SWMP.

*Please note that this information is not intended to replace regulatory requirements. Actual individual and/or general permits issued by PADEP should be followed to ensure that MS4 regulatory requirements are met. This information was adapted from Appendix A of PADEP's Stormwater Management Program & EPA's Stormwater Fact Sheet Series).

ILLICIT DISCHARGE DETECTION AND ELIMINATION

Small MS4 Program: Minimum Control Measure #3

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Illicit Discharge Detection and Elimination is one of the six (6) Minimum Control Measures (MCMs) required under the small MS4 program*. The goal of the Illicit Discharge Detection and Elimination (IDD&E) is to reduce pollution to our waterways through the removal of non-stormwater contributions to the storm sewer system. Common sources of illicit discharges include sanitary wastewater, improper disposal of auto and household toxins, and car wash wastewaters.

There are six (6) Best Management Practices (BMPs) required under this MCM.

BMP #1 – Develop and implement a written program for the detection, elimination, and prevention of illicit discharges into your regulated small MS4. Your program should include dry weather field screening of outfalls for non-stormwater flows, and sampling of dry weather discharges for selected chemical and biological parameters. Test results should be used as indicators of possible discharge sources. The program must include the following:

- Procedures for identifying priority areas
- Procedures for screening outfalls in priority areas during varying seasonal and meteorological conditions
- Procedures for identifying the source of an illicit discharge when a contaminated flow is detected
- Procedures of eliminating an illicit discharge
- Procedures for assessing the potential for illicit discharges caused by the interaction of sewage disposal systems
- Mechanisms for gaining access to private property to inspect outfalls
- Procedures for evaluation, program documentation, and assessment

Why are illicit (illegal) discharges important?

Illicit discharges make their way to our waterways untreated. Illicit discharges such as paint or oil dumped into storm drains, septic effluent, car wash wastewater, and wastewater piping connected illegally can cause serious pollution issues. These illicit discharges can carry a variety of pollutants, such as:

- Heavy metals
- Bacteria
- Viruses
- Nutrients
- Oil and grease
- Solvents
- Toxins

MCM #3 under the MS4 program requires regular screening of stormwater outfalls to detect any illicit discharges. *Photo: water.epa.gov*

(OVER)

BMP #2 – Develop and maintain a map of your regulated small MS4. The map must also show the location of all outfalls and the locations and names of all surface waters of the Commonwealth that receive discharges from those outfalls. Surface waters that should be included are creeks, streams, ponds, lakes, basins, swales, and channels that receive stormwater discharges. Outfalls should have unique names to assist in record-keeping.

BMP #3 – In conjunction with the map created under BMP #2, new permittees should map the entire storm sewer collection system including roads, inlets, piping, swales, catch basins, channels, basin, and any other features of the permittees storm sewer system including municipal boundaries and watershed boundaries. New permittees should develop this map by the completion of the fourth year of the permit. Renewal permittees should update and maintain the map annually.

BMP #4 – Following the IDD&E program created under BMP #1, the permittee shall conduct outfall field screening, identify the source of any illicit discharges, and remove or correct any illicit discharges using the procedures outlined under BMP #1.

BMP #5 – Enact a stormwater ordinance to implement and enforce a stormwater management program that includes the prohibition of non-stormwater discharged to the regulated MS4. Ordinances associated with an Act 167 Stormwater Management Plan that was approved by PA DEP in 2005 or later meet the requirements of BMP #5. You can also meet the ordinance requirement by utilizing PA DEP's model MS4 Stormwater Management Ordinance or by developing an ordinance that meets all applicable requirements outlined in the MS4 Stormwater Management Ordinance Checklist.

BMP #6 – Provide educational outreach to public employees, business owners and employees, property owners, the general public, and elected officials about the program to detect and eliminate illicit discharges. Educational outreach should be conducted to the target audiences by the methods outlined in MCM #1, Public Education/Outreach. Programs should be developed to encourage and facilitate public reporting of illicit discharges, illegal dumping, or outfall pollution.

Some common sources of illicit discharges include fryer oil from restaurants (above), carwash wastewater (below), and septic tank effluent. *Photos: clemson.edu & keepitcleanpartnership.org*

Unusual colors, odors, or flow volumes may be indicators of illicit discharges.
Photos: facilities.vt.edu & pwcgov.org

*Please note that this information is not intended to replace regulatory requirements. Actual individual and/or general permits issued by PADEP should be followed to ensure that MS4 regulatory requirements are met.
This information was adapted from Appendix A of PADEP's Stormwater Management Program & EPA's Stormwater Fact Sheet Series).

CONSTRUCTION SITE RUNOFF CONTROL

Small MS4 Program: Minimum Control Measure #4

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Construction Site Runoff Control is one of the 6 minimum control measures (MCMs) required under the small MS4 program*. The goal of the Construction Site Runoff Control MCM is to protect our waterways from stormwater-related pollution that can result from construction activities. Four (4) best management practices (BMPs) are required under this MCM.

Under Chapter 102, Erosion and Sediment (E&S) Control, County Conservation Districts and/or DEP must issue a permit for earth disturbance activities greater than or equal to 1 acre. If the permittee chooses to rely on DEP's statewide program for issuing NPDES permits for stormwater discharges associated with construction activities, they satisfy all requirements under this MCM. It is a good practice for the permittee to have a written agreement, such as a Memorandum of Understanding (MOU), with their County Conservation District which clearly defines roles in the permitting, inspection, and enforcement of land development activities.

BMP #1 – Develop your program consisting of all procedures necessary to comply with the requirements of this MCM. The program must include:

- Construction stormwater permitting
- Construction inspection
- Enforcement of installation and maintenance of E&S controls

The program should be developed within the first year of permit coverage and reviewed/updated annually. A simple tracking system for active construction sites, inspections, enforcement actions, and other activities related to this MCM can simplify the reporting process while ensuring that all applicable activities are being managed.

Pollutants Commonly Associated with Construction Sites

- Sediment
- Trash
- Sanitary Waste
- Phosphorus
- Nitrogen
- Pesticides
- Oil and Grease
- Concrete Truck Washout
- Construction Chemicals

Sediment is the primary pollutant of concern associated with construction site stormwater runoff. Sediment-polluted stormwater can cause physical, chemical, and biological damage to waterways. Proper installation and maintenance of erosion and sediment control best management practices is essential to protect our waterways.

Photos: catawbariverkeeper.org

(OVER)

BMP #2 – Enact, implement, and enforce an ordinance to require the implementation of erosion and sediment control BMPs, as well as sanctions to ensure compliance. Permittees should adopt the ordinance within the first year of permit coverage.

BMP #3 – Develop and implement requirements for construction site operators to control waste at the construction site that may cause adverse impacts to water quality. Sediment is the primary pollutant of concern for MCM #4; however, other pollutants associated with construction are also important and should be addressed under this BMP. Pollutants may include but are not limited to: discarded building materials, washout from concrete trucks, chemicals, litter, and sanitary waste. Permittees should establish requirements within the first year. The goal of these requirements should be communicated to construction site operators during pre-construction meetings. Permittees must keep detailed records of site inspections, findings, and any resulting actions.

BMP #4 – Develop and implement procedures for the receipt and consideration of public inquiries, concerns, and information submitted by the public regarding local construction activities. The permittee should demonstrate acknowledgement and consideration of the information submitted. Permittees should establish and implement a tracking system to keep a record of any submitted public information as well as responses, actions, and results. This BMP should be implemented during each year of permit coverage. This BMP closely aligns with and supports requirements associated with MCM #2, Public Involvement and Participation.

Sediment Pollution in Our Waterways

Sediment pollution is, by volume, the greatest contributor to pollution in Pennsylvania waterways. Nationally, it is the second leading cause of pollution in impaired waterways (second only to bacteria). Sediment can cause physical, biological, and chemical harm to streams, lakes, wetlands, and rivers. According to the EPA, sediment runoff from construction sites can be 1,000 to 2,000 times greater than that of forested land, and 10 to 20 times greater than that of agricultural land. The installation and maintenance of construction site erosion and sediment controls is critical for the protection of our waterways.

Polluted runoff from construction sites eventually makes its way to our waterways untreated (left). Sediment is the most common pollutant associated with construction sites. Impacts of uncontrolled sediment runoff include but are not limited to: ecosystem damage, storm system infrastructure damage, and increased costs of producing drinking water.
Photo: blog.epa.gov

Elements of An Effective Stormwater Site Plan

A stormwater site plan is one of many essential elements necessary to minimize stormwater pollution from construction sites. Ten (10) key elements of an effective stormwater site plan include:

1. Minimize clearing and grading
2. Protect waterways
3. Phase construction to limit soil exposure
4. Immediately stabilize exposed soils
5. Protect steep slopes and cuts
6. Install perimeter controls to filter sediments
7. Employ advanced sediment settling controls
8. Certify and train contractors on stormwater site plan implementation
9. Control waste at the construction site
10. Inspect and maintain BMPs

Source: http://water.epa.gov/polwaste/npdes/swbmp/Construction-Phase-Plan-Review.cfm

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This information was adapted from Appendix A of PADEP's Stormwater Management Program & EPA's Stormwater Fact Sheet Series).

POST-CONSTRUCTION RUNOFF CONTROL

Small MS4 Program: Minimum Control Measure #5

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Post-Construction Runoff Control is one of the six (6) Minimum Control Measures (MCM) required under the Small MS4 program*. The goal of the Post-Construction Runoff Control MCM is to avoid increased stormwater runoff problems and increased non-point source pollution that often accompanies the development of land and associated increase in impervious surfaces. Six (6) best management practices (BMPs) are required under this MCM.

Under Chapter 102, Erosion and Sediment (E&S) Control, County Conservation Districts and/or the Pennsylvania Department of Environmental Protection (DEP) must issue a permit for earth disturbance activities greater than or equal to 1 acre. If the permittee chooses to rely on DEP's statewide program for issuing NPDES permits for stormwater discharges associated with construction activities, they satisfy all requirements under BMPs 1-3 of this MCM. It is a good practice for permittees to have a written agreement, such as a Memorandum of Understanding (MOU), with their County Conservation District which clearly defines roles in the permitting, inspection, and enforcement of land development activities.

BMP #1 – Develop a written procedure that describes how the permittee will address all required components of this plan. Guidance can be found in the Pennsylvania Stormwater Best Management Practices Manual, which can be accessed at www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305. The plan should be developed within the first year of permit coverage and be annually reviewed and updated where necessary. Minimum requirements of the plan include:

- Minimum requirements for use of structural and/or non-structural BMPs in plans for development and redevelopment
- Criteria for selecting and standards for sizing stormwater BMPs
- Implementation of an inspection program to ensure that BMPs are properly installed

BMP #2 – Require the implementation of a combination of structural and/or non-structural BMPs that are appropriate to the local community, that minimize water quality impacts, and that are designed to maintain pre-development runoff conditions. The ordinance requirements under BMP #4 of this MCM (see next page) will satisfy this requirement. All qualifying development or redevelopment projects should be reviewed to ensure that their post-construction stormwater management plans and selected BMPs conform to the applicable requirements. A tracking system should be used to record qualifying projects and their BMPs.

Preserving and restoring riparian buffers (right) are best management practices that can effectively manage stormwater in post-construction situations.

(OVER)

BMP #3 – Ensure that controls are installed that will prevent or minimize water quality impacts. Qualifying development or redevelopment projects should be inspected during construction to ensure proper installation of the approved post-construction stormwater management (PCSM) BMPs. A tracking system should be used to track inspections and results. Permittees that do not rely on Chapter 102 as a QLP to fulfill these requirements must summarize construction inspections and results in periodic reports.

BMP #4 – The permittee should enact, implement, and enforce an ordinance or other regulatory mechanism to address post-construction stormwater runoff from new development and redevelopment projects, as well as sanctions and penalties associated with non-compliance, to the extent allowable under state law. An ordinance must be adopted within the first year.

BMP #5 – Develop and implement measures to encourage and expand the use of Low Impact Development (LID) in new and redevelopment. Measures also should be included to encourage retrofitting LID into existing development. DEP's Pennsylvania Stormwater Best Management Practices Manual provides guidance on implementing LID practices. An inventory of development and redevelopment projects that discharge stormwater to your regulated MS4 must be kept. In this inventory, note which projects that have been authorized for construction since 3/10/2003 that incorporated LID practices (and specifics on what LID practices were used). Additionally, ordinances should be enacted that are consistent with LID practices. Sections of existing ordinances that conflict with LID practices should be repealed.

BMP #6 – Ensure adequate operation and maintenance of all post-construction stormwater management BMPs installed at all qualifying development or redevelopment projects (including those owned or operated by the permittee). Within the first year of permit coverage, permittees should develop and implement a written inspection program to ensure that BMPs are properly operated and maintained. This program should be reviewed annually and updated accordingly. An inventory of PCSM BMPs should be developed and updated regularly. The inventory should include all PCSM BMPs installed since 3/10/2003 that discharge to your regulated MS4. Information required in inventory includes but is not limited to: owner, location, type of BMP, installation date, required maintenance, inspection activities, and an assessment by the permittee to determine if proper inspection and maintenance of BMP has been taking place.

Bioswales (above) are a structural BMP that can help mitigate the effects of stormwater once a site has been developed.

What is a Post Construction Stormwater BMP (PCSM BMP)?

PCSM BMPs are practices that are put in place to prevent and mitigate stormwater runoff after the site is developed. PCM BMPs include non-structural and structural BMPs. Non-structural BMPs include practices that aim to avoid and/or minimize damages associated with stormwater volumes and runoff from development. Structural BMPs are engineered systems that are designed to mitigate the impacts of stormwater.

Examples of Non-Structural BMPs

- Minimize Impervious Area
- Protect Special Value Features (e.g., Floodplains, Wetlands, Riparian areas, etc.)
- Re-vegetate Disturbed Areas with Native Vegetation

Examples of Structural BMPs

- Rain Gardens
- Constructed Wetlands
- Riparian Buffer Restoration

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POLLUTION PREVENTION / GOOD HOUSEKEEPING

Small MS4 Program: Minimum Control Measure #6

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Pollution Prevention/Good Housekeeping is one of the six (6) Minimum Control Measures (MCMs) required under the small MS4 program*. The goal of the Pollution Prevention/Good Housekeeping MCM is to help ensure a reduction in the amount and type of pollution that is generated from municipally-owned and maintained facilities (e.g., streets, parking lots, and vehicle maintenance areas) and eventually discharged into local waterways. An additional goal of MCM #6 is to reduce the amount of pollution that is discharged to waterways from poor maintenance of storm sewer systems.

There are three (3) best management practices (BMPs) required under this MCM.

BMP #1 – Identify and document all facilities and activities that are owned or operated by the permittee and have the potential for generating stormwater runoff to the small regulated MS4. This includes activities conducted by contractors for the permittee.

Municipal Activities may include the following:

- Street sweeping
- Snow removal/deicing
- Inlet/outlet cleaning
- Lawn/grounds care
- Storm system maintenance, inspection and repair
- Park and open space maintenance
- Municipal building maintenance
- New construction and land disturbances
- Right of Way maintenance
- Vehicle maintenance, operation, fueling and washing
- Material transfer operations, including leaf/yard debris pickup and disposal procedures

Municipal Facilities may include the following:

- Streets, roads, highways and parking lots
- Maintenance and storage yards
- Waste transfer stations
- Parks
- Fleet or maintenance shops
- Wastewater treatment plants
- Stormwater conveyances (open and closed)
- Riparian buffers
- Stormwater storage or treatment units (e.g., basins, constructed wetlands, etc.)

Potential Pollutants Associated with Municipal Facilities and Municipal Activities

Pollutants from municipal facilities and activities can eventually make their way to our local waterways through the stormwater conveyance and collection system. These pollutants can cause physical, chemical, and biological harm to our lakes, streams, rivers, and wetlands. Pollutants associated with municipal facilities and activities may include but are not limited to:

- Sediment
- Nutrients
- Trash
- Metals
- Bacteria
- Oil
- Toxic Materials
- Organic Materials
- Pesticides
- Grease

(OVER)

BMP #2 – Develop, implement, and maintain a written operation and maintenance (O&M) program for all municipal operations and facilities that could contribute to the discharge of pollutants from the regulated small MS4s, as identified under BMP #1. This program should address municipally-owned stormwater collection or conveyance systems, but could include other areas (as identified in BMP #1). The O&M plan should stress pollution prevention and good housekeeping measures, contain site-specific information, and address the following areas:

- Management practices, policies, and procedures to reduce or prevent the discharge of pollutants to your small regulated MS4. Consider eliminating maintenance-area floor drains.
- Maintenance activities, schedules, and inspection procedures to reduce the potential for pollutants to reach your small regulated MS4.
- Controls for reducing or eliminating the discharge of pollutants from streets, roads, highways, municipal parking lots, maintenance and storage yards, waste transfer stations, fleet or maintenance shops with outdoor storage areas, and salt/sand (anti-skid) storage locations and snow disposal areas.
- Procedures for the proper disposal of waste removed from your regulated smalls MS4s and your municipal operations, including dredge spoil, accumulated sediments, trash, household hazardous waste, used motor oil, and other debris.

Many municipal facilities and activities have the potential to negatively impact water quality. Some examples include improper storage of chemicals (above); allowing vehicle washing effluent to enter storm sewer system (below); improper disposal of hazardous waste; and, improper disposal of debris collected during street sweeping.
Photos: waterresources.saccounty.net & arlnow.com

BMP #3 – Develop and implement an employee training program that addresses appropriate topics to further the goal of preventing or reducing the discharge of pollutants from municipal operations to your regulated small MS4s. The program may be developed and implemented using any guidance and training materials that are available from federal, state, or local agencies, or other organizations. Any municipal employee or contractor shall receive training; this may include:

- Public Works Staff
- Building/Zoning/Code Enforcement Staff
- Engineering Staff (On-Site and Contracted)
- Administrative Staff
- Elected Officials
- Police and Fire Responders
- Volunteers
- Contracted Personnel

Training should cover all relevant parts of the stormwater management program that could affect municipal operations, such as illicit discharge detection and elimination, construction sites, and ordinance requirements.

Application and storage protocols for commonly-used materials such as road salt (above), herbicides (below), pesticides and fertilizers can help protect water quality while also reducing costs. *Photos: 27east.com & npic.orst.edu*

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QUICK RESOURCE GUIDE TO THE MS4 PROGRAM

Quick Resource Guide to the MS4 Program

SOUTHWESTERN PENNSYLVANIA COMMISSION
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DEPARTMENT OF ENVIRONMENTAL PROTECTION

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Cover photo credits: Etna Borough, Southwestern Pennsylvania Commission, and the Westmoreland Conservation District

How to Use This Guide

This guide was written for municipalities that own and operate **Municipal Separate Storm Sewer Systems** (**MS4s)**. Stormwater regulations associated with the Federal Clean Water Act (CWA) are administered under the MS4 Program by the Environmental Protection Agency (EPA). In Pennsylvania, the MS4 program is managed by the Pennsylvania Department of Protection (PADEP). The PADEP General Permit PAG-13 provides a streamlined process to meet the state and federal stormwater requirements. Operators of a regulated MS4 must obtain a National Pollutant Discharge Elimination System (NPDES) permit and develop and implement a stormwater management plan (SWMP) according to the details of their specific permit. Mandatory elements of the SWMP include six (6) Minimum Control Measures (MCMs); each MCM has a number of associated BMPs.

In this guide, we begin with the history and background of MS4s and regulations. Then we provide an overview of the six (6) **Minimum Control Measures (MCMs)** of the **NPDES MS4 permit** and their associated **Best Management Practices (BMPs)**. Examples provided of BMPs are not meant to be the only available solution – there are many other BMPs, and we have listed a few examples from our region within the MCM section and in the Resources section.

This booklet will provide an overview on the following topics:

1. Keys to developing your SWMP
2. Record keeping strategies for each MCM
3. What to expect during an inspection
4. Resource directory of essential contacts

What is an MS4?

MS4s are conveyances or systems of conveyances including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains that are owned or operated by a public entity, are designed or used for collecting or conveying stormwater, and are not a combined sewer or part of a publicly-owned treatment works.

A municipality is bound by US Environmental Protection Agency (EPA) regulations for an MS4 when all or a portion of a municipality lies within an urbanized area (UA), as determined by the US Census Bureau (see glossary).

History and Background

Figure 1: A polluted waterway (Source: wwf.panda.org)

Why Do We Regulate Stormwater?

The MS4 program requires the MS4 owner/operator to implement a series of programs to reduce the discharge of pollutants from the storm sewer system to the maximum extent practicable in a manner that protects water quality. The Pennsylvania Code Chapter 93 sets the water quality standards for surface waters of the Commonwealth and these standards seek to protect the waters for aquatic life, water supply, recreation and fish consumption, and areas that need special protection. The MS4 program focuses on managing discharges into the waters of the Commonwealth by educating and implementing proper control measures and best management practices (BMPs).

Total maximum daily loads (TMDLs) are in place to reduce pollutants in impaired waterways so that they meet water quality standards. TMDLs focus on identifying sources of impairment and implementing corrective work based on the best available data and information. Additional monitoring and data collection will occur to track progress and better characterize pollutant sources, loadings and the effectiveness of control measures and BMPs.

See the DEP's municipal stormwater NPDES permits page at http://www.dep.pa.gov/Pages/default.aspx#NPDES for more information.

Stormwater Management Program

Each MS4 permittee must create a **Stormwater Management Program (SWMP)** to minimize the impacts from runoff. A SWMP must be completed to comply with the NPDES MS4 General Permit. The SWMP requires municipalities to focus on six Minimum Control Measures (MCMs). In the permit application, the permittee indicates whether the BMPs and Measurable Goals under each of the six MCMs follow Appendix A in the permit, or whether alternative BMPs and Measurable Goals for any of the MCMs are provided. The permittee is required to satisfy all requirements of the Stormwater Management Program as a condition of the permit during the term of your permit.

To the right is an outline of a typical SWMP, which will give you an idea of what should be included in this plan. All plans should be reviewed/updated annually.

An introduction may be written to tie the document together that provides background information, the goal of the plan, and how they plan to assess the progress/value of plan implementation.

The introduction could include, but is not limited to: land area total, population, number of acres of urbanized area for the permit, a breakdown of the residential, industrial, commercial and undeveloped land, where the stormwater discharges go, impaired waterways, any TMDL pollutants, and/or how to assess the effectiveness of the SWMP.

Each surface water in the state has designated use(s) to be protected. Each designated use has water quality standards and criteria assigned to protect the designated use(s). Water quality standards for all Pennsylvania surface waters can be found in Pa Code: Chapter 93 - Water Quality Standards and Chapter 16 - Water Quality Toxics Management Strategy.

Surface waters that do not meet water quality standards for the designated uses are commonly called “impaired” and are placed on the federal Clean Water Act (CWA) Section 303(d) List. Once on the 303 (d) List, a TMDL will be developed to address the pollutant(s) of concern.

Identifying impairments allows you to focus your program efforts on improving water quality prior to a TMDL being issued. Water quality impairments and/or TMDLs within the MS4 permittee boundaries need to be incorporated into the plan and MS4 program.

It is anticipated that the new PAG13 will be released March 2018, so check the DEP Program Updates section often for any changes or additional guidance.

Sample SWMP Outline

- Introduction
- MCM 1: Public Education and Outreach
  - BMPs 1-4
    - Measurable Goals
- MCM 2: Public Involvement and Participation
  - BMPs 1-3
    - Measurable Goals
- MCM 3: Illicit Discharges Controls
  - BMPs 1-6
    - Measurable Goals
- MCM 4: Construction Site Runoff Control
  - BMPs 1-4
    - Measurable Goals
- MCM 5: Post-Construction Stormwater Management
  - BMPs 1-6
    - Measurable Goals
- MCM 6: Pollution Prevention and Good Housekeeping
  - BMPs 1-3
    - Measurable Goals
- Outfall Inventory Checklist
- TMDL Plan (if applicable)

Refer to Sample Appendix A in your individual permit for more information regarding the Stormwater Management Program.

One common issue found in audits is that the SWMP does not identify pollutants of concern, “impairments” or address TMDLs.

For more information about the 303(d) List and TMDLs:

303(d) List
http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/WaterQuality/Pages/Integrated-Water-Quality-Report-2014.aspx#.V0btMXLD9aQ

TMDLs
http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/default.aspx

Minimum Control Measures (MCMs)

As part of the terms of your permit, you must include the six MCMs in your SWMP in order to meet the conditions of your NPDES permit.

MCM 1: Public Education and Outreach
Distributing educational materials and performing outreach to inform the public about the impacts polluted stormwater runoff discharges can have on water quality.
MCM 2: Public Participation/Involvement
Providing opportunities for the public to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging representatives on a stormwater management panel.
MCM 3: Illicit Discharge Detection and Elimination
Developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system (includes developing a system map and informing the community about hazards associated with illegal discharges and improper disposal of waste).
MCM 4: Construction Site Runoff Control
Developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb 1 or more acres of land (controls could include silt fences and temporary stormwater detention ponds).
MCM 5: Post-Construction Runoff Control
Developing, implementing, and enforcing a program to address discharges of post-construction stormwater runoff from new development and redevelopment areas. Applicable controls could include preventative actions such as protecting sensitive areas (e.g., wetlands) or the use of structural BMPs such as grassed swales or porous pavement.
MCM 6: Pollution Prevention/Good Housekeeping
Developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques (e.g., regular street sweeping, reduction in the use of pesticides or street salt, or frequent catch-basin cleaning).

Implementation Options

There are a number of implementation options for regulated MS4 operators. These include sharing responsibility for program development with a nearby regulated MS4 operator; taking advantage of existing local or state programs; or participating in the implementation of an existing MS4's stormwater program as a co-permittee. These options are intended to promote a regional approach to stormwater management coordinated on a watershed basis.

Program Evaluation and Assessment

Permittees need to evaluate the effectiveness of their chosen BMPs to determine whether the BMPs are reducing the discharge of pollutants from their systems to the “maximum extent practicable” and to determine if the BMPs are satisfying the water quality requirements of the Clean Water Act. Permittees also are required to assess their progress in achieving their program’s measurable goals.

Documentation

Documentation is the required evidence to ensure the MS4 permittee is implementing the SWMP. Failure to properly provide documentation will result in violations and other potential enforcement actions. Although documentation can be time consuming, it will help the permittee in assessing the effectiveness of the SWMP, MCMs, and BMPs. Documentation helps relay information to the regulating community and to the public.

Minimum Control Measure #1: Public Education & Outreach on Stormwater Impacts

The goal of the Public Education and Outreach MCM is to educate the public about stormwater activities. It aims to build greater support for the stormwater management program (SWMP), increase compliance, and promote environmental awareness in local communities.

BMP #1 – Develop, implement, and maintain a **Public Education & Outreach Program (PEOP)**. A written plan must be developed for each program. The plan should include goals, strategies, a timeline, and provisions for reviewing and updating annually. See EPA's "Getting in Step, A Guide for Conducting Watershed Outreach Campaigns" https://cfpub.epa.gov/npstbx/files/getnstepguide.pdf.

BMP #2 – Develop and maintain lists in a document or a spreadsheet of target audience groups that are served by your stormwater system. Target audiences typically include residents, businesses, developers, schools, and municipal employees.

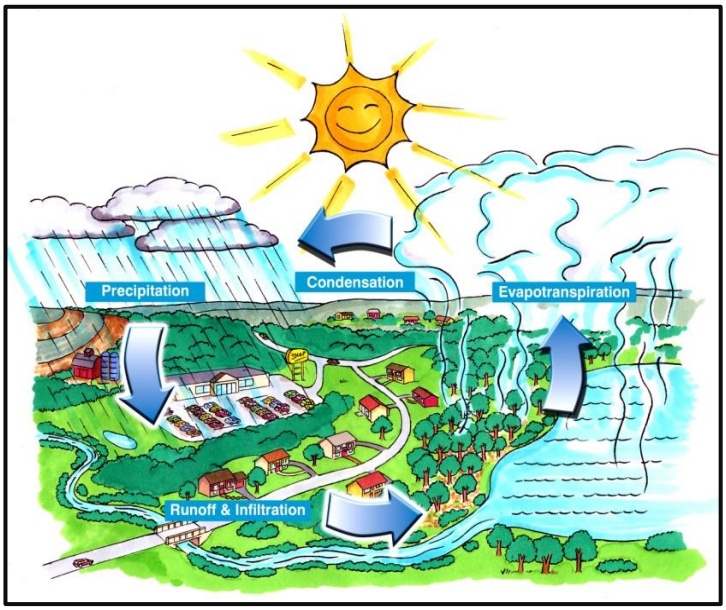

Figure 2: The water cycle created by Westmoreland Conservation District to educate the public

BMP #3 – Annually publish at least one issue of a newsletter, a pamphlet, a flyer, or a website that includes general stormwater educational information, a general description of your SWMP, and/or information about your stormwater management activities either in printed form or on your municipal website.

BMP #4 – Distribute educational materials and/or information to the target audiences identified in BMP #2 using your choice of at least two distribution methods.

Example options include, but are not limited to:

- Classroom integration of stormwater education
- Displays, posters, signs, fact sheets
- Pamphlets, booklets, brochures
- Radio, local cable TV, newspaper articles
- Presentations, conferences, meetings
- Promotions/Giveaways

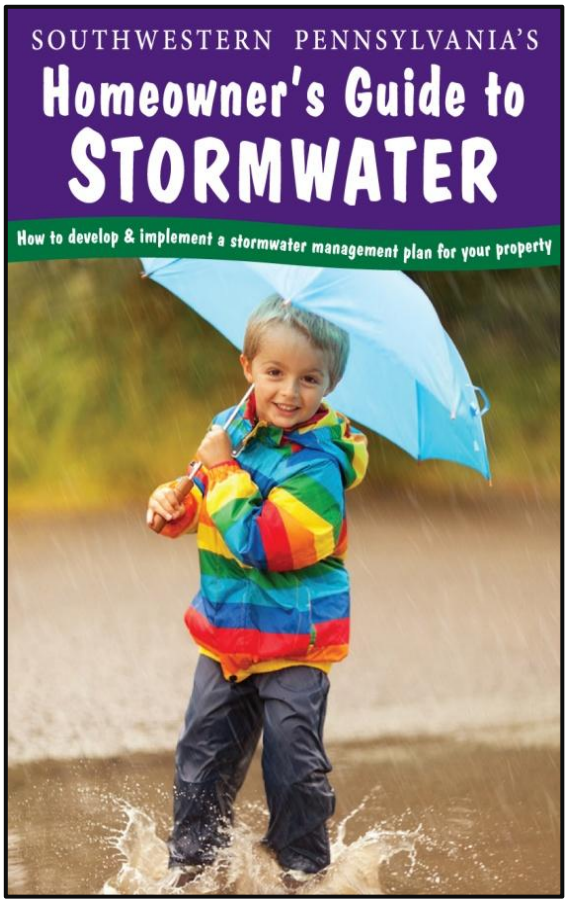

Figure 3: The "Southwestern Pennsylvania's Homeowner's Guide to Stormwater" educates homeowners about stormwater issues

Helpful Tips

- **Documentation of your public education and outreach actions are important throughout the MCM process and proper records will need to be kept. Keep track of the dates that you publicize a document and when you update them as well.**
- **Have a stormwater link on your website for the public to access your information and provide links for more resources.**
- **A newsletter should contain information that is exclusively MS4 and stormwater-focused.**
- **Be sure to give good rationale as to why you selected your target group and why you chose to educate them on a particular topic.**

Minimum Control Measure #2: Public Participation/Involvement

Figure 4: The public participating in a rain barrel workshop in Westmoreland County

Active Outreach	Passive Outreach
Active outreach engages the public in learning and is therefore a more effective tool in educating the public. It may be difficult to prove the effectiveness of passive distribution methods.	
Examples • Community clean-ups • Tours • Workshops • Storm drain stenciling • Interactive public meetings	**Examples** • Publication of fact sheets, pamphlets, newsletters, etc. • Social media websites • Educational signage
Pros • Creates interactive dialogue • Increases critical thinking of participants • Provides an engaged process and requires a conscious effort to make sense of the information	**Pros** • There is a lot of information and requires a smaller effort to organize it • Very organized and controlled distribution to the public
Cons • Time and effort to organize • It can take some time to catch on as an activity	**Cons** • No opportunity to clarify the information immediately • No direct engagement with the public

The goal of the Public Participation/Involvement is to involve the public in stormwater activities. It should facilitate the successful implementation of your Stormwater Management Program (SWMP) through garnering public support; utilizing expertise and local knowledge; shortening implementation schedules; and, building partnerships with other community and government programs. It goes hand-in-hand with MCM 1.

BMP #1 – Develop, implement, and maintain a written **Public Involvement and Participation Program (PIPP).** A written plan must be developed for each program. It can be combined with the Public Education and Outreach Program (PEOP) discussed under MCM 1 BMP #1.

The PIPP should describe various types of participation activities, methods of encouraging involvement and getting input from the public. It should include:

- Opportunities for public participation in decision-making processes associated with the development, implementation and update of programs and activities associated with the permit.
- How you communicate with and update groups in or near your MS4, such as watershed associations, environmental organizations and others.
- Your method of making your MS4 reports available to the public on your website, at municipal offices, or by mail upon request.

BMP #2 – Provide adequate public notice and opportunities for the public to review a stormwater ordinance and provide their input and feedback prior to adopting any sort of ordinance. You should advertise any proposed MS4 stormwater ordinance, accept public comments, and document how you received and responded to them.

BMP #3 – Regularly solicit public involvement and participation from target audience groups. One public meeting per year is required, either as a stand-alone MS4 meeting or as part of another public meeting. At these meetings, you should summarize the ongoing implementation of your SWMP, including activities and accomplishments, and allow time and opportunities for public feedback and input.

Helpful Tips

- **Documentation is a critical component of the entire MS4 program, including MCM #2 – Public Participation and Involvement. You must be sure to document public involvement, which might include various activities from presentations at municipal meetings to stream clean-ups.**
- **Keep sign in sheet information from public meetings to show who and how many were in attendance.**
- **Show your connections and relationships with watershed and other environmental groups in your documentation.**
- **Properly identify which meetings the public should attend to learn more about MS4 practices and stormwater management.**
- **There are plenty of issues to discuss, including the stormwater management budget; what is and is not working in your municipality; the topic of a stormwater authority; or even a stormwater fee. Be sure that the public knows which meetings to attend for this information.**

Minimum Control Measure #3: Illicit Discharge Detection & Elimination

The goal of the Illicit Discharge Detection & Elimination (IDD&E) MCM is to locate and stop illicit discharges into your MS4.

DEP recommends that you utilize the 2004 IDD&E Guidance Manual that is referenced in the MS4 NPDES permit to develop or improve your IDD&E Program. Common sources of illicit discharges include sanitary wastewater, improper disposal of auto and household toxins, and car wash wastewaters.

Why are illicit (illegal) discharges important?

Illicit discharges make their way to our waterways untreated. Illicit discharges such as paint or oil dumped into storm drains, septic effluent, car wash wastewater, and illegally connected wastewater piping into sewers can cause serious pollution issues. These illicit discharges can carry a variety of pollutants, such as heavy metals, bacteria, viruses, nutrients, oil and grease, and solvents. Illicit discharges are dangerous to public and environmental health, it's unsightly, may affect drinking water, and will diminish recreational value.

Dry weather flows need to be sampled to determine if discharge is illicit. Dry weather flow outfalls need to be screen annually.

BMP #1 – Develop and implement a written IDD&E program for the detection, elimination, and prevention of illicit discharges into your MS4. The program must include dry weather field screening of outfalls for non-stormwater flows, and sampling of dry weather discharges or selected chemical and biological parameters. Test results are to be used as indicators of possible discharge sources.

BMP #2 – Map streams and outfalls. This map can be combined with BMP #3. The map must show the location of all outfalls and the locations and names of all surface waters of the Commonwealth that receive discharges from those outfalls. Surface waters that should be included are creeks, streams, ponds, lakes, basins, swales, and channels that receive stormwater discharges. Maps should be developed within the first year of permit coverage and updated/maintained from thereafter.

BMP #3 – The storm sewer collection system including pipes, municipal watershed boundaries and roads (including streets, catch basins, curbs, basins and artificial channels) must be mapped. This map can be created in conjunction with BMP #2.

Figure 5: Illicit discharge (Source: EPA IDDE Manual: https://www3.epa.gov/npdes/pubs/idde_manualwithappendices.pdf)

What should be included in your IDD&E Program

- Identify priority areas with a high likelihood of discharge or dumping. Consider looking at old infrastructure, dumping history, sewage conversion or failing septic systems – put this info on a map.
- Screen outfalls – check for dry weather flows and sample them for pollutants or pathogens. Two people should do this together for safety reasons.
- Identify pollution sources. Did you find an illicit discharge? Where is it coming from? Investigate using standard written procedures. Photographic documentation is useful.
- Eliminate illicit discharge when a contaminated flow is detected. Have a process in place to follow – start by knocking on doors and escalate as necessary.
- Sewage discharge potential – is your MS4 a retrofit built separately?
- Access to private property – your ordinance should address this as it is a big issue for MS4s and should provide adequate authority. Include access as a discussion topic in public education and involvement activities (MCMs 1 and 2). Provide instructions to staff to avoid liability and ensure safety.
- Documentation and evaluation – record who went where, what they found, and what was done (what was the follow-up? was it effective?).
- Develop and maintain a reporting system for the public to report illicit discharges. Make sure the reporting system is user-friendly so that anyone can understand how to submit the complaint. Also, keep records on what actions were taken and how.

Figure 6: From left to right: A stenciled storm drain in Pittsburgh; Staining which shows some sort of illicit discharge poured down a drain; A "no dumping" stormwater identification marker in Etna; An outfall to a stream (Sources: SPC and Westmoreland Conservation District)

BMP #4 – Outfall screenings must be done in your MS4. "Screening" means that you physically check your outfalls and report the results as outlined in your SWMP. Documentation is key – write down who went, what they found, include their inspection checklist and any photos taken. New permittees need to screen each outfall twice (screen 40% of outfalls each year of the permit term). During subsequent permit terms, outfalls are to be screened once per permit term (screen 20% of outfalls each year).

BMP #5 – Enact a stormwater management ordinance to implement and enforce a SWMP. Two model ordinances are included in the DEP permit application. Sections that should be included are prohibitions, right of entry, and enforcement. The ordinance must meet the requirements listed in the MS4 Stormwater Management Ordinance Checklist.

Ordinance-related BMPs of MCMs 3, 4 and 5 can be combined into a single stormwater management ordinance.

Ordinances associated with an Act 167 Stormwater Management Plan that was approved by DEP in 2005 or later meet the requirements of BMP #5. You can also meet the ordinance requirement by utilizing DEP's model MS4 Stormwater Management Ordinance or by developing an ordinance that meets all applicable requirements outlined in the MS4 Stormwater Management Ordinance Checklist.

BMP #6 – Provide educational outreach on IDD&E to your target audience. Programs should be developed to encourage and facilitate public reporting of illicit discharges, illegal dumping, or outfall pollution.

Helpful Tips

- **Stay current on IDD&E ordinances. Be sure that they are up to date and check to see if you have multiple ordinances that may make regulating this issue burdensome.**
- **When screening 20% of your outfalls each year, make sure that you're screening different outfalls each year. Don't screen the same ones year after year.**
- **Be sure to be informed on what a proper outfall is. Mapping your outfalls, as well as outfalls maintained by PennDOT, will be helpful in the process.**
- **DEP has an MS4 IDD&E Checklist that can be useful for completion of MCM3: http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/MS4-Resources.aspx#.VxfJG_krKUk.**

Minimum Control Measure #4: Construction Site Runoff Control

Sediment is the primary pollutant of concern associated with construction site stormwater runoff. Sediment-polluted stormwater can cause physical, chemical, and biological damage to waterways. The goal of the Construction Site Runoff Control MCM is to protect our waterways from stormwater-related pollution that can result from construction activities.

In your Notice of Intent (NOI) submission (permit application) to DEP for your MS4 NPDES permit, the MS4 permittee decides whether it will be relying on DEP's Qualifying Local Program (QLP) or developing a program in-house. Relying on the QLP means that all BMPs under MCM 4 and BMPs #1 - 3 of MCM 5 are automatically satisfied. County Conservation Districts (CCD) play a major role in implementing the Chapter 102 program. MS4s are encouraged to enter into a Memorandum of Understanding (MOU) with their CCD to oversee stormwater program requirements for construction. Municipalities should have a copy of the MOU to review during an inspection and it is recommended that municipalities develop a written plan for the responsibilities beyond the QLP.

If you will not be relying on DEP's statewide QLP, you must satisfy one of the following statements:

- Enact, implement, and enforce an ordinance from an Act 167 Plan approved by DEP in 2005 or later
- Enact the MS4 Stormwater Management Ordinance
- Enact an ordinance that satisfies all applicable requirements in a completed and signed MS4 Stormwater Management Ordinance Checklist

Figure 7: Filter sock used to provide erosion and sediment control (Source: Westmoreland Conservation District)

BMP #1 – Develop a written construction site stormwater runoff control program. The purpose is to establish clear roles and responsibilities for this MCM, outlining the procedures necessary for compliance. The program must include construction stormwater permitting, construction inspection, and enforcement of installation and maintenance of erosion and sediment (E&S) controls.

The program should be developed within the first year of permit coverage and reviewed/updated annually. A simple tracking system for active construction sites, inspections, enforcement actions, and other activities related to this MCM can simplify the reporting process while ensuring that all applicable activities are being managed.

BMP #2 – Write, adopt and enforce an ordinance that requires the implementation of erosion and sediment (E&S) control BMPs, as well as sanctions to ensure compliance. Permittees should adopt the ordinance within the first year of permit coverage.

BMP #3 – Develop and implement requirements for site operators to control waste at the construction site that may cause adverse impacts to water quality. Sediment is the primary pollutant of concern for MCM 4; however, other pollutants associated with construction are also important and should be addressed. Permittees should establish requirements within the first year. Requirements should be reviewed annually and updated if necessary.

BMP #4 – Develop and implement procedures for the receipt and consideration of public inquiries, concerns, and information submitted by the public regarding local construction activities. The permittee should demonstrate acknowledgement and consideration of the information submitted. Permittees should establish and implement a tracking system to keep a record of any submitted public information as well as response, actions, and results. If you have TMDL responsibilities, you may choose to regulate disturbances less than one acre and take credit for BMPs serving this purpose. This should be included in your ordinance.

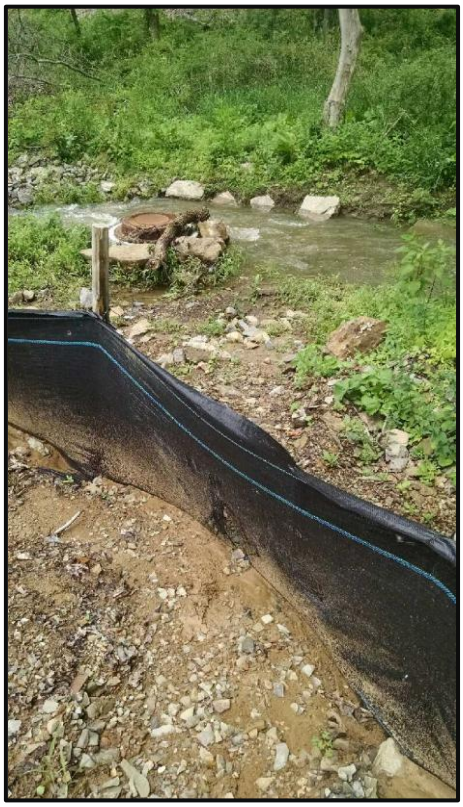

Figure 8: A damaged silt fence which is supposed to provide erosion and sediment control where soil is being disturbed by construction (Source: Allegheny County Conservation District)

Minimum Control Measure #5: Post-Construction Stormwater Management

The goal of the Post-Construction Stormwater Management MCM is to avoid increased stormwater runoff problems and increased non-point source pollution that often accompanies the development of land and the associated increase in impervious surfaces.

Under Chapter 102, Erosion and Sediment (E&S) Control, County Conservation Districts and/or DEP must issue a permit for earth disturbance activities one acre or greater. If the MS4 permittee elects to use their participation in the Chapter 102 program as a Qualifying Local Program (QLP) under their MS4 permit requirements, then MCM 5 BMPs 1 -3 are automatically accounted for.

Once again, municipalities should have a copy of the MOU to review during an inspection and it is recommended that municipalities develop a written plan for the responsibilities beyond the QLP for MCM5 as well. There should be coordination with the QLP to have copies of your inspection records for documentation.

BMP #1 – Develop a post-construction stormwater management procedure. This written procedure describes how the permittee will address all required components of the plan. Guidance can be found in the Pennsylvania Stormwater Best Management Practices Manual (source can be found in Appendix 3).

Minimum requirements of the plan should include:

- Minimum requirements for use of structural and/or non-structural BMPs in plans for development and redevelopment
- Criteria for selecting and standards for sizing stormwater BMPs
- Implementation of an inspection program to ensure that BMPs are properly installed

BMP #2 – Require the implementation of a combination of structural and/or non-structural BMPs that are appropriate to the local community; minimize water quality impacts; and, are designed to maintain pre-development runoff conditions.

Figure 9: A rain garden in a parking lot to capture stormwater from an impervious parking lot (Source: Westmoreland Conservation District)

BMP #3 – Ensure that controls are installed that will prevent or minimize water quality impacts. Qualifying development or redevelopment projects should be inspected during construction to ensure proper installation of the approved post-construction stormwater management (PCSM) BMPs. Permittees that do not rely on Chapter 102 as a QLP to fulfill these requirements must summarize construction inspections and results in periodic reports.

All MS4 permittees are responsible for implementing BMPs 4, 5 and 6.

BMP #4 – Enact, implement, and enforce a post-construction stormwater runoff ordinance or other regulatory mechanism to address new development and redevelopment projects, as well as sanctions and penalties associated with non-compliance. PCSM controls apply to disturbances one acre or greater, but can also apply to those less than one acre.

BMP #5 – Develop and implement measures to encourage and expand the use of Low Impact Development (LID) in new and redevelopment. DEP's Pennsylvania Stormwater Best Management Practices (BMP) Manual provides guidance on implementing LID practices, including, but not limited to:

- Protect sensitive and special-value features by avoiding floodplains, woods and wetlands
- Cluster and concentrate
- Minimize disturbance
- Reduce impervious cover
- Disconnect, distribute, decentralize
- Source control, such as street-sweeping

An inventory of development and redevelopment projects that discharge stormwater to your regulated MS4 must be kept. In this inventory, note which projects that have been authorized for construction since 3/10/2003 that incorporated LID practices (and specifics on what LID practices were used). Additionally, ordinances should be enacted that are consistent with LID practices.

Figure 10: Infiltration swale at Westmoreland County Community College (Source: Westmoreland Conservation District)

Information required in this inventory includes but is not limited to:

- Owner
- Location
- Type of BMP
- Installation date
- Required maintenance inspection activities and maintenance
- An annual assessment by you that the BMP operation and maintenance is adequate

BMP #6 – Ensure adequate operation and maintenance of all post-construction stormwater management BMPs installed at all qualifying development or redevelopment projects (including those owned or operated by the permittee). Within the first year of permit coverage, permittees should develop and implement a written inspection program to ensure that BMPs are properly operated and maintained. An inventory of BMPs should be developed and updated regularly. The inventory should include all BMPs installed since 3/10/2003 that discharge to your regulated MS4.

Helpful Tips

- **A single system to record and track the inventory implementation specified in BMPs 3, 5 and 6 of this MCM will be helpful for your MS4 documentation.**
- **For MCM5, make sure your SWMP identifies the mechanism that will be used to address post-construction runoff (i.e., ordinance); why that mechanism was chosen; and describe the plan to develop that mechanism.**
- **The Pennsylvania Stormwater Best Management Practices Manual can be found here: http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305**

Minimum Control Measure #6: Pollution Prevention/Good Housekeeping

The goal of the Pollution Prevention/Good Housekeeping MCM is to help ensure a reduction in the amount and type of pollution that is generated from municipally-owned and maintained facilities (e.g., streets, parking lots, and vehicle maintenance areas) and eventually discharged into local waterways. An additional goal of MCM 6 is to reduce the amount of pollution that is discharged to waterways from environmentally damaging land development, flood management practices, and/or poor maintenance of storm sewer systems.

BMP #1 – Identify and document all facilities and activities that are owned or operated by the permittee and have the potential for generating stormwater runoff to the small regulated MS4. This includes activities conducted by contractors for the permittee. The examples below are not limited to these facilities.

Municipal Facility Examples	Municipal Activity Examples
• Streets, roads, highways, and parking lots • Maintenance and storage yards • Waste transfer stations • Parks • Fleet or maintenance shops • Wastewater treatment plants • Stormwater conveyances (open and closed) • Riparian buffers • Stormwater storage or treatment units (e.g., basins, constructed wetlands, etc.)	• Street sweeping • Snow removal/deicing • Inlet/outlet cleaning • Lawn/grounds care • Storm system maintenance, inspection, and repair • Park and open space maintenance • Municipal building maintenance • New construction and land disturbances • Right of Way maintenance • Vehicle maintenance, operation, fueling, and washing • Material transfer operations, including leaf/yard debris pickup and disposal procedures

Figure 11: Municipal facilities and activities (Source: SPC and regional partners)

BMP #2 – Develop, implement, and maintain a written operation and maintenance (O&M) program for all municipal operations and facilities that could contribute to the discharge of pollutants from the regulated small MS4s, as identified under BMP #1. A written plan must be developed within your O&M program. The O&M plan should stress pollution prevention and good housekeeping measures, contain site-specific information, and address the following areas:

- Management practices, policies, and procedures to reduce or prevent the discharge of pollutants to your small regulated MS4. Consider eliminating maintenance-area floor drains.
- Maintenance activities, schedules, and inspection procedures to reduce the potential for pollutants to reach your small regulated MS4.
- Controls for reducing or eliminating the discharge of pollutants from streets, roads, highways, municipal parking lots, maintenance and storage yards, waste transfer stations, fleet or maintenance shops with outdoor storage areas, salt/sand (anti-skid) storage locations, and snow disposal areas.
- Procedures for the proper disposal of waste removed from your regulated MS4s and your municipal operations, including dredge spoil, accumulated sediments, trash, household hazardous waste, used motor oil, and other debris.

Figure 12: Vandergrift streetscape with mature tree and porous concrete to reduce impervious surfaces (Source: Westmoreland Conservation District)

BMP #3 – Develop and implement an employee training program that addresses appropriate topics to further the goal of preventing or reducing the discharge of pollutants from municipal operations to your regulated small MS4s. The program may be developed and implemented using any guidance and training materials that are available from federal, state, or local agencies, or other organizations. Any municipal employee or contractor must receive training, including, but not limited to:

- Public works staff
- Building/zoning/code enforcement staff
- Engineering staff (on-site and contracted)
- Administrative staff
- Elected officials
- Police and fire responders
- Volunteers
- Contracted personnel

Training should cover all relevant parts of the permittees' overall stormwater management program that could affect municipal operations, such as illicit discharge detection and elimination, construction sites, and ordinance requirements.

Helpful Tips

- **Even if you contract out your catch basin cleanings, be sure to have records regarding the cleanings.**
- **Remember that your municipal garage isn't the only housekeeping you need to do. Good housekeeping applies to your entire permit area/municipality.**
- **Be specific regarding the training your employees are receiving. Document the date and topic of the training.**
- **Organization is key. Keeping good records and using a tracking software will help with implementation as well as a DEP or EPA audit. Even with a tracking software in place, paper copies/binders still need to be kept.**

Record-Keeping & Reporting Strategies

Record-keeping is a very important aspect of your MS4 permit compliance activities. This is how you will demonstrate to inspectors that you have satisfied the requirements of your permit. There are many resources on the internet and companies that offer tracking, reporting and record-keeping services. This may be the right choice for you, depending on budget constraints and technology preferences. It is also fairly simple to keep your efforts organized and documented by using inexpensive three-ring binders. These binders should be updated, organized, and easily accessible to staff responsible for MS4 compliance.

You should consider networking with other regulated MS4s to compare notes about what types of forms they use for inspections; the templates they use for reports and notices; and, how they interact with their various municipal departments (e.g., public works for fleet maintenance and engineering for building permits) to ensure compliance with the terms of their permit. Regulatory agencies, including DEP and EPA, often have templates and resources available to assist with compliance.

Avoid language that presents uncertainty in your annual reports and documentation, such as "maybe," "should," "could," or "can." Be specific on the "what," "when," "where," and "how."

Documentation Needed by MCM

<table>
<tr><td>MCMs 1 & 2</td><td colspan="2">✓ Two written plans are required under these MCMs – the PEOP and the PIPP. These two plans can be combined into one document if you wish. Be prepared to show these plans to the inspector, along with your target audience list.
✓ Keep copies or photographic evidence of your stormwater education materials. Also, document how you distributed them to the public and your target audience via at least two methods in past year.
✓ Keep documentation that you held at least one meeting in the last year by making a copy of the sign-in sheet or the meeting minutes. The date and time of the meeting and which staff members were present should also be included.
✓ Detail the rationale behind your PEOP and PIPP. For example, explain why a certain flyer was selected, the logic behind the timeline for distribution or why you chose your target audience. These descriptions are vital to the documentation and audit processes.
✓ If you adopted a stormwater ordinance, show that you provided adequate public notice by copying the newspaper article or keeping a transcript of your PSA. You should document who received comments and how they were responded to.</td></tr>
<tr><td>MCM 3</td><td colspan="2">✓ Provide a copy of your written IDD&E Program Plan, which includes:
✓ Records of outfall screening and inspections
✓ Results, documentation on identified IDD&E and resolutions
✓ Maps of all outfalls, receiving waters and stormwater collection system
✓ Outfall sampling records
✓ Ordinance prohibiting illicit discharges
✓ Tracking system for outfall screening (Excel spreadsheet, for example)
✓ Be sure the IDD&E Program Plan describes the processes for screening, tracing, resolution and enforcement.
✓ Mapping your MS4 is critical. The map should include your entire storwmater collection system, including all outfalls. Drainage areas feeding each outfall should also be delineated. The map of your MS4 should be completed by the 4th year of permit coverage. If you are operating under a renewed permit, your mapping should already be complete.</td></tr>
<tr><td rowspan="2">MCM 4</td><td colspan="2">Are you are relying on Pennsylvania's QLP for stormwater associated with construction activity under Chapter 102?</td></tr>
<tr><td>Yes
✓ Be prepared to describe your local approval process of construction-related projects. Explain step-by-step who does what, when it is done, and how your municipality ensures building permits are not issued until Chapter 102 requirements have been satisfied. DEP strongly encourages that you have a Memorandum of Understanding (MOU) in place with your County Conservation District to formalize your roles in this process.
✓ It is still your responsibility to outline the processes in the MOU and explain the roles and responsibilities within that process.</td><td>No
✓ You must show your written program for stormwater associated with construction activities, an ordinance requiring implementation of erosion and sediment control BMPs, and written procedures for managing inquiries of local construction activity.</td></tr>
</table>

<table>
<tr><td rowspan="3">MCM 5</td><td colspan="2">Are you relying on Pennsylvania's QLP for stormwater associated with construction activity under Chapter 102?</td></tr>
<tr><td>Yes
✓ You are covered, however, the process should be described with roles and responsibilities if an MOU is not in place.</td><td>No
✓ Be prepared to show written Post-Construction Stormwater Management (PCSM) plan, tracking system with post-construction BMPs, and results of post-construction BMP inspections.</td></tr>
<tr><td colspan="2">✓ In either case, you will need to show the inspector your ordinance for inspecting BMPs and your inspection program that ensures BMPs are properly operated and maintained. Implementation – you will need to maintain an inventory of BMPs, including their location. For private property, you should have maintenance agreements. An MOU with the CCD to help implement MCM 5 is a useful option for many MS4s.
✓ Demonstrate to DEP that you understand the SW Management ordinance and are enforcing it. Must provide authority to control, regulate construction activity and inspect BMPs and legal authority to access private land (DEP model ordinance).
✓ DEP may request a field visit to verify construction and operation of BMPs, especially when reported in periodic reports, especially if TMDLs are in place. Discuss ongoing O&M needs for BMPs. Design plans or as-built plans should be available.</td></tr>
<tr><td>MCM 6</td><td colspan="2">✓ DEP will ask to see an inventory of municipal facilities and land uses that contribute stormwater to MS4, including all facilities owned and operated by the permittee (e.g., street sweeping, fleet care, storage yards, composting sites, streets, lots). The O&M plan will need to be shown to the inspector, as well as the written employee training program (includes contractors and consultants) and a list of trainings with frequency and participants.
✓ DEP will also want to see the activities associated with the listed facilities. These activities can often have greater pollution potential than the facilities. Keep track of these activities and document the actions.</td></tr>
</table>

Office and Field Inspections

Your MS4 NPDES permit is an authorization to discharge stormwater under specific rules that you must follow. If DEP inspects your MS4, their objective will be make sure you understand what is required and they will expect you have documentation on hand demonstrating compliance for each of the MCMs.

It is important that your records are easily found and well organized for the office portion of the inspection. Documentation of the activities outlined in your SWMP is an important part of demonstrating compliance. If you are routinely inspecting and reporting, this should not become an overwhelming task.

The inspector will need a full day and a space to work in. Consider who from your staff will need to be there and when they will need to be available. The following forms available from DEP (http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-11575) will provide information on what you can expect during your inspection. Keep in mind that the inspector may ask questions or request documentation not listed here.

Helpful Tips

- **You can organize your filing system any way you choose, but it must be well-organized and easily accessible. You might consider organizing it by MCMs of the permit in a three-ring binder. This keeps the information organized and attainable for you and your inspector.**
- **Summary spreadsheets in Excel can be a great organization tool for when inspections are done, your outfall information and when public workshops were held. Consider keeping an Excel file for each MCM with the necessary information.**
- **Printed maps are the most helpful as they will be needed for the field inspection. Consider this when preparing for your audit and have plenty of maps prepared.**

Inspectors may request additional information, including but not limited to:

Individual tracking sheets should include but are not limited to:	Summary Spreadsheets that may be helpful to develop may include but are not limited to:
• Illicit Discharge Complaint Forms • Outfall Screening Forms • PCSM Complaint Forms and PCSM Inspection Forms • Active Construction Complaint Forms and Active Construction Inspection Forms • Snow Removal/De-icing/Anti-icing Logs • Catch Basin Cleaning Logs • Street Sweeping Logs • Housekeeping Inspection Forms • Training Sign-in Sheets • Public Meeting Sign-in Sheets • Public Comments and Municipal Response • Education & Outreach Documents • Etc.	• Illicit Discharge Tracking • Illicit Discharge Complaints • Illicit Discharge Enforcement • PCSM BMPs • PCSM Inspections • PCSM Enforcements • PCSM Complaints • Active Construction Sites • Active Construction Inspections • Active Construction Enforcements • Employee Trainings • Public Meetings • Municipally-Owned Facilities/Activities/Land Uses • Etc.

Records must be retained for 3 years and at least 1 year after permit termination. A copy of the NOI (the permit application), the MS4 NPDES permit and any other authorization or approval must be kept for at least 1 year after permit termination.

Items that will need to be available for review during the office inspection:

- A copy of all past Annual Reports
- A copy of the original and renewal NOI
- A copy of the original and renewal permits
- The Public Education and Outreach Program (PEOP) (written plan)
- The Public Involvement and Participation Program (PIPP) (written plan)
- The Illicit Discharge Detection and Elimination (IDD&E) Program (written plan)
- The inventory of municipal facilities and activities that are owned or operated by the permittee and have the potential for generating stormwater runoff to the regulated small MS4
- The written Operation & Maintenance Plan for municipal facilities and activities
- The written employee training program
- A map of all outfalls, receiving waters, stormwater collection systems, swales, basins, etc.
- Ordinance prohibiting non-stormwater discharges
- The stormwater management ordinance
- The inventory of all Post-Construction BMPs installed since March 10, 2003 that discharge directly or indirectly to your regulated small MS4
- The Memorandum of Understanding between the permittee and the County Conservation District

Field Inspections

During the field inspection, BMPs may be inspected to verify their functionality. Previous and active construction sites may also be inspected. Physical operations may be inspected, such as outfalls and maintenance facilities. Stomwater facilities that have been constructed from 2003 on, such as ponds, must be maintained and functioning as originally designed. Common issues to look for may include:

- Erosion may be occurring; remove as needed
- Check DEP and/or the United States Army Corps of Engineers (USACE) about removal of wetland vegetation if not part of original design
- Overflow structures need to function as designed
- Clear trash and debris
- Remove sediment buildup; maintain as designed

Overview of Stormwater Best Management Practices (BMPs)

BMPs are important, because they can provide some actions that municipalities can take to fulfill some of the required permit obligations. Structural and non-structural BMPs help manage stormwater in our municipalities.

Structural BMPs are engineered systems that are designed to mitigate the impacts of stormwater. Structural BMPs are effective tools for stormwater management in both development and retrofit situations.

Non-Structural BMPs focus on the prevention of stormwater generation, therefore effectively reducing runoff volume, and decreasing development costs while increasing property value and marketability.

The Pennsylvania Department of Environmental Protection's Stormwater Best Management Practices (BMP) Manual will help guide you as you look into BMPs that might work well for your municipality. Refer to this manual for a comprehensive look at stormwater BMPs.

Figure 13: Local examples of Structural BMPs. Derry Borough parking with porous pavers (top left), a rain garden at Green Forge (top right), a residential rain garden (bottom left), and an adjustment to a parking lot in Greensburg. (Source: Westmoreland Conservation District)

This document can be found here: http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305.

The purpose of the Pennsylvania Stormwater Best Management Practices (BMP) Manual is to provide guidance, options and tools that can be used to protect water quality, enhance water availability and reduce flooding potential through effective stormwater management. This manual presents design standards and planning concepts for use by local authorities, planners, land developers, engineers, contractors, and others involved with planning, designing, reviewing, approving, and constructing land development projects.

The manual describes a stormwater management approach to the land development process that strives to:

- Prevent or minimize stormwater problems through comprehensive planning and development techniques
- Mitigate any remaining potential problems by employing structural and non-structural BMPs

Structural BMPs provide benefits for **water quality, groundwater-recharge, volume reduction and peak rate control**, but they also provide other benefits beyond stormwater management that are illustrated below.

Structural BMPs	Additional Benefits
Floodplain Restoration aims to restore a floodplain to conditions present prior to development. It is a system-based BMP that strives to mimic undisturbed conditions between stream system elements: groundwater, stream surface flow, soils, and root systems of vegetation.	• Increased aquatic and terrestrial habitats • Increased wetland areas and native plants in floodplain • Reduction of invasive plants • Thermal cooling of stream baseflow
Rain Gardens are excavated shallow depressions, planted with native vegetation that can withstand dry and wet periods. Stormwater is collected in the rain garden and is both infiltrated into the ground and evapotranspired by the vegetation.	• Enhances aesthetic appeal of homes, neighborhoods and commercial or industrial sites • Provides a wildlife habitat
	**Rain garden** in Mt. Pleasant. Photos: Westmoreland Conservation District
Riparian Buffer Restoration (RBR) is the restoration of the area surrounding streams, lakes, ponds, and wetlands.	• Provides a wildlife habitat • Provides aesthetic value
Vegetated Swales are shallow channels, planted densely with vegetation, designed to reduce the rate of stormwater and encourage infiltration.	• Enhances aesthetic appeal of streets, neighborhoods and commercial or industrial sites
	**Infiltration/Vegetated swale** at Westmoreland County Community College. Photos: Westmoreland Conservation District
Wet Ponds (WPs), also called **Retention Basins**, are stormwater basins that include a permanent pool of water as well as additional capacity for temporary storage of stormwater. They are effective at controlling peak stormwater rates and also provide water quality benefits.	• Provides a wildlife habitat • Provides aesthetic value

Non-Structural BMPs	Additional Benefits
Cluster Uses at Each Site/Build on Smallest Area Possible (CUES/BSAP) is a design and development strategy which reduces site disturbance through clustering proposed uses together, building vertically, and moving uses closer together.	♦ Preservation of open space ♦ Improved aesthetics ♦ Increased recreation opportunities ♦ Improved air quality ♦ Temperature moderation
Minimize Disturbed Area – Grading (MDA-G) focuses on minimizing grading and site disturbance while maximizing soil restoration and the conservation of existing site vegetation. MDA-G includes practices such as modifying the alignment of roads and disturbance areas to minimize necessary grading.	♦ Maximized soil restoration ♦ Preservation of open space ♦ Protection of open space and wildlife habitat
Protect/Conserve/Enhance Riparian Areas (PCERA) preserves and enhances vegetated areas that are adjacent to streams and rivers.	♦ Provides a food supply, habitat, and thermal protection for fish and other wildlife
Protect/Utilize Natural Flow Pathways in Overall Stormwater Planning and Design minimizes stormwater impacts associated with site development. Protecting natural drainage features such as swales, depressions, and ephemeral streams during site development can provide a variety of stormwater management functions.	♦ Protection of open space and wildlife habitat ♦ Potential to increase property values ♦ Provides aesthetic value
Reducing Street Imperviousness (RSI) and Reducing Parking Imperviousness (RPI): RSI includes minimizing street widths and lengths; RPI includes reducing the impervious area associated with parking through practices such as designating overflow parking on an area that is pervious.	♦ Increased neighborhood livability, traffic conditions, and pedestrian safety

New parking at Valley High School with permeable pavers. Photos: Westmoreland Conservation District

(Disclaimer: The BMP examples and references included are not intended to be comprehensive. This list of BMPs is not all-inclusive, nor does it preclude MS4 permittees from using other technically sound practices.)

Appendix 1: Glossary of Terms and Acronyms

BMP - A BMP is a term used to describe "Best Management Practices" for reducing quantity and improving quality of stormwater, either through physical structures and practices or through planning and outreach (non-structural). BMPs are typically divided into two categories: structural or non-structural. They describe control measures taken to control stormwater changes caused by changes to land use (development or re-development). Generally, BMPs focus on water quality problems caused by increased impervious surfaces from land development.

Combined Sewer Overflow (CSO) - Discharge from a combined sewer system that is caused by snowmelt or stormwater runoff.

DEP – Pennsylvania Department of Environmental Protection.

EPA – United States Environmental Protection Agency.

Green Infrastructure (GI) - Reduces and treats stormwater at its source while delivering environmental, social, and economic benefits.

Illicit (illegal) discharge - All discharges other than authorized discharges listed in your permit.

Minimum Control Measure (MCM) - MS4 permits call for the development and implementation of a stormwater management program that addresses six "minimum control measures" (MCMs). Implementing these minimum control measures means identifying **Best Management Practices (BMPs)** and measurable goals the MS4 permittee can implement to satisfy the CMC. MS4 permittees must satisfy the six MCMs in their permit. These are six elements that your **Stormwater Management Plan (SWMP)** must address.

MS4 - MS4 stands for **Municipal Separate Storm Sewer System**. It is any conveyance or system of conveyances (including streets, ditches, and pipes) that is: owned by a municipality; designed or used for collecting or conveying stormwater; not a combined sewer (i.e., not intended for both sewage and stormwater); AND not part of a Publicly Owned Treatment Works (POTW). It is a separate stormwater collection system owned and operated by a municipality. (When a municipality only has one system for sewage and stormwater, it is called a combined sewer system.)

NPDES Permit - A **National Pollutant Discharge Elimination System (NPDES) permit** is a permit authorized by the Clean Water Act, a federal law. In Pennsylvania, it is administered by the state's Department of Environmental Protection (DEP). It is required for any point source discharge to waters of the Commonwealth, including stormwater. The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States, including stormwater.

Stormwater - Water on the surface of the ground resulting from rain or melting snow (precipitation). It is also called "runoff"

Urbanized Area (UA) – Land area comprising one or more places (central places) and the adjacent densely-settled surrounding area (urban fringe) that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile, as defined by the United States Bureau of the Census, and as determined by the latest available decennial census. The UA outlines the extent of automatically regulated areas.

Appendix 2: Directory of Public and Non-Profit Partners

State, regional, and local partners are essential to the MS4 process. If you have questions, for example, regarding your permit or regarding MS4 BMPs, find the appropriate contact in the list below.

<table>
<tr><th colspan="2">Southwestern Pennsylvania Commission Water Resource Center</th></tr>
<tr><td colspan="2">Two Chatham Center, Suite 400
112 Washington Place
Pittsburgh, PA 15210
412-391-5590
www.spcwater.org
Counties: Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Washington and Westmoreland</td></tr>
<tr><th colspan="2">Pennsylvania Department of Environmental Protection offices</th></tr>
<tr><td>DEP Southwest Region
400 Waterfront Drive
Pittsburgh, PA 15222-4745
412-442-4000
Counties: Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington and Westmoreland</td><td>DEP Northwest Region
230 Chestnut St.
Meadville, PA 16335-3481
814-332-6984
Counties: Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren</td></tr>
<tr><th colspan="2">Local US Environmental Protection Agency office</th></tr>
<tr><td colspan="2">EPA Region 3
1650 Arch Street
Philadelphia, PA 19103-2029
215-814-5122
States: Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia</td></tr>
<tr><th colspan="2">County Conservation Districts</th></tr>
<tr><td>Allegheny County Conservation District
River Walk Corporate Centre
33 Terminal Way, Suite 325B
Pittsburgh, PA 15219
412-241-7645
www.accdpa.org</td><td>Armstrong Conservation District
Armsdale Administration Building
124 Armsdale Road, Suite B-2
Kittanning, PA 16201-3738
724-548-3425
www.armstrongcd.org</td></tr>
<tr><td>Beaver County Conservation District
156 Cowpath Road
Aliquippa, PA 15001
724-378-1701
www.beavercountyconservationdistrict.org</td><td>Butler County Conservation District
122 McCune Drive
Butler, PA 16001
724-284-5270
www.bccdonline.org</td></tr>
<tr><td>Fayette County Conservation District
10 Nickman Plaza
Lemont Furnace, PA 15456
724-438-4497
www.fayettecd.org</td><td>Greene County Conservation District
Ben Franklin Building, Suite 204
22 West High Street, Waynesburg, PA 15370
724-852-5278
www.co.greene.pa.us/secured/gc2/depts/gccd/GCCD-index.htm</td></tr>
<tr><td>Indiana County Conservation District
625 Kolter Drive, Suite 8
Indiana, PA 15701-3571
724-471-4751
www.iccdpa.org</td><td>Lawrence County Conservation District
Lawrence County Government Center
430 Court Street
New Castle, PA 16101
724-652-4512
www.lawrencecd.org</td></tr>
<tr><td>Washington County Conservation District
2800 North Main Street, Suite 105
Washington, PA 15301
724-705-7098
www.pawccd.org/index.html</td><td>Westmoreland Conservation District
J. Roy Houston Conservation Center
218 Donohoe Road
Greensburg, PA 15601
724-837-5271
www.wcdpa.com</td></tr>
</table>

In addition to the organizations listed above, nonprofits such as watershed groups can also work cooperatively to help with various tasks such as MCM2 and general baseline water quality sampling.

3800-FM-BCW0521 12/2015
MS4 Outfall Field Screening Report

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DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CLEAN WATER

MS4 OUTFALL FIELD SCREENING REPORT

BACKGROUND INFORMATION

Permittee Name:	NPDES Permit No.: PA
Date of Inspection:	Outfall ID No.:
Land Uses in Outfall Drainage Area (Select All): ☐ Industrial ☐ Urban Residential ☐ Commercial ☐ Suburban Residential ☐ Open Space ☐ Other:	Latitude: ____° ____' ____" Longitude: ____° ____' ____" Dry Weather Inspection? ☐ Yes ☐ No Date of Previous Precipitation: Amount of Previous Precipitation: in
Inspector Name(s):	Were Photographs Taken? ☐ Yes ☐ No Are Photographs Attached? ☐ Yes ☐ No

OUTFALL DESCRIPTION

TYPE	MATERIAL	SHAPE	DIMENSIONS	SUBMERGED
☐ Closed Pipe	☐ RCP ☐ CMP ☐ PVC ☐ HDPE ☐ Steel ☐ Other	☐ Circular ☐ Single ☐ Elliptical ☐ Double ☐ Box ☐ Triple ☐ Other ☐ Other	Diameter: ____ in	☐ In Water ☐ With Sediment
☐ Open Channel	☐ Concrete ☐ Earthen ☐ Rip-Rap ☐ Other	☐ Trapezoid ☐ Parabolic ☐ Other	Depth: ____ in Top Width: ____ in Bottom Width: ____	

Dry Weather Flow Present at Outfall During Inspection? ☐ Yes ☐ No *(If No, skip to Certification Section)*

Description of Flow Rate: ☐ Trickle ☐ Moderate ☐ Significant ☐ N/A

DRY WEATHER FLOW EVALUATION

Does the dry weather flow contain color? ☐ Yes ☐ No If Yes, provide a description below.

Does the dry weather flow contain an odor? ☐ Yes ☐ No If Yes, provide a description below.

Is there an observed change in the receiving waters as a result of the discharge? ☐ Yes ☐ No
If Yes, provide a description below.

Does the dry weather flow contain floating solids, scum, sheen or substances that result in deposits? ☐ Yes ☐ No
If Yes, provide a description below.

Were sample(s) collected of the dry weather flow? ☐ Yes ☐ No (If Yes, No. Samples: _____)

FIELD / LABORATORY ANALYSIS

PARAMETER	RESULTS	UNITS	PARAMETER	RESULTS	UNITS
Flow Rate		GPM	Fecal Coliform		No./100 mL
pH		S.U.	COD		mg/L
Total Residual Chlorine (TRC)		mg/L	BOD5		mg/L
Conductivity		µmhos/cm	TSS		mg/L
Ammonia-Nitrogen		mg/L	TDS		mg/L
Other: _____			Oil and Grease		mg/L
Other: _____			Other: _____		

Indicate the parameters above that were analyzed by a DEP-certified laboratory:

ILLICIT DISCHARGES

Is the dry weather flow an illicit discharge? ☐ Yes ☐ No

If Yes, describe efforts made to determine the source(s) of the illicit discharge.

Describe corrective actions taken by the permittee in response to the finding of an illicit discharge.

Inspector Comments:

RESPONSIBLE OFFICIAL CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowledge of violations. See 18 Pa. C.S. § 4904 (relating to unsworn falsification).

Responsible Official Name	Signature
Telephone No.	Date

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MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)
ILLICIT DISCHARGE DETECTION & ELIMINATION (IDD&E) CHECKLIST

This checklist may be used by MS4 permittees to ensure complete implementation of MCM #3 of MS4 NPDES permits.

Requirement	Check if Completed
BMP #1: Develop and maintain a written IDD&E program to detect, eliminate and prevent illicit discharges. The program must be developed within one year of permit coverage for new permittees and updated and evaluated annually for renewal permittees. The program must include:	☐
a. Dry weather field screening of outfalls for non-stormwater flows.	☐
b. Sampling of dry weather discharges for selected chemical and biological parameters.	☐
c. Procedures for identifying priority areas. These are areas with a higher likelihood of illicit discharges, illicit connections or illegal dumping. Priority areas may include areas with older infrastructure, a concentration of high-risk activities, or past history of water pollution problems.	☐
d. Procedures for screening outfalls in priority areas during varying seasonal and meteorological conditions.	☐
e. Procedures for identifying the source of an illicit discharge when a contaminated flow is detected at a regulated small MS4 outfall.	☐
f. Procedures for eliminating an illicit discharge.	☐
g. Procedures for assessing the potential for illicit discharges caused by the interaction of sewage disposal systems (e.g., on-lot septic systems, sanitary piping) with storm drain systems.	☐
h. Mechanisms for gaining access to private property to inspect outfalls (e.g., land easements, consent agreements, search warrants).	☐
i. Procedures for program documentation, evaluation and assessment.	☐
j. Recordkeeping – records must be kept of all outfall inspections, flows observed, results of field screening and testing, and other follow-up investigation and corrective action work performed under this program.	☐
BMPs #2 & #3: Develop and maintain map(s) of your regulated small MS4. The map(s) must be developed by the fourth year of permit coverage for new permittees and be updated as necessary. The map(s) must depict the following:	☐
a. Locations of all outfalls directly or indirectly discharging stormwater from your MS4.	☐
b. Locations and names of all surface waters of the Commonwealth that receive discharges from those outfalls.	☐
c. The entire storm sewer collection system, including roads, inlets, piping, swales, catch basins, channels, basins, etc.	☐
d. Municipal and/or watershed boundaries.	☐
BMP #4: Conduct outfall field screening, identify the source of any illicit discharges, and remove or correct any illicit discharges using procedures developed under BMP #1. Specific requirements include the following:	☐
a. New permittees – screen all identified MS4 outfalls at least twice during dry weather during the permit term; screen at least forty percent of the total number of outfalls per year.	☐
b. Renewal permittees – screen all identified MS4 outfalls at least once during each permit coverage term; for areas where past problems have been reported or known sources of dry weather flows occur on a continual basis, outfalls must be screened annually.	☐

Requirement	Check if Completed
c. If screening reveals dry weather flow, the discharge from the outfall and the area around the outfall must be inspected visually for color, turbidity, sheen, floating or submerged solids; for adverse effects on plants or animals in proximity to the outfall; and for odor. If the outfall produces any odor, or if the visual inspection shows any indication that the discharge may contain pollutants, then samples of the discharge must be collected for field and/or lab testing of selected chemical and biological parameters as part of a process to determine if the dry weather flow is illicit.	☐
d. Prioritize outfall screenings according to the perceived chance of illicit discharges within the outfall's contributing drainage area.	☐
e. Inspections must be recorded on the Outfall Reconnaissance Inventory/Sample Collection field sheet.	☐
f. Adequate written documentation must be maintained to justify a determination that an outfall flow is not illicit. If an outfall flow is illicit, the actions taken to identify and eliminate the illicit flow must be documented.	☐
g. The results of outfall inspections and actions taken to remove or correct illicit discharges must be summarized in periodic reports.	☐
BMP #5: Enact a stormwater management ordinance to implement and enforce a stormwater management program that includes prohibition of non-stormwater discharges to the regulated small MS4.	☐
a. New permittees – within the first year of coverage under the permit, new permittees must enact and implement an ordinance from an Act 167 Plan approved by the Department in 2005 or later, the MS4 Stormwater Management Ordinance, or an ordinance that satisfies all applicable requirements in a completed and signed MS4 Stormwater Management Ordinance Checklist.	☐
b. New permittees – submit a letter signed by a municipal official, municipal engineer, or the municipal solicitor as an attachment to your first year report certifying the enactment of an ordinance that meets all applicable requirements of this permit.	☐
c. Renewal permittees – continue to maintain, update, implement, and enforce a Stormwater Management Ordinance that satisfies all applicable requirements.	☐
BMP #6: Provide educational outreach to public employees, business owners and employees, property owners, the general public and elected officials (i.e., target audiences) about the program to detect and eliminate illicit discharges.	☐
a. During each year of permit coverage, appropriate educational information concerning illicit discharges shall be distributed to the target audiences using methods outlined under MCM #1 of the MS4 NPDES permit.	☐
b. Establish and promote a stormwater pollution reporting mechanism (e.g., a complaint line with message recording) by the end of the first year of permit coverage for the public to use to notify you of illicit discharges, illegal dumping or outfall pollution.	☐
c. Respond to all complaints in a timely and appropriate manner. Document all responses, include the action taken, the time required to take the action, whether the complaint was resolved successfully.	☐

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF POINT AND NON-POINT SOURCE MANAGEMENT

MS4 COMPLIANCE INSPECTION REPORT

OFFICE INSPECTION

Most Recent Annual/Progress Report Due Date:

Date Most Recent Annual/Progress Report Submitted:

List all deficiencies identified in the most recent Annual/Progress Report Review:

Describe the permittee's progress with addressing deficiencies, if applicable:

Verify the presence of the following documentation; check "Yes" if available, "No" if not available, and "NA" if not applicable.

MCM	Item	Yes	No	NA
1	Public Education and Outreach Program (PEOP) (written plan)	☐	☐	☐
	Lists of target audience groups	☐	☐	☐
	Published stormwater educational materials	☐	☐	☐
	Two methods of distributing educational materials in past year	☐	☐	☐
2	Public Involvement and Participation Program (PIPP) (written plan)	☐	☐	☐
	Public notice prior to adoption of any ordinance (municipal) or SOP (non-municipal)	☐	☐	☐
	At least one public meeting in past year	☐	☐	☐
3	Illicit Discharge Detection and Elimination (IDD&E) Program (written plan)	☐	☐	☐
	Outfall inspection and illicit discharge tracking system	☐	☐	☐
	Complaint tracking system for illicit discharges	☐	☐	☐
	Map of all outfalls, receiving waters, stormwater collection system, swales, basins, etc.	☐	☐	☐
	Stormwater sampling and monitoring records	☐	☐	☐
	Ordinance (municipal) or SOP (non-municipal) prohibiting non-stormwater discharges	☐	☐	☐
4	If not relying on PA's program, a written stormwater associated with construction activities program (written plan)	☐	☐	☐
	If not relying on PA's program, an ordinance (municipal) or SOP (non-municipal) requiring implementation of erosion and sediment control BMPs	☐	☐	☐
	If not relying on PA's program, written procedures for managing public inquiries of local construction activities	☐	☐	☐
5	If not relying on PA's program, a written post-construction stormwater management plan	☐	☐	☐
	If not relying on PA's program, a tracking system containing post-construction BMPs	☐	☐	☐
	If not relying on PA's program, inspection results of post-construction BMPs	☐	☐	☐
	An ordinance (municipal) or SOP (non-municipal) to enforce post-construction BMPs	☐	☐	☐
	An inspection program ensuring stormwater BMPs are properly operated and maintained	☐	☐	☐
6	Inventory of municipal facilities and land uses that contribute to stormwater runoff	☐	☐	☐
	Written Operation & Maintenance Plan for municipal facilities addressing housekeeping	☐	☐	☐
	Written employee training program	☐	☐	☐

Page: of Date: Permit No.:

☐ White – Regional Office ☐ Yellow – Permittee ☐ Pink – Inspector

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BUREAU OF POINT AND NON-POINT SOURCE MANAGEMENT

MS4 COMPLIANCE INSPECTION REPORT

FIELD INSPECTION – BMPs

BMP Description:

☐ Structural BMP ☐ Non-Structural BMP
BMP Reported In:
☐ Annual/Progress Report ☐ Other (__________________)

Locational Description:

Structural BMPs Only:
Latitude: ° ' "
Longitude: ° ' "

Property: ☐ Public ☐ Private
Is BMP Implemented or Being Implemented? ☐ Yes ☐ No
Who Is Responsible for O&M (Structural BMPs Only)?
☐ Municipality ☐ Other (Name: ______________________)

Comments/Deficiencies:

Date Installed (Structural BMPs Only):
Is BMP Located in Urbanized Area? ☐ Yes ☐ No

BMP Description:

☐ Structural BMP ☐ Non-Structural BMP
BMP Reported In:
☐ Annual/Progress Report ☐ Other (__________________)

Locational Description:

Structural BMPs Only:
Latitude: ° ' "
Longitude: ° ' "

Property: ☐ Public ☐ Private
Is BMP Implemented or Being Implemented? ☐ Yes ☐ No
Who Is Responsible for O&M (Structural BMPs Only)?
☐ Municipality ☐ Other (Name: ______________________)

Comments/Deficiencies:

Date Installed (Structural BMPs Only):
Is BMP Located in Urbanized Area? ☐ Yes ☐ No

BMP Description:

☐ Structural BMP ☐ Non-Structural BMP
BMP Reported In:
☐ Annual/Progress Report ☐ Other (__________________)

Locational Description:

Structural BMPs Only:
Latitude: ° ' "
Longitude: ° ' "

Property: ☐ Public ☐ Private
Is BMP Implemented or Being Implemented? ☐ Yes ☐ No
Who Is Responsible for O&M (Structural BMPs Only)?
☐ Municipality ☐ Other (Name: ______________________)

Comments/Deficiencies:

Date Installed (Structural BMPs Only):
Is BMP Located in Urbanized Area? ☐ Yes ☐ No

BMP Description:

☐ Structural BMP ☐ Non-Structural BMP
BMP Reported In:
☐ Annual/Progress Report ☐ Other (__________________)

Locational Description:

Structural BMPs Only:
Latitude: ° ' "
Longitude: ° ' "

Property: ☐ Public ☐ Private
Is BMP Implemented or Being Implemented? ☐ Yes ☐ No
Who Is Responsible for O&M (Structural BMPs Only)?
☐ Municipality ☐ Other (Name: ______________________)

Comments/Deficiencies:

Date Installed (Structural BMPs Only):
Is BMP Located in Urbanized Area? ☐ Yes ☐ No

Page: of
Date:
Permit No.:

☐ White – Regional Office ☐ Yellow – Permittee ☐ Pink – Inspector

Appendix 4: Document Sources and Additional Resources

SPC Water Resource Center
www.spcwater.org

DEP MS4 Resources
http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/MS4-Resources.aspx#.VxfJG_krKUk

DEP's Appendix A: Stormwater Management Program. April 2012.
http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-95044/08_3800-PM-BPNPSM0100h-AppendixA.pdf

Pennsylvania Stormwater Best Management Practices Manual. December 2006.
http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305

EPA MS4 Resources
https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#edu

StormwaterPA
http://www.stormwaterpa.org/

PA DCNR Parks BMPs
http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_006535.pdf

3 Rivers Wet Weather
3 Rivers Wet Weather is a nonprofit environmental organization created in 1998 to support 82 Allegheny County municipalities and the City of Pittsburgh in addressing the region's wet weather overflow problem.
http://www.3riverswetweather.org/

DEP Individual Permit – MS4 Stormwater Operation and Maintenance (O&M) Ordinance Checklist and MS4 Stormwater Management Ordinance Checklist
http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-94978/11_3800-PM-BPNPSM0200k%20Ordinance%20Checklist.pdf

NPDES Sample Inspection Reports
http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-_1575

MCM1: Public Education and Outreach on Stormwater Impacts

- EPA Public Education and Outreach on Stormwater Impacts Resources
  https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#edu
- Westmoreland Conservation District Homeowner's Guide to Stormwater
  http://wcdpa.com/wp-content/uploads/Homeowners-Stormwater-Guide.pdf
- EPA "Getting in Step, A Guide for Conducting Watershed Outreach Campaigns"
  https://cfpub.epa.gov/npstbx/files/getnstepguide.pdf

MCM2: Public Involvement/Participation

- DEP Public Education Plan Template
  http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/MS4-Resources.aspx#.VxfnYfkrKUk
- EPA Public Involvement/Participation Resources
  https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#inv

MCM3: Illicit Discharge Detection and Elimination (IDD&E)

- DEP MS4 IDD&E Checklist
  Checklist may be used by MS4s to ensure complete implementation of MCM #3 of MS4 NPDES permits.
  http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/MS4-Resources.aspx#.VxfJG_krKUk
- DEP MS4 Outfall Field Screening Report
  http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-12798
- EPA Illicit Discharge Detection and Elimination Resources
  https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#ill

- Illicit Discharge Detection and Elimination Guidance Manual
  http://nepis.epa.gov/Exe/ZyNET.exe/20017KFK.TXT?ZyActionD=ZyDocument&Client=EPA&Index=2000+Thru+2005&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C00thru05%5CTxt%5C00000010%5C20017KFK.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=p%7Cf&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL

MCM4: Construction Site Stormwater Runoff Control

- DEP Erosion and Sediment Pollution Control Program Manual (PDF)
  http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-88925/363-2134-008.pdf
- Construction Site Complaint Form
  This form may be used by MS4s for logging and tracking complaints about construction stormwater issues.
  http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/MS4-Resources.aspx#.VxfJG_krKUk
- EPA Construction Site Stormwater Runoff Control Resources
  https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#constr
- Westmoreland Conservation District Typical Best Management Practices for Construction Sites
  http://wcdpa.com/wp-content/uploads/WCD-BMP-Booklet-2016-web.pdf

MCM5: Post-Construction Stormwater Management

- DEP Pennsylvania Stormwater Best Management Practices Manual
  http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305
- EPA Post-Construction Stormwater Management in New Development and Redevelopment Resources
  https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#post
- Westmoreland Conservation District Typical Best Management Practices for Construction Sites
  http://wcdpa.com/wp-content/uploads/WCD-BMP-Booklet-2016-web.pdf

MCM6: Pollution Prevention/Good Housekeeping for Municipal Operations

- Sample Municipal Facilities Operation and Maintenance Program Plan
  Optional MS4 MCM #6 model "Inventory" and "O&M Plan"
  http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/MS4-Resources.aspx#.VxfJG_krKUk
- EPA Pollution Prevention/Good Housekeeping for Municipal Operators Resources
  https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#poll

**Links are active as of June 2016. Please contact the Water Resource Center with any information on broken links.
An electronic version of this guide can also be found on the SPC Water Resource Center Website (www.spcwater.org).

The Southwestern Pennsylvania Commission (SPC) hereby gives public notice that it is the policy of the Commission to assure full compliance with Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987, Executive Order 12898 on Environmental Justice, and related statutes and regulations in all programs and activities. Title VI and other related statutes require that no person in the United States of America shall, on the grounds of race, color, sex, national origin, age, or disability, be excluded from the participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which SPC receives federal financial assistance. Any person who believes they have been aggrieved by an unlawful discriminatory practice by SPC under Title VI has a right to file a formal complaint with the Commission. Any such complaint must be in writing and filed with SPC's Title VI Coordinator within one hundred eighty (180) days following the date of the alleged discriminatory occurrence. For more information, or to obtain a Title VI Discrimination Complaint Form, please see our website at: www.spcregion.org or call 412-391- 5590.

Funding for the development of this booklet was provided by the Southwestern Pennsylvania Commission Water Resource Center and the Pennsylvania Department of Environmental Protection's Environmental Education Grants Program

Southwestern Pennsylvania Commission Water Resource Center

In 2013, SPC formed the Water Resource Center (WRC) to address various water issues within the region. WRC's Mission is to promote regional collaboration on water topics; be a leader in facilitating coordination and education; and provide technical assistance to its member governments.

For an electronic version of this guide, visit:
www.spcwater.org

HOMEOWNER'S GUIDE TO STORMWATER

This guide has been funded by the League of Women Voters of Pennsylvania Citizen Education Fund through a Section 319 federal Clean Water Act grant from the Pennsylvania Department of Environmental Protection, administered by the U.S. Environmental Protection Agency

The Southwestern Pennsylvania's Homeowner's Guide to Stormwater is based upon The Homeowner's Guide to Stormwater produced by the Little Conestoga Partnership and its funder the National Fish and Wildlife Foundation

Partners for the Southwestern Pennsylvania Guide

County of Allegheny

City of Pittsburgh

County of Westmoreland

PENNSTATE Cooperative Extension
College of Agricultural Sciences

Allegheny County Conservation District

Westmoreland Conservation District

Produced by:

Penn's Corner Conservancy and Charitable Trust, Inc.

Penn's Corner Conservancy and Charitable Trust, Inc.
c/o Allegheny County Conservation District
Riverwalk Corporate Centre
33 Terminal Way, Suite 325 B
Pittsburgh, PA 15219

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SOUTHWESTERN PENNSYLVANIA'S

Homeowner's Guide to STORMWATER

How to develop & implement a stormwater management plan for your property

Residential rain garden in Mount Pleasant, PA

Penn's Corner Conservancy Charitable Trust, Inc.

Our vision: Complete restoration and ongoing conservation of our natural resources, in harmony with strong, productive communities.
Our mission: To enhance the area's natural resources and build strong communities by fostering regional partnerships, securing resources, and delivering needed services and programs.
Our focus: Entire southwestern Pennsylvania region.

Contact your local County Conservation District for more information about stormwater

Allegheny	(412) 241-7645	www.accdpa.org
Armstrong	(724) 548-3425	www.armstrongcd.org
Beaver	(724) 378-1701	beavercountyconservationdistrict.org
Butler	(724) 284-5270	www.bccdonline.org
Fayette	(724) 438-4497	www.fayettecd.org
Greene	(724) 852-5278	www.co.greene.pa.us
Indiana	(724) 471-4751	www.iccdpa.org
Washington	(724) 705-7098	pawccd.org
Westmoreland	(724) 837-5271	www.wcdpa.com

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Stephen Simpson, page 2, stormwater on road

Margaret Kyler, page 6, rain guage

Matt Kofroth, LCCD, page 18, girl and rain barrel

Matt Royer, Penn State, page 8, planting

Dick Brown, page 8, vegetated swale

Fritz Schroeder, Live Green, page 17, rain barrel

Kristen Kyler, Penn State, page 19 measuring water

Mark Jackson, page 2, forest; page 7, riparian buffer; page 8 meadow; page 23, houses

Graphics

Matt Zambelli, page 4, property boundaries; buildings on property; page 5, natural features on property; page 21, BMP graphics, map of potential best management practices on property, Best Management Practices Treatment Potential for one inch rainfall.

Table of Contents

Purpose of this Guide

Are you concerned about water quality? Is flooding a problem in your neighborhood? Are you planning a home improvement project? If the answer is yes to any of these questions, then you need to know more about managing stormwater.* This guide will help you better understand:

- what stormwater is, why stormwater runoff can be a problem, and what you can do about it;
- how much stormwater runoff is generated by impervious areas on your property;
- how stormwater flows across and leaves your property; and
- how you can reduce the amount of stormwater runoff leaving your property.

This guide will help you create your own stormwater management plan and select simple stormwater solutions to be implemented on your property.

** Check with your local municipality to find out more about what permits may be required for any building projects.*

Acknowledgments

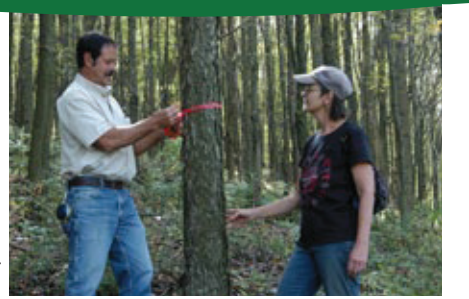
The Penn's Corner Conservancy Charitable Trust, Inc., extends its appreciation to the Little Conestoga Partnership and its funder, the National Fish and Wildlife Foundation, for allowing us to adapt their publication, The Homeowner's Guide to Stormwater, for our residents in southwestern Pennsylvania. Members of the Little Conestoga Partnership include: Alliance for the Chesapeake Bay, Brandywine Conservancy, Chesapeake Bay Foundation, Habitat MT, Lancaster County Clean Water Consortium, Lancaster County Conservancy, Lancaster County Conservation District, Lancaster County Planning Commission, Little Conestoga Watershed Alliance, PA Department of Environmental Protection, PA Department of Conservation and Natural Resources, PA Landscape & Nursery Association, and Penn State University.

Section 1: Introduction

What is Stormwater Runoff?

Stormwater runoff is precipitation (rain or snowmelt) that flows across the land. Stormwater may infiltrate into soil, discharge directly into streams, water bodies, or stormdrains, or evaporate back into the atmosphere.

In the natural environment, most precipitation is absorbed by trees and plants or permeates into the ground, which results in stable stream flows and good water quality.



Healthy forest

Things are different in the built environment. Rain that falls on a roof, driveway, patio, or lawn runs off the surface more rapidly, picking up pollutants as it goes. This stormwater runoff flows into streams or storm drains that empty into waterways like the Allegheny, Monongahela and Ohio rivers.

Storm drain

Polluted urban flooding

Why Can Stormwater Runoff Be a Problem?

Poorly managed stormwater runoff can cause many problems. These include:

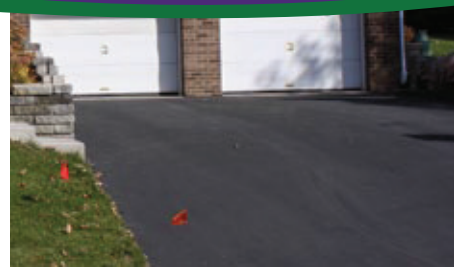
- **Flooding.** As stormwater runs off roofs, driveways, and lawns, large volumes quickly reach streams, causing them to rise and flood. When more impervious surfaces exist, flooding occurs rapidly and can be severe, resulting in damage to property and harm to people.
- **Pollution.** Stormwater running over roofs, driveways, roads, and lawns will pick up pollutants such as oil, fertilizers, pesticides, dirt/sediment, trash, and animal waste. These pollutants "hitch a ride" with the stormwater and flow untreated into local streams, polluting our waters.
- **Stream Bank Erosion.** When stormwater flows into streams at unnaturally high volumes and speeds, the power of these flows can cause severe stream bank erosion. Eroding banks can eat away at streamside property, create dangerous situations, and damage natural habitat for fish and other aquatic life. This erosion is another source of sediment pollution in streams.
- **Threats to Human Health.** Stormwater runoff can carry many pollutants, such as toxic metals, organic compounds, bacteria, and viruses. Polluted stormwater, especially coming from combined sewer overflows, can contaminate drinking water supplies and hamper recreational opportunities as well as threaten fish and other aquatic life.

What Can I Do to Help?

As a homeowner, you can help avoid the problems associated with stormwater runoff by:

- reducing impervious areas (hard surfaces like roofs, paved areas) so that rain soaks into the ground
- planting native trees and plants which help infiltrate stormwater and increase evaporation and transpiration
- managing stormwater on-site with rain gardens, rain barrels, and similar practices
- following the lawn care practices described in this guide

By doing many small things on your property, you can have a big impact on improving stormwater management and water quality in our region.



Impervious surface

Permeable pavers

Photo by ESRI

In Pennsylvania, the drainage area of the Allegheny, Monongahela, and Ohio rivers covers more than a third of the state and is home to more than three million people. (www.orsanco.org)

Managing stormwater on your property will not only help protect local streams, but will also help clean up downstream waterways like these rivers.

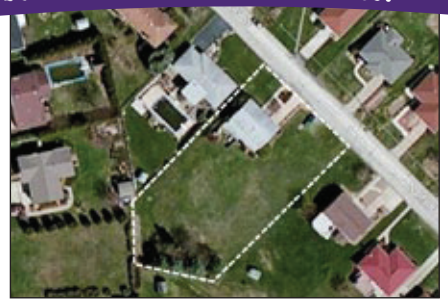
Section 2: Assessing Stormwater on Your Property

In order to better manage stormwater on your property you should first understand how stormwater affects it. Follow these simple steps to figure out where stormwater is generated, how it flows, and approximately how much stormwater comes from your property. You may draw your map on paper using Appendix A, or use the additional instructions in Appendix B to create an aerial photo map.

1. Walk your property and map your boundaries and basic features.

Step 1: Draw your property boundaries.

Draw the boundaries of your lot. If you are not sure of your boundaries, you may be able to look this up on your property tax assessment, deed to your house, or at your county's tax office.



Typical property boundary mapped via www.stormwaterguide.org

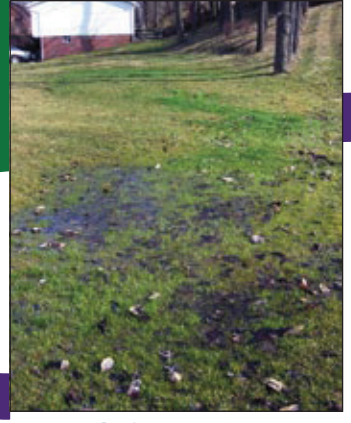
Step 2: Draw buildings and other features of your property.

Draw and label the buildings and other features of your property. These include:

Impervious surfaces mapped via www.stormwaterguide.org

- **Impervious areas.** These are hard surfaces on your property that prevent stormwater from soaking into the ground. They include rooftops, driveways, parking areas, walkways, decks, patios, or other hard surfaces.
- **Lawn and landscaped areas.** These include any areas with grass or landscaping that you regularly maintain.
- **Natural vegetation.** These are areas of woods, meadow, or other naturally vegetated areas that are allowed to grow on your property.
- **Water features.** These could be streams, wetlands, ponds, or swimming pools.

You can determine the approximate size of each area by using a tape measure and calculating the square footage of each. Depending on the overall size of your property, you may want to calculate these areas in square feet or convert to acres (1 acre = 43,560 square feet). If your property has no natural vegetation, such as woods or meadows, or water features on it, you can simply subtract the impervious areas from your total lot size to get your total lawn and landscaped area.



Surface ponding

2. Assess and map your stormwater flow.

The next step is to show how and where runoff flows on your property and identify any problems it may be causing. Common stormwater problems may include large puddles ("ponding"), damp basements, soil erosion, and collapsing stream banks. The ideal time to assess stormwater flow is during or immediately after a rain storm. Look for and map the following:

- **Roof downspouts.** Indicate the location of roof downspouts and the direction stormwater flows from the downspouts.
- **Stormwater flow paths.** Using arrows, show the direction of stormwater flow off impervious surfaces. If you have any areas where stormwater collects, such as drainage swales or ditches, show this and label them as such.
- **Areas of ponding.** Indicate locations of standing water or ponding on the map.
- **Gullies or ditches from soil erosion.** Indicate any areas of soil erosion which have resulted in gullies or ditches. This may appear within existing drainage swales or channels and would be good to note on your assessment.
- **Slope of the land.** Water always flows downhill. Which areas of your property are high and which are low? What is above or below your home?

Stream erosion

If you have multiple downspouts, drainage channels, ponding areas, etc., organize your map and assessment plan by numbering them.

Natural features mapped via www.stormwaterguide.org

Downspouts for roof runoff

3. Estimate how much stormwater is generated on your property.

The amount of stormwater runoff generated from your property depends on how long and how hard it rains, the slope of your property, the type and quality of the soils, the amount of impervious surface on your property, and other factors. Nevertheless, there is a simple calculation you can use to estimate how much stormwater runoff your property generates during a typical rainstorm.

The majority of annual rainfall in southwestern Pennsylvania comes in the form of small storms of one inch or less. These small storms carry most of the pollutants that impact water quality, and thus the stormwater generated by your property for the one inch storm is a good measure of typical stormwater runoff. Use the following chart to determine how much stormwater is generated by the impervious area on your property:

Rain gauge

Square Feet of Impervious Area	Gallons of Runoff to be Managed
500 or less	less than 312
501 – 1,000	312 – 624
1,001 – 2,000	624 – 1,246
2,001 – 3,000	1,246 – 1,869
3,001 – 4,000	1,869 – 2,492
4,001 – 5,000	2,492 – 3,115
5,001 – 10,000	3,115 – 6,231
10,001 – 20,000	6,231 – 12,462
20,001 – 43,000	12,462 – 26,793

The above numbers were calculated using the following formula:
(Total square feet of impervious area) x 0.0833 x 7.48 = _____ gallons of runoff

Use this formula if you want a more accurate calculation of the runoff generated from your impervious area.

0.0833 is to convert feet to inches • 7.48 = number of gallons per cubic foot

Section 3: Developing Your Stormwater Management Plan

Now that you know what areas of your property generate stormwater when it rains, how the runoff flows, and what areas generate the most amount of runoff, you can start thinking about adding stormwater management practices to your property.

1. Types of stormwater best management practices.

Many management practices exist for handling stormwater runoff. This guide suggests six of the simpler, easier to implement practices. Each practice is introduced briefly in this section so you can consider which ones are right for you. (related cost value scale: $ $$ $$$)

RAIN GARDEN

A depressed landscape bed that uses mulch, soil mix, and deep-rooted native plants to capture, absorb, and infiltrate stormwater.

Benefits
- Manages stormwater and filters pollutants
- Provides wildlife habitat
- Minimal maintenance
- Adds beauty

Negatives
- Plants can take 2-3 years to establish
- More maintenance required in first few years

Cost
$ – $$$
- Varies depending on size and depth

Maintenance
- Low once plants are established
- Weeding and watering in first two years
- Some thinning in later years

Aesthetic Appeal
- Ranges from medium to high
- Can customize based on plant selection

Implementation Considerations
- Construct downslope of runoff to be captured
- Locate at least 10 feet from buildings & utilities
- Soils may require underdrain

RIPARIAN BUFFER

Planting native trees or shrubs along streams to restore the streamside area to forested conditions. These "riparian buffers" filter runoff and have numerous water quality benefits.

Benefits
- Increases infiltration and groundwater recharge
- Improves water quality
- Controls erosion & sedimentation
- Provides wildlife habitat

Negatives
- Not as effective on steep slopes
- Flooding may damage planting

Cost
$
- Supplement existing native vegetation

Maintenance
- Low, once native plants are established
- Weeding and watering in first two years
- Some plant thinning in later years
- Regularly remove debris

Aesthetic Appeal
- Ranges from medium to high
- Higher aesthetic appeal than conventional stormwater conveyances

Implementation Considerations
- Plant in spring or fall
- Contact your municipality or conservation district for possible permit information

TREE PLANTING

Planting native trees and shrubs to restore a portion of your property to forested conditions.

Benefits

- Increases infiltration and evapotranspiration of stormwater
- Filters pollutants
- Requires minimal maintenance
- Provides wildlife habitat
- Large numbers of native trees maximizes benefits

Negatives

- Takes many years before trees grow to provide maximum benefit
- Regular maintenance is required where invasive plant species exist
- Must guard against deer browsing and rodent damage

Cost

$-$$

- Varies, depending on species, size, and type of tree planted

Maintenance

- Maintain tree tube/stakes or cages, remove after 5 years
- Mow between trees at least twice a year during first 4 to 5 years

Aesthetic Appeal

- High asethetic appeal, as trees add interest, structure, color, and wildlife to property

Implementation Considerations

- Plant in spring or fall
- Watering may be necessary after planting during dry weather (25 gallons/week)

"Trees can lower energy costs, remove pollution from the air, increase property values, capture stormwater and provide wildlife habitat."

(Pittsburgh Office of Sustainability)

VEGETATED SWALE OR NATIVE MEADOW

An area planted with native grasses and wildflowers and maintained as a natural area. "No mow" areas can also develop into meadow areas.

Benefits

- Increases infiltration and evapotranspiration of stormwater
- Filters pollutants
- Requires little maintenance
- Provides wildlife habitat

Negatives

- Site preparation (including turf grass removal) is required before planting
- Meadows may conflict with local weed ordinances

Cost

$

- Native seed mixes vary depending on type of species and amount of variety desired

Maintenance

- Mow twice a year for first two years, then annually
- Control invasive plant species

Aesthetic appeal

- High aesthetic appeal, as tall grasses and wildflowers add interest, structure, color, and wildlife to property

Implementation Considerations

- Plant in spring
- Monitor and control invasive species

Appendix A: Stormwater Management Plan Template

You may use this template to create your stormwater management plan.

1. Map

Use the grid paper provided to hand draw your stormwater management plan map. (See sample map on page 16.) Or, follow the tutorial provided in Appendix B to create a computer generated aerial map. If you hand draw your map, it is suggested you use one ink color to draw existing conditions and a different color to draw your proposed stormwater management practices.

2. Plan Details

Fill in the template to create the details of your plan. For both existing conditions and proposed stormwater management practices, be sure to label all features on your map with numbers that correspond to the plan template.

Stormwater Management Plan

Property Owner's Name: _____

Property Address: _____

Municipality: _____ County: _____

Watershed: _____ (example: Youghiogheny River)

Name of stream into which stormwater flows: _____ (example: Sewickley Creek)

EXISTING CONDITIONS

IMPERVIOUS AREAS		
Buildings		
Number	Description (house, shed, etc.)	Square Feet
Driveways and Walkways		
Number	Description (driveway, back walkway, front walkway, etc.)	Square Feet
Other Hard Surfaces		
Number	Description (patio, deck, etc.)	Square Feet
Total Impervious Area:		

LAWN AND LANDSCAPED AREAS

Number	Description (front yard, back yard, flowerbed, etc.)	Square Feet
Total Lawn and Landscape Area:		

NATURAL AREAS

Woods

Number	Description (back woodlot, side woods, etc.)	Square Feet

Meadow

Number	Description (back meadow, front meadow, etc.)	Square Feet
Total Natural Area:		

Note any water features (streams, wetlands, ponds, etc) on your property:

Total Stormwater Generated in a 1 inch rainstorm:
(Total Impervious Areas x 0.0833 x 7.48)

_____ ft^2 x 0.0833 ft x 7.48gal./ft^3 = _____ gallons

STORMWATER FLOW

Downspouts

Number	Description (front house, back house, shed, etc.)

Drainage Swales

Number	Description (side yard swale, back yard swale, etc.)

Areas of Ponding

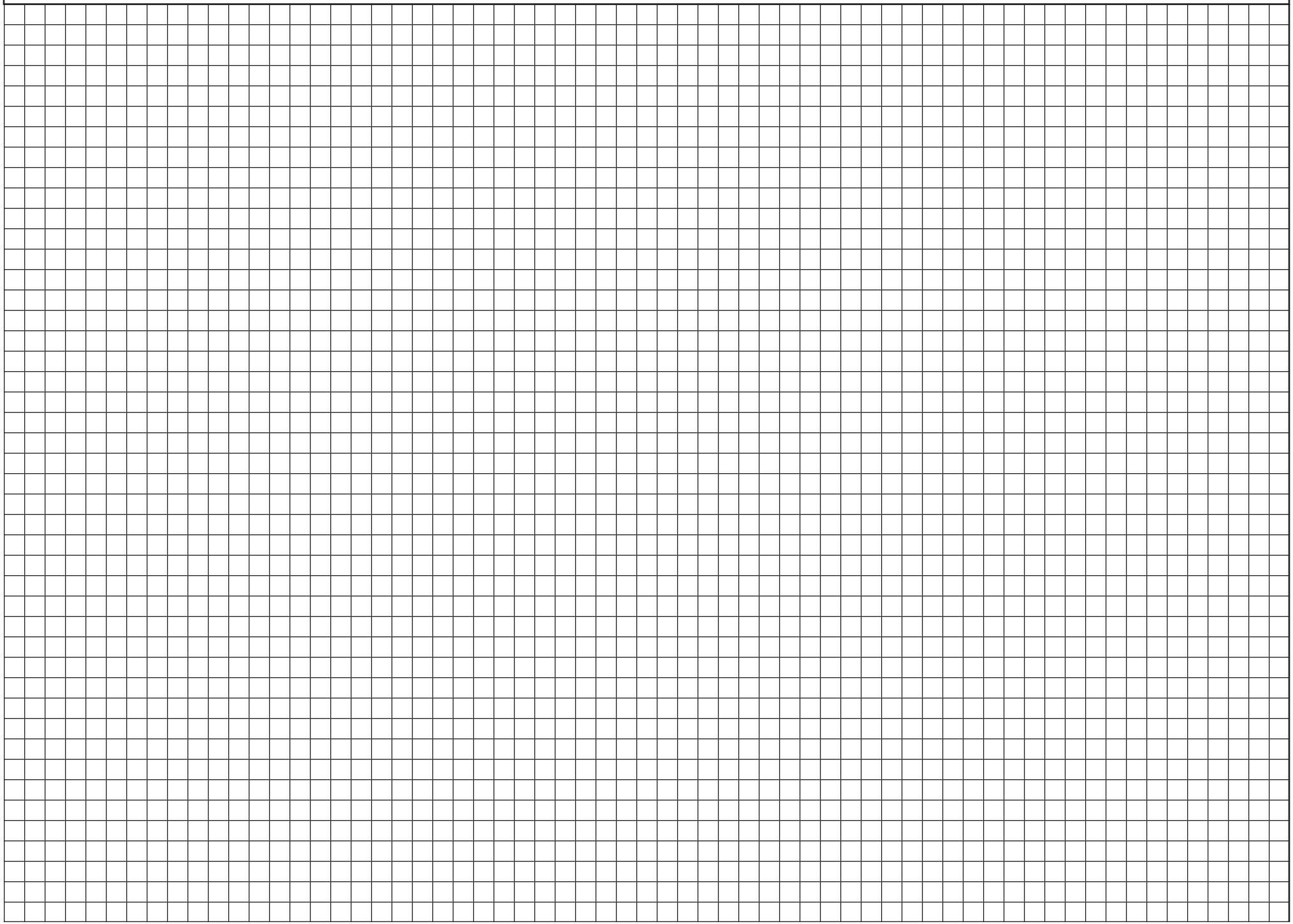
Number	Description (side yard ponding, back yard ponding, etc.)

Note any areas of gullying or erosion or any other areas of concern:

UTILITIES

	Location (Front, Side, etc.)
GAS	
WATER	
SEWER	
ELECTRIC	
PHONE/CABLE	

Stormwater Management Plan Map



Rain Garden		
Number	Description (front yard, back yard, etc.)	Square Feet
Riparian Buffer		
Number	Description (tributary, main stem of creek, etc.)	Square Feet
Tree Planting		
Number	Description (backyard woods, side woods, etc.)	Square Feet
Vegetated Swale or Native Meadow		
Number	Description (side yard swale, back yard meadow, etc.)	Square Feet
Pervious Paving		
Number	Description (front walkway; back patio etc.)	Square Feet
Rain Barrel		
Number	Description (side house barrel, shed barrel, etc.)	Gallons

Appendix B: Interactive Computer Resources

COMPUTER MAPPING TUTORIAL

1. Open Web Browser.

Go to Google maps (www.google.com/maps) or Bing maps (www.bing.com/maps), or your local county's tax maps to access an aerial map of your property. Or use **www.stormwaterguide.org** and follow the prompts.

2. Type in your property address, if using Google or Bing Maps.

Use the zoom functions to zoom in as close as you can to your property, making sure your entire lot is shown on the map. Make sure the "Satellite" or "Aerial" function is turned on so that the map is shown in aerial photography format.

3. Press "Print Screen"; Paste.

Use print screen option on your computer to paste the screen shot in the program of your choice to crop and edit. We recommend Power Point, Microsoft Word, or Paint.

4. Use drawing tools to add your different elements.

Using the "shapes" or other drawing tools available you can add your areas affected by stormwater and your new best management practices. The arrows and freeform tools are particularly useful. Be sure to use different colors for different elements of your map. Text boxes can be used to add labels or a legend.

5. Save and print your map.

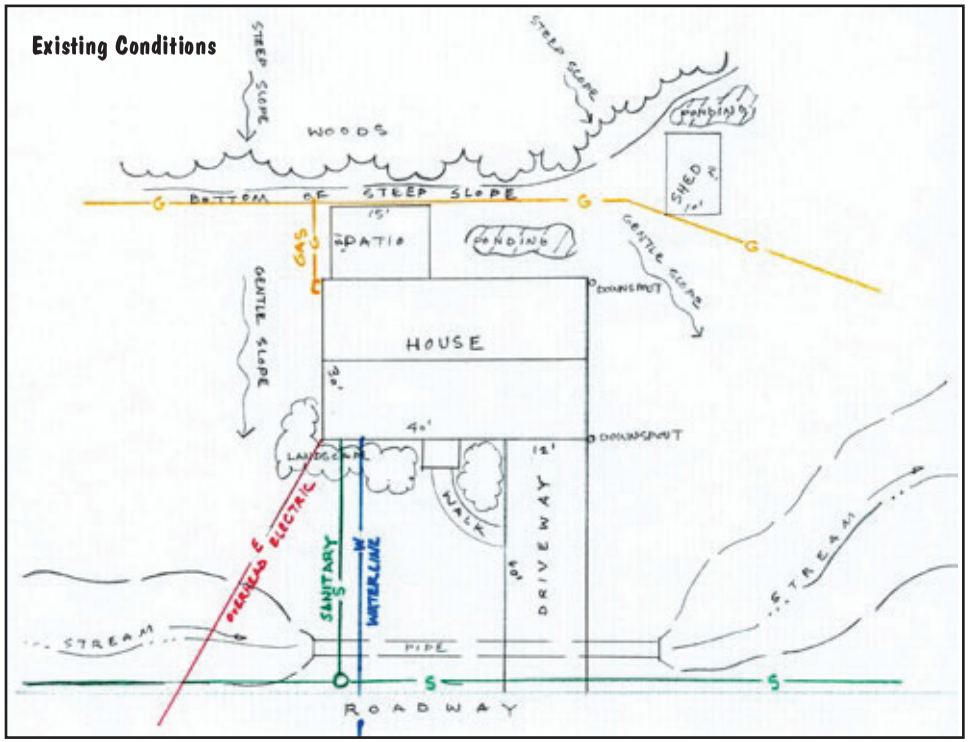
When you are done, you can save your map as a .pdf or print it to go with your written stormwater management plan.

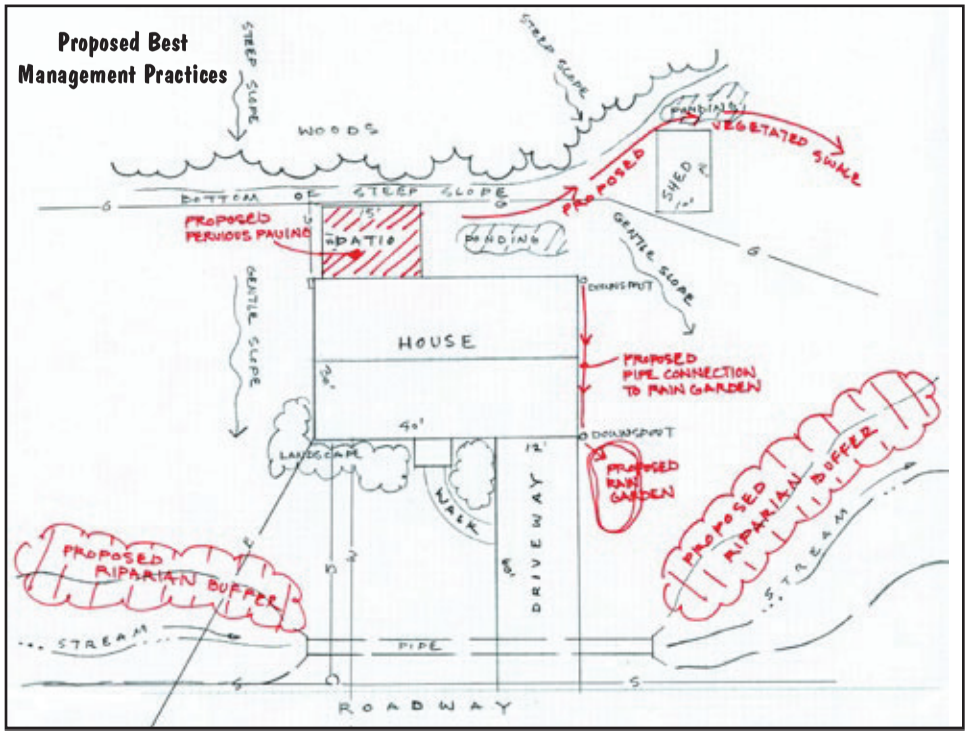
STORMWATER CALCULATOR

EPA's National Stormwater Calculator is a computer desktop application that estimates the annual amount of rainwater and frequency of runoff from a specific site anywhere in the United States. Estimates are based on local soil conditions, land cover, and historic rainfall records. All you need to do is supply information on your property's cover and what best management practices you would like to use. Just follow these instructions to download the National Stormwater Calculator to your computer.

1. Go to www.2.epa.gov/water-research/national-stormwater-calculator
2. Download the National Stormwater Calculator Exe (13MB) version 1.1
3. If your browser offers the option to run the setup program then do so.
4. Otherwise, have your browser display its list of recent downloads and select the setup file to run it.
5. If you have problems installing the calculator, contact your system administrator or try to download a 7MB zip file version.

SAMPLES - MAPS & PLANNING





PERVIOUS PAVING

Pervious concrete or asphalt can be poured in place for use in driveways, parking areas, or walkways. Impervious building materials, such as stone, concrete, or brick, can be laid with space in between to allow for pervious areas (gravel, sand, or vegetation).

Benefits
- Increases infiltration and groundwater recharge
- Reduces volume and rate of runoff

Negatives
- More labor intensive to install than other practices
- Extra maintenance needed

Cost
$$$
- Can save by installing permeable pavers
- May need to excavate and install stone base

Maintenance
- Moderate to high maintenance
- Grass between pavers may have to be mowed
- Inspect for signs of clogging
- Pressure wash and replace pea stone as needed
- Snow plow using higher blade

Aesthetic appeal
- Ranges from low to medium
- Artistic designs with layout can increase aesthetic appeal
- Creeping plants can be used as infill

Implementation Considerations
- Need to install permeable stone base layer 10”-12” thick
- May require underdrain
- Pavement subgrade should slope away from building foundation

RAIN BARREL/CISTERN

A barrel that captures rainwater from a roof and stores it for later use, such as watering plants or gardens. A cistern is a larger container that does the same thing.

Benefits
- Conserves water
- Captures and reuses stormwater

Negatives
- Minimal volume captured
- Poor construction or maintenance can result in mosquitoes
- Freezing/splitting if not put away in the winter

Cost
$
- Minimal cost as DIY project
- Can save dollars because of reduced potable water usage

Maintenance
- Clean screen/filter regularly
- Clean gutters twice annually
- Monitor during severe storms to avoid overflow
- Empty before winter months

Aesthetic appeal
- Ranges from low to medium depending on type of barrel used

Implementation Considerations
- Place on level surface
- Full rain barrel weighs 400 lbs
- Can be used in series for more storage capacity
- Water should be used between rain events

2. Factors to consider when choosing stormwater best management practices for your property.

Here are some considerations that might help you decide which practices you would like to install on your property.

- If you would like to enhance your landscaping with flowers and other attractive plants consider a rain garden or a native meadow/swale.
- If you want to reduce the amount of time it takes to mow the lawn, a rain garden or native meadow/swale would help accomplish this goal.

Native Purple Coneflower

Rain barrel use

- If you would like to see more butterflies, a rain garden or native meadow/swale can provide excellent butterfly habitat.
- If you have outdoor water needs (water for a garden, to water your lawn, or to wash your car) consider a rain barrel.
- If you don't have much yard to work with, a rain barrel takes up minimal space.
- If your driveway needs to be repaved, consider using pervious paving instead of traditional pavement.
- If you would like to give your patio a new look, consider pervious paving.
- If you would like to restore forested conditions on a portion of your property, consider tree planting.
- If a stream is running through your property installing a forested riparian buffer would be beneficial.
- If you want to cut down on air conditioning costs during the summer, consider planting some trees on your property.

Tree planting

3. Choose where to locate the stormwater best management practices on your property.

Now that you know about your property and the type of practices you would like to install, it's time to choose the right locations for the practices. Some considerations in your planning are:

- **Ponding Water.** Many stormwater practices encourage water to infiltrate into the soil (such as rain gardens and pervious paving). Where water ponds on your property, water is unable to infiltrate and it may be inappropriate to use these practices. *(Note- if you have an on-lot sanitary septic disposal system and an area is permanently wet near this system, the septic system may be failing. The disposal system should be evaluated and fixed before any other practices are installed.)*
- **Depth to bedrock.** You do not want to construct infiltration practices where rock layers are visible or are close to the surface.
- **Proximity to foundations.** You should also avoid constructing infiltration practices within 10 feet of building foundations.
- **Location of underground utilities.** Do not construct infiltration practices near septic systems or drinking water wells. Also avoid any underground utilities such as electric, cable, water, sewer, and gas lines (make sure to use the PA ONE-CALL system to locate underground utilities and contact your municipality).
- **Slope.** Depending on the practice, a steeper slope may prohibit siting, or it may be something that needs to be taken into account during the design stage. Consult the chart on the next page for guidance.
- **Soil percolation.** Since rain gardens and pervious paving are designed to infiltrate stormwater into the ground, the soil in the location of the rain garden or pervious paving must be able to drain. When considering these practices, you should conduct a simple percolation test where you would like to locate them:

Infiltration test

- Dig a 1 foot deep hole and fill with water.
- Allow the water to moisten soil and drain completely. If water is still in the hole after 24 hours, choose a different location.
- Fill the hole with water a second time and place a ruler in the hole. Note the water level and time.
- After 15 minutes, re-measure the water level. Multiply the change in water level by 4 to get the number of inches of infiltration per hour.
- A perforated underdrain may be necessary to drain excess water from a rain garden or permeable pavement if the infiltration rate is less than 1/2 inch per hour.

Use this summary chart to help you select one or more stormwater practices that are right for your property.

	Rain Garden	Riparian Buffer	Tree Planting	Native Swale/Meadow	Pervious Paving	Rain Barrel/ Cistern
Space Required	Minimum Size: 50 – 200 ft² 5 – 10 ft wide 10 – 20 ft long 6 – 12 inches ponding depth	The wider the better for water quality benefits based on lot size and configuration	Consider space needed for canopy spread	Not a factor	As needed to accommodate walkway, patio, or driveway	Not a factor
Slopes	Locate down slope of building foundations and drainage	Not usually a limitation, but a design consideration	Not usually a limitation, but a design consideration	5% or less along length of swale	2% or less	Barrel must be on level surface
Depth to Water Table	1 – 4 ft clearance	Not a factor if correct species are planted			1 – 4 ft clearance	Not a factor
Depth to Bedrock	1 – 4 ft clearance	1 – 4 ft clearance	1 – 4 ft clearance	Not a factor	1 – 4 ft clearance	Not a factor
Building Foundations	Minimum 10 ft down slope from building foundations	Usually not a factor				
Maintenance All practices should be inspected seasonally and after major storm events.	Low to Moderate: Weeding and watering in first 2 years. Some thinning in later years. Replace mulch.	Low to Moderate: Maintain tree tubes or cages. Mow between trees for first 4-5 years. Control invasives. Water as needed.	Low to Moderate: Maintain tree tubes or cages. Mow between trees for first 4-5 years. Control invasives. Water as needed.	Low to Moderate: Mow twice annually for first two years. Control invasive plants	Moderate to High: Trim vegetation. Inspect for signs of clogging and vaccuum 2 times per year. Replace stone fill as needed.	Low: Clean screen/ filter regularly. Clean gutters twice annually. Monitor for overflows. Empty and store before winter months.
Treatment Potential	1500 gallons treatment capacity per 200 ft²*	200 gallons captured and treated per 1000 ft²	45 gallons of water captured and treated per 2 inch caliper deciduous tree. 75 gallons of water captured and treated per 6 ft evergreeen tree	200 gallons captured and treated per 1000 ft²	30 gallons water captured and treated for a 1/2 inch rain fall per 100 ft²	A 55 gallon drum will be filled from a one inch storm on a 100 ft² roof

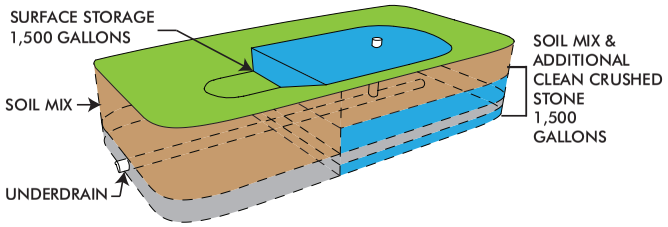
*the subsurface storage of a rain garden should be equal to the surface ponding volume.

Chart adapted from the New Hampshire Homeowner's Guide to Stormwater Management Do-It-Yourself Stormwater Solutions. NH Department of Environmental Services (March 2011, revised February 2012).

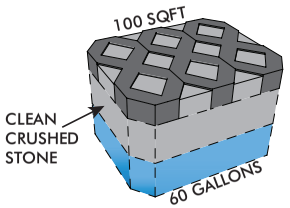
Please remember that by law and for safety you must call PA One Call before digging underground so you know where your underground utilities are located (ie electrical, sanitary sewer, water, etc.).

Best Management Practices: Stormwater Captured During a 1" Rainfall

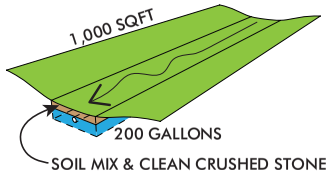
Rain Garden



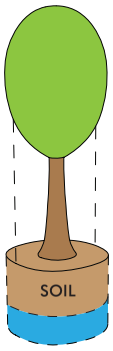
Permeable Pavement



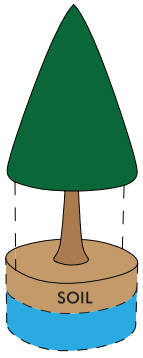
Vegetated Swale



2" Caliper Deciduous Tree



6' Tall Evergeen Tree



Rain Barrel 100 sq ft of Roof

4. List and map your chosen stormwater best management practices.

Now that you've chosen stormwater management practices for your property, list them on the stormwater management plan template provided in Appendix A. Draw them on your property map. Again, you can either hand draw them on the graph paper provided in Appendix A, or continue to follow the Computer Mapping Tutorial in Appendix B to map your chosen stormwater practices on your computer generated property map.

Map of potential best management practices via www.stormwaterguide.org

Section 4: Implementing Your Stormwater Management Plan

Congratulations! Your stormwater management plan is complete! You have taken an important step in managing stormwater on your property to help clean your local stream and river. Now you are ready to start implementing your plan. If you are a do-it-yourselfer, there are several online resources that provide detailed design and implementation guidance for the six practices discussed in this guide. Note: Please refer to the disclaimer at the end of this guide.

In the meantime, here are some other online guides you can reference:

RAIN GARDENS

Rain Gardens: A How-To Manual for Homeowners (University of Wisconsin Extension)
http://learningstore.uwex.edu/assets/pdfs/GWQ037.pdf
Rain Gardens in Connecticut: A Design Guide for Homeowners (UConn Cooperative Extension System) http://nemo.uconn.edu/publications/rain_garden_broch.pdf
Primer - Bioretention in Clay Soils http://wcdpa.com/tech-services/stormwater-management/stormwater-primer-entry-page/
Three Rivers Rain Garden Alliance
http://www.raingardenalliance.org

RIPARIAN BUFFERS

Riparian Forest Buffer Guidance (PA Department of Environmental Protection)
http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-82308/394-5600-001.pdf

TREE PLANTING

Planting and After Care of Community Trees (Penn State Extension)
http://pubs.cas.psu.edu/freepubs/pdfs/uh143.pdf
PATrees.org: The Free Resource Guide
http://www.patrees.org

NATIVE MEADOWS

Meadows and Prairies: Wildlife-Friendly Alternatives to Lawn (Penn State Extension)
http://pubs.cas.psu.edu/FreePubs/pdfs/uh117.pdf

PERVIOUS PAVING

New Hampshire Homeowner's Guide to Stormwater Management Do-It-Yourself Stormwater Solutions: Pervious Walkways & Patios (NH Dept. of Environmental Sciences)
http://des.nh.gov/organization/divisions/water/stormwater/documents/perv-walkw-patios-fs.pdf
Westmoreland Conservation District Fact Sheets
http://www.wcdpa.com

RAIN BARRELS AND CISTERNS

Build Your Own Rain Barrel (Chesapeake Bay Foundation) http://www.cbf.org/Document.Doc?id=30
Rainwater Harvesting: Guidance for Homeowners (North Carolina Cooperative Extension)
http://www.ces.ncsu.edu/depts/agecon/WECO/documents/WaterHarvestHome2008.pdf

STORMWATER MANAGEMENT

3 Rivers Wet Weather
http://www.3riverswetweather.org
StormwaterPA
http://stormwaterpa.org/
Pennsylvania Stormwater Best Management Practices Manual
http://wcdpa.com/publications/technical-reference-manuals/pa-stormwater-bmp-guide-2006-cover-id/

WATERSHEDS

EPA Surf Your Watershed
http://cfpublepa.gov/index.cfm

If installing these stormwater practices is not something you want to tackle, you can take your plan to a landscape professional with experience in designing and implementing these types of stormwater practices. You may want to do some of the work yourself and enlist the help of a professional to do the other part. The choice is up to you.

Please note that this guide focuses on six practices that are fairly simple to plan and construct. There are many other, more complex stormwater best management practices that may be applicable to your property and that you may want to consider. These include bioswales, underground cisterns, drywells, infiltration trenches, and many more. If you are interested in seeing if any of these types of practices are a good fit for your property, you should consult an experienced professional to plan, design, and implement them.

Section 5: Healthy Lawn Care Practices

The practices described in this guide are alternatives to maintaining a lawn and go a long way to protecting our streams. Yet lawns remain a significant component of the residential landscape and are important to homeowners for many uses. A special EPA Expert Panel looking at the issue of lawns and water quality concluded that maintaining a dense, vegetative cover of turf grass reduces runoff, prevents erosion, and retains nutrients in the turf grass.

EPA'S TIPS FOR GROWING AND MAINTAINING A HEALTHY LAWN:

Consult with your local Penn State extension office or lawn care professional for technical assistance to develop an effective nutrient management plan for your lawn based on a soil test analysis.

The precise lawn care prescription should be based on site-specific recommendations that take into account soil properties, the type of grass species, the age of the lawn, and other factors. Look

for professionals who are Pennsylvania Certified Horticulturists or Landscape Industry Certified.

Per the recommendations of your local extension educator or your lawn care professional, follow one of four fertilizer application strategies: (1) choose not to fertilize; (2) fertilize with organic materials; (3)reduce rate and monitor; or (4) apply less than a pound of nitrogen per 1,000 square feet per each individual application.

First, elect not to fertilize at all. Some lawns, due to their age or natural soil fertility may be able to maintain a healthy, dense cover without additional fertilization. (However, if your lawn is thin, is weed infested, or has bare spots, you should consider fertilizing to restore a thick turf grass cover, using one of the other three strategies.)

Second, apply organic fertilizer such as compost, composted manure, or Milorganite™

Third, take a "reduced rate and monitor" approach. For this approach, follow the nitrogen application rates on the fertilizer bag label and reduce them by one-third to a half, and monitor the results. If lawn quality starts to fall below acceptable levels, re-apply at the reduced rates.

Fourth, fertilize at the Penn State Extension recommended rate (3.0 to 3.5 pounds of nitrogen per 1,000 square feet of lawn per season), but split into 3 or 4 small doses during the growing season (for example, early spring, late spring, late summer and mid-fall). This will get you to an accepted application rate of less than a pound of nitrogen per 1,000 square feet for each individual application.

Most bagged fertilizers in Pennsylvania have already removed phosphorus from their products, except for "starter fertilizers" used to establish grass seed in new lawns. If your soil tests show a phosphorus deficiency, ask your lawn care professional for recommendations on how to provide the phosphorus your lawn needs.

Use a mulching mower to retain clippings and mulched leaves on the lawn and keep them out of streets and storm drains.

Lawn clippings are high in nutrients and should be treated as if they are a fertilizer. Nitrogen fertilization can be reduced without decreasing turf grass quality when clippings are left to decompose and return to the lawn.

Do not apply fertilizers before spring green up or after the grass becomes dormant.

The risk of pollution by leaching or surface runoff is greatest during the seasons of the year when grass is dormant. Avoid applying fertilizer in the late fall or winter. In spring, wait until the grass begins to green.

Maximize use of slow release nitrogen fertilizer.

Less nutrient loss occurs when slow release fertilizer products are used during the growing season, compared to water soluble formulations. Slow release fertilizer is typically shown on fertilizer products as water insoluble nitrogen (WIN), and can range from 20 to 50% of the total nitrogen product. You can shop for the fertilizer product with the greatest percentage of WIN. Avoid using in late fall as they may release nitrogen when the grass is dormant or frozen.

Apply lime.

Lime will improve vegetation health and soil porosity. Many southwestern PA soils are clay-based and have a low pH - an indication of an acid soil. Lime applied according to Penn State Extension recommendations will ensure good turf grass growth and stormwater retention.

Immediately sweep off any fertilizer that lands on a paved surface.

Rotary spreaders are the most common method to apply fertilizers and can broadcast fertilizer granules near the edge of a lawn, street, or driveway, where they can be subsequently washed off in a rain storm. Sweep up wayward granules before they have a chance to get into gutters and storm sewers. If you use a rotary spreader, purchase one with a deflector shield to prevent spraying fertilizer on the street, driveway, or sidewalks.

Do not apply fertilizer within 15 to 20 feet of a stream, pond, or other water body and consider managing this zone as a perennial planting, native meadow, native grass buffer, or forest buffer.

The risk of runoff is greatest from lawn areas adjacent to water features such as streams, shorelines, sinkholes and drainage ditches. Consider establishing a riparian buffer of shrubs, trees, or perennials along streams and other water courses.

Set mower height at 3 inches or taller.

Maintaining taller grass produces a deeper and more extensive root system, increasing nutrient uptake, and reducing runoff. The deeper roots also capture moisture during times of drought, suppress weeds, and increase turf density.

A well maintained lawn, with a dense healthy cover of turf grass significantly slows and absorbs stormwater runoff. However, you should consider installing stormwater best management practices where runoff is causing problems. Rain gardens, trees, and vegetated swales help lawns infiltrate excess stormwater.

Disclaimer

WHAT YOU CAN DO TO HELP

Interesting Fact!

Every dog produces about 3/4 lbs. of solid waste per day… and about 7.8 billion fecal coliform bacteria!

- Clean up after your pet every single time, on walks and in the yard.
- Dispose of the waste properly in the toilet, or bagged in the trash. **Never** place it in a storm drain!
- Town parks, trails and recreation areas offer complimentary waste bags and disposal receptacles for your convenience. Don't just leave bags on the ground.
- Carry extra bags when walking your dog and share them with other pet owners who are without.
- Keep extra bags in your car so you are prepared when you travel with your dog.
- Tell friends and neighbors about the harmful effects of animal waste on the environment. Encourage them to clean up after their pets also.

Pet Waste and Water Quality

You and your pet both love the outdoors, but did you know that failing to pick up your dog's waste can hurt the environment? Pet waste is full of bacteria, viruses and parasites. When pet waste is left on the lawn or the side of the street, all of the bacteria, viruses and parasites in that pet waste are picked up by rain water and washed down the storm drain into the nearest creek, river or pond. This is harmful for water quality and human health.

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Dog feces have a higher phosphorous concentration than found in cow and swine manure. Phosphorus is a nutrient that negatively impacts water quality and plant species. Nitrogen, found in dog urine, also causes contaminated runoff and leads to serious water quality issues.

Pet waste left on the ground eventually contaminates the watershed. Waste components like fecal bacteria and nutrients are washed into storm drains, streams, and other receiving waters by irrigation, rain, melting snow, and flooding. They can also simply leach through the soil and into the groundwater.

You Can Make A Difference!

Dog waste is cited as the 3rd or 4th largest contributor of bacterial pollution in urban watersheds.

The average dog produces approximately 3/4 pounds of poop every day. 1,000 dogs will produce 750 pounds of excrement a week. Do your part- pick up after your dog. It's the neighborly thing to do!

When pet waste is disposed of improperly, not only water quality suffers – your health may be at risk, too. Pets, children who play outside, and adults who garden are most at risk for infection from some of the bacteria and parasites found in pet waste. Flies may also spread diseases from animal waste.

Diseases or parasites that can be transmitted from pet waste to humans include:

- **Campylobacteriosis** – A bacterial infection carried by dogs and cats that frequently causes diarrhea in humans.
- **Cryptosporidium** – A protozoan parasite carried by dogs, cats, mice, calves and many other mammals. Common symptoms include diarrhea, stomach cramps, nausea and dehydration. May be fatal to people with depressed immune systems.
- **Toxocariasis** – Roundworms usually transmitted from dogs to humans, often without noticeable symptoms, but may cause vision loss, a rash, fever, or cough.
- **Toxoplasmosis** – A protozoan parasite carried by cats that can cause birth defects such as mental retardation and blindness if a woman becomes infected during pregnancy; also a problem for people with depressed immune systems. Symptoms include headache, muscle aches, lymph node enlargement.

Scooping your dog's waste isn't just a courtesy for those walking behind you; it also keeps our water resources safe.

Clean water resources are essential for drinking, navigation, and recreational activities such as swimming and boating.

We all need to work together to keep our lakes and streams healthy.

Please remember to clean up after your pet.

Pet waste pollutes local water resources and can be a significant public health risk!

Scoop the Poop!

Dog owners can make a positive change in our community by keeping local water resources clean!

This brochure was created as part of the MS4 Public Stormwater Education Program funded by the City of Monessen in Westmoreland County, PA.

Why all the fuss? Because pet waste pollutes local water resources and can be a significant public health risk!

When rain or snowmelt flows over land surfaces, it carries pet waste to storm drains and eventually flows into nearby lakes, streams, and wetlands. The polluted runoff contains harmful bacteria and nutrients such as phosphorus and nitrogen and can make lakes and streams unsafe for drinking and swimming. Microorganisms found in the dog waste can cause human diseases and health problems from roundworms, Giardia and Salmonella, viruses, and parasites. Nitrogen and phosphorus from the waste will also promote the growth of unwanted algae and rooted aquatic plants in lakes and streams.

Stepping in dog waste can be a nasty experience.

Even worse is the knowledge that dog waste may be polluting our drinking water, local swimming areas, and favorite lake fishing spots. Listed below are a few tips on how dog owners can protect local water resources.

Dog owners are encouraged to clean up after their pets in order to protect our local community and its water resources.

- Always bring a plastic bag with you when you walk your dog.
- Use the bag like a glove, pick up the pet waste, turn the bag inside out, and seal it.
- Place the bag in the trash, or flush the un-bagged waste down the toilet. Homeowners with large yards can also bury the dog waste in a hole at least 5 inches deep and away from vegetable gardens and waterways.

Never place the dog waste (bagged or un-bagged) in the storm drain!

Storm drains lead directly to streams, rivers, lakes and wetlands. And remember — dog waste is only one of many pollutants that impact local waterways. Community members are also encouraged to reduce runoff containing lawn fertilizers, motor oil, driveway sand and salt, and yard waste such as grass clippings and leaves.

One day's waste from a large dog can contain 7.8 billion fecal Coliform bacteria.

Pet waste pollutes our rivers, lakes, and streams. If you think picking up dog waste is unpleasant, try swimming in it!

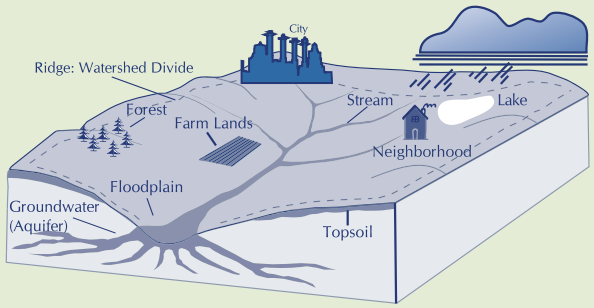
What is a Watershed?

A watershed is an area of land that drains to a common point, such as a nearby creek, stream, river or lake. Every small watershed drains to a larger watershed that eventually flows to the ocean.

Watersheds support a wide variety of plants and wildlife and provide many outdoor recreation opportunities. By protecting the health of our watersheds we can preserve and enhance the quality of life for Kansas City area residents.

What is Stormwater Runoff?
Stormwater is water from rain or melting snow. It flows from rooftops, over paved streets, sidewalks and parking lots, across bare soil, and through lawns and storm drains. As it flows, runoff collects and transports soil, pet waste, salt, pesticides, fertilizer, oil and grease, litter and other pollutants. This water drains directly into nearby creeks, streams and rivers, without receiving treatment at sewage plants.

Polluted stormwater contaminates streams, rivers and lakes. It can kill or damage plants, fish and wildlife, while degrading the quality of our water.



A typical watershed system

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Spring Watershed Tip

Wash your car the right way

The car is clean but what about the water?

Clean Water. Healthy Life.

Clean Water. Healthy Life.

The Facts About Car Washing

For many, car washing is a springtime ritual. Often, citizens don't know that by washing all that winter grime off their vehicles they might actually be causing harm to our local waterways.

Water entering storm drains, unlike water that enters sanitary sewers, does not undergo treatment before it is discharged into our waterways. When cars are washed on streets and driveways, that dirty water eventually winds up in rivers, streams, creeks, and lakes.

Washing one car may not seem to be a problem, but collectively car washing activity adds up to big problems for our local lakes, creeks and streams. Pollution associated with car washing degrades water quality while also finding its way into sediments, impacting aquatic habitats.

What's the Problem?

Washing your car is only a problem if you don't know where or how to do it correctly. The average homeowner uses 116 gallons of water to wash a car! Most commercial car washes use 60 percent less water for the entire process than a homeowner uses just to rinse the car.

Among the many impacts of motor vehicles on our environment, car washing has been noted by water quality experts as a serious contributor to water pollution.

Water that runs off a car when it is washed in a driveway, street, or parking lot can contain substances that pollute the environment. Dirty water containing soap, detergents, residue from exhaust fumes, gasoline, heavy metals from rust, and motor oils can wash off cars and flow directly to storm drains and into the nearest creek or stream where it can harm water quality and wildlife.

The phosphates from soap can cause excess algae to grow. Excessive algae smell bad, look bad, and harm water quality. As algae decay, the process uses up oxygen in the water that fish need.

Car wash fundraisers can be a significant source of this kind of pollution. These events are usually held in heavily paved areas where there is little runoff control or grass to filter out harmful substances before they reach our waterways.

What Can You Do?

The best way to minimize the effect washing your car has on the environment is to use a commercial car wash. Most locations reuse wash water several times before sending it to a treatment plant.

However, if you choose to wash your car at home or on the street, these are some things that you can do to minimize the water quality impact:

- Use biodegradable, phosphate-free, water-based cleaners only.
- Minimize water usage. Use a spray gun with flow restriction to minimize water volume and runoff.
- Wash on an area that absorbs water, such as gravel, or grass. This can filter water before it enters groundwater, storm drains, or creeks. Avoid washing cars on concrete or asphalt pavement unless it drains into a vegetated area.
- Only let wash water soak into the ground as long as you are using biodegradable, phosphate-free cleaners.
- When planning a car wash fundraiser, try developing a partnership with a commercial car wash facility, or use a safe location.
- Always empty wash buckets into sinks or toilets.

Green Lawns, Clean Water

Simple lawn care tips to keep your yard healthy and prevent polluted runoff.

FROM YOUR YARD TO THE RIVER

Your lawn can either be a source of water pollution or a buffer to protect against it.

DID YOU KNOW that poor lawn care practices create pollution in our waterways? Grass clippings, leaves, fertilizer and other pollutants can wash into the streets, through the stormdrains and into nearby water bodies.

MOW HIGH — 3 INCHES OR HIGHER

Don't cut your grass too short. Setting your lawn mower at a height of three inches or greater will produce denser, healthier grass that is more resistant to weeds, drought and erosion. It will also help trap pollutants that would otherwise blow into stormdrains.

CUT ONE-THIRD (OR LESS) AT A TIME

At any given time, don't cut more than one-third of the length of the grass blade. Doing so will stress your lawn and make it difficult to re-grow. It will also leave unsightly piles of grass clippings that can blow into stormdrains and pollute nearby waterbodies.

KEEP YOUR MOWER BLADES SHARP

Dull lawn mower blades can damage grass tips and give lawns a yellowish or whitish appearance. Keep your mower blades sharp to keep your lawn healthy and help your mower run more efficiently. Most hardware stores can sharpen mower blades for a small fee.

WATER WISELY

Early morning watering is best, so the grass can retain the moisture better. Lawns generally require one inch of water per week, so use a rain gauge to determine how much (if any) extra water your lawn needs between rainfalls. Also, avoid sprinkling hard surfaces.

MULCH OR COMPOST YOUR YARD WASTE

Mulch your grass clippings and leave them on your lawn; it's the same as applying a round of fertilizer. You can also mulch leaves and leave them on your lawn as long as it doesn't cover up more than 50 percent of the grass. You can put excess mulch in a compost bin.

FERTILIZE SMART

If you choose to use fertilizer, do it in the fall when it's most effective. Apply the amount directed, and use only zero-phosphorus fertilizers. Sweep up any excess that falls on hard surfaces. Also, consider aerating your yard in the fall; it will strengthen your lawn naturally.

STORMDRAINS AND WATER POLLUTION

The stormdrains in your street connect directly to the Monongahela River and other waterbodies. Grass clippings, leaves and other yard trimmings pollute water with phosphorus, nitrogen and other excess nutrients.

BEAUTIFY YOUR YARD AND STOP POLLUTED RUNOFF

- Pick up your pet's waste to prevent lawn burns and keep bacteria out of stormdrains
- Replace your turfgrass with native perennial plants
- Install a raingarden to capture and absorb stormwater runoff
- Wash your vehicles at a commercial car wash — not in your driveway
- Install a rainbarrel to capture stormwater for irrigation
- Point your downspouts away from hard surfaces

MS4 and Grass Clippings

With the rains that occurred over the past several years, many of us have had to mow our lawns more often. These heavy rains can also contribute to grass clippings ending up in storm water runoff. Grass clippings that are blown into the street eventually enter the street storm drain.

When lawn clippings, fertilizers, soil, leaves, or animal wastes, are picked up by storm water runoff, they are carried directly to our local streams and lakes. All of these materials including grass clippings contain phosphorus. According to the U.S. EPA, phosphorus is one of the most troublesome pollutants in storm water runoff and it is considered the primary cause of water quality problems in our river and streams.

Grass clippings contribute nutrients such as nitrogen and phosphorous, which cause unwanted and uncontrolled growth of algae and aquatic weeds in the waterways. Increased algae growth is observed as green algae blooms or “scums” on the river and streams. Too much algae is harmful to our natural water system. It blocks sunlight and prevents other plants from growing. When it dies and decays, it also takes much needed oxygen away from fish. Limiting phosphorus reduces algae blooms. According to the Northeast Wisconsin Stormwater Coalition, one bushel of fresh grass clippings can contain 0.1 pounds of phosphorus is enough to produce 30 to 50 pounds of algae.

When mowing your yard, make certain that you do not blow grass clippings into the street. The City of Monessen has an MS4 Permit with the DEP which regulates stormwater and pollution which may enter the streams from the storm system. The City was required to adopt an MS4 Ordinance adhering to these regulations. Lawn clippings blown into the street and not cleaned up by the homeowner may enter the storm system and is a violation of the MS4 Ordinance. When mowing, make the first few passes with the lawnmower blowing the grass clippings into the lawn not the street. If there are grass clippings on the street or sidewalk, use a broom or leaf blower to blow them back into the lawn. Do not use a hose to wash them into the street or storm drains. Keeping your leaves and lawn clippings out of the streets and gutters will have significant benefits for your river or stream. You can reduce the amount of phosphorus entering the river or stream and keep one of our most precious renewable resources clean for the next generation.

BENEFITS OF RAIN BARRELS

Environmental Benefits:

- Reduces roof runoff
- Conserves water use
- Reduces pollutants from entering streams
- Clean water for gardens, lawns, washing cars, etc.!

Maintenance:

- Keep openings covered with a fine-mesh screen to prevent mosquito breeding; You can also use "dunks," a non-toxic bacteria to kill larvae.
- Empty barrel frequently to keep stored water from developing odors. Baking soda (not vinegar) can also help.
- Check barrel and connections frequently to remove debris.
- Drain barrel and connections and place in storage during winter to avoid freezing damage.

Application:

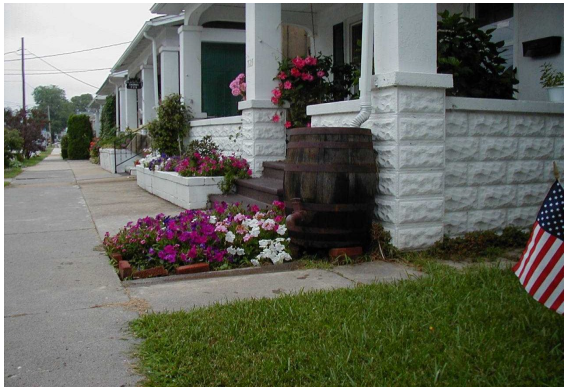
- Residence
- Business
- School
- Anywhere there is a rain leader from a roof!

Take Note:

Water from barrel should NEVER be used for drinking, cooking, or bathing!

RAIN BARRELS: *STORMWATER SOLUTIONS FOR ANY LOCATION*

URBAN: Rain barrels can be installed in any small area; some models even include planter boxes or flat backs for conserving space.



RESIDENTIAL/ BUSINESS: Barrels come in all designs to best fit space, amount of rainwater, and aesthetics.

Stormwater
Best Management Practices

Nonpoint Source Pollution Reduction Strategy:

RAIN BARRELS

City of Monessen

557 Donner Avenue
Monessen, PA 15062
Phone: 724-684-9000

www.cityofmonessen.com

ABOUT THIS BROCHURE

This brochure was developed to educate the residents of Monessen about stormwater management; nonpoint source pollution and its impacts; and, strategies for reducing water pollution that can be implemented at home, at work, or in the community.

What is nonpoint source pollution (NPS)? NPS pollution occurs when precipitation flows over lawns, parking lots, farm fields, city streets and forests picking up pollutants and carrying them into our streams, rivers and oceans.

Activities such as littering, oil leaks, lawn over-fertilization, and improper disposal of chemicals contribute to the contamination of our local waters. If left unchecked, these activities eventually increase the level of pollution content in our streams & waterways.

What can we each do? Strategies for managing stormwater and reducing nonpoint source pollution can be accomplished in many ways. Some of those ways are demonstrated on this trail and include Installation of Pervious Surfaces, Water Quality Units, Rain Gardens or Bioretention Areas, and Subsurface Infiltration Systems.

RAIN BARRELS

What are Rain Barrels?

A **rain barrel** is a rainwater collection system that stores rooftop runoff that can be used for irrigating gardens and lawns, while conserving water!

Can I use a Rain Barrel?

Cisterns, Rain Barrels, Vertical Storage, and similar devices have been used for centuries to capture stormwater from the roofs of buildings. Capture and reuse encompasses a wide variety of water storage techniques designed to "capture" precipitation, hold it for a period of time, and reuse the water. Storage/ reuse techniques range from small, residential systems such as **rain barrels** that are maintained by the homeowner to supplement garden needs, to large, "vertical storage" units that can provide firefighting needs. Storage/reuse techniques can be useful in urban areas where there is little physical space to manage stormwater.

WATER RESOURCE MANAGEMENT

WATER RESOURCE CENTER

WATER RESOURCE CENTER

FACT SHEET

Water resource management is a large and growing field with continuous emerging concerns. In 2013, SPC formed the Water Resource Center (WRC) to address various water issues within the region, with an initial focus on Stormwater Management Planning.

The SPC region covers a 10-county area with a total of 7,112 square miles. The 10 counties are Allegheny, Armstrong, Beaver, Butler, Indiana, Fayette, Greene, Lawrence, Washington, and Westmoreland and contain a total of 548 municipalities.

Mission

The WRC's mission is to promote regional collaboration on water topics; be a leader in facilitating coordination and education; and provide technical assistance to its member governments. Specifically, the WRC will have four major tasks to undertake for its members:

- Provide needed technical assistance
- Provide educational resources
- Serve as a regional information clearinghouse
- Provide a forum for regional coordination of water issues

The primary Clients for the WRC are: Member Governments (Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Washington and Westmoreland Counties and the City of Pittsburgh); Local Governments (municipalities, municipal authorities and school districts); Related Agencies (Federal Agencies, State Agencies and Conservation Districts); and, Related Organizations (including but not limited to regional nonprofits that share a related mission).

Southwestern Pennsylvania Commission

WATER RESOURCE CENTER

For more information contact:

Erin Kepple, Water Resource Manager
(412) 391-5590 x374
ekepple@spcregion.org

Sarah Koenig, Water Resource Planner
(412) 391-5590 x357
skoenig@spcregion.org

Two Chatham Center
Suite 500
112 Washington Place
Pittsburgh, PA 15219-3451
Voice (412) 391-5590
Fax (412) 391-9160
www.spcwater.org

The photo above shows the improper installation of stormwater management controls for new construction. Act 167 Stormwater Management Plans, and associated ordinances require proper management of stormwater runoff from new development and redevelopment projects.

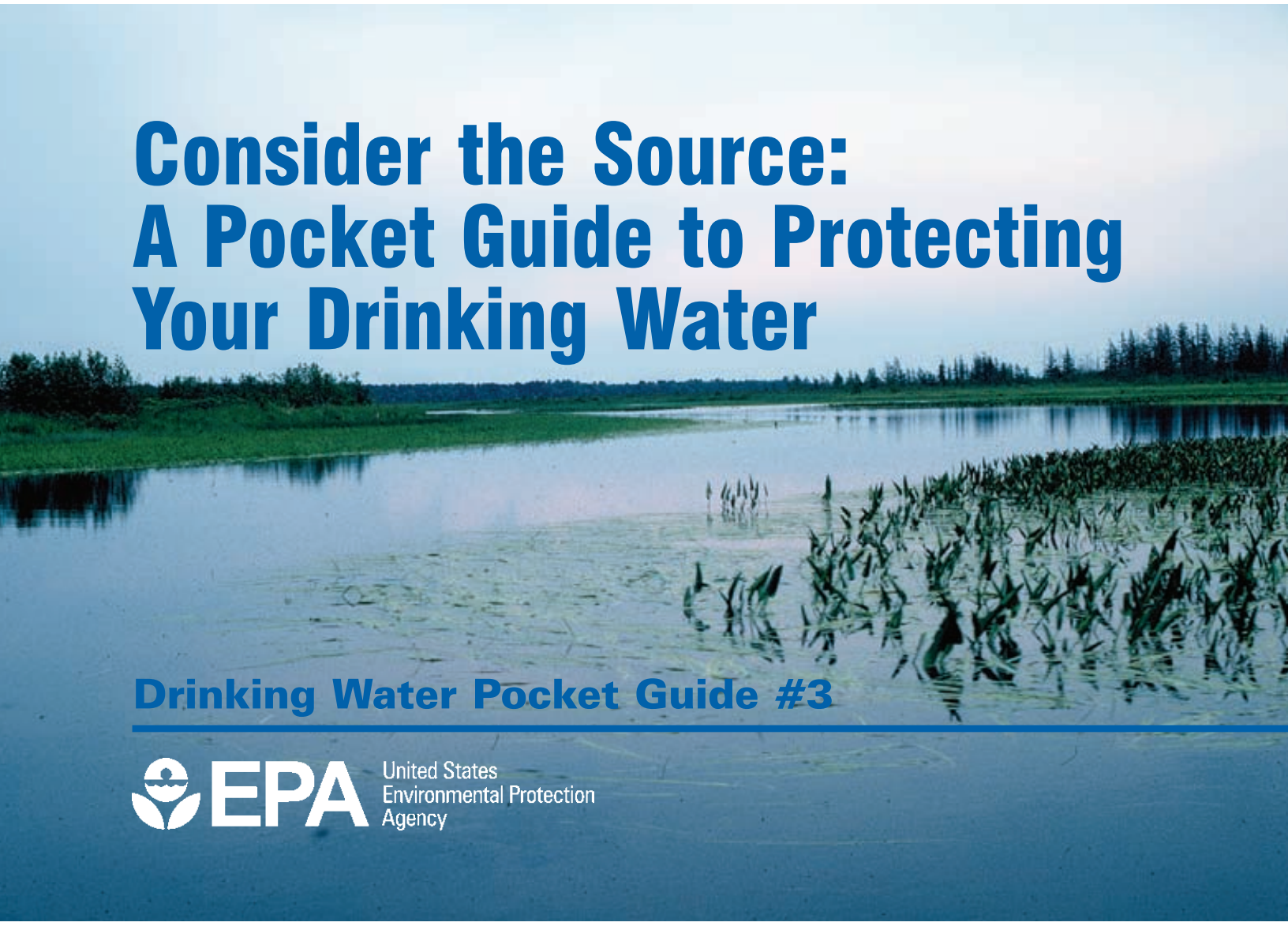
Leading causes of stream impairments in the SPC Region:

- Acid Mine Drainage, 34.5%
- Other/Unknown, 18.6%
- Agriculture, 15.5%
- Runoff, 13.8%
- Bank Mod/Channelization, 4.5%
- Habitat Mod/Land Dev., 4.3%
- Other Categories, <1%, 2.3%
- Mining, 1.6%
- Combined Sewer Overflows, 1.4%
- Construction, 1.4%
- On-Site Wastewater, 1.3%
- Erosion from Derelict Land, 1.0%

Source: PADEP Integrated List Non-Attaining, GIS Data July 2013

CONSIDER THE SOURCE:

A POCKET GUIDE TO PROTECTING YOUR DRINKING WATER



Consider the Source: A Pocket Guide to Protecting Your Drinking Water

Drinking Water Pocket Guide #3

EPA United States Environmental Protection Agency

Cover Photo: The Kakagon Sloughs is located in northern Wisconsin, on the Bad River Chippewa Indian reservation. The Tribe depends on its waters for wild rice harvesting, fishing, and hunting. The integrity of this wetland is also important to drinking water sources in Lake Superior's Chequamegon Bay region. — USEPA Region 5, Great Lakes National Program Office.

Office of Ground Water and
Drinking Water (4606-M)
EPA 816-K-02-002
www.epa.gov/safewater
June 2002

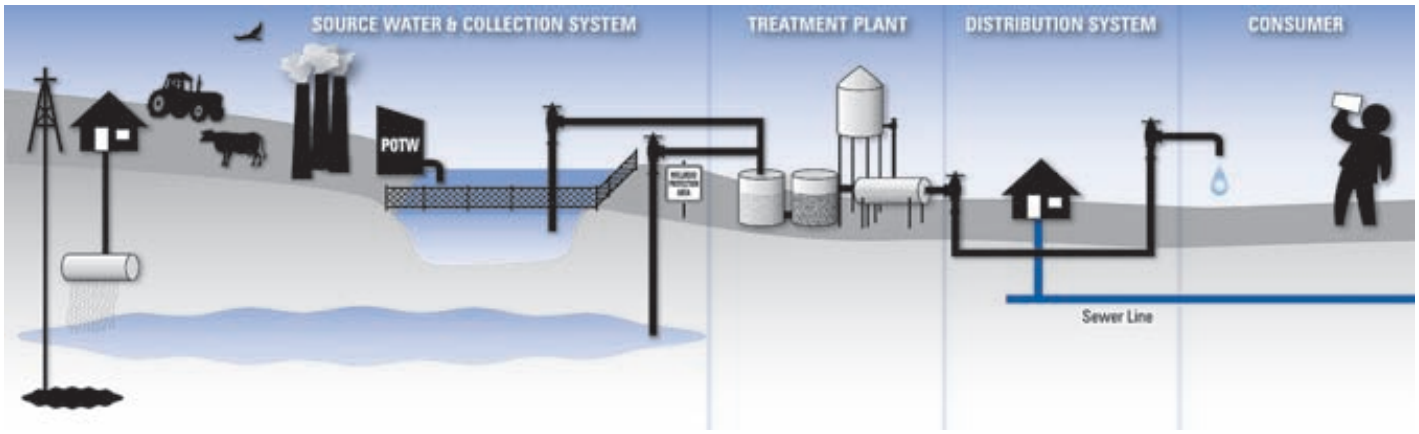
Printed on Recycled Paper

Table of Contents

I. Introduction

Virtually every stream, lake, river and aquifer in this country is used as a drinking water source. Protecting these source waters from contaminants is a major national priority in protecting public health through ensuring a clean, safe drinking water supply. Reducing the threat of waterborne illnesses helps save hundreds of millions of dollars annually by eliminating costly health care expenses, lost wages, work absences, decreased job productivity, and additional treatment costs incurred by Public Water Sytems (PWSs) required to meet federal drinking water quality standards. The Source Water Protection Program, authorized by the 1996 Amendments to the Safe Drinking Water Act (SDWA), outlines a comprehensive plan to achieve maximum public health protection. According to the plan, it is essential that every community take these six steps:

- **DELINEATE** your drinking water source protection area
- **INVENTORY** known and potential sources of contamination within these areas
- **DETERMINE THE SUSCEPTIBILITY** of your water supply system to these contaminants
- **NOTIFY AND INVOLVE THE PUBLIC** about threats identified in the contaminant source inventory and what they mean to their PWS.
- **IMPLEMENT MANAGEMENT MEASURES** to prevent, reduce, or eliminate threats
- **DEVELOP CONTINGENCY PLANNING STRATEGIES** to deal with water supply contamination or service interruption emergencies



II. Ensuring Safe Drinking Water Through the Multiple-Barrier Approach

Whether your tap water comes from surface or ground water, all drinking water sources are vulnerable to a variety of contaminants from a variety of activities. The origin of contaminants might be in your neighborhood or many miles away. When rain falls or snow melts, it picks up and carries away pollutants, depositing them into lakes, rivers, wetlands, coastal and even underground sources of drinking water. Because we know these activities have the potential to

contaminate the source of our drinking water, we have created four major barriers to protect our source water from contamination. Preventing pollution is critical to protecting drinking water from contamination and reducing the need for costly treatment. Community involvement and individual action are key to providing a safe supply of drinking water.

Risk Prevention Barrier

The best way to protect drinking water is to keep contaminants from entering source water. Multiple federal, state, and local laws and programs and individual action help communities identify the sources of drinking water and potential threats. This work enables communities to take appropriate steps to protect the watershed.

Risk Management Barrier

The public water system is the first line of defense to reduce or eliminate contaminants in source water. The Safe Drinking Water Act, which regulates these systems, develops standards and guidance to help them reach the goal of providing safe and reliable drinking water. They must collect and treat water, hire trained and qualified operators and have an emergency response plan in case of natural disaster or terrorist attack.

Risk Monitoring and Compliance Barrier

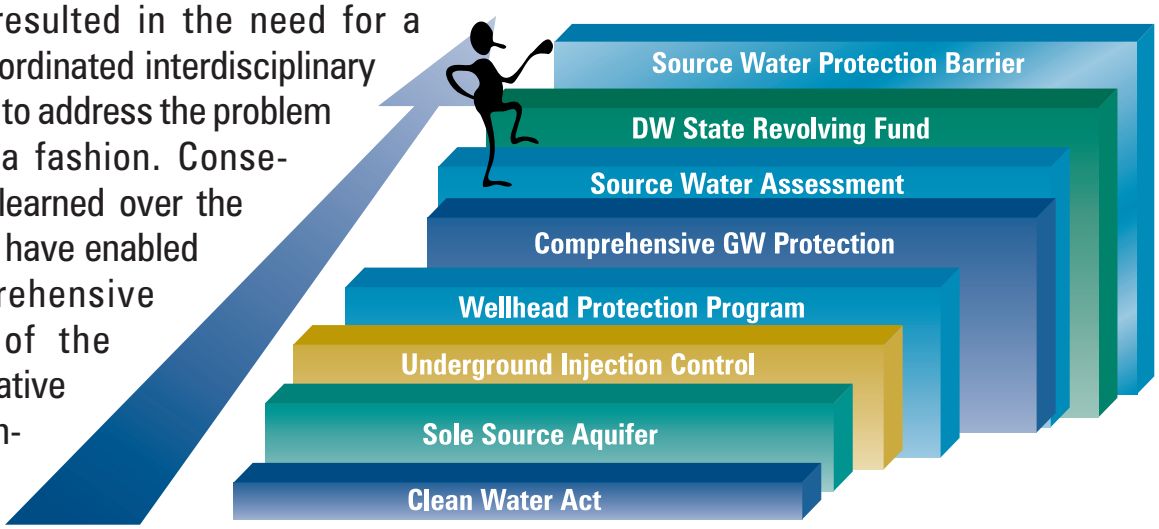
Dealing effectively with risks to drinking water requires constant evaluation of the water quality. Water is monitored at the source; at the treatment plant, after it has been treated and disinfected; at the distribution system, which delivers water through pumps and pipes to your home; and in some cases, at the consumer's tap. If systems have difficulty meeting regulations and providing safe, reliable drinking water, assistance can be provided to help them. If all this fails, enforcement action can be taken against the system.

Individual Action Barrier

Constant vigilance to protect water before it becomes your drinking water is essential and involves all of us. An informed, involved and supportive public is the foundation of drinking water protection. What we do in the watershed can directly impact the quality of water that arrives at the treatment plant. The more you know about drinking water, the better equipped you are to help protect it. See what you can do in the next section, titled, "What You Can Do to Protect Your Drinking Water."

III. SDWA and the Source Water Assessment and Protection Program

Originally created in 1970, EPA's primary mission was to address the potential risks to public health posed by a variety of sources polluting our air and water, and initial program efforts within the agency focused on individual threats from unique, discreet sources. Since then an understanding of the complexity of contaminants and activities posing threats has increased dramatically, and has resulted in the need for a combined and coordinated interdisciplinary approach in order to address the problem in a cross-media fashion. Consequently, lessons learned over the last two decades have enabled a more comprehensive understanding of the concept of cumulative risk (e.g., net impact from many



media such as air, water, and land uses) and we have modified preventive programs to meet those changing needs.

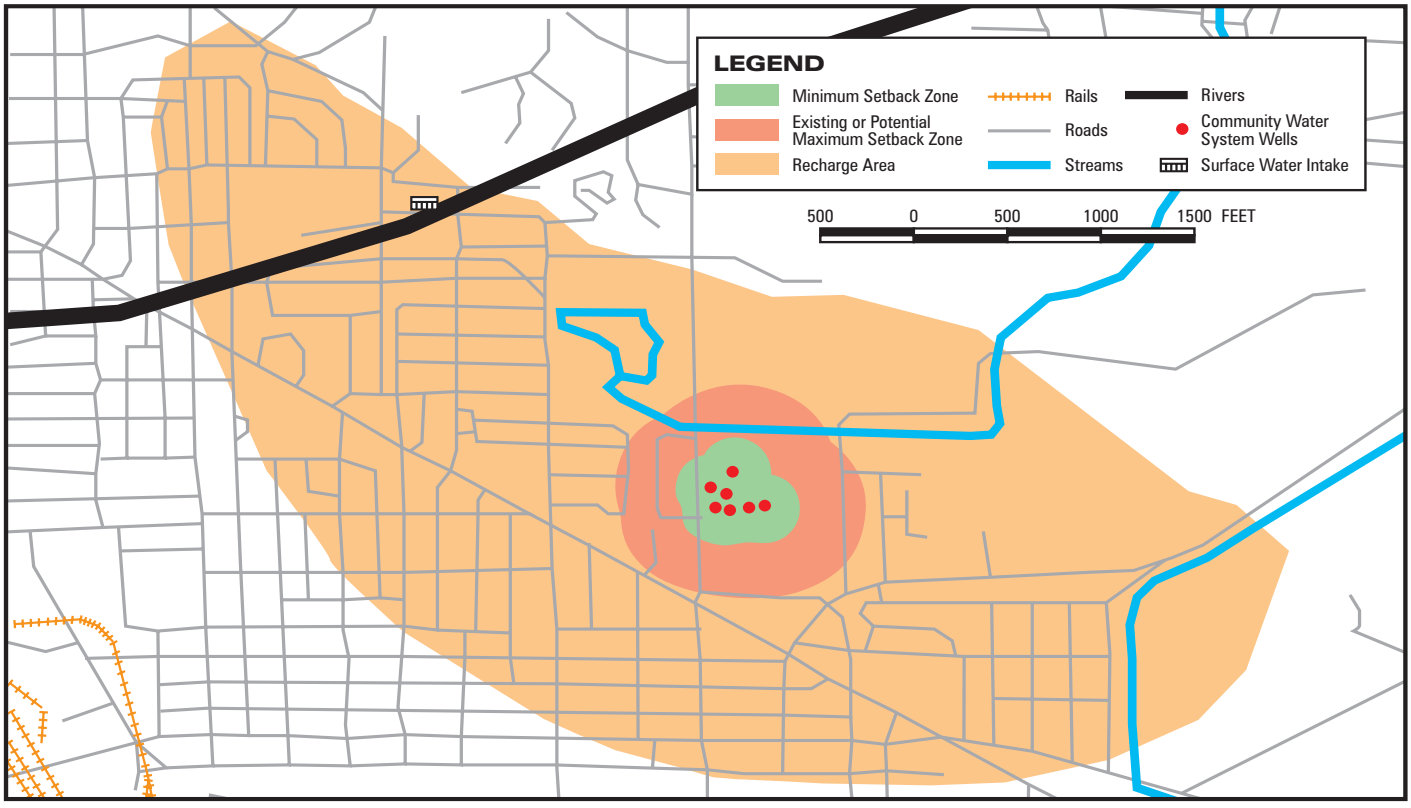
The 1996 amendments to the Safe Drinking Water Act (SDWA 1996) established EPA's Source Water Assessment and Protection Programs. They are the Agency's newest programs targeted at providing clean safe drinking water, but they build on programs developed to carry out EPA's original mission. Congress recognized the need for a more comprehensive and integrated approach to the problem of cumulative risk reduction, and SDWA 1996 mandated specific program elements to address the areas of risk identification (delineation and source inventories), risk ranking and screening (susceptibility analyses), risk management measures (prevention programs), and preparation for unexpected drinking water supply replacement emergencies (contingency planning).

The SDWA Amendments of 1996 outline six steps for prevention programs to protect and benefit public drinking water systems. Together, they form the basis of comprehensive drinking water source protection.

- **STEP 1 – DELINEATE** the Source Water Protection Area (SWPA).

  PURPOSE: Delineating the SWPA shows the area to be protected and prescribes the boundaries of the area from which drinking water supplies are drawn.

  This step also designates the area within which contaminant source inventories are conducted, identifying substances or activities that may pose potential risks to the drinking water supplies withing that area. Delineations may be performed using a variety of accepted methods (e.g., calculated fixed radius; computer modeling, etc.), and are most protective when they include all sources of water and potential contaminants and activities affecting them within the prescribed area.



This map shows the delineation of a Source Water Protection Area.

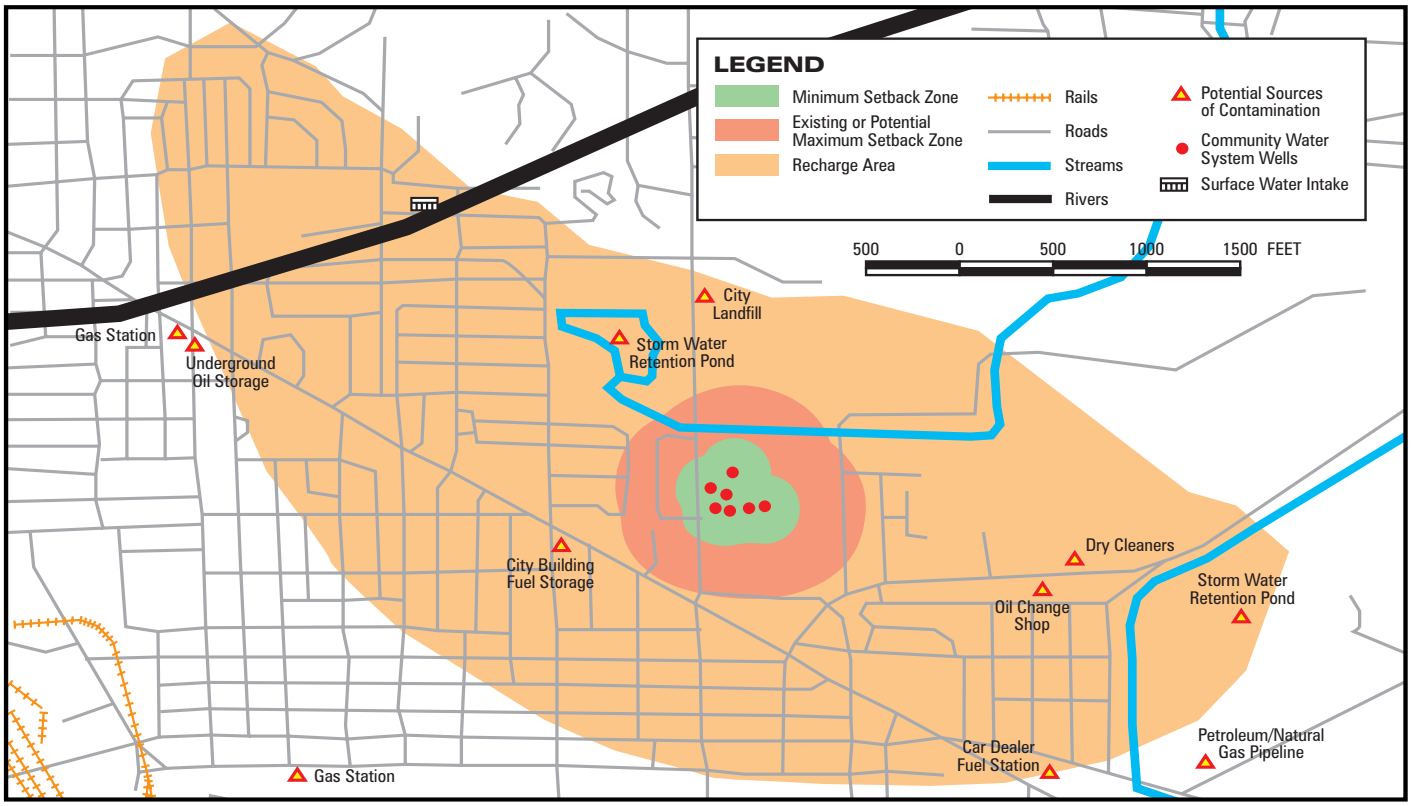
- **STEP 2 – INVENTORY** known and potential sources of contamination.

  PURPOSE: The source inventory lists all documented and potential contaminant sources or activities of concern that may be potential threats to drinking water supplies.

  The source inventory indicates the level of concern assigned to each potential risk by ranking, rating, or prioritzing management measures to reduce or eliminate them.

A contaminant source list may look like this:

Potential Contaminant/Activity	Threat or Risk	Level of Concern
Agricultural Crop Spraying	Excess amounts of material or improper application methods	Low to moderate, depending on proximity to source waters
Industrial Waste Disposal Wells (e.g., Class V Wells)	Introduction of chemicals directly into or above USDWs	Moderate to high, depending on surrounding hydrogeology
Storm water runoff; car washes; service stations	Introduction of contaminants into ground or surface water	Low to moderate, depending on type of surrounding facilities (e.g., parking lots) and proximity to source waters.



This map inventories known and potential sources of contamination.

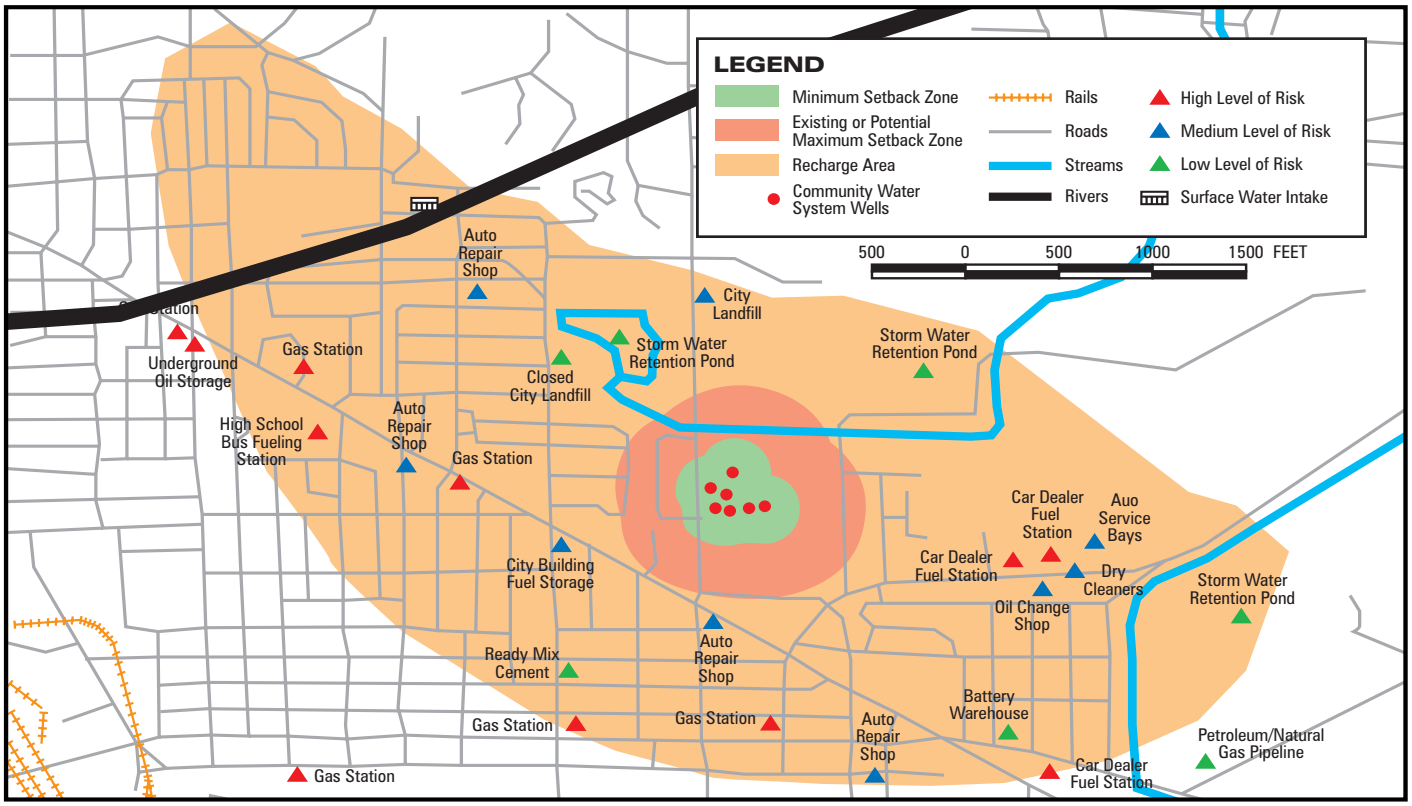
- **STEP 3 – DETERMINE THE SUSCEPTIBILITY** of the PWS to contaminant sources or activities within the SWPA.

  PURPOSE: Determining susceptibility of the PWS to inventoried threats relates the nature and severity of the threat to the likelihood of source waters serving that system being contaminated.

  Mitigating factors taken into account when determining susceptibility include potency or toxicity of the contaminant, volume of discharge or release, distance from wells or intakes, and the likelihood of entry of the contaminant into the source waters.

  A susceptibility determination for an individual PWS may look like this:

Contaminant/ Activity	Level of Concern	Risk Reducing Factors	Susceptibility Rating
Leaking Underground Storage Tanks	High	Remove or Repair Tanks	High
Concentrated Animal Feeding Operations	Moderate	New/Upgraded Facility and Equipment	Low
Road Salt Storage Shed	Moderate	Diked facility with berms	Moderate



This map rates the susceptibility of a PWS to inventoried threats.

- **STEP 4 – NOTIFY AND INVOLVE THE PUBLIC** about threats identified in the contaminant source inventory and what they mean to their PWSs.

  PURPOSE: To ensure that the public has information necessary to control and modify their own actions to prevent contamination and to participate effectively in community activities to protect drinking water.

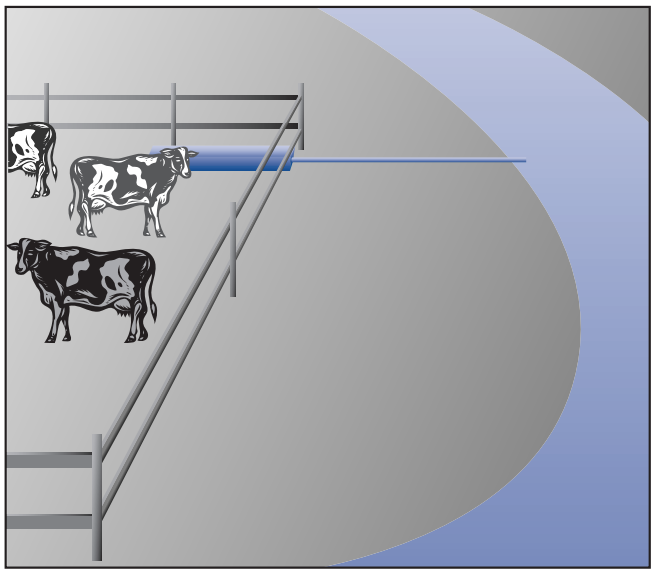
  – Use plain English in reports
  – Provide maps of the SWPA
  – List, show or indicate potential sources/threats to the PWS identified within the SWPA
  – List, rank, or otherwise prioritize importance of threats identified to the individual PWS and explains what it means to your water supply
  – Reports are unique to each individual PWS
  – Public meetings are effective methods of involving the community.

- **STEP 5 – IMPLEMENT MANAGEMENT MEASURES** to prevent, reduce, or eliminate risks to your drinking water supply.

  PURPOSE: Using the information gathered from the assessments allows specific management measures to be formulated and put in place. By examining the results of the contaminant source inventory and the susceptibility determination for each PWS, these measures can be tailored to address each threat or array of risks specific to each PWS.

  A successful drinking water contamination prevention plan is tailored to the unique concerns and circumstances of the local community. Effective involvement is a critical component to a successful public health plan.

  – Every PWS's source water is unique.
  – Management measures need to tailor local actions to address threats to your water supplies.



– Early involvement in the source water protection process and consensus on need for action is essential — you can help!
– Many players make for broad application and coverage of management strategies that bring the best individual programs into play.
– Some key players and tools are:
  - local business communities
  - media
  - parent-teacher associations
  - citizen activists
  - state, county, and local governments
  - sanitary surveys
  - zoning regulations
  - voluntary best management practices (BMPs)

- **STEP 6 – DEVELOP CONTINGENCY PLANNING STRATEGIES** to deal with water supply contamination or service interruption emergencies.

  PURPOSE: In the event of short- or long-term water drinking water supply disruption as a result of natural causes (e.g., biological contamination or floods) or intentional destruction (e.g., vandalism or terrorism), water supply replacement strategies that coordinate all available efforts to restore service to single or multiple PWSs are an indispensible part of any drinking water protection program.

  – Outline emergency plans for short or long-term drinking water supply replacement
  – Direct plan towards water supply interruption due to contamination or physical damage to supply system
  – Coordinate the efforts of water supply managers with those of civil defense, local emergency response, hazmat/spill cleanup, and local area disaster response networks

IV. Tools, Resources, and Actions Useful In Protecting Your Drinking Water Supplies

The Safe Drinking Water Act provides for a number of resources to help local communities protect their drinking water:

- **Source Water Assessments** — States are required to complete source water assessments for every public water supply in the U.S. Congress provided for funds under Section 1453 through the Drinking Water State Revolving Fund (DWSRF) for support.
- **Drinking Water State Revolving Fund Set Asides** — States may set aside funds under 1452(g) from the DWSRF up to 10 percent of a state's allotment for the DWSRF to administer or provide technical assistance. States must match, dollar-for-dollar, the 10 percent set aside (see Section VIII).
- **Drinking Water State Revolving Fund Set Asides** — States may set aside funds under 1452(k) from the DWSRF up to 15 percent of the state's capitalization grant for more than one of several source water protection activities (i.e., land acquisition/easements, voluntary protection and petition activities, source water assessments and well head protection).

- **Wellhead Protection** — Each state must establish a program under Section 1428 to protect the land areas around water supply wells from contaminants that may enter the ground water and adversely affect human health.
- **Source Water Petition Program** — A state may establish a source water protection partnership petition program under 1454 of the Act designed to assist in the local development of a voluntary, incentive-based partnership between water supplies and community members. States can use DWSRF funds for loans to water supplies to implement local programs.
- **Water Conservation Planning Guidelines** — EPA issued guidelines under Section 1455 for water conservation plans for public water systems. States may require systems to submit water conservation plans as a condition of receiving a DWSRF loan.
- **Sole Source Aquifer Protection** — Entities may petition EPA for protection of an aquifer that is the sole or principal source of drinking water for 50 percent or greater of the local population served (see "Petition's Guidance for Sole Source Aquifers", EPA 44016-87-003 Feb. 1987).
- **State Underground Injection Control Programs** — EPA must review applications under Section 1422 of the Act for state or tribal primacy (primary enforcement responsibility). Approved programs will be adopted by the state or tribe, which will promulgate rules to ensure non-endangerment of drinking water sources.

- **Oil and Gas Programs** — Section 1425 of the Act allows EPA approval of existing state oil and gas programs if the state can show that the program is effective in preventing endangerment of drinking water supplies.
- **More Information** — "State Source Water Assessment and Protection Program Guidance" (EPA 816-R-97-009 Aug. 1997) on www.epa.gov/safewater/Pubs/index.html discusses these and other statues and provisions pertaining to Source Water Assessment and Protection.

V. Additional Resources Available Under the Clean Water Act

The Clean Water Act was established by Congress in 1972 and is the primary federal law that protects our nation's waters, including lakes, rivers, aquifers and coastal areas. The Clean Water Act's primary objective is to restore and maintain the integrity of the nation's waters. This objective translates into two fundamental national goals: eliminate the discharge of pollutants into the nation's waters, and achieve water quality levels that are fishable and swimmable.

- **Federal Assistance to States** — Under Section 106 of the Act, EPA may provide money to states (including territories, the District of Columbia, tribes) and interstate agencies to establish and implement ongoing water pollution control programs, including ground water programs.
- **Water Quality Standards** — Under Section 303(C)(1) define water quality goals for a water body by designating the use of the water, setting criteria to protect those uses, and setting anti-degradation provisions for the water body. States must update their water quality standards every three years.

  New and revised water quality standards "shall be submitted" to EPA for review. Under Section 303(c)(2) of the Act, water quality standards "shall consist of" designated uses and water

quality criteria. In setting water quality standards, states shall consider the use and value of public water supplies.

- **Point Source Effluent Limits, or Total Maximum Daily Loads (TMDLs)** — Under Section 303(d), States "shall identify those waters for which" the point source effluent limits [see §§301 (b)(l)(A)-(B)] are not stringent enough to implement a water quality standard, and establish a ranking of such waters taking into account the severity of pollution and the uses made of such waters.

  Section 303(d)(1) provides for the establishment of TMDLs for pollutants that EPA has listed under §304(a)(2) as "suitable for such calculation." States shall set the TMDLs "at a level necessary to implement the applicable water quality standards with seasonal variation and a margin of safety taken into account."

  Section 303(d)(2) requires States to submit to EPA for approval "from time to time" their list of impaired and threatened waters and the TMDLs they have established for those waters.

- **The National Water Quality Inventory Report to Congress** — Under 305(b) States must report to EPA on the quality of their waters.

- **Publishing of TMDLs** — 304(a)(2) of the Act requires EPA to publish information on, "and the identification of, pollutants suitable for maximum daily load measurement correlated with the achievement of water quality objectives."
- **NPS Program** — States must 1) conduct statewide assessments of their waters under Section 319 to identify those that were either impaired or threatened because of NPSs; 2) develop NPS management programs to address the impaired or threatened waters.

  Under 212, 319, and 320, funding is provided through the Clean Water State Revolving Fund (CWSRF) — funding is provided for non point source, point source and estuary source water protection projects, depending on priorities determined by each State.
- **Dredge and Fill** — Section 404 regulates the discharge of dredged or fill material into waters of the U.S.
- **NPDES Program** — The National Pollutant Discharge Elimination System Program — regulates point source discharges to surface waters under Section 402 of the Act.

VI. Financing for Source Water Assessment and Protection Programs

There are two major avenues of funding for the drinking water source water assessment and protection programs. They are the Drinking Water State Revolving Fund (DWSRF) and the Clean Water Act State Revolving Fund (CWSRF).

Section	*Description*
SDWA 1452	The 1996 Amendments to the Safe Drinking Water Act authorized the DWSRF to assist public water suppliers to finance the cost of infrastructure needed to achieve or maintain compliance with SDWA requirements and to protect public health. In addition, states may use a portion of their capitalization grants to fund various state and local water systems management programs and projects including SWP activities. States may elect to use up to 31 percent of the funds available to them under Section 1452 for eligible "set-aside" activities. The DWSRF program has made available billions of dollars in assistance since 1997 to finance infrastructure improvements for drinking water utilities. States have also reserved $575 million from the

$3.6 billion in federal grants they have received to fund other programs and activities that support their drinking water programs through these "set-asides;"

CWA 106; 319 Subchapter VI of the CWASRF provides a powerful partnership between EP A and the states, providing states with the flexibility to fund projects that will address the highest priority water quality needs (see Sections 601-607). CW A funds may be used to fund certain source water protection activities, and cost savings can be realized through combining SWP and CWA efforts. CWASRF loans can be used for watershed protection; funds allocated under Section 106 of the Act may be set aside for state ground water programs, and Section 319 funds, which are aimed at non-point source pollution prevention, may also be used for source water protection. Nationally, the CWSRF program has more than $37 billion in assets and has provided $34 billion in assistance since 1988. The CWSRF program currently funds nearly $4 billion annually in water-quality related projects, including more than $1 billion to fund projects addressing non-point sources of pollution that can often negatively impact sources of drinking water.

In addition to federal resources, these tools bolster protection at the local level.

- **Education**: Consumer awareness and citizen advocacy highlight the problem
- Voluntary **Best Management Practices** (BMPs): Once individuals understand they may be part of the problem, they also understand they can be part of the solution
- **Sanitary Setbacks** are prescribed by local health codes for the placement of individual private waste disposal systems (septic tanks) and community waste-treatment systems
- **Zoning** has proven to be a very powerful tool in preventing siting of potential contaminant threats or activities adjacent to public drinking water supply source waters

VII. The Underground Injection Control (UIC) Program and SWAP

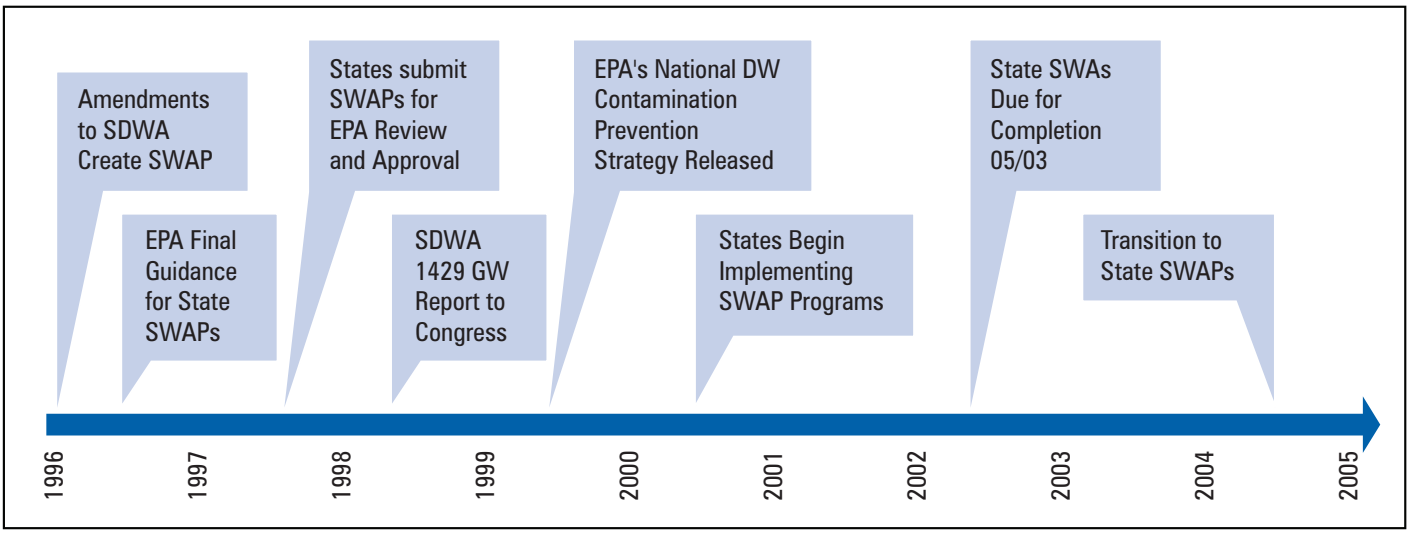
The UIC program is a crucial component of the source water assessment and protection program, because it identifies, permits, and regulates the design, siting, operation, and maintenance of injection wells that are designed to dispose of waste underground. It is the major federal and state program to control some 800,000 wells with the potential to contaminate drinking water sources if not properly managed. The program identifies, as such, these wells are considered potential contaminant sources in any source water assessment and protection program contaminant source inventory. For example, all new motor vehicle waste disposal wells (e.g., service station bay floor drains) and all new large-capacity cesspools (e.g., serving multiple dwellings or single units serving more than 20 persons per day) were banned as of April 2000. The Safe Drinking Water Act requires EPA to provide safeguards so that injection wells or other similar conveyance systems do not endanger current and future underground sources of drinking water (USDWs).

Through the UIC program, EPA has developed minimum federal standards to regulate wells that range from deep, technically-sophisticated and highly-monitored wells, to shallow on-site drainage systems such as septic systems, cesspools, and storm water drainage wells. These require-

ments also cover wells that discharge a variety of hazardous and nonhazardous fluids above, into, or below aquifers. A comprehensive description of the five different classes of UIC wells may be found in "Protecting Drinking Water Through Underground Injection Control," EPA 816-K-02-001.

EPA's main concern relative to the source water assessment and protection program is the large inventory of Class V UIC wells — typically shallow on-site drainage systems such as septic systems, cesspools, and storm water drainage wells. They are a concern because their simple construction provides little or no treatment of the injected fluids. There are more than 500,000 Class V wells in operation. Some examples are agricultural drainage wells, aquifer recharge and aquifer storage and recovery wells, industrial waste disposal wells, large capacity cesspools, large capacity septic systems, motor vehicle waste disposal wells, and storm water drainage wells. There are many other subcategories of Class V wells.

VIII. SWAP Milestones



The focus of many of EPA's efforts in the 1990s shifted from a cleanup and remediation-oriented approach to one of prevention. In the next few years, citizens, local, state, tribal, and federal officials will work together to collect information and take action to protect our precious drinking water sources. Because of the changing nature of potential threats and local needs, communities will need to periodically revise their strategies.

IX. Best Management Practices (BMPs) Available for SWPAs

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Septic Systems	Improper siting, maintenance and use may contaminate both surface and ground water by percolation or runoff. Bacteria, protozoa, and viruses present in sanitary wastewater can cause gastrointestinal illness, cholera, hepatitis A and typhoid if consumed.	• Establish proper siting criteria • Specify appropriate design and construction criteria • Establish operation and maintenance protocols ("Septic System Ground Water Protection" EPA, July 1986 GPO 1991-517-003-28046) • Analyze assimilative capacity of soils and receiving water to

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
		determine appropriate density of septic system units. • Consider connecting to a public water system
Lawn and Garden Fertilizer	Field leaching or runoff into surface and ground water. Nitrogen leaching into drinking water supplies at levels above MCLs may cause "blue baby syndrome" in infants under 6 months — life-threatening without immediate medical	• Eliminate excess uses • Ensure proper application • Select appropriate fertilizer • Avoid application near wells used for drinking water, agricultural drainage wells; surface waters

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
	attention. Symptoms are shortness of breath and blue skin color. Phosphorus may affect taste and odor of drinking water and may require treatment.	• Plant native plants and grasses requiring less fertilizer and water
Pet Waste	Watershed runoff or direct contact can introduce wastes into drinking water supplies. *Cryptosporidium*; *Giardia lamblia*, *Salmonella*, and *E. coli* pose the greatest threats	• Pick up after pets

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Pesticide Application (Large Scale)	Runoff to surface waters due to rainfall or irrigation return flow. Soil injection threatens ground water sources. Possible health from exposure to large amounts of pesticides in drinking water over a long period of time include: effects include cancer, liver and kidney damage, reproductive difficulties, and nervous system effects.	• Pesticide alternatives through Integrated Pest Management • Mix, load, and apply consistent with label directions • Reduce techniques such as soil incorporation, pre- and post-plant emergence applications, spot treatments; split applications • Proper storage and disposal

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
		• Avoid application around wells used for drinking water, agricultural drainage wells, and surface water
Turfgrass/ Agricultural Fertilizer Application	Field leaching or runoff into surface and ground water. Nitrogen leaching into drinking water supplies at levels above MCLs may cause "blue baby syndrome" in infants under 6 months — life-threatening without immediate medical	• Utilize application rates and fertilizer types consistent with actual plant needs. • Time applications with periods of maximum crop uptake • Impede runoff by using tillage buffer strips, or filter strips

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
	attention. Symptoms are shortness of breath and blue skin color. Phosphorus may affect taste and odor of drinking water and may require treatment.	• Store and dispose fertilizers properly • Avoid application near wells used for drinking water
Livestock and Poultry Waste	High Nitrogen and pathogens (*Cryptosporidium; Giardia lamblia*, *Salmonella*, and *E. coli* can enter both ground and surface water sources used for drinking water via runoff or percolation.	• Prevent animal waste contact with water • Ensure proper land application of manure

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
		• Avoid application near drinking water wells and surface waters • Use pasture management techniques such as fencing and planting legumes • Avoid siting animal waste lagoons near drinking water wells or flood plains • Use low-permeability lagoon liners • Aerobically compost horse manure

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
		• Divert wildlife from sensitve areas by fencing, mowing, landscaping, tree pruning, and drainage devices
Sanitary and Combined Sewer Overflows (SSOs/CSOs)	SSOs discharge untreated sewage through broken pipes, equipment failures and overloads CSOs discharge untreated sewage and storm water when system capacity is exceeded Contaminants are bacteria, molds, fungi, protozoa and helminths	• Non-structural prevention methods such as visual inspections, monitoring and maintenence programs, employee training and public education • Consider structural prevention methods such as upgrading of collection

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
	Chief threats are gastroenteritis, cholera, dysentery and infectious hepatitis	systems, wet-weather storage facilities, and new sewer collection systems
Injection Wells (UIC Program), Classes I-IV	Misuse or discharge of harzardous chemicals into Class V Wells	See companion Pocket Guide for descriptions of well classes and regulations that apply to each
Injection Wells (UIC Program), Class V	Injection of nonhazardous fluids into or above USDWs	(Available BMPs for selected representative examples below) See vehicle washing, small quantity chemical use, and underground storage tanks

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Storm Water Runoff – Rain or snow runoff carrying sediments and contaminants into surface or ground waters – Pathways include excess volume runoff from settling ponds, municipal storm drains, parking lots, truck stops, gas stations, airports (fuel and	Possible contaminants include gasoline, oil, automotive fluids, sediment, pesticides, nutrients, animal wastes, and hazardous wastes. Nationally, 77 of 127 priority pollutants have been detected in urban runoff. Potential health effects from these contaminants include gastrointestinal illness, reproductive and developmental effects and increased cancer risk.	Basic pollution prevention practices such as erosion control and sedimentation control measures; land use controls; grassed swales; buffer strips; filter strips; storm water capture and retainment ponds, and constructed wetlands.

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
deicing fluids) and road chemical storage		
– Sediment and contaminants carried to surface and ground waters via infiltration through soil of drainage to subsurface wells or septic systems.		

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Vehicle Washing – Nationally, States estimate that there are in excess of 7,200 facilities of this type currently in operation.	Contaminants include used oil, degreasers, antifreeze and synthetic oils. Patrons may use solvents or degreasers at unmanned washing facilities, thereby contributing to contamination of rinse waters entering Class V wells. Potential health effects from these contaminants include kidney damage; circulatory problems, increased cancer risk; delays in physical or mental development.	• Use alternative cleansing agents such as phosphate-free, biodegradable detergents. • Discourage use of solvent and emulsifier-based agents • Install water-recycling systems • Train employees on spill control and response to problems • Control and manage spills

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Small Quantity Chemical Use Chemicals of concern may reach ground and surface waters through improper disposal practices via discharge to sewers, septic systems, dry wells, or through improper handling, hauling and disposal.	Includes chemicals used in cleaning, degreasing, polishing, paint preparation, rust removal, photo processing, medical practices.	• Avoid excess use of chemicals • Follow label directions on proper use, storage and disposal • Train employees on spill control and response protocols • Refer to manufacturer's Material Safety Data Sheets for specific hazard descriptions

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Underground Storage Tanks (USTs) National inventory shows approximately 714,000 USTs on 269,000 sites.	Releases of petroleum fuel substances through corrosion of parts, improper installation, failure of piping systems, sloppy fuel deliveries, and improper operation and maintenance	• Ensure compliance with federal UST requirements (see: www.epa.gov/oilspill) • Consider local registration programs for exempt tanks • Consider local land-use controls such as zoning, use restrictions, permits and setbacks

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Above Ground Storage Tanks (ASTs)	Release of petroleum fuel substances mainly through leaks or spills may enter drinking water supplies via soil accumulation or runoff in storm waters to surface	• Follow federal AST requirements (see: www.epa.gov/oilspill) • Periodic cleanup of containment areas • Consider local registration programs for exempt tanks • Consider local land-use controls such as zoning, use restrictions, permits and setbacks

X. Glossary

Aquifer – A natural underground layer, often of sand or gravel, that contains water.

Assessment – An analysis of the susceptibility of drinking water sources to contamination, communicated effectively to the public.

Ground Water – The water that systems pump and treat from aquifers.

Potential Contaminant Source – Specific point or nonpoint sources from which contamination of drinking water may originate; activities that may result in drinking water contamination.

Public Water System (PWS) – Any water system which provides water to at least 25 people for at least 60 days annually. There are more than 170,000 PWSs providing water from wells, rivers and other sources to about 250 million Americans. The others drink water from private wells. There are differing standards for PWSs of different sizes and types.

Risk Ranking – Rating or prioritizing levels of concern of potential contaminant sources based on susceptibility of public water systems.

Sole Source Aquifer – A drinking water supply in an area with few or no alternative sources to the ground water resource, and where if contamination occurred, using an alternative source

would be extremely expensive. If such an aquifer supplies a public water system on which at least 50 percent of the population depends, it may be designated as a sole source aquifer.

Source Water Protection Area – The area delineated by the state for a public water system, or including numerous PWSs, whether the source is ground water, surface water, or both. Delineating the source water protection area is part of the state source water assessment plan approved by EPA under section 1453 of the Safe Drinking Water Act.

Surface Water – The water that systems pump and treat from sources open to the atmosphere, such as rivers, lakes, and reservoirs.

Susceptibility – The level of risk of drinking water contamination, based on the nature and severity of contaminants, and the likelihood of the contaminants getting into a drinking water source.

Underground Injection Control Program – A program to prevent injection activities from endangering underground sources of drinking water.

Wellhead Protection Area – The surface and subsurface area surrounding a well or well field, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or field.

XI. Contacts

The following list includes regional office contacts for Source Water Assessment and Protection and Underground Injection Control. For state contacts, regional and local contacts at other federal agencies, and other partners, see www.epa.gov/safewater/protect/contacts.html. The Safe Drinking Water Hotline (bottom of page) also maintains the list of these contacts.

EPA Region 1 – Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut ..... (617) 918-1578

EPA Region 2 – New York, New Jersey, Puerto Rico and the U.S. Virgin Islands ..... (212) 637-3822

EPA Region 3 – Pennsylvania Delaware, Maryland, Virginia, West Virginia, and Washington, DC ..... (215) 814-5779

EPA Region 4 – Kentucky, Tennessee, North Carolina, South Carolina, Mississippi, Alabama, Georgia, and Florida ..... (404) 562-9459

EPA Region 5 – Minnesota, Wisconsin, Illinois, Michigan, Indiana, and Ohio ..... (312) 886-9262

EPA Region 6 – New Mexico, Texas, Oklahoma, Arkansas, and Louisiana ..... (214) 665-7129

EPA Region 7 – Nebraska, Kansas, Iowa, and Missouri ..... (913) 551-7423

EPA Region 8 – Montana, North Dakota, Wyoming, South Dakota, Utah and Colorado ..... (303) 312-6753

EPA Region 9 – California, Nevada, Arizona, Hawaii, Guam, and American Samoa ..... (415) 744-1829

EPA Region 10 – Washington, Oregon, Idaho, and Alaska ..... (206) 553-1563

Headquarters – Office of Ground Water and Drinking Water ..... (202) 564-3867

For More Information

EPA Office of Ground Water and Drinking Water

www.epa.gov/safewater

Safe Drinking Water Hotline 1 (800) 426-4791

WINITER MAINTENANCE BMP’s

Quick Resource Guide for Winter Maintenance BMPs

SOUTHWESTERN PENNSYLVANIA COMMISSION
SPC
WATER RESOURCE CENTER

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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Cover photo credits: Forestry Images; North Fayette Township; Pittsburgh City Photographer Collection, 1901-2002, AIS.1971.05 Archives Service Center, University of Pittsburgh; Southwestern Pennsylvania Commission; Upper St. Clair

Introduction

This quick resource guide was developed to provide information to municipalities on how to improve winter maintenance operations by utilizing **best management practices (BMPs)** for the two most utilized materials in winter maintenance operations: **road salt** (chloride-based deicers) and **abrasives**. Solid and liquid chemicals (known as deicers) and abrasives (such as sand) may be used in combination with a mechanical removal method (such as plowing) to minimize accidents during the winter months.

In this guide, we begin with a brief history of winter maintenance practices and the concerns associated with them. Winter maintenance chemicals and their associated impacts are explained and recommendations for winter maintenance BMPs that reduce chlorides are also provided. Alternatives to deicers, application rates and additional considerations including MS4 minimum control measures, specifically for MCM6: Pollution Prevention/Good Housekeeping, are also discussed. The section on MS4 considerations is not intended to be comprehensive, but provides a good starting point for improving your program.

Some of the BMPs covered in this booklet will include:

- Calibration of equipment
- Brine
- Anti-icing
- Pre-wetting
- Retrofitting trucks and equipment

The BMPs that are covered in this quick resource guide are intended to provide the most efficient and effective way to reduce chlorides in the environment without compromising public safety. The BMPs have been proven to: improve the level of service and safety, reduce impacts, and save money and resources. Although there is an initial start-up cost required to begin the process of implementing BMPs, the costs are shown to be recovered after implementation.

Figure 1: Liberty Avenue, March 5, 1917 Source: Pittsburgh City Photographer Collection, 1901-2002, AIS.1971.05 Archives Service Center, University of Pittsburgh

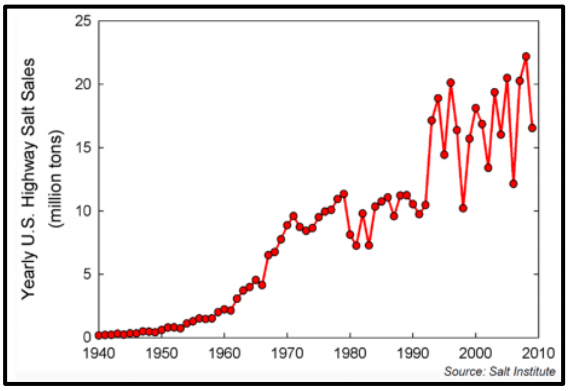

Figure 2: Yearly US Highway Salt Sales. Source: Salt Institute

History and Background

Over time, the traveling public's view of snow on roadways changed significantly. In the 18th and 19th centuries horse-drawn carts traded wheels for ski-like runners in the winter. The more packed snow on the roads, the better. In areas where covered bridges were located, snow was added so travel was not interrupted. By the mid 1800s the first snow plow was invented. In 1862, Milwaukee became the first major municipality to try one.

In the 18th and 19th centuries, "snow was never a threat" to road travel, "but rather it was an asset" - Eric Sloane

In the early 1920s, car-mounted snow plows were first invented and since then snow and ice management has continued to evolve. In addition to the removal of snow and ice by plowing or other mechanical means, chemicals have been utilized to further improve winter driving conditions. The most common chemical utilized is sodium chloride (NaCl), or more commonly referred to as road salt. Figure 2 from the Salt Institute illustrates an increasing trend of salt use. Along with the increased use of salt, levels of chloride in surface and groundwater and associated impacts will also increase.

Concerns with Winter Maintenance Practices

Negative impacts have proven to be associated with the use of snow and ice control materials and have become a real concern in some states.

As of June 2016, there are no ambient water quality standards for chlorides, chloride or salinity in Pennsylvania; therefore no TMDLs have been established. Although ambient water criteria are not yet adopted, the **Municipal Separate Storm Sewer System (MS4)** program does require that permittees comply with **Minimum Control Measures (MCMs)** that would apply to maintenance practices that deal with use and storage of both deicers and abrasives. These topics will be covered in greater detail under the MS4 Considerations section.

Due to the amounts of deicers used in Pennsylvania during the winter months, it is probable that impairments may exist. Municipalities can take a proactive management approach by adopting BMPs that other states have found effective at reducing the amounts of chemical needed. BMPs can improve the level of service and provide cost savings while making snow and ice management move conveniently and reduce environmental impacts.

The Commonwealth of Pennsylvania Department of Environmental Protection (DEP) Bureau of Point and Non-Point Source Managements draft rationale for the development of ambient water quality criteria for chloride protection of aquatic life use stated that: "The existing chloride criterion in PA was developed primarily for the protection of potable water supplies. Although this criterion, a maximum of 250 mg/l, may be protective of instream aquatic life uses when applied, it is not applied in all waters of the Commonwealth, but rather only at the point of water supply intake, pursuant to 25 Pa. Code § 96.3(d) (relating to water quality protection requirements)".

The impacts from road salt and abrasives are shown below in Figure 3.

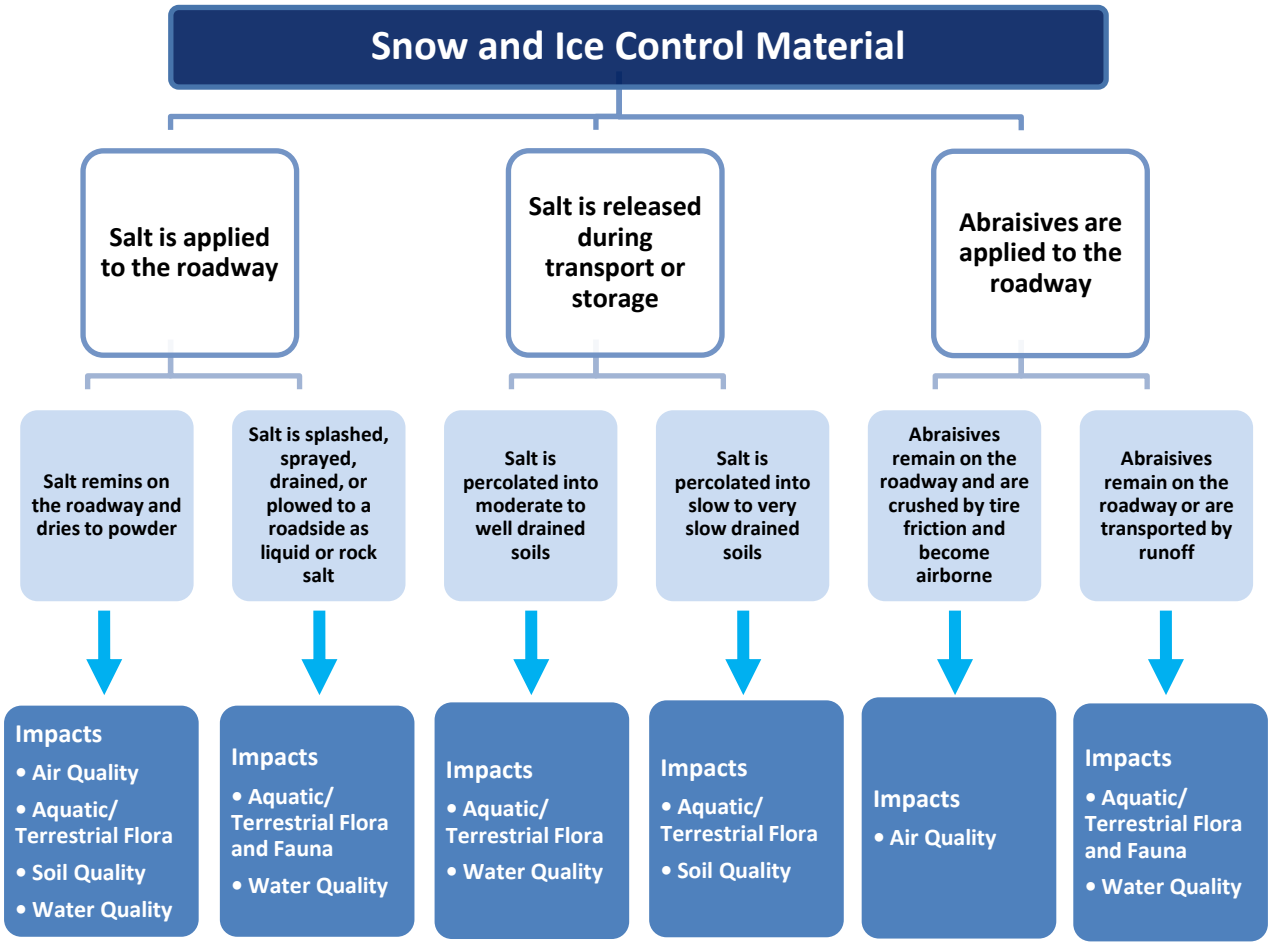

Figure 3: Impacts from road salt and abrasives. Source: Strategies to Mitigate the Impacts of Chloride Roadway Deicers on the Natural Environment

It takes only one teaspoon of road salt to permanently pollute 5 gallons of water. Once in the water, there is no way to remove the chloride, and at high concentrations, chloride can harm fish and plant life. Less is more when it comes to applying road salt.
Source: MN Pollution Control Agency

Many states have chloride impaired waterways and have US Environmental Protection Agency (EPA) approved **Total Maximum Daily Load (TMDL)** plans for chlorides. According to the EPA National Summary of Impaired Waters and TMDL Information website, the following states have an EPA established or approved TMDL for chlorides, chloride or salinity: AR, CA, GA, CO, IL, KS, KY, LA, MN, OH, NH, OK, SD, TX, VA, WV and WY.

One state that has implemented BMPs to reduce chlorides as a result of TMDLs is New Hampshire. TMDLs are in place to reduce pollutants in impaired waterways so that they meet water quality standards. TMDLs focus on identifying sources of impairment and implementing corrective actions based on the best available data and information. Additional monitoring and data collection will occur to track progress and better characterize pollutant sources, loadings and the effectiveness of control measures and BMPs.

During the development of the Chloride Reduction Implementation Plan for Dinsmore Brook Watershed in New Hampshire, the following key issues that lead to the over-application of road salt were identified:

One common issue found in DEP/EPA audits is that the Stormwater Management Program does not identify pollutants of concern, "impairments" or address TMDLs.

For more information about the Integrated Water Quality Report (formerly 303(d) and TMDL list):

http://www.dep.pa.gov/Business/Water/CleanWater/WaterQuality/Integrated%20Water%20Quality%20Report-2016/Pages/default.aspx

- Key Issue #1: Not knowing that certain conditions may not warrant salt application
- Key Issue #2: Not knowing and/or tracking how much material is being applied
- Key Issue #3: Not knowing how much material is needed to achieve desired results
- Key Issue #4: Over-application of chlorides due to liability concerns
- Key Issue #5: Decisions are made without knowledge of new technologies and practices

The key issues above offer valuable insight to understanding why road salt was over-applied. A municipality may use this information to develop/revise a winter maintenance plan to reduce rates applied prior to a TMDL needing to be issued. Particular practices that are associated with the above issues and overlap with the MS4 permit MCMs could be a topic of focus for staff education. In New Hampshire, they addressed Key Issue #4 by creating state legislation that reduces the liability from slip and fall claims for the private sector salt applicators.

Helpful Tips

- **New Hampshire legislation for salt applicators**
  - **RSA 489-C: Salt Applicator Certification Option**
  - **RSA 508:22 Liability Limited for Winter Maintenance**
- **For more information on the state of New Hampshire and their management of chlorides, please see http://des.nh.gov/organization/divisions/water/wmb/was/salt-reduction-initiative/index.htm.**

Winter Maintenance Chemicals

Chloride-Based Deicers and Associated Impacts

Sodium Chloride (NaCl): Road Salt

Road salt or sodium chloride (NaCl), is the cheapest and most readily available chemical that efficiently melts ice and can be easily applied to our roadways and parking lots. The purpose of using salt on roadways is to prevent or minimize the snow and ice bond to the pavement, keep the snow and ice in a condition so that it is easily plowed off, and prevent the formation of snow and ice on the road.

Sodium (Na) can impact soil chemistry and release nutrients such as calcium, magnesium and potassium into the groundwater and surface water leading to increased nutrient concentrations impacting the aquatic environment. The USEPA has set an advisory limit for drinking water for public water systems at 20mg Na/L to assist doctors in making recommendations for those patients on a salt-restricted diet. **Chloride (Cl-)** is highly soluble, very mobile, and its density allows for it to settle to the bottom of a waterbody. Chloride is toxic to aquatic life at levels above 230 mg/l. There is no natural process by which chlorides are broken down, metabolized or taken up by vegetation.

Other Commonly Used Chlorides for Winter Maintenance

- **Calcium Chloride (CaCl)** – CaCl, the second most commonly used chemical, is available in flake, pellet or liquid. It is effective at lower temperatures with a practical melting temperature of -20°F. In liquid form it can be used to pre-wet salt or applied directly as an anti-icing technique which can help in preventing snow and ice from bonding to the pavement and reduce the application amount needed. Several disadvantages to CaCl include a higher cost, environmental impact due to chloride, corrosiveness to metal, difficulty handling and storage, and it can contribute to slippery conditions if applied incorrectly.
- **Potassium chloride (KCl)** - KCl is a naturally occurring material (muriate of potash) that is also used as fertilizer. It is available in liquid or crystal form with a practical melting temperature of 20°F. KCl can be damaging to concrete, has environmental impacts due to chloride and can inhibit plant growth and burn foliage.
- **Magnesium Chloride (MgCl)** - MgCl is available in liquid or crystal form that melts faster than rock salt with a practical melting temperature of 5°F. MgCl attracts moisture and can lead to slippery conditions if applied incorrectly. MaCl is corrosive and contributes to the chloride load in our waters. It is important to note that additives to road salt like ferrocyanide, which is used as an anti-caking compound in large salt supplies, can have impacts on both the environmental and human health due to cyanide ions being released by certain types of bacteria, as well as from exposure to sunlight.

The improper management of chlorides can have negative impacts. Impacts can vary and include, but are not limited to: infrastructure and vehicle impacts; human impacts associated with drinking water supply; and, environmental impacts.

Infrastructure and Vehicle Impacts

Within the Southwestern Pennsylvania Commission (SPC) region, there are a 5,281 state bridges and 1,341 local bridges over 20' long. According to the 2013 Structural Scorecard Report from the American Society of Engineers, 22.33% of state bridges and 33.56% of local bridges over 20' are classified as structurally deficient. Chloride use accelerates corrosion, including penetrating/deteriorating concrete on bridge decking and parking garage structures, damage to reinforcing rods, and compromising structural integrity. As infrastructure is replaced or repaired, it is recommended that suitable alternative(s) to chlorides be utilized to minimize future infrastructure impacts.

Figure 4: Significant damage from many years of salt and deicing chemical use from a leaking expansion joint. Source: Bridge retrofit using fiber reinforced polymer, cenews.com

Vehicle parts damaged from chlorides include: brake linings, frames, bumpers, and body corrosion. The cost of corrosion damage and protection practices for highways and auto industry have been reported to cost $16-19 billion per year *(City of Madison Wisconsin, Report to The Salt Use Subcommittee for the Commission on the Environment, 2006)*.

Human Impacts: Drinking Water

Rivers are a common drinking water supply in the region. The USEPA requires drinking water to be monitored for sodium. Public water suppliers are to report to local health authorities any concentration above 20 mg sodium per liter of water (20mg/l). Chloride is not toxic to human health at low levels but does pose taste and odor issues at concentrations exceeding 250 mg/l. In rural areas, private wells located near a road or parking lot may be impacted due to the improper storage of salt.

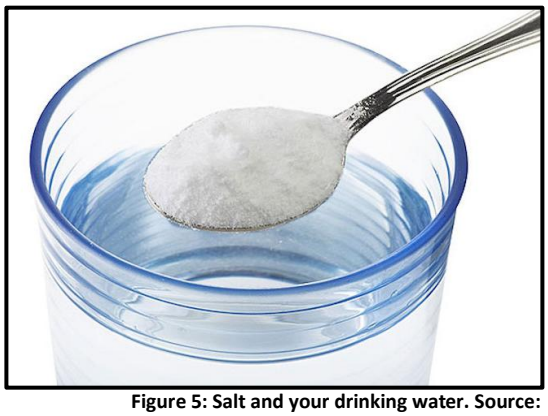

Figure 5: Salt and your drinking water. Source: Healthyfoodstar.com

Environmental Impacts

Chloride remains in a solution and is not subject to any significant natural removal methods. Chlorides are toxic to aquatic life at high concentrations. Study results are conflicting in regards to what time of the year aquatic ecosystems are at the greatest risk for exposure times to chlorides. Some studies suggest that during the summer months at times when there is low stream baseflow (ground water and surface water connection) there are higher chloride concentrations. The highest concentrations of chlorides are present when chlorides have been applied to roads and parking lots, running off into streams throughout the winter months.

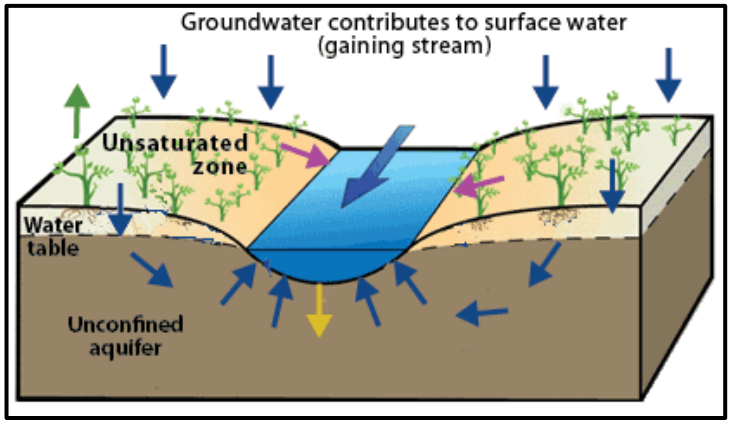

Figure 6: Groundwater contributes to surface water. Source: United States Geological Survey

Figure 6 shows how streams and groundwater can be interconnected, depending on the geology of the area. With this figure it is easy to see how groundwater may become impacted by chlorides that are transported to streams via runoff or how groundwater that is impacted can affect water quality in a stream.

Impacts can also occur in ponds and lakes. Over time chloride levels increase and a higher water density is created and settles at the deepest part of ponds and lakes where current velocities are low. This can lead to a chemical stratification (i.e., impedes turnover/mixing in the fall/spring preventing dissolved oxygen within the upper layers of the water from reaching the bottom layers and nutrients within the bottom layers from reaching the top layers). This results in the bottom layer of the water body becoming void of oxygen and becoming unable to support aquatic life.

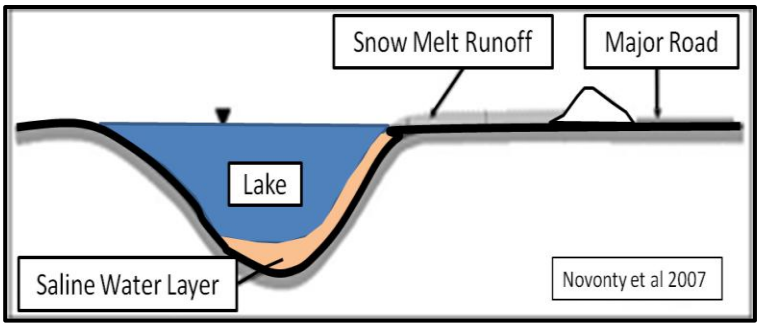

Figure 7: Stratification

Studies show that when safe and sustainable snowfighting practices are implemented the impact of road salt on the environment is minimal and manageable. **Source: Salt Institute**

Acetate and Formate-Based Deicers and Associated Impacts

Non-chloride deicers are acetate and formate-based deicers. Acetate-based deicers such as potassium acetate (KAc), sodium acetate (NaAc), calcium magnesium acetate (CMA) and formate-based deicers such as sodium formate (NaFm) and potassium formate (KFm) are the most commonly used.

Sodium acetate (NaAc) has excellent melting properties and works at lower temperatures than NaCl. CMA generally works as a deicer similar to NACl, yet it can require 50% more by weight than NaCl to achieve the same results (Wegner and Yaggim 2001).

Impacts from acetate-based deicers can include but are not limited to: elevated biochemical oxygen demand (BOD) in waterways and potential oxygen depletion, increased turbidity and hardness in waterways, and the leaching of heavy metals (Fay et al, June 2015).

Agriculturally-Derived Deicers and Associated Impacts

Various types of agriculturally/naturally-derived products have been developed for snow and ice control. Product types can include but are not limited to corn-based products such as corn syrup, and steeps and other derivatives; beet juice, cane molasses, distiller's grain and cheese brine by-product. See Figure 10 for more details. These products are used as additives and/or mixed with solids, liquids and abrasives to improve performance. They can also reduce deicer corrosiveness and enhance longevity of deicer treatments. Some common issues with these products are linked to high levels of phosphates, nitrates or total organic content when used on roadways adjacent to nutrient-impaired waterways.

Figure 8: Agricultural brines. Source: Deeproot.com

Beet juice is an effective alternative to salt alone because it lowers the freezing point of water to as low as -20 degrees. Salt only prevents water from freezing at temperatures of 5 degrees or higher. **Source: Deicing with Beet Juice, Deeproot.com**

Suitable products have been verified by third party organizations that have evaluated both environmental and health impacts, as well as their performance. As of December 2013, there were nearly 100 products identified on the Pacific Northwest Snow Fighters Qualified Products List. Also in 2013, nine manufacturers offering over 20 different products were provided in the *Design for the Environment–Recognized Products* report.

Figure 9: Solar Roadway. Source: PVBuzz.com

Helpful Tips

- **Model specifications have also been developed in other states. Ohio has developed *Ohio's Model Specifications for Natural/Agricultural-Based Deicing Liquid* and Ohio's DOT developed a contract for agricultural-based (called natural) deicing liquids.**
- **For more information see: http://www.dot.state.oh.us/Divisions/Operations/Maintenance/SnowandIce/Snow%20and%20Ice%20Best%20Practices/Agricultural%20De-icer%20Contract%20124-11.pdf**

Category	Type	Potential for Corrosion Impairment[3]				Environmental Impact[3]		
		Atmospheric Corrosion to Metals	Concrete Matrix	Concrete Reinforcing	Water Quality/Aquatic Live	Air Quality	Soils	Vegetation
Chloride Based Deicers	Sodium Chloride	High: Will initiate and accelerate corrosion	Low/moderate: Will exacerbate scaling; low risk of paste attack	High: Will initiate corrosion of rebar	Moderate: Excessive chloride loading/metals contaminants; ferrocyanide additives	Low: Leads to reduced abrasives use	Moderate/high: Sodium accumulation breaks down soil structure and decreases permeability and soil stability; potential for metals to mobilize	High: Spray causes foliage damage; osmotic stress harms roots; chloride toxicosis
	Calcium Chloride	High: Will initiate and accelerate corrosion; higher potential for corrosion related to hydroscopic properties	Low/moderate; Will exacerbate scaling; low risk of paste attack	High: Will initiate corrosion of rebar	Moderate: Excessive chloride loading; heavy metal contamination	Low: Leads to reduced abrasives use	Low/moderate: Improves soil structure; increases permeability; potential for metals to mobilize	High: Spray causes foliage damage; osmotic stress harms roots; chloride toxicosis
	Magnesium Chloride	High: Will initiate and accelerate corrosion; higher potential for corrosion related to hydroscopic properties	Moderate/high: Will exacerbate scaling; risk of paste deterioration from magnesium	High: Will initiate corrosion of rebar, evidence suggests MgCl2 has the highest potential for corrosion of chloride produces	Moderate: Excessive chloride loading; heavy metal contamination	Low: Leads to reduced abrasives	Low/moderate: Improves soil structure; increases permeability; potential for metals to mobilize	High: Spray causes foliage damage; osmotic stress harms roots; chloride toxicosis
Acetate Based Deicers	Calcium Magnesium Acetate	Low/moderate: Potential to initiate and accelerate corrosion due to elevated conductivity	Moderate/high: Will exacerbate scaling; risk of paste deterioration from magnesium reactions	Low: Probably little or no effect	High: Organic content leading to oxygen demand	Low: Leads to reduced abrasives use	Low/moderate: Improves soil structure; increases permeability; potential for metals to mobilize	Low: Little or no adverse effect; osmotic stress at high levels
	Potassium Acetate	Low/moderate: Potential to initiate and accelerate corrosion due to elevated conductivity	N/A	Low: Probably little or no effect	High: Organic content leading to oxygen demand	Low: Leads to reduced abrasives use	N/A	N/A
	Sodium Acetate	N/A						
Carbohydrates	Beet Juice	Low: Potential to initiate and accelerate corrosion due to elevated conductivity clams of mitigation of corrosion require further evaluation	Low: Probably little or no effect	Low: Probably little or no effect; claims of mitigation of corrosion require further evaluation	High Organic matter leading to oxygen demand; nutrient enrichment by phosphorus and nitrogen; heavy metals	Low: Leads to reduced abrasive use	Low: Probably little or no effect; limited information available	Low: Probably little or no effect
	Molasses	N/A						
	Corn Syrup	N/A						

Figure 10: Impairments Associated with Commonly Used Deicing Chemicals. Source: NCHRP Report 577

Winter Maintenance Best Management Practice Recommendations

Almost all chloride applied to roads, sidewalks and parking lots will reach our lakes and streams via runoff or infiltration. The BMPs within this guide focus on source control, and applying less material. Stormwater management BMPs that use capture and infiltration methods (e.g., swales, ponds, and catchment basins) primarily slow or catch water and allow suspended solids to settle out and for infiltration to occur. These BMPs do not work well for removing chlorides due to their high solubility. Chlorides do not degrade in the environment; instead they accumulate and therefore infiltration is not a good practice for addressing chloride impairments specifically.

Benefits of implementing winter maintenance BMPs can include:

- **Improved Level of Service**: A winter maintenance plan that is informative, knowledgeable and well-executed results in consistent services to the public.
- **Improved Safety**: A good understanding of materials, application rates, weather, and equipment can minimize dangerous road conditions.
- **Reduction of Impacts**: Understanding and implementing BMPs will reduce the amount of impacts associated with these products and reduce pollutants for the protection of infrastructure and the environment.
- **Save Money and Resources**: Knowing how to use the right treatment at the right time will save time, money, and materials.

BMPs	Description
Alternative Snow-Removal Methods	• Use mechanical means to remove snow, such as, plowing, shoveling or blowing as much as possible.
Calibration and Equipment Maintenance Retrofitting	• Calibrate your equipment. This will save chemical cost and reduce environmental impacts. Keep a record of your calibration. Each truck will be calibrated based on how it operates, and should be calibrated for varying types of materials. • Do not overfill your truck. Only put the amount of salt in your truck that you need for the route. • Retrofit trucks for use of on-board application regulators with temperature sensors that monitor air and pavement temperatures (or purchase hand-held unit); equip trucks with GPS; tanks and equipment for anti-icing and/or pre-wetting practices (with brine). Use ground speed control on your spreader. • Retrofit your trucks with applicator regulators or if Road Weather Information System (RWIS) is available in your area, use RWIS to determine when to apply deicers and which ones to use.
Anti-icing	• Anti-icing is the proactive method of preventing snow and ice from bonding to pavement. It can be more than 50% more efficient than deicing. This can reduce the amount of chemical needed by 30%.
Pre-wetting	• Pre-wetting is the process of coating a solid deicer with a liquid before it is spread on a roadway. Deicing chemicals must form brine before they can begin melting ice. Pre-wetting your chemicals accelerates the brine making process, which improves the melting action of the material. Pre-wetting salt can reduce application rates by 20%.
Resource Management	• Create a winter snow and ice control policy that will outline levels of service, application rates and plowing frequency. • Keep a log of winter storm events, time, and application rates to help describe maintenance activities and results.
Good Housekeeping and Education	• Know the limits of deicing; choose the proper material and apply the correct amount. Rock salt is not effective at temperatures below 15°F. • Don't mix salt and sand. Salt is for melting and sand is for traction on top of the ice; they work against each other. • Attend training workshops and stay up-to-date with new technologies and practices.

Alternative Snow-Removal Method BMPs

There are various alternatives to using chlorides. The most common BMPs are calibration of equipment, use of brine, anti-icing, pre-wetting and retrofitting equipment.

Calibration of Equipment

Calibration of equipment allows you to monitor the amount of materials you apply and test application rates to ensure efficient use of materials. Calibrating equipment is the first step to reducing salt use and saving money. Knowing staff and their habits is also an important component of managing the amount of salt applied.

Knowing how much deicing material that is being applied by equipment is critical to every winter maintenance program. It is important to understand that each truck or piece of equipment can apply different amounts of deicer. Variations in spinner speed, RPMs, spinner throw distance and/or patterns, and belt speed can affect and vary the amount of salt being applied. It is important for the operators of each truck to know their equipment capabilities and identify any issues.

Calibration procedures should be part of yearly training prior to the winter season. Appendix 2 provides example calibration spreadsheets from the state of New Hampshire. Online manuals are available for most types of spreaders. The goal is to know how much material you are putting down for every setting on each of your trucks that you use. Each truck must be independently calibrated.

Helpful Tips

The Salt Institute: Snowfighters Handbook: Safe and Sustainable Snowfighting
http://www.saltinstitute.org/wp-content/uploads/2013/07/Snowfighters_HB_2012.pdf

LTAP: Technical Information Sheet #168 Winter Operations Strategies
http://www.dot7.state.pa.us/BPR_PDF_FILES/Documents/LTAP/Techsheets/techSheet168-color.pdf

LTAP: Technical Information Sheet #111: New Chemical Application Guidelines for Winter Operations
http://www.dot7.state.pa.us/BPR_pdf_files/Documents/LTAP/TechSheets/TS_111_revised%202009.pdf

Figure 11: An example of anti-icing BMP, where a brine solution is placed on a roadway prior to a winter storm. Photo credit: Darrel Lewis, Armstrong County.

Brine

Brine is commonly used for anti-icing and for pre-wetting practices. Brine is a mixture of salt and water mixed together to 23% salinity. The *Brine Making: NH Best Management Practice* fact sheet can be found in Appendix 2 or can be found at: http://des.nh.gov/organization/divisions/water/wmb/was/salt-reduction-initiative/documents/bmp-brine.pdf.

This fact sheet goes into the detail of how brine is made and also states that brine can be safely stored for up to a year, however its concentration should be tested before use. A 23% brine solution may be stored outside; however, if temperatures get below 0°F, the brine may freeze. A circulator pump will reduce the risk of freezing. Using salt with minimal debris will greatly reduce the amount of equipment clogging – solar salt is commonly used.

The Minnesota Department of Transportation Research Services provides technical information on *Salt Brine Blending to Optimize Deicing and Anti-Icing Performance* http://www.dot.state.mn.us/research/documents/201220.pdf.

Anti-Icing

The key to maintaining ice-free surfaces is to create a brine layer between the pavement and winter precipitation to prevent ice from forming and make it easier to remove if it does form. **Anti-icing** is a proactive method of applying a brine solution to the roadway, preventing snow and ice from bonding to pavement. It can be more than 50% more efficient than deicing. Typically anti-icing is most effective if applied 1-2 hours before the precipitation begins; however, it can be applied up to 24 hours in advance.

LEAVE SOME PAVEMENT BARE It's always best to use stream nozzles instead of fan tip to avoid creating a slippery condition. If the anti-icing liquid freezes the bare pavement will still provide a traction surface.
Source: NH Fact Sheet BMP

Anti-icing advantages:

- Anti-icing returns road surfaces to normal faster, resulting in fewer accidents and delays.
- Salt needs moisture to be effective. Applying brine jumpstarts the melting process.
- Brine sticks to the road surface. It will not bounce and scatter like road salt.
- Application of brine to a road surface can result in 25%-30% less salt needed.
- The time required to treat lanes is reduced, therefore labor costs can be reduced if snow falls on the weekend or during hours where overtime would be paid.

Knowing when to employ anti-icing is dependent on weather and pavement conditions. Figure 12 below can act as a guide in assisting you with making the determination when to anti-ice.

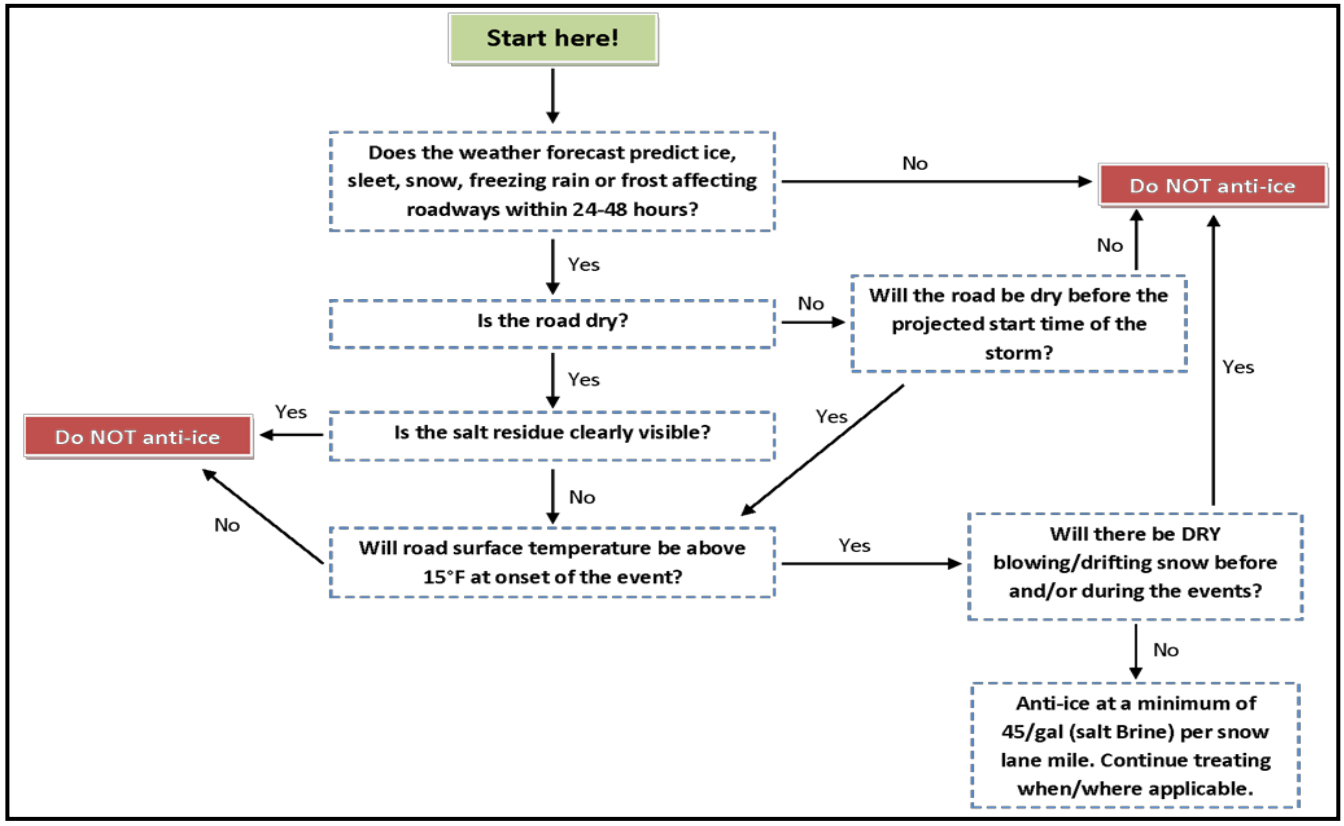

Figure 12: Anti-ice Decision Tree. Source: PennDOT Maintenance Manual

For more information, see the links below and the resources section in Appendix 4:

- http://www.dot7.state.pa.us/BPR_pdf_files/Documents/LTAP/TechSheets/TS_129.pdf
- http://www.fhwa.dot.gov/reports/mopeap/mop0296a.htm

Pre-wetting

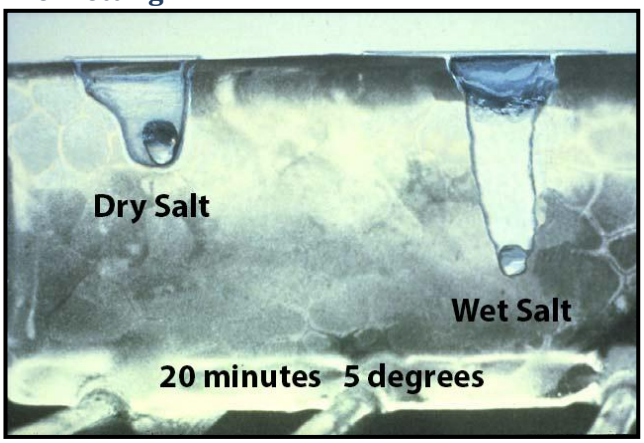

Figure 13: Pre-wetted salt works faster than dry salt. Image source: Wisconsin DOT Transportation Bulletin

Dry salt needs to form a brine to start its melting action. **Pre-wetting** is the process of coating a solid deicer with a liquid before it is spread on a roadway. Pre-wetting your chemicals accelerates the brine making process, which improves the melting action of the material. In some cases, depending on the liquid used, this process can also lower the material's effective working temperature allowing for chemical deicers to work at lower pavement temperatures.

Pre-wetting also reduces the amount of bounce and scatter on the roadway, which keeps the material on the roadway. It also reduces the total amount of deicer needed to obtain the desired results. As seen in Figure 14, Michigan DOT found a cost savings of one-third over the use of dry salt and 78% of the pre-wetted salt remained within the center of the roadway when applied.

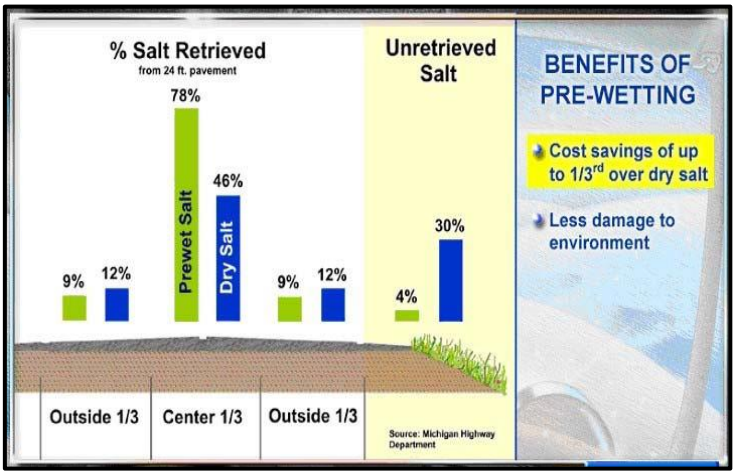

Figure 14: Benefits of Pre-Wetting. Image Source: Michigan Highway Department

Pre-wetting can be accomplished by applying the liquid chemical onto the material at the spinner as the material is being applied, or over the truck bed or loader bucket at the stockpile. If the liquid chemical is to be added at the stockpile, care should be taken to perform this operation on an impervious pad to alleviate leaching problems.

Pre-wetting salt is being used by more agencies than ever before. Their experience has proven the cost-effectiveness and increased safety of pre-wetted salt. The Salt Institute recommends the application rates to the right in gallons of liquid per ton of salt for the three commonly used chemicals.

As with any recommended application rate, be sure to test and adjust the rates based on current weather and pavement conditions within your municipality.

Prewetting Agent	Application Rate (gallons per ton of salt)
Salt Brine	8 – 10
Calcium Chloride	6 – 12
Magnesium Chloride	6 – 8

Source: "Pre-wetting Salt: Another Cost Effective Took for Your Winter Maintenance Toolbox." Source: The Salt Institute.

Helpful Tips

- **A good rule of thumb is to use 8-10 gallons of pre-wetting liquid for every ton of deicer.**
- **If you are pre-wetting, don't forget to reduce your application rates accordingly.**
- **For more information about anti-icing please see:**
  - **FHWA: Manual of Manual of Practice for an Effective Anti-icing Program: A Guide For Highway Winter Maintenance Personnel http://www.fhwa.dot.gov/reports/mopeap/mop0296a.htm**
  - **http://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/8_0.aspx**

Retrofitting Trucks

Retrofitting trucks with equipment for the use of on-board application regulators, temperature sensors that monitor air and pavement temperatures, and anti-icing or pre-wetting practices can help significantly reduce the amount of salt used. Retrofitting trucks and investing in equipment can be costly, but you may discover that over a few years, with reduced materials applied, the equipment pays for itself. Below are a few examples of the cost savings that can be associated with retrofitting existing equipment to use anti-icing and pre-wetting practices.

Adding pre-wet capabilities to plow and spreader trucks requires investment to purchase the saddle tanks, pumps and nozzles that are capable of applying a liquid at the spreader's spinner. During initial start-up programs, modification of existing equipment may be the most economical.

Figure 15: Salt skirt retrofitted on a municipal truck to target salt application at the center line. Source: Minnesota DOT.

Local Highlight:
North Fayette Township, Allegheny County

North Fayette Township began utilizing brine in 2013. In their very first year of operations, in 2014, they went from spending $311,000 to $202,000 on winter maintenance operations for a savings of $109,000.

North Fayette experiences, on average, 30 snowfall events per year. For each pass (township-wide), they use about 90 tons of salt to treat 100 lane miles. It takes between 5 and 10 tons of salt to make enough brine to treat all of their roads. Utilizing brine for pre-treating roadways, North Fayette estimates that 80 tons of salt during each snowfall event is saved, which equates to an average savings of about $4,700 per event. The potential savings is around $141,000 a year.

Helpful Tips from North Fayette:

- One ton of salt can yield between 1,600 to 1,800 gallons of salt brine depending on the size of the salt crystals used
- The adjusted salt brine price for North Fayette Township is around 14 cents per gallon
- Average yearly costs associated with manufacturing brine is approximately $46,000 a year
- By pre-treating roads prior to a snow event, it is estimated that they saved 80 tons of salt per event

Their upfront costs consisted of:

- Equipment and retrofit: $18,000/truck (GPS, spreader controls, tanks and equipment)
- Original mixing equipment and tank: $95,000
- Pre-wetting tower for brine: $10,000

The example data below shows how the cost savings can be realized through simple calculations.

Example Base Data	Example Material Cost Savings
Salt Usage: 1,000 tons of salt per year **Cost of Salt:** $45.00 per ton **Cost of Calcium Chloride (CaCl):** $0.85 per gallon **Rate:** 10 Gallons CaCl per ton of salt **Percent Reduction of Salt:** 30%	**Amount of Salt Saved**: 1000 tons x 30% reduction = 300 tons/year **Cost of Salt Saved**: 300 tons x $45.00/ton = $13,500 **Amount of CaCl Used:** 10 gallons/ton x 700 tons = 7,000 gallons **Cost of CaCl Used**: 7,000 gallons x 0.85/galonl = $5,950
Annual Net Material Savings: $13,500 - $5,950 = $7,550 **Annual Labor Cost Savings:** Less Salt to Spread + Return Trips to Re-Salt Eliminated	

Figure 16: Cost savings example. Source: PennDOT LTAP Technical Information Sheet #129 (Prices reflected as of 2006)

Alternatives to Deicers

There are various alternatives to using deicers near sensitive aquatic resources. Some alternatives may have their own impacts; be sure to research and select the alternative that is most suitable.

Abrasives

Abrasives serve to provide a temporary friction layer on the road surface and are relatively inexpensive. They are commonly used on roads with low levels of service (LOS) or in areas that may need immediate traction; such as hills, curves, and intersections or other problem areas. Abrasives provide limited effectiveness on snowy or icy roads with higher vehicle speed and have substantial clean-up costs due to repeated applications that are needed. Abrasives can negatively impact water quality and aquatic species, air quality, vegetation and soil. Abrasives accumulate in stormwater inlets and pipes and travel into waterways via stormwater runoff and snowmelt. It is estimated that 50% to 90% of sand applied may remain somewhere in the environment after clean-up (Parker, 1997).

If you use a 50/50 salt/sand mix, you're generally either half right or half wrong. Using a salt/sand mix leads to overapplication of both materials.
Source: MN Snow and Ice Control

Under the current PennDOT publications, abrasives (antiskid materials) fall into two categories: 1) Aggregates and 2) Cinders, coke, crushed coal boiler bottom ash, or burned anthracite coal mine refuse. Although abrasive piles need to have salt applied to them so that they do not freeze, applying a salt/abrasive mix to the road is generally not recommended. Salt reduces the effectiveness of abrasives, and abrasives reduce the effectiveness of salt. However, a salt/abrasive mix may be helpful in certain situations such as a freezing rain event where the salt is washed away quickly. Some reports state that a abrasive/salt mixture can be effective in increasing friction in icy situations by sticking the abrasive to the surface, like sandpaper.

Recommended Abrasives Applications

Road Type	Recommended Practices	Use of Dry Abrasives
High Speed Urban Roads	Plow and apply chemicals to achieve bare pavement.	Inappropriate
Low Speed Urban Roads	Abrasives should be limited to parts of the road where motorists must brake, accelerate, or maneuver. Even then, abrasives should be applied only when it will likely take a long time to provide bare pavement.	Only in certain locations, and when snow pack will persist
Urban Intersections	Abrasives should be used only when an intersection might be snow or ice-covered beyond a normal period.	Only when snow pack will persist
Rural Roads, Paved	Abrasives should be applied on hills and curves only on low-speed low-volume roads. Paved rural roads should be plowed and chemical applied to achieve bare pavement.	Inappropriate
Rural Roads, Gravel	The recommended approach should be to simply groom the snow pack.	Only on low speed sections (perhaps hills and curves)
Rural Intersections	The preferred approach for paved roads is to plow and apply chemicals to achieve bare pavement. On gravel parts of intersections, abrasives may be applied over the part of the road where speeds less than 30 mph are expected.	Only on low speed approach length of gravel roads

Snow Fences

Blowing snow can impair motorists' visibility, cause accidents and make clearing the road more difficult. Reductions of blowing snow can be reduced by constructing snow fences. By reducing the amount of snow blowing across the road, snow fences can improve motorist's visibility, and reduce the amount of drifting snow on the road. New lightweight plastic fencing makes snow fences more portable and convenient to install than previous versions that were made of wood. Living

snow fences are made up of trees or vegetation that are strategically planted to act in the same manner as a traditional snow fence. Living snow fences are ideal in situations where a natural setting is desired, are more aesthetically pleasing and do not have the maintenance associated with them as portable snow fences.

Pervious Pavement

The University of New Hampshire's research suggests that porous asphalt, if installed correctly and functioning as designed, reduces the formation of ice on the pavement surface, so that the use of deicing chemicals may be drastically reduced. It is very important that sand and abrasives not be used for winter maintenance, as they will clog the pores. It is recommended that vacuum sweeping be performed at least twice a year.

The National Ready Mixed Concrete Association has produced a new *Pervious Concrete Pavement Maintenance and Operations Guide* which provides more detail on maintenance including specific recommendations on Winter Maintenance. The guide lists a number of deicing chemicals that should never be used and suggests some significant limitations on the type of equipment to be used for mechanical removal. The guide can be downloaded at: http://www.perviouspavement.org/downloads/pervious_maintenance_operations_guide.pdf.

Application Rates

Pennsylvania experiences a broad range of winter conditions so there is no one single set of application rate standards that will give "proper application rates" for all storm conditions because no two storms are exactly alike. Generally speaking, only apply enough chemical deicer to permit plows to remove the snow or melt ice. Several resources for application rate guidelines are provided in this section and are included in the resources at the end of this document.

Figure 17: Over-application. Source: Howard County, Maryland

Some of the resources may provide guidelines that you are used to using, while others that are recommended for the reduction of chloride may be a new concept. As stated earlier in this document, some of the reasons that lead to the over-application of chlorides can be due to not knowing that certain conditions may not warrant salt application; not knowing and/or tracking how much material is being applied; not knowing how much material is needed to achieve desired results; and decisions being made without knowledge of new technologies and practices.

It is recommended that you research BMPs and associated application rates. Test, document, and refine your practices based on your findings.

Helpful Tips

There are many resources are available to help with your winter maintenance program.

- **Minnesota Snow and Ice Control Field Handbook for Snowplow Operators: Second Revision http://www.mnltap.umn.edu/publications/handbooks/documents/snowice.pdf**
- **Winter Parking Lot and Sidewalk Maintenance Manual https://www.pca.state.mn.us/sites/default/files/parkinglotmanual.pdf**
- **FHWA: Manual of Practice for an Effective Anti-icing Program: A Guide for Highway Winter Maintenance Personnel http://www.fhwa.dot.gov/reports/mopeap/mop0296a.htm**
- **The Salt Institute: Snowfighters Handbook: Safe and Sustainable Snowfighting http://www.saltinstitute.org/wp-content/uploads/2013/07/Snowfighters_HB_2012.pdf**

Additional Considerations

In addition to applying chlorides to roads, parking lots and sidewalks, salt can also impact the environment from chemicals at storage areas and snow storage/dump areas.

Figure 18: Salt Storage Area. Source: SPC regional partners

Storage Recommendations for Deicing Chemicals

General rules for salt facilities and piles:

- Locate away from water sources
- Locate on an impervious surface
- Adequate drainage controls to prevent runoff
- After loading materials clean up any spills that occur
- Locate all salt and deicing areas outside the 100-year floodplain, areas of localized flooding and away from stormwater facilities
- Cover all salt and deicing material storage piles with tarps, hard shelters or within dikes or berms

The Pennsylvania Department of Environmental Protection (PADEP) has established minimum requirements for exposed salt storage piles under its National Pollutant Discharge Elimination System (NPDES) Industrial General Permit. (Note: This information was accurate as of June 2016. Please check for any changes that may occur when new permits are issued.)

For piles less than 3,000 tons:	For piles greater than 3,000 tons:
Recommendations and BMPs from the Salt Institute's Salt Storage Handbook must be incorporated. These piles must be covered by a permanent structure and be located on an impermeable base.	Recommendations and BMPs from the Salt Institute's Voluntary Salt Storage Guidelines for Distribution Stockpiles must be incorporated. These piles must be on an impermeable base and must be covered at all times with canvas, polyethylene or other synthetic material, except when receiving salt, building the stockpile, or loading out to customers, and then only the working face may be exposed.

Many states have considerations for siting new municipal deicing storage/salt facilities. These are good practices to consider within each municipality.

Ohio	• Avoid locating within 300 feet of any well, whether used for drinking, irrigation, or industrial water supply. • Avoid locating within 100 feet of features that have the capability to serve as a rapid pathway for salty water to migrate, such as storm drains and ditches (including roadside ditches). Avoid locating within 300 feet of dry wells (drains directly into subsurface). • Avoid locating within the 100-year floodplain of a stream or within 300 feet of a stream, river, lake, pond, or wetland.
New Jersey	• Locate at least 200 hundred feet from streams, wells, reservoirs and ground water sources. • Avoid wellhead protection areas. • Top elevation of the pad and access way should be higher than the 100-year storm level. • Divert storm water away from storage area.
Connecticut	Per Connecticut guidance, in order to prevent a new salt storage facility from becoming a source of pollution, it should **not** be located in any of the following: • Within a 100-year flood plain • Within 250 feet of a well that is utilized for potable water • Within an Aquifer Protection Area • Where adjacent surface water bodies are tributary to public water supply reservoirs, unless it is not feasible to locate the facility in a less sensitive area • In areas where the groundwater has been classified as GAA or GA, unless it is not feasible to locate the facility in a less sensitive area

Snow Storage/Dump Area Recommendations

Figure 19: Dumping snow into a waterway is not recommended. Photo Credit: Flickr.com

Consideration must also be given to the disposal of snow removed from roadways. This snow may contain higher concentrations of roadway salts and sediments. Snow storage areas should be located in upland areas only, where abrasives and other debris will remain after snowmelt for later removal. Large quantities of snow (and the sand and debris) may also cause blockage of storm drainage systems, and may result in increased chance for localized flooding, so do not locate them on or close to drainage systems.

Once the winter season is over and all the snow/ice has melted clean, remove all debris and sediment from storm drains, ditches and basins. Complete street sweeping practices per MS4 permit requirements.

Do not dump accumulated snow:

- **Into waterways, wetlands, on top of storm drains**
- **On stream or river banks that slope toward the water, where sand and debris can get into the watercourse**
- **In areas immediately adjacent (within at least 100 feet) of private or public drinking water well supplies (due to the possible presence of road salt)**
- **In stormwater management/green infrastructure BMP areas**

Figure 20: Snow dump area. Source: Minnesota DOT

Salt Truck Wash Water Management

Salt truck wash water and runoff from salt storage facilities can contain high levels of sodium, chloride, cyanide, and other associated pollutants. When possible, capture, treat, and recycle salt-containing wash water or storage facility runoff. Capture and recycle salt-containing wash water or storage facility runoff for use as salt-brine in salt pre-wetting and anti-icing materials, or properly route the collected runoff to a wastewater treatment facility. For additional information regarding wash water containment and recycling see the Vehicle Washing fact sheet in Appendix 4.

The *Innovative Environmental Management of Winter Salt Runoff Problems at INDOT Yards* publication describes beneficial salt truck wash water reuse. The report states six key factors for the reuse of salt truck wash water involves: 1) wash water collection, 2) wash water pretreatment, 3) temporary wash water storage, 4) brine manufacturing hardware and operational details, 5) product brine storage, and 6) brine application procedures and timing.

Helpful Tips

- **Bring extra salt back to the pile, do not use it up on the route if not needed. Clean out salt from truck thoroughly before washing truck.**
- **The Salt Institute: Salt Storage Handbook: Safe and Sustainable Salt Storage http://www.saltinstitute.org/wp-content/uploads/2013/09/Salt-Storage-Handbook-2015.pdf.**

MS4 Considerations

Stormwater regulations associated with the Federal Clean Water Act (CWA) are administered under the Municipal Separate Storm Sewer System (MS4) Program by the EPA. In Pennsylvania, the MS4 program is managed by PADEP, with oversight from EPA. MS4s are conveyances or systems of conveyances including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains that are owned and operated by a public entity, are designed or used for collecting or conveying stormwater, and are not a combined sewer or part of a publicly-owned treatment works. A municipality is bound by USEPA regulations for an MS4 when all or a portion of a municipality lies within an urbanized area, as determined by the US Census Bureau.

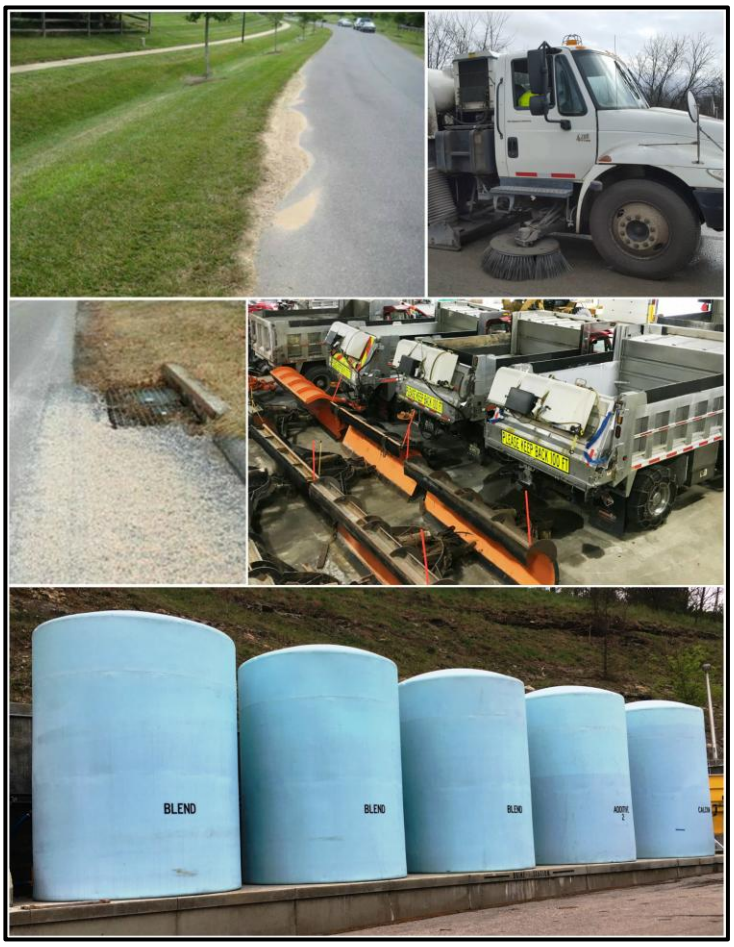

Figure 21: Municipal facilities and activities (Source: SPC, regional partners, and the Chesapeake Stormwater Network)

Chloride reduction also affects these MS4 municipalities. Currently, there are over 200 MS4 municipalities in the Southwestern Pennsylvania region. Winter BMPs are directly tied to Minimum Control Measure (MCM) 6, which focuses on Good Housekeeping and Pollution Prevention within the municipality to reduce the amount of pollution that is discharged to waterways, including chlorides. Municipal activities, including winter maintenance practices must be identified and staff training on pollution reduction, which includes chloride reduction, is a requirement of the program. Regulating authorities will also expect to see logs of specific municipal activities, such as snow removal, deicing and anti-icing. Standard operating procedures (SOPs) should be created for these winter maintenance activities.

Record-keeping and documentation is a very important aspect when developing and implementing your municipal pollution prevention and good housekeeping program. There are many resources and companies that offer tracking, reporting and record-keeping services, which may be the right option for you, depending on budget constraints and technology preferences. It is also fairly simple to keep your efforts organized and documented by using inexpensive three-ring binders. These binders should be updated, organized, and easily accessible to staff responsible for MS4 compliance.

For a more information on the MS4 Program, refer to SPC's "Quick Resource Guide to the MS4 Program" found at http://spcwater.org/ed_facts.shtml.

Helpful Tips

There are several available plans that give good operations and maintenance guidance:

- **City of Hamilton Public Works Department Operations and Maintenance Division: Road Salt Management Plan (TOE02129a)**
- **Good Housekeeping O&M Program http://www.lancasterintermunicipalcommittee.org/OM%20Program%20Template.pdf**
- **BMP Fact Sheet: GH-23 Salt Storage http://www.lancasterintermunicipalcommittee.org/GH%2023%20Salt%20Storage.pdf**

When developing and implementing a municipal pollution prevention and good housekeeping program, priorities should be based on a series of principles. Documentation and processes help fine-tune your winter maintenance program. Consider the topics below and the proper documentation needed for your winter maintenance MCM6 MS4 permit compliance.

Develop Salt Management Policies and Objectives	✓ Adopt a salt management policy that commits to measurable improvements in salt management practices ✓ Review current practices to form a benchmark ✓ Document policies, procedures and guidelines for your salt management practices, including: level of service for each roadway type, salt/sand application rates, managed salt/sand storage, good housekeeping practices, equipment calibration and re-calibration, training, snow disposal, incorporation of salt management consideration into road design and construction, and salt vulnerable areas ✓ Address the following areas of concern in your policies: general road use, salt use in salt vulnerable areas, salt storage and mixing, and snow storage and disposal ✓ Create a policy to minimize the use of potential pollutants, such as road salt and abrasives
Prevent Pollution at its Source	✓ Sweep streets and clean catch basins (abrasives removal, litter, organic debris removal from snow dump areas) ✓ Store solid deicers on impervious surfaces and provide secondary containment at storage sites for liquid deicers (must have secondary containment for valves and hoses) ✓ Re-vegetate eroding slopes from vegetation that may have been killed by the over-application of salt
Manage Clean Water Runoff and Minimize Pollutant Exposure to Clean Water	✓ Have structural cover over storage sites ✓ Site drainage design/runoff diversion ✓ Maximize infiltration of runoff away from potential pollutant sources ✓ Be able to identify where runoff outlets to
Plan for Spills and Accidents	✓ Develop spill prevention and response policies and procedures for ALL facilities that use or store chemicals ✓ Provide secondary containment ✓ Equip the facility to handle any size of spill ✓ Assign a responsible person/team for response ✓ Post procedures and emergency contacts
Practice Preventive Maintenance	✓ Use dry cleanup methods rather than washing (do not dump left over road salt or brine after finished with a run, clean out truck using dry methods prior to washing the truck) ✓ Establish an inspection calendar and incorporate into records/data system (equipment calibration and salt application records) ✓ Establish equipment maintenance and calibration calendar and incorporate those into records/data system
Identify Potential Pollution Sources	✓ Identify all material storage sites, especially those with any outside loading or unloading operations ✓ Plan for new facilities to include stormwater pollution prevention
Improve Data Collection, Mapping, and Records Maintenance	✓ Assign responsibility for monitoring and recording data collection ✓ Maintain chemical usage data for deicers and abrasives ✓ Benchmark the annual amount of salt applied per unit of weather/precipitation, such as degrees below 32°F or per inch of snow ✓ Records for street sweeping activities ✓ Cleaning catch basins and what you do with the materials ✓ If taken to a landfill, you need to be able to show documentation ✓ Make use of application rate guidelines
Train and Reward Employees	✓ Provide targeted training on policies ✓ Provide procedures and best management practices for staff ✓ Annually review the previous year's salt management practices and results to review progress ✓ Emphasize communication and coordination for municipal departments and operations with county and state agencies, organizations and institutions
Educate your Public	✓ Develop public outreach and participation regarding municipal pollution prevention activities ✓ Educate the public on proposed and existing winter maintenance practices ✓ Public education information could include adjusting driving behavior based on roadway condition

Source: Information adapted from NYS Municipal Pollution Prevention And Good Housekeeping Program Assistance, May 2006

MS4 Considerations for Brine and Other Liquids

All liquid containers must be labeled and protected from vehicle impacts and should have secondary containment. Secondary containment can consist of a bunker, berm, building, double-walled tank, etc. Spills from ice control products can occur during production, delivery and transfer so secondary containment is also needed for valves, hoses and pumps.

MS4 Considerations for Abrasives and Anti-Skid Materials

MS4 auditors may request the following street sweeping operations information:

- Does the permittee regularly sweep streets or municipal owned parking lots?
- What is the sweeping schedule?
- Are areas scheduled for sweeping based on aesthetics only, or is consideration given for reducing impacts on the stormwater and surface waters?
- What types of sweepers are used?
- How is street sweeping debris disposed? If the debris is dewatered, how is it done? How is the decanted water disposed?
- Are records kept of the amount of debris collected and amount of debris properly disposed of?
- How does the municipality use the data to further its program or evaluate program effectiveness? Are the data used to help prioritize cleaning frequency?

MS4 auditors may request the following catch basin cleaning operations information:

- Does the municipality have a schedule for routine maintenance or cleaning of basins?
- How many are cleaned and how often?
- Has the municipality targeted certain areas for more frequent maintenance? Does this targeting help minimize stormwater pollution?
- Are goals set for how many basins are inspected and cleaned each year?
- How are basin cleaning and maintenance needs tracked and recorded?
- What information is documented? Does the municipality track how much material is removed from each basin?
- What are the procedures for disposal of waste removed from basins or drains?
- Does flushing occur that could potentially discharge to surface water?
- If the material is removed by wet vacuum, how is the material dewatered? How is the decanted water disposed?
- Does the municipality have a schedule for routine maintenance or inspection of stormwater pipes?
- What are the maintenance procedures for cleaning clogged stormwater pipes?

MS4 auditors may request the following winter maintenance operations information:

- What type of winter anti-icing, deicing, and traction materials are used?
- How are the materials stored? Is the material covered and/or graded with a berm to prevent runoff?
- Does the municipality track the location and volumes of agents applied?
- Is the material picked up after the winter event? Is there a schedule for cleaning up after an event?

Helpful Tips

- **Keep in mind that the evaluator will question both managers and field staff regarding procedures used. The evaluator will ascertain the level of understanding at the field level as well as what procedures are deemed appropriate and feasible for your specific winter operations and MS4 maintenance activities.**
- **Website resources: LTAP Technical Information Sheets https://www.dot7.state.pa.us/LTAP/Public/PublicDocs_GenInfo.aspx**
- **Secondary containment options for liquids can be found at www.oregon.gov/ODOT/HWY/OOM/emsdoc/section3.pdf**

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Appendix 1: Minnesota Deicing Application Rate Guidelines

Deicing Application Rate Guidelines for Roads

24' of pavement (typical two - lane road)

The Minnesota Snow and Ice Control Field Handbook Manual 2005-1 recommended application rates have proven to be effective. MN application rates may be lower than PA Guidelines. MN and other states have TMDLs issued for Chlorides and as a result, have reduced application rates. Develop your own application rates by adjusting your current rates incrementally downward towards these guidelines. Where temperature rates overlap, select the rate most applicable to your situation.

Pavement Temp. (ºF) and Trend ( )	Weather Condition	Maintenance Actions	Application Rate in lbs/two - lane mile			
			Salt Prewetted/ Pretreated With Salt Brine	Salt Prewetted/ Pretreated With Other Blends	Dry Salt	Winter Sand (abrasives)
>30º ↑	Snow	Plow, treat intersections only	80 (40/lane mile)	70	100*	Not Recommended
	Frz. Rain	Apply chemical	80 - 160	70 - 140	100 - 200*	Not Recommended
30º ↓	Snow	Plow & apply chemical	80 - 160	70 - 140	100 - 200*	Not Recommended
	Frz. Rain	Apply chemical	150 - 200	130 - 180	180 - 240*	Not Recommended
25 - 30º ↑	Snow	Plow & apply chemical	120 - 160	100 - 140	150 - 200*	Not Recommended
	Frz. Rain	Apply chemical	150 - 200	130 - 180	180 - 240*	Not Recommended
25 - 30º ↓	Snow	Plow & apply chemical	120 - 160	100 - 140	150 - 200*	Not Recommended
	Frz. Rain	Apply chemical	160 - 240	140 - 210	200 - 300*	400
20 - 25º ↑	Snow or Frz. Rain	Plow & apply chemical	160 - 240	140 - 210	200 - 300*	400
20 - 25º ↓	Snow	Plow & apply chemical	200 - 280	175 - 250	250 - 350*	Not Recommended
	Frz. Rain	Apply chemical	240 - 320	210 - 280	300 - 400*	400
15º to 20º ↑	Snow	Plow & apply chemical	200 - 280	175 - 250	250 - 350*	Not Recommended
	Frz. Rain	Apply chemical	240 - 320	210 - 280	300 - 400*	400
15º to 20º ↓	Snow or Frz. Rain	Plow & apply chemical	240 - 320	210 - 280	300 - 400*	500 for freezing rain
0 to 15º ↑ ↓	Snow	Plow, treat with blends, sand hazardous areas	Not Recommended	300 - 400	Not Recommended	500 - 750 spot treat as needed
< 0º	Snow	Plow, treat with blends, sand hazardous areas	Not Recommended	400 - 600**	Not Recommended	500 - 750 spot treat as needed

From the *Winter Parking Lot and Sidewalk Maintenance Manual*. June 2006, revised 2010. Produced by: Minnesota Pollution Control Agency and Mississippi Watershed Management Organization – 2010 revision. Written by Fortin Consulting Inc.

Deicing Application Rate Guidelines for Parking Lots and Sidewalks

The Minnesota Snow and Ice Control Field Handbook Manual 2005-1 recommended application rates have proven to be effective. MN application rates may be lower than PA Guidelines. MN and other states have TMDLs issued for Chlorides and as a result, have reduced application rates. Develop your own application rates by adjusting your current rates incrementally downward towards these guidelines. Where temperature rates overlap, select the rate most applicable to your situation.

Pavement Temp. (ºF) and Trend ( )	**Weather Condition**	**Maintenance Actions**	**Application Rate in lbs/1000 square foot area**			
			Salt Prewetted/ Pretreated With Salt Brine	**Salt Prewetted/ Pretreated With Other Blends**	**Dry Salt**	**Winter Sand (abrasives)**
>30º↑	Snow	Plow, treat intersections only	0.75	0.5	0.75	Not Recommended
	Frz. Rain	Apply chemical	1.25	1	1.5	Not Recommended
30º↓	Snow	Plow & apply chemical	1.25	1	1.5	Not Recommended
	Frz. Rain	Apply chemical	1.5	1.25	1.75.	Not Recommended
25 - 30º ↑	Snow	Plow & apply chemical	1.25	1	1.5	Not Recommended
	Frz. Rain	Apply chemical	1.5	1.25	1.75	Not Recommended
25 - 30º ↓	Snow	Plow & apply chemical	1.25	1	1.5	Not Recommended
	Frz. Rain	Apply chemical	1.75	1.5	2.25	3.25
20 - 25º ↑	Snow or Frz. Rain	Plow & apply chemical	1.75	1.5	2.25	3.25 for frz. rain
20 - 25º ↓	Snow	Plow & apply chemical	2	2	2.75	Not Recommended
	Frz. Rain	Apply chemical	2.5	2	3	3.25
15º to 20º↑	Snow	Plow & apply chemical	2	2	2.75	Not Recommended
	Frz. Rain	Apply chemical	2.5	2	3	3.25
15º to 20º↓	Snow or Frz. Rain	Plow & apply chemical	2.5	2	3	3.25 for frz. rain
0 to 15º ↑ ↓	Snow	Plow, treat with blends, sand hazardous areas	Not Recommended	3	Not Recommended	5.0 spot treat as needed
< 0º	Snow	Plow, treat with blends, sand hazardous areas	Not Recommended	4.5	Not Recommended	5.0 spot treat as needed

From the *Winter Parking Lot and Sidewalk Maintenance Manual*. June 2006, revised 2010. Produced by: Minnesota Pollution Control Agency and Mississippi Watershed Management Organization – 2010 revision. Written by Fortin Consulting Inc.

Hydraulic-Run Spreader Calibration

NH Best Management Practices

WHY CALIBRATE?

You can't reduce your salt use if you don't know how much salt you actually use! The goal of calibrating is to know how much material you are putting down on a roadway or parking lot for every setting on your truck that you use. This is why calibrating your equipment is the first step to reducing salt use and saving money!

REMEMBER:

Each truck must be independently calibrated for each material it will be used to spread (the salt calibration chart *will* be different than the sand calibration chart).

Calibrations should be preformed annually, or after a spreader is serviced.

CALCULATIONS:

There are a few simple calculations you must perform in order to complete the calibration. Once all of the necessary data is recorded, head back inside and warm up! Refer to the reverse side of this fact sheet for calculation instructions.

Step 1: Load the Truck

Partially load the truck. Half of a full load should be more than adequate for calibration purposes.

Step 2: Set Your Controls

Gate Height: Set the gate height to its lowest practical setting (~ 2"). This should be kept constant throughout the calibration process. If you find that not enough material is dispensed with this setting, try 2.5" to 3".

Engine Speed: Warm the truck up and run the engine at the typical rate seen during spreading (approximately 2000 rpm).

Step 3: Measure Spread Width

Measure the width that the material covers during spreading. Do this for each conveyor/auger setting you are calibrating. Round your numbers to the nearest half foot and record them in column "**W**" of the calibration chart (see reverse side).

Step 4: Collect & Weigh Material

You will need either a sheet of canvas, a tarp, or a bucket to collect the material that is dispensed from the spreader, as well as a scale. Weight the object you are using to collect the material in, and record that value in the purple box above the discharge rate column. Collect material for 1 minute. Weigh the collected material and subtract the weight of the tarp/canvas/bucket. Record this value in the first purple column of the calibration chart. Do this 3 times for each conveyor/auger setting that is typically used. Average these three values together and record in the orange column in the calibration chart.

Step 5: Perform Calculations

Go inside and calculate your discharge rate using the calibration chart for each truck speed and conveyor/auger setting you normally use. Refer to the reverse side of this fact sheet for calculation instructions. The formula you will be using is shown below:

$$D = \frac{B \times C}{A}$$

Step 6: Distribute Completed Calibration Cards!

Put a copy of the calibration chart in the truck you just calibrated. Also, leave a copy of the calibration chart in the office so you have a copy incase the original is damaged.

Produced in partnership with:

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

New Hampshire DOT

Technology Transfer Center
New Hampshire LTAP at UNH

Calibration Chart (Hydraulic Type)

Material: _____ Truck/Spreader ID: _____

Date: _____ Performed by: _____

Tarp/Canvas/Bucket Weight: _____

Conveyor or Auger Setting	W	A	Discharge Rate (lb/min.)			B	D					
	Spread Width (ft.)	5.28 × W	Run 1	Run 2	Run 3	Average Discharge Rate *((Run1 + Run2 + Run3)/3)*	Pounds of Material Discharged per 1000 square ft. *(D = B × C ÷ A)*					
							5 mph (C = 12)	10 mph (C = 6)	15 mph (C = 4)	20 mph (C = 3)	25 mph (C = 2.4)	30 mph (C = 2)
1												
2												
3												
4												
5												
EX	14	5.28 × 14= **73.92**	87	92	93	(87+92+93)÷3= **90.67**	12 × 90.67 ÷ 73.92= **14.72**	6 × 90.67 ÷ 73.92= **7.36**	4 × 90.67 ÷ 73.92= **4.91**	3 × 90.67 ÷ 73.92= **3.68**	2.4 × 90.67 ÷ 73.92= **2.94**	2 × 90.67 ÷ 73.92= **2.45**

Calculation Instructions: Multiply the spread width from column **W** by **5.28** and record the answer in column **A**. For each conveyor/auger setting, add **Run 1**, **Run 2**, and **Run 3** together. Divide the result by **3** and record in column **B** to get the average discharge rate. To find the pounds of material discharge per 1000 square feet, you must know the number of minutes it takes to travel one mile at every truck speed you intend to calibrate for. These numbers are designated as variable "**C**". The "**C**" value for each travel speed is shown in red under that given speed. Multiply column **B** by the "**C**" value for that speed and divide by the **A** column to find the number of pounds of material discharged per 1000 square feet for the given speed. Record these numbers in the **D** columns. The full equation is shown here:

$$D = \frac{B \times C}{A}$$

Pony Motor-Run Spreader Calibration

NH Best Management Practices

WHY CALIBRATE?

You can't reduce your salt use if you don't know how much salt you actually use! The goal of calibrating is to know how much material you are putting down on a roadway or parking lot for every setting on your truck that you use. This is why calibrating your equipment is the first step to reducing salt use and saving money!

REMEMBER:

Each truck must be independently calibrated for each material it will be used to spread (the salt calibration card *will* be different than the sand calibration card).

Calibrations should be preformed annually, or after a spreader is serviced.

CALCULATIONS:

There are a few simple calculations you must perform in order to complete the calibration. Once all of the necessary data is recorded, head back inside and warm up! Refer to the reverse side of this fact sheet for calculation instructions.

Step 1: Load the Truck

Partially load the truck. Half of a full load should be more than adequate for calibration purposes.

Step 2: Set Your Controls

Gate Height: Set the gate height to its lowest practical setting to start (approximately 1" to 1.5"). After the truck is calibrated for the lowest gate setting, calibrate for each 1/2" increment greater than the lowest setting. Continue until all gate settings you use are calibrated.

Engine Speed: Set the pony motor speed to the maximum setting, or to the setting you would normally use.

Step 3: Measure Spread Width

Measure the width that the material covers during spreading. Do this for each gate setting you are calibrating. Round your numbers to the nearest half foot and record them in column "**W**" of the calibration chart (see reverse side).

Step 4: Collect & Weigh Material

You will need either a sheet of canvas, a tarp, or a bucket to collect the material that is dispensed from the spreader, as well as a scale. Weight the object you are using to collect the material in, and record that value in the purple box above the discharge rate column. Collect material for 1 minute. Weigh the collected material and subtract the weight of the tarp/canvas/bucket. Record this value in the first purple column of the calibration chart. Do this 3 times for each gate opening that is typically used. Average these three values together and record in the orange column in the calibration chart.

Step 5: Perform Calculations

Go inside and calculate your discharge rate using the calibration chart for each truck speed and gate setting you normally use. Refer to the reverse side of this fact sheet for calculation instructions. The formula you will be using is shown below:

$$D = \frac{B \times C}{A}$$

Step 6: Distribute Completed Calibration Cards!

Put a copy of the calibration card in the truck you just calibrated. Also, leave a copy of the calibration card in the office so you have a copy incase the original is damaged.

Produced in partnership with:

NH Department of Environmental Services

New Hampshire DOT

Technology Transfer Center
New Hampshire LTAP at UNH

Calibration Chart (Pony Motor Type)

Material: _____ Truck/Spreader ID: _____

Date: _____ Performed by: _____

Tarp/Canvas/Bucket Weight: _____

Gate Opening	W	A	Discharge Rate (lb/min.)			B	D					
	Spread Width (ft.)	5.28 × W	Run 1	Run 2	Run 3	Average Discharge Rate *((Run1 + Run2 + Run3)/3)*	Pounds of Material Discharged per 1000 square ft. *(D = B × C ÷ A)*					
							5 mph (C = 12)	10 mph (C = 6)	15 mph (C = 4)	20 mph (C = 3)	25 mph (C = 2.4)	30 mph (C = 2)
1”												
1.5”												
2”												
2.5”												
3”												
EX	14	5.28 × 14= **73.92**	87	92	93	(87+92+93)÷3= **90.67**	12 × 90.67 ÷ 73.92= **14.72**	6 × 90.67 ÷ 73.92= **7.36**	4 × 90.67 ÷ 73.92= **4.91**	3 × 90.67 ÷ 73.92= **3.68**	2.4 × 90.67 ÷ 73.92= **2.94**	2 × 90.67 ÷ 73.92= **2.45**

Calculation Instructions: Multiply the spread width from column **W** by **5.28** and record the answer in column **A**. For each gate setting, add **Run 1**, **Run 2**, and **Run 3** together. Divide the result by **3** and record in column **B** to get the average discharge rate. To find the pounds of material discharge per 1000 square feet, you must know the number of minutes it takes to travel one mile at every truck speed you intend to calibrate for. These numbers are designated as variable “**C**”. The “**C**” value for each travel speed is shown in red under that given speed. Multiply column **B** by the “**C**” value for that speed and divide by the **A** column to find the number of pounds of material discharged per 1000 square feet for the given speed. Record these numbers in the **D** columns. The full equation is shown here:

$$D = \frac{B \times C}{A}$$

Technical Update

OHIO LTAP | Local Technical Assistance Program

Snow and Ice Control Treatments – Salt with Salt Brine

Winter weather events present roadway agencies responsible for Snow & Ice removal with options on treatment materials to improve roadway safety. Due to budgetary or equipment-related limitations, some smaller local agencies might not be able to take full advantage of available treatment materials/options (see page 4). In this *R*oute *o*f *N*avigation (RON) technical update, we address the scenario where salt and salt brine might be the only materials being used at the local agency for treating a roadway.

Material Types:

Salt

Salt is sodium chloride, NaCl, a white crystalline substance with its characteristic taste found in natural beds, in seawater, etc. The mineral form is *halite*, also called "rock salt". Salt used for winter maintenance operations is sometimes referred to as "road salt".

Salt was first used to treat snow and ice covered roads in the mid-1940s, but its use wasn't fully embraced until the fifties. Use increased as more agencies became aware of the higher level of service salt could provide in addition to plowing and as the North American road system expanded.

Salt Brine

Salt brine is made by mixing salt in water to approximately a 23% solution by weight (23% salt / 77% water). Salt brine is commonly used in anti-icing operations and for pre-wetting solid rock salt.

The proportion of salt to water is critical to the effectiveness of the brine. Too much or too little salt affects the freezing point depressing qualities of the brine. The proper salt brine mixture is 23.3% at which the freezing point is –6°F **Caution:** If the solution of brine dilutes below its effective concentration, you will not achieve any reduction of ice bonding to the pavement.

Salt brine is widely used because it is:

- Readily available (easy to produce)
- Very economical
- Effective for events occurring at moderate subfreezing temperatures

Green brine is recommended to be used as much as possible. It is the salty water runoff from washing snow plow trucks after each snow storm which is collected in an onsite storm water retention pond that also collects storm water from the salt barn(s), loading area, and remaining site area. This water is beneficially reused by transferring it to a tank specially designed to mix brine.

EPA regulations must be met when using this green brine. This usually means running the wastewater through an oil-water separator, collection and storage, and filtration of heavy metals. Contact your local Ohio EPA office when considering this alternative.

Treating Asphalt, Brick, and Concrete Surfaces:

If conditions and timing allow, operators should apply anti-icing materials to the road prior to a snow fall.

Anti-icing is the application of a deicing material to the roadway prior to a snowfall event to prevent the bond from occurring between the snow and the roadway. Anti-icing materials are typically a brine, or in some cases rock salt. Anti-icing practices can also be used to prevent the formation of black ice on roadways.

Deicing is the application of a deicing material to the roadway after a snowfall event has occurred and the snow has bonded to the roadway. Always plow before applying treatment material to a snow covered roadway. Plowing is the most cost effective means of removing snow and ice from the roadway. Reversing the order will result in plowing deicing material off the roadway. It is usually not cost-effective to apply salt alone at pavement temperatures below 15 degrees Fahrenheit.

Salt's effectiveness can be increased by pretreating and pre-wetting.

Pretreating is mixing a non-caking liquid into the stockpile of salt before it is applied. It does not require changes to an agency's plow trucks and requires no new capital investment for application equipment if it is applied by a vendor.

Pre-wetting is adding a liquid to the salt as it is being applied-either at the spinner or through a soaker pipe in the auger box to reduce bounce and scatter and to accelerate the melting process. Although pre-wetting requires some changes to an agency's plow truck, it provides flexibility to switch the liquid chemical makeup depending on conditions. You can also switch from dry application immediately-just turn down the liquid application rate.

Note the Ohio Department of Transportation may sell salt brine to local government agencies at local sites where salt brine is produced. Contact your local Ohio Department of Transportation facility for more details.

Use an appropriate **amount** of salt.

Use a calibrated, speed-synchronized spreader and good judgment in selecting application rates and truck speeds. Apply just enough material to prevent or loosen the bond between the road and the snow or ice so it can be plowed off.

These guidelines are a starting point. Reduce or increase rates incrementally based on your experience according to your local conditions.

Application Rates:

The following salt application rates are for typical 24' two-lane roads, during the specified pavement temperatures, with the listed precipitation:

Dry Pavement Light Snow Less Than 2"/Hour					
Above 32° F (Rising)	Above 32° F (Falling)	25° F to 32° F	20° F to 25° F	15° F to 20° F	Below 15° F
Bridges and Icy Spots	Acceptable	Recommended	Recommended	Recommended	Recommended
Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 100 to 200 lb./mile #	Plow and monitor conditions	Plow and monitor conditions
Wet Pavement Light Snow Less Than 2"/Hour					
Above 32° F (Rising)	Above 32° F (Falling)	25° F to 32° F	20° F to 25° F	15° F to 20° F	Below 15° F
Bridges and Icy Spots	Acceptable	Recommended	Recommended	Recommended	Recommended
Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 100 to 200 lb./mile #	Plow and treat @ 300 to 400 lb./mile #	Plow and treat @ 400 lb. max/mile
Dry Pavement Heavy Snow More Than 2"/Hour					
Above 32° F (Rising)	Above 32° F (Falling)	25° F to 32° F	20° F to 25° F	15° F to 20° F	Below 15° F
Bridges and Icy Spots	Acceptable	Recommended	Recommended	Recommended	Recommended
Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 100 to 200 lb./mile #	Plow and treat @ 300 to 400 lb./mile #	Plow and monitor conditions	Plow and monitor conditions

- Pre-wet the material @ 8 to 10 gallons of salt brine/ton of salt

Wet Pavement Heavy Snow More Than 2"/Hour					
Above 32° F (Rising)	Above 32° F (Falling)	25° F to 32° F	20° F to 25° F	15° F to 20° F	Below 15° F
Bridges and Icy Spots	Acceptable	Recommended	Recommended	Recommended	Recommended
Plow and treat @ 100 lb./mile #	Plow and treat @ 100 to 200 lb./mile #	Plow and treat @ 100 to 200 lb./mile #	Plow and treat @ 400 lb. max/mile #	Plow and treat @ 400 lb. max/mile #	Plow and treat @ 400 lb. max/mile #
Freezing Rain					
Above 32° F (Rising)	Above 32° F (Falling)	25° F to 32° F	20° F to 25° F	15° F to 20° F	Below 15° F
Bridges and Icy Spots	Recommended	Recommended	Recommended	Recommended	Recommended
Plow and treat @ 100 lb./mile #	Plow if needed and treat @ 200 to 300 lb./mile #	Plow only Plow if needed and treat @ 300 to 400 lb./mile #	Plow if needed and treat @ 400 lb. max/mile #	Plow if needed and treat @ 400 lb. max/mile #	Plow if needed and treat @ 400 lb. max/mile #
Black Ice					
Above 32° F (Rising)	Above 32° F (Falling)	25° F to 32° F	20° F to 25° F	15° F to 20° F	Below 15° F
Bridges and Icy Spots	Recommended	Recommended	Recommended	Recommended	Recommended
Apply anti-icing material prior to the formation of black ice ^	Apply anti-icing material prior to the formation of black ice ^	Apply anti-icing material prior to the formation of black ice ^	Apply anti-icing material prior to the formation of black ice ^	Apply anti-icing material prior to the formation of black ice ++	Apply anti-icing material prior to the formation of black ice ++

- Pre-wet the material @ 8 to 10 gallons of salt brine/ton of salt

^ - Apply anti-icing brine @ 20 to 40 gallons/lane mile

++ - *Do not apply liquid anti-icing material when the pavement temperature is below 20° F.*

Additional Treatment Materials:

For information about additional treatment materials commonly used for winter roadway maintenance, please refer to the separate RON Technical Update on *Snow and Ice Control Treatments – Popular Materials*.
http://www.dot.state.oh.us/Divisions/Planning/LocalPrograms/LTAP/Documents/Popular_Materials_for_Snow_and_Ice_Control_Treatments.pdf

Information Sources:

Federal Highway Administration – www.fhwa.dot.gov
Ohio DOT – www.dot.state.oh.us; Scott Lucas, Office of Maintenance Operations – 614-644-6603
Salt Institute – www.saltinstitute.org
Minnesota Local Road Research Board – www.lrrb.org

DISCLAIMER: *This RON Technical Update is provided for purposes of general information. Interested persons should refer to the resources referenced herein for additional information as needed.*

Appendix 4: Document Sources and Additional Resources

Best Management Practices

- Pennsylvania Stormwater Best Management Practices Manual - Special Management Areas (Brownfields, Highways and Roads, Karst Areas, Mined Lands, Water Supply Well Areas, Surface Water Supplies and Special Protection Waters) http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-48478/08_Chapter_7.pdf
- Pre-wetting Winter Materials. PennDOT LTAP Technical Information Sheet #129. 2006. http://www.dot7.state.pa.us/BPR_pdf_files/Documents/LTAP/TechSheets/TS_129.pdf
- Transportation Association of Canada - Synthesis of Best Practices Road Salt Management http://tac-atc.ca/en/bookstore-and-resources/free-resources-and-tools/syntheses-practice
- Transportation Research Circular E-C063: Proactive Snow and Ice Control Toolbox, June 7–9, 2004 http://onlinepubs.trb.org/onlinepubs/circulars/ec063.pdf

Blowing/Drifting Snow Control: Snow Fences

- Controlling Blowing and Drifting Snow with Snow Fences and Road Design http://www.esf.edu/willow/lsf/Litterature/Tabler%202003%20-%20Controlling%20Blowing%20and%20Drifting%20Snow.pdf
- LTAP Technical Information Sheet #63: Snow Fences
- Natural Resource Conservation Service: Tree Plantings in CRP Living Snow Fences, Field Windbreaks, and Shelterbelts https://prod.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs141p2_000874.pdf
- NCHRP Synthesis 449 http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_449.pdf

Cost Benefits

- Benefit-Cost of Various Winter Maintenance Strategies. Clear Roads. September 2015. http://clearroads.org/wp-content/uploads/dlm_uploads/FR_CR.13-03_Final.pdf
- Winter Maintenance. Pennsylvania DOT LTAP presentation. September 2014.
- The Real Cost of Salt use for Winter Maintenance in the Twin Cities Metropolitan Area. https://www.pca.state.mn.us/sites/default/files/wq-iw11-06bb.pdf

General Resources

- Environment Canada, Road Salt Case Studies https://www.ec.gc.ca/sels-salts/default.asp?lang=En&n=CBE1C6ED-1
- Highway Deicing: Road Salt Use in the United States. Transportation Research Board. http://onlinepubs.trb.org/onlinepubs/sr/sr235/017-030.pdf
- PennDOT LTAP Technical Information Sheet #63: Snow Fences
- Road Salt Moving Toward the Solution. Special Report December 2010 http://www.caryinstitute.org/sites/default/files/public/reprints/report_road_salt_2010.pdf
- Source Water Protection Practices Bulletin Managing Highway Deicing to Prevent Contamination of Drinking Water. July 2009 www.epa.gov/safewater

Guidance Manuals

- A Guide for Selecting Anti-icing Chemicals, Version 1.0.IIHR, Technical Report No. 420, 2001 http://dot.alaska.gov/stwddes/research/assets/pdf/anti_icing_guide.pdf.
- Controlling Blowing and Drifting Snow with Snow Fences and Road Design http://www.esf.edu/willow/lsf/Litterature/Tabler%202003%20-%20Controlling%20Blowing%20and%20Drifting%20Snow.pdf
- Federal Highway Administration (FHWA), Manual of Practice for an Effective Anti-icing Program: A Guide for Highway Winter Maintenance Personnel, FHWARD_ 95-202, June 1996 http://www.fhwa.dot.gov/reports/mopeap/eapcov.htm
- Manual of Practice for Anti-icing of Local Roads. October 1996. A Publication of the Technology Transfer Center University of New Hampshire. http://www.ltap.org/login/resource/entryupload/uploads/20100217122816_resource_yZm9.pdf

- Minnesota Snow and Ice Control Field Handbook for Snowplow Operators. Minnesota Local Road Research Board. August 2005. http://www.lrrb.org/media/reports/200501REV.pdf
- Road Salt Management. Adapted from Pollution Prevention/Good Housekeeping for Municipal Operations (USEPA). May 2006. Massachusetts Nonpoint Source Pollution Management Manual. http://projects.geosyntec.com/npsmanual/Fact%20Sheets/Road%20Salt%20Management.pdf
- The Snow fighters Handbook. The Salt Institute. 2012 http://www.saltinstitute.org/wp-content/uploads/2013/07/Snowfighters_HB_2012.pdf
- Winter Parking Lot and Sidewalk Maintenance Manual. June 2006, Revised: June2008. Fortin Consulting Inc., Minnesota Pollution Control Agency (MPCA), Minnesota Department of Transportation & Circuit Training and Assistance Program. http://www.pca.state.mn.us/publications/parkinglotmanual.pdf
- PADOT Maintenance Manual. Chapter 4: Winter Services. Updated January 2015. http://www.dot.state.pa.us/public/PubsForms/Publications/PUB%2023/Pub%2023-Chapter%204%20.pdf

MS4 Resources

- PennDOT LTAP: Sheet#167 Summer/2015 Abrasives and Anti-Skid Material http://www.dot7.state.pa.us/BPR_pdf_files/Documents/LTAP/TechSheets/TS_167.pdf
- Pollution Prevention and the MS4 Program: A Guide on Utilizing Pollution Prevention Activities to Meet MS4 General Permit Requirements https://www.pca.state.mn.us/sites/default/files/wq-strm4-26.pdf

Road Salt and the Environment

- Acute Toxicity of Sodium Chloride to Freshwater Aquatic Organisms. A Watershed Restoration Plan for the Root River Watershed. SEWRPC Community Assistance Planning Report No. 316. Appendix E.
- Environmental Impacts of Road Salt and Alternatives in the New York City Watershed. By William Wegner and Marc Yaggi. Stormwater July 2001. www.stormh2o.com/julyaugust-2001/salt-road-environmental-impacts.aspx
- Highway Deicing: Road Salt Impacts on Drinking Water. Transportation Research Board. http://onlinepubs.trb.org/onlinepubs/sr/sr235/099-112.pdf
- Highway Salt and Our Environment. The Salt Institute. 2004. http://www.saltinstitute.org/news-articles/road-salt-and-the-environment/
- Increase in Urban Lake Salinity by Road Deicing Salt. Novotny, E., D. Murphy, and H. Stefan. 2008. Science of the Total Environment 406 (2008) 131-144. http://www.ncbi.nlm.nih.gov/pubmed/18762321
- Rationale for the Development of Ambient Water Quality Criteria for Sulfate Protection of Aquatic Life Use. Commonwealth of Pennsylvania DEP Bureau of Point and Non-Point Source Management.
- Strategies to Mitigate the Impacts of Chloride Roadway Deicers on the Natural Environment. Transportation Research Board. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_449.pdf
- Winter Operations and Salt, Sand, and Chemical Management. Center for Environmental Excellence by AASHTO. 2013. http://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/8_1.aspx

Road Salt Management Plan Examples

- City of Hamilton's Road Salt Management Plan TOE 021Salt Management Plan (TOE02129a) 2003 http://www2.hamilton.ca/Hamilton.Portal/Inc/PortalPDFs/ClerkPDFs/committee-of-the-whole/2003/Apr15/TOE02129(a).pdf
- Twin Cities Metropolitan Area, Chloride Management Plan, February 2016 https://www.pca.state.mn.us/sites/default/files/wq-iw11-06ff.pdf

Road Salt Storage

- Recommendations for Salt Storage Guidelines for Protecting Ohio's Water Resource, February 2013. http://www.epa.ohio.gov/portals/35/owrc/SaltStorageGuidance.pdf
- State Oversight of Road Salt Storage in Midwestern and Northeastern U.S. http://www.epa.ohio.gov/portals/35/owrc/StateSaltOversightSummary.pdf

- Virginia Transportation Research Council, Research Report, Recycling of Salt-Contaminated Stormwater Runoff for Brine Production at Virginia Department of Transportation Road-Salt Storage Facilities. May 2008. www.virginiadot.org/vtrc/main/online_reports/pdf/08-r17.pdf

Salt Wash Water Reuse

- FHWA Road Weather Management Best Practices http://www.ops.fhwa.dot.gov/weather/best_practices/1024x768/transform2.asp?xslname=publications_title.xslt&xmlname=publications.xml
- Innovative Environmental Management of Winter Salt Runoff Problems at INDOT Yards, 2004 http://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1601&context=jtrp

Snow Dumps and Regulations

- NH Department of Environmental Services: Environmental Fact Sheet WMB-3 2015, Snow Disposal Guidelines http://des.nh.gov/organization/commissioner/pip/factsheets/wmb/documents/wmb-3.pdf
- Private Snow Disposal Sites (On-Site Snow Storage Only) Operations Guidance---draft Prepared by Scott R Wheaton, MOA Watershed Management Services Winter 2003 http://anchoragewatershed.com/Documents/privtsnobmps.pdf

Useful Organizations and Websites

- American Association of State Highway and Transportation Officials http://www.transportation.org
- Cornell Local Roads Program: Workshops on snow and ice control www.clrp.cornell.edu
- Fortin Consulting, Inc. Road Salt Training (Minnesota) http://www.fortinconsulting.com/our-work/road-salt/certification/
- Maine Road Salt Risk Assessment Project. Margaret Chase Smith Policy Center, University of Maine http://mcspolicycenter.umaine.edu/?q=RoadSalt_Background
- Minnesota Pollution Control Agency Road Salt Education Program www.pca.state.mn.us/programs/roadsalt.html
- Pennsylvania Department of Transportation (PADOT) Local Technical Assistance Program (LTAP) https://www.dot7.state.pa.us/LTAP/default.aspx
- Road Salt and Water Quality. 1996. Environmental Fact Sheet, New Hampshire Department of Environmental Services. www.des.nh.gov
- Transportation Resource Board of the National Academies www.trb.org
- US Federal Highway Administration http://environment.fhwa.dot.gov
- The Salt Institute www.saltinstitute.org
- Safe Winter Roads www.safewinterroads.org

The Southwestern Pennsylvania Commission (SPC) hereby gives public notice that it is the policy of the Commission to assure full compliance with Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987, Executive Order 12898 on Environmental Justice, and related statutes and regulations in all programs and activities. Title VI and other related statutes require that no person in the United States of America shall, on the grounds of race, color, sex, national origin, age, or disability, be excluded from the participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which SPC receives federal financial assistance. Any person who believes they have been aggrieved by an unlawful discriminatory practice by SPC under Title VI has a right to file a formal complaint with the Commission. Any such complaint must be in writing and filed with SPC's Title VI Coordinator within one hundred eighty (180) days following the date of the alleged discriminatory occurrence. For more information, or to obtain a Title VI Discrimination Complaint Form, please see our website at: www.spcregion.org or call 412-391- 5590.

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Southwestern Pennsylvania Commission Water Resource Center

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In 2013, SPC formed the Water Resource Center (WRC) to address various water issues within the region. WRC's Mission is to promote regional collaboration on water topics; be a leader in facilitating coordination and education; and provide technical assistance to its member governments.

For an electronic version of this guide, visit:
www.spcwater.org

WINITER MAINTENANCE BMP’s

ORDINANCES

ILLICIT DISCHARGE DETECTION AND ELIMINATION ORDINANCE

BILL NO.: 4 of 2015
INTRODUCED: October 26, 2015
BY: Lucille D'Alfonso
ENACTED: November 23, 2015
ORDINANCE NO: 4 of 2015

MS4 ILLICIT DISCHARGE DETECTION AND ELIMINATION ORDINANCE

AN ORDINANCE OF THE CITY OF MONESSEN, WESTMORELAND COUNTY, PENNSYLVANIA, TO PROVIDE FOR THE HEALTH, SAFETY, AND GENERAL WELFARE OF THE CITIZENS WITHIN THE CITY OF MONESSEN THROUGH THE REGULATION OF NON-STORM WATER DISCHARGES TO THE STORM DRAINAGE SYSTEM TO THE MAXIMUM EXTENT PRACTICABLE AS REQUIRED BY FEDERAL AND STATE LAW.

ARTICLE I - GENERAL PROVISIONS

Section 101 Purpose

The purpose of this Ordinance is to provide for the health, safety, and general welfare of the citizens within the City of Monessen (City) through the regulation of non-storm water discharges to the storm drainage system to the maximum extent practicable as required by federal and state law. This ordinance establishes methods for controlling the introduction of pollutants into the municipal separate storm sewer system (MS4) in order to comply with requirement of the National Pollutant Discharge Elimination System (NPDES) permit process. The objectives of this ordinance are:

A. To regulate the contribution of pollutants to the MS4 by storm water discharges by any user.

B. To prohibit illicit connections and discharges to the MS4.

C. To establish legal authority to carry out all inspection, surveillance, monitoring, and enforcement procedures necessary to ensure compliance with this ordinance.

Section 102 Applicability

This ordinance shall apply to all water entering the storm drain system generated on any developed and undeveloped lands unless explicitly exempted by the City. The majority of the City is a combined storm and sewage sewer system which is exempted from this ordinance.

The streets with separate storm sewer systems for which this ordinance applies are located in the Grand Boulevard Sewer Shed and are listed in Appendix A. This ordinance will be amended periodically as additional combined sewer systems are separated.

Section 103 Responsibility for Administration

The City shall administer, implement, and enforce the provisions of this ordinance. Any powers granted or duties imposed upon the City may be delegated in writing by the Mayor of the City to persons or entities acting in the beneficial interest of or in the employ of the City.

Section 104 Compatibility with Other Requirements

This ordinance is not intended to modify or repeal any other ordinance, rule, regulation, or other provision of law. The requirements of this ordinance are in addition to the requirements of any other ordinance, rule, regulation, or other provision of law, and where any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule, regulation, or other provision of law, whichever provision is more restrictive or imposes higher protective standards for human health or the environment shall control.

Section 105 Severability

The provisions of this ordinance are hereby declared to be severable. If any provision, clause, sentence, or paragraph of this ordinance or the application thereof to any person, establishment, or circumstances shall be held invalid, such invalidity shall not affect the other provisions or application of this ordinance.

Section 106 Ultimate Responsibility

The standards set forth in this ordinance are minimum standards; therefore this ordinance does not intend or imply that compliance by any person will ensure that there will be no contamination, pollution, or unauthorized discharge of pollutants.

Section 107 Erroneous Permit

Any permit or authorization issued or approved based on false, misleading or erroneous information provided by an applicant is void without the necessity of any proceedings for revocation. Any work undertaken or use established pursuant to such permit or other authorization is unlawful. No action may be taken by a board, agency, employee or designee of the City purporting to validate such a violation.

ARTICLE II - DEFINITIONS

For the purposes of this Ordinance, certain terms and words used herein shall be interpreted as follows:

A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.

B. The word "includes" or "including" shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.

C. The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.

Authorized Enforcement Agency – Employees or designees of the Mayor of the City of Monessen designated to enforce this ordinance.

Best Management Practices (BMPs) – Schedule of activities, prohibitions of practices, general good housekeeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices identified in the Pennsylvania Stormwater Best Management Practices Manual (http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-68851/363-0300-002.pdf) issued by the Pennsylvania Department of Environmental Protection to prevent or reduce the discharge of pollutants directly or indirectly to stormwater, receiving waters or stormwater conveyance systems. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage. Stormwater BMPs are commonly grouped into one of two broad categories or measures: "structural" or "non-structural". In this Ordinance, nonstructural BMPs or measures refer to operational and/or behavior related practices that attempt to minimize the contact of pollutants with stormwater runoff whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to, a wide variety of practices and devices, from large scale retention ponds and constructed wetlands, to small scale underground treatment systems, infiltration facilities, filter strips, low impact buffers, sand filters, detention basins, and manufactured devices. Structural stormwater BMPs are permanent appurtenances to the project site.

City – City of Monessen, Westmoreland County, Pennsylvania.

Clean Water Act – The federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.), and any subsequent amendments thereto.

Commonwealth – The Commonwealth of Pennsylvania

Conservation District – The Westmoreland County Conservation District, a conservation district as defined in Section 3(c) of the Conservation District Law (3 P. S. § 851(c)) that has the authority under a delegation agreement executed with DEP to administer and enforce all or a portion of the regulations promulgated under 25 Pa. Code 102.

Construction Activity – Activities subject to NPDES Stormwater Permits. These include construction projects resulting in earth disturbance of one acre or more. Such activities include but are not limited to clearing and grubbing, grading, excavating, and demolitions.

DEP – The Pennsylvania Department of Environmental Protection.

Earth Disturbance Activity – A construction or other human activity which disturbs the surface of the land, including, but not limited to: clearing and grubbing; grading; excavations; embankments; road maintenance; building construction; and the moving, depositing, stockpiling, or storing of soil, rock, or earth materials. Earth disturbance activity is subject to regulation under 25 Pa. Code 92, 25 Pa. Code 102, or the Clean Streams Law.

EPA – The United States Environmental Protection Agency.

Hazardous Material – Any material, including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Illegal Discharge – Any direct or indirect non-storm water discharge to the storm drain system, except as exempted in Article III of this ordinance.

Illicit Discharge Detection and Elimination Program – A document that describes the process to effectively detect and eliminate illegal discharges into the stormwater system.

Illicit Connections – An illicit connection is defined as either of the following:

- Any drain or conveyance, whether on the surface or subsurface that allows an illegal discharge to enter the storm drain system including but not limited to any conveyances that allow any non-storm water discharge including sewage, process wastewater and wash water to enter the storm drain system and any connections to the storm drain system from indoor drains and sinks, regardless of whether said drain or connection had been previously allowed, permitted, or approved by an authorized enforcement agency or,

- Any drain or conveyance connected from a commercial or industrial land use to the storm drain system that has not been documented in plans, maps, or equivalent records and approved by an authorized enforcement agency.

Industrial Activity – Activities subject to NPDES Industrial Storm Water Permits as defined in 40 CFR, Section 122.26 (b)(14).

Municipal Separate Storm Sewer System (MS4) – The system of conveyances (including sidewalks, roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) owned and operated by the City of Monessen and

designed or used for collecting or conveying stormwater, and that is not used for collecting or conveying sewage.

National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit – Means a permit issued by the Conservation District or DEP (under authority delegated pursuant to 33 U.S.C. § 1342(b)) that authorizes the discharge of pollutants to waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis. .

Non-Stormwater Discharge – Any discharge to the storm drain system that is not composed entirely of storm water.

Notice of Intent (NOI) – Notice of Intent to the DEP to discharge stormwater associated with industrial activity from a facility including construction sites.

Operation and Maintenance (O&M) Agreement – An agreement between the City and land owner covering stormwater control facilities that are privately owned.

Person – Any individual, association, organization, partnership, firm, corporation or other entity recognized by law and acting as either the owner or the owner's agent.

Pollutant – Anything which causes or contributes to pollution. Pollutant may include, but are not limited to: paint, varnishes, and solvents; oil and other automotive fluids; non-hazardous liquid and solid wastes and yard wastes; refuse, rubbish, garbage, liter, or other discarded or abandoned objects, ordinances, and accumulations, so that may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; hazardous substances and wastes; wastes and residues that result from constructing a building or structure; building and deck cleaning mixtures; and noxious or offensive matter of any kind.

Premises – Any building, lot, parcel of land, or portion of land whether improved or unimproved including adjacent sidewalks and parking strips.

Regulated Activity – Any activity that may affect stormwater runoff and any activities that may contribute non-stormwater discharges to a regulated small MS4.

State Water Quality Requirements – The regulatory requirements to protect, maintain, reclaim, and restore water quality under Title 25 of the Pennsylvania Code and the Clean Streams Law.

Storm Drainage System – Publicly owned facilities by which storm water is collected and/or conveyed, including but not limited to any roads with drainage systems, municipal streets, gutters, curbs, inlets, piped storm drains, pumping facilities, retention and detention basins, natural and human made or altered drainage channels, reservoirs, and other drainage structures.

Stormwater – Any surface flow, runoff, and drainage consisting entirely of water from the surface of the land resulting from natural precipitation or snow or ice melt.

Stormwater Management Plan (SWMP) – A document which describes the Best Management Practices and activities to be implemented by a person or business to identify sources of pollution or contamination at a site and the actions to eliminate or reduce pollutant discharges to

stormwater, stormwater conveyance systems, and/or receiving water to the maximum extent practicable.

Wastewater – Any water or other liquid, other than uncontaminated stormwater, discharged from a facility.

Waters of this Commonwealth – Any and all rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

ARTICLE III – PROHIBITIONS

Section 301 Prohibition of Illegal Discharges

A. Any drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter a regulated small MS4 or to enter the waters of this Commonwealth is prohibited.

B. No person shall allow, or cause to allow, discharges into a regulated small MS4, or discharges into waters of this Commonwealth, which are not composed entirely of stormwater, except discharges allowed under a state or federal permit or as provided in Subsection E below.

C. No person shall throw, drain, or otherwise discharge, cause, or allow others under its control to throw, drain, or otherwise discharge into the MS4 any pollutants or waters containing any pollutants, other than stormwater.

D. The commencement, conduct or continuance of any illegal discharge to the storm drain system is prohibited.

E. The following discharges are authorized unless they are determined to be significant contributors to pollution of a regulated small MS4 or to the waters of this Commonwealth:

- Diverted stream flows	- Flows from riparian habitats and wetlands
- Potable water sources including water line flushing	- Uncontaminated water from foundations or from footing drains
- Irrigation drainage	- Lawn watering
- Air conditioning condensate	- Dechlorinated swimming pool discharges
- Springs	- Uncontaminated groundwater
- Water from crawl space pumps	- Water from individual residential car washing
- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used	- Routine external building wash down (which does not use detergents or other compounds)

F. Discharges or flow from firefighting, and other discharges specified in writing by the City as being necessary to protect public health and safety are authorized.

G. Discharges associated with dye testing are authorized, however this activity requires a verbal notification to the City prior to the time of the test.

H. The prohibition shall not apply to any non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the EPA, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for any discharge to the storm drain system.

I. In the event that the City determines that any of the discharges identified above significantly contribute pollutants to a regulated small MS4 or to the waters of this Commonwealth, the City will notify the responsible person(s) to cease the discharge.

Section 302 Prohibition of Illegal Connections

A. The construction, use, maintenance or continued existence of illicit connections to the storm drain system is prohibited.

B. This prohibition expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.

C. A person is considered to be in violation of this ordinance if the person connects a line conveying sewage to the MS4, or allows such a connection to continue.

D. Improper connections in violation of this ordinance must be disconnected and redirected, if necessary, to an approved onsite wastewater management system or the sanitary sewer system upon approval of the City or the Mon Valley Sewage Authority.

E. Any drain or conveyance that has not been documented in plans, maps or equivalent, and which may be connected to the storm sewer system, shall be located by the owner or occupant of that property upon receipt of written notice of violation from the City requiring that such locating be completed. Such notice will specify a reasonable time period within which the location of the drain or conveyance is to be determined, that the drain or conveyance be identified as storm sewer, sanitary sewer or other, and that the outfall location or point of connection to the storm sewer system, sanitary sewer system or other discharge point be identified. Results of these investigations are to be documented and provided to the City.

ARTICLE IV – WATERCOURSE PROTECTION

Section 401 Responsibilities of the Land Owner

Every person owning property through which a watercourse passes, or such person's lessee, shall keep and maintain that part of the watercourse within the property free of trash, debris, excessive vegetation, and other obstacles that would pollute, contaminate, or significantly retard the flow of water through the watercourse. In addition, the owner or lessee shall maintain existing privately owned structures within or adjacent to a watercourse, so that such structure will not become a hazard to the use, function, or physical integrity of the watercourse.

Section 402 Use of Best Management Practices

The City adopts the requirements of the Pennsylvania Stormwater Best Management Practices Manual (http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-68851/363-0300-002.pdf) identifying BMPs for any activity, operation, or facility which may cause or contribute to pollution or contamination of stormwater, the storm drain system, or waters of the Commonwealth. The owner or operator of such activity, operation, or facility shall provide, at their own expense, reasonable protection from accidental discharge of prohibited materials or other wastes into the municipal storm drain system or watercourses through the use of these structural and non-structural BMPs. Further, any person responsible for a property or premise that is, or may be, the source of an illicit discharge, may be required to implement, at said person's expense, additional structural and non-structural BMPs to prevent the further discharge of pollutants to the MS4. Compliance with all terms and conditions of a valid NPDES permit authorizing the discharge of stormwater associated with industrial activity, to the extent practicable, shall be deemed compliance with the provisions of the section. These BMPs shall be part of a SWMP as necessary for compliance with requirements of the NPDES permit.

Section 403. Operation and Maintenance Agreements

A. Prior to completing construction of a SWM Site Plan, the property owner shall sign and record an Operation and Maintenance (O&M) Agreement (see Appendix B) covering all stormwater control facilities which are to be privately owned.

   1. The owner, successor and assigns shall operate and maintain all facilities in accordance with the approved schedule and plan in the O&M Agreement.

   2. The owner shall convey to the City conservation easements to assure access for periodic inspections by the City and maintenance, as necessary.

   3. The owner shall keep on file with the City the name, address, and telephone number of the person or company responsible for operation and maintenance activities. In the event of a change, new information shall be submitted by the owner to the City within ten (10) working days of the change.

B. The owner is responsible for operation and maintenance of the SWM BMPs. If the owner fails to adhere to the O&M Agreement, the City may perform the services required and

charge the owner appropriate fees. Nonpayment of fees may result in a lien against the property.

Section 404 Notification of Spills

Notwithstanding other requirements of law, as soon as any person responsible for a facility or operation, or responsible for emergency response for a facility or operation has information of any known or suspected release of materials which are resulting or may result in illegal discharges or pollutants discharging into stormwater, the storm drain system, or waters of the Commonswealth, said person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release. In the event of a release of non-hazardous materials, said person shall notify the City in person or by telephone or facsimile no later than the next business day. Notifications in person or by telephone shall be confirmed by written notice addressed and mailed to the City within three (3) business days of the telephone notice. If the discharge of prohibited materials emanates from a commercial or industrial establishment, the owner or operator of such establishment shall also retain an on-site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least five (5) years.

Failure to provide notification of a release as provided above is a violation of this ordinance.

ARTICLE V – INDUSTRIAL OR CONSTRUCTION ACTIVITY DISCHARGE

Section 501. Submission of Notice of Intent to the City

A. Any person subject to an industrial or construction activity NPDES stormwater discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the City prior to the allowing of discharges to the MS4.

B. The operator of a facility, including construction sites, required to have an NPDES permit to discharge stormwater associated with industrial or construction activity shall submit a copy of the Notice of Intent (NOI) to the City at the same time the operator submits the original NOI to DEP.

C. The copy of the NOI may be delivered to the City either in person or by mailing it to:

Notice of Intent to Discharge Stormwater
City of Monessen, City Clerk
1 Wendell Ramey Lane
4th Floor, Room 423
Monessen, Pennsylvania 15062

D. A person commits an offense if the person operates a facility that is discharging stormwater associated with industrial activity without having submitted a copy of the NOI to the City.

ARTICLE VI – COMPLIANCE MONITORING

Section 601 Inspection by Landowner

Stormwater management BMPs shall be inspected (and documented) by the landowner, or the owner's designee according to the following list of minimum frequencies:

A. Annually for the first five (5) years following construction.

B. Once every three (3) years thereafter.

C. During or immediately after the cessation of a 10-year or greater storm.

Section 602 Right of Entry

Upon presentation of proper credentials, the City, the Conservation District, DEP, or their authorized agents, shall be permitted to enter any property within the City and inspect facilities subject to regulation under this ordinance as often as may be necessary to determine compliance with this ordinance.

A. If a discharger has security measures in force which require proper identification and clearance before entry into its premised, the discharger shall make the necessary arrangements to allow access to representatives of the City, the Conservation District, and DEP.

B. Facility operators shall allow the City, the Conservation District, and DEP ready access to all parts of the premises for the purposes of inspection, sampling, examination and copying of records that must be kept under the conditions of an NPDES permit to discharge storm water, and the performance of any additional duties as defined by state and federal law.

C. The City, the Conservation District, and DEP shall have the right to set up on any permitted facility such devises as are necessary in the opinion of the City, the Conservation District, or DEP to conduct monitoring and/or sampling of the facility's stormwater discharge.

D. The City, the Conservation District, and DEP have the right to require the discharger to install monitoring equipment as necessary. The facility's sampling and monitoring equipment shall be maintained at all times in a safe and proper operation condition by the discharger at its own expense. All devices used to measure stormwater flow and quality shall be calibrated to ensure their accuracy.

E. Any temporary or permanent obstruction to safe and easy access to the facility to be inspected and/or sampled shall be promptly removed by the operator at the written or oral request of the City, the Conservation District, or DEP and shall not be replaced. The costs of clearing such access shall be borne by the operator.

F. Unreasonable delays in allowing the City, the Conservation District, or DEP access to a permitted facility is a violation of a stormwater discharge permit and of this ordinance. A person who is the operator of a facility with an NPDES permit to discharge stormwater

associated with industrial or construction activity commits an offense if the person denies the City, the Conservation District, or DEP reasonable access to the permitted facility for the purpose of conducting any activity authorized or required by this ordinance.

Section 603 Search Warrants

If the City, the Conservation District, or DEP has been refused access to any part of the premises from which stormwater is discharged, and is able to demonstrate probable cause to believe that there may be a violation of this ordinance, or that there is a need to inspect and/or sample as part of a routine inspection and sampling program designed to verify compliance with this ordinance or any order issued under this ordinance, or to protect the overall public health, safety, and welfare of the City, then the City, the Conservation District, or DEP may seek issuance of a search warrant from any court of competent jurisdiction.

ARTICLE VII – VIOLATIONS, ENFORCEMENT AND PENALTIES

Section 701 Violations

It shall be unlawful for any person to violate any provision or fail to comply with any of the requirements of this ordinance. It is unlawful for any person to modify, remove, fill, landscape, or alter any approved SWM BMPs, facilities, areas, or structures without the written approval of the City. Any person who has violated or continues to violate the provisions of this ordinance, may be subject to the enforcement actions outlined in this section or may be restrained by injunction or otherwise abated in a manner provided by law.

In the event the violation constitutes an immediate danger to public health or public safety, the City is authorized to enter upon the subject private property, without giving prior notice, to take any and all measures necessary to abate the violation and/or restore the property. The City is authorized to seek costs of the abatement as outlined in this ordinance.

Section 702 Warning Notice

When the City finds that any person has violated, or continues to violate, any provision of this ordinance, or any order issued under this ordinance, the City may serve upon that person a written Warning Notice, specifying the particular violation believed to have occurred and requesting the discharger to immediately investigate the matter and to seek a resolution whereby any offending discharge will cease. Investigation and/or resolution of the matter in response to the Warning Notice in no way relieves the alleged violator of liability for any violations occurring before or after receipt of the Warning Notice. Nothing in this subsection shall limit the authority of the City to take any action, including emergency action or any other enforcement action, without first issuing a Warning Notice.

Section 703 Notice of Violation

Whenever the City finds that a person has violated a prohibition or failed to meet a requirement of this ordinance, the City may order compliance by written notice of violation to the responsible person.

A. The Notice of Violation shall contain:

1. The name and address of the alleged violator;

2. The address when available or a description of the building, structure or land upon which the violation is occurring, or has occurred;

3. A statement specifying the nature of the violation;

4. A description of the remedial measures necessary to restore compliance with this ordinance and a time schedule for the completion of such remedial action;

5. A statement of the penalty or penalties that shall or may be assessed against the person to whom the notice of violation is directed;

6. A statement that the determination of violation may be appealed to the City by filing a written notice of appeal within three (3) days of service of notice of violation; and

7. A statement specifying that, should the violator fail to restore compliance within the established time schedule, the work will be done by the City or a designated contractor and the expense shall be charged to the violator.

B. Such notice may require without limitations:

1. The performance of monitoring, analyses, and reporting;

2. The elimination of illicit connections or discharges;

3. That violating discharges, practices, or operations shall cease and desist;

4. The abatement or remediation of storm water pollution or contamination hazards and the restoration of any affected property;

5. Payment of a fine to cover administrative and remediation costs; and

6. The implementation of source control or treatment BMPs.

Section 704 Compensatory Action

In lieu of enforcement proceedings, penalties, and remedies authorized by this ordinance, the City may impose upon a violator alternative compensatory actions, such as storm drain stenciling, attendance at compliance workshops creek cleanup, etc.

Section 705 Suspension and Revocation

A. Any approval or permit issued by the City may be suspended or revoked for:

1. Non-compliance with or failure to implement any provision of an approved SWM Site Plan or O&M Agreement.

2. A violation of any provision of this Ordinance or any other applicable law, ordinance, rule, or regulation relating to a Regulated Activity.

3. The creation of any condition or the commission of any act which constitutes or creates a hazard, nuisance, pollution, or endangers the life or property of others.

B. A suspended approval may be reinstated by the City when:

1. The City has inspected and approved the corrections to the violations that caused the suspension.

2. The City is satisfied that the violation has been corrected.

C. An approval that has been revoked by the City cannot be reinstated. The applicant may apply for a new approval under the provisions of this Ordinance.

D. If a violation causes no immediate danger to life, public health, or property, at its sole discretion, the City may provide a limited time period for the owner to correct the violation. In these cases, the City will provide the owner, or the owner's designee, with a written notice of the violation and the time period allowed for the owner to correct the violation. If the owner does not correct the violation within the allowed time period, the City may revoke or suspend any, or all, applicable approvals and permits pertaining to any provision of this Ordinance.

E. The City may, without prior notice, suspend MS4 discharge access when it is necessary to stop an actual or threatened discharge which presents or may present imminent and substantial danger to the environment, or to the health or welfare of persons, or to the MS4 or water of the Commonwealth.

Section 706 Penalties

A. In the event the alleged violator fails to take the remedial measures set forth in the notice of violation or otherwise fails to cure the violations described therein within seven calendar days, or such greater period as authorized by the City shall deem appropriate, after the City has taken one or more of the actions described above, the City may impose a penalty.

B. Anyone violating the provisions of this Ordinance shall be guilty of a summary offense, and upon conviction, shall be subject to a fine of not more than $ _____ for each violation, recoverable with costs. Each calendar day, after receipt of the notice of violation, that the violation remains unremedied shall be a separate offense and penalties shall be cumulative.

C. In addition, the City may institute injunctive, mandamus, or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus, or other appropriate forms of remedy or relief.

Section 707 Criminal Prosecution

Any person that has violated or continues to violate this ordinance shall be liable to criminal prosecution to the fullest extent of the law, and shall be subject to a criminal penalty of $_____ per violation per day and/or imprisonment for a period of time not to exceed _____ days. Each act of violation and each day upon which any violation shall occur shall constitute a separate offense.

Section 708 Appeals

A. Any person receiving a Notice of Violation may appeal the determination of the City. The notice of appeal must be received within three (3) calendar days from the date of the Notice of Violation. Hearing on the appeal before Council, or Council's designee shall take place

within three (3) business days from the date of receipt of the notice of appeal. The decision of Council, or Council's designee, shall be final.

B. Any person aggrieved by any decision of the City, relevant to the provisions of this Ordinance, may appeal to the Westmoreland County Court of Common Pleas within thirty (30) days of the City's decision.

Section 709 Enforcement Measures After Appeal

In the event of an appeal if the violation has not been corrected, in accordance with the requirements set forth in the Notice of Violation, within five (5) business days of the decision of Council or Council's designee upholding the decision of the City, then representatives of the City shall enter upon the subject private property and are authorized to take any and all measures necessary to abate the violation and/or restore the property. It shall be unlawful for any person, owner, agent or person in possession of any premises to refuse to allow the City or designated contractor to enter upon the premises for the purposes set forth above.

Section 710 Cost of Abatement of the Violation

Within thirty (30) calendar days after abatement of the violation, the owner of the property will be notified of the cost of abatement, including administrative costs. The property owner may file a written protest objecting to the amount of the assessment within five (5) calendar days. The City shall respond in writing within five (5) business days to the written protest of the property owner with a final determination. If the amount due is not paid within a thirty (30) calendar days or by the expiration of the time in which to file an appeal, the charges shall be a special assessment against the property and shall constitute a lien on the property for the amount of the assessment.

Section 711 Violations Deemed a Public Nuisance

In addition to the enforcement processes and penalties provided, any condition caused or permitted to exist in violation of any of the provision of this ordinance is a threat to public health, safety, and welfare, and is declared and deeded a nuisance, and may be summarily abated or restored at the violator's expense, and/or a civil action to abate, enjoin, or otherwise compel the cessation of such nuisance may be taken.

Section 712 Remedies Not Exclusive

The remedies listed in this ordinance are not exclusive of any other remedies available under any applicable federal, state or local law and it is within the discretion of the City to seek cumulative remedies.

The City may recover all attorney's fees, court costs and other expenses associated with enforcement of this ordinance, including sampling and monitoring expenses.

ARTICLE VIII - REFERENCES

1. Pennsylvania Department of Environmental Protection. No. 363-0300-002 (December 2006), as amended and updated. *Pennsylvania Stormwater Best Management Practices Manual.* Harrisburg, PA.

2. Pennsylvania Department of Environmental Protection. No. 363-2134-008 (April 15, 2000), as amended and updated. *Erosion and Sediment Pollution Control Program Manual.* Harrisburg, PA.

MS4 Illicit Discharge Detection and Elimination Ordinance

Ordinance Number _____

ENACTED and **ORDAINED** at a regular meeting of the

City of Monessen Council

on this _____ day of _____, 20____

This Ordinance shall take effect immediately.

_____ _____
(Name) (Title)

_____ _____
(Name) (Title)

_____ _____
(Name) (Title)

ATTEST:

_____
Secretary

APPENDIX A

MS4 Streets

Anderson Court
Arch Avenue
Balazia Avenue
Center Drive
Circle Drive
City Park Road
Colonial Drive
Columbus Drive
Coolidge Drive
Crest Drive
Crestcent Drive
Delrose Drive
Euclid Drive
Fairfield Drive
Grand Boulevard (1)
Hale Avenue
Hartung Court
Helen Avenue
High Street
Jackson Drive
Jefferson Drive
Jo Ann Drive
Keystone Drive
Lee Drive
McKinley Avenue
Mellon Avenue
Merando Drive
Monessen Boulevard
Overhill Drive
Park Manor Drive
Pennsylvania Boulevard
Pioneer Drive
Pleasant Drive
Rex Boulevard
Ridge Avenue
Scenery Drive
Shady Drive
Shaw Drive
Skurkay Street
Spring Drive
Stanton Drive
State Road
Surrey Street
Washington Drive
Westmoreland Drive
Willow Drive
Woodcrest Avenue

(1) Grand Boulevard from Pleasant Drive to Parente Boulevard

APPENDIX B

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property as recorded by deed in the land records of Westmoreland County, Pennsylvania, Deed Book_____ at page _____, (hereinafter "Property").

WHEREAS, the Landowner is proceeding to build and develop the Property; and

WHEREAS, the SWM BMP Operation and Maintenance (O&M) Plan approved by the City (hereinafter referred to as the "O&M Plan") for the property identified herein, which is attached hereto as Appendix A and made part hereof, as approved by the City, provides for management of stormwater within the confines of the Property through the use of BMPs; and

WHEREAS, the City, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the City and the protection and maintenance of water quality require that on-site SWM BMPs be constructed and maintained on the Property; and

WHEREAS, the City requires, through the implementation of the SWM Site Plan, that SWM BMPs as required by said SWM Site Plan be constructed and adequately operated and maintained by the Landowner, successors, and assigns.

NOW, THEREFORE, in consideration of the foregoing promises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The Landowner shall construct the BMPs in accordance with the plans and specifications identified in the SWM Site Plan.

2. The Landowner shall operate and maintain the BMPs as shown on the SWM Plan in good working order in accordance with the specific operation and maintenance requirements noted on the approved O&M Plan.

3. The Landowner hereby grants permission to the City, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper credentials, to inspect the BMPs whenever necessary. Whenever possible, the City shall notify the Landowner prior to entering the property.

4. In the event the Landowner fails to operate and maintain the BMPs in accordance with condition number 2 above, the City or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). It is expressly understood and agreed that the City is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the City.

5. In the event the City, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the City for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the City.

6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMPs by the Landowner; provided, however, that this Agreement shall not be deemed to create or affect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.

7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the City from all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or City.

8. The City intends to inspect the BMPs at a minimum of once every three years to ensure their continued functioning.

This Agreement shall be recorded at the Office of the Recorder of Deeds of Westmoreland County, Pennsylvania, and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs, and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the City:

_____

For the Landowner:

_____

ATTEST:

_____ (City)

County of Westmoreland, Pennsylvania

I,_____, a Notary Public in and for the county and state aforesaid, whose commission expires on the _____ day of_____, 20 _____, do hereby certify that_____ whose name(s) is/are signed to the foregoing Agreement bearing date of the _____ day _____, 20____, has acknowledged the same before me in my said county and state.

GIVEN UNDER MY HAND THIS _____ **day of** _____, 20____.

_____ _____

NOTARY PUBLIC **(SEAL)**

ORDAINED AND ENACTED into law this 23rd day of November, 2015.

ATTEST:

By _____
Holly Minnis
City Clerk

CITY OF MONESSEN

By _____
Louis Mavrakis
Mayor

OPERATIONS AND MAINTENANCE

ORDINANCE

BILL NO.: 1 of 2016
INTRODUCED: March, 28, 2016
BY: Councilman Chiaravalle
ENACTED: April 21, 2016
ORDINANCE NO: 1 of 2016

MS4 OPERATIONS AND MAINTENANCE ORDINANCE

ARTICLE I - GENERAL PROVISIONS

Section 101. Short Title

This Ordinance shall be known and may be cited as the "MS4 Operations and Maintenance Ordinance."

Section 102. Statement of Findings

The governing body of the City of Monessen (City) finds that:

A. Inadequate maintenance of stormwater facilities contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, increases the cost of public facilities to carry and control stormwater, undermines flood plain management and flood control efforts in downstream communities, reduces groundwater recharge, threatens public health and safety, and increases pollution of water resources.

B. Reasonable regulation of connections and discharges to municipal separate storm sewer systems is fundamental to the public health, safety, and welfare and the protection of people of the Commonwealth, their resources, and the environment.

C. Reasonable regulation of connections and discharges to the waters of the Commonwealth of Pennsylvania (Commonwealth) is fundamental to the public health, safety, and welfare and the protection of people of the Commonwealth, their resources, and the environment.

D. Stormwater is an important water resource, which provides groundwater recharge for water supplies and base flow of streams, which also protects and maintains surface water quality.

E. Federal and state regulations require certain municipalities to obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES). Permittees are required to enact, implement, and enforce a prohibition of non-stormwater discharges to the permittee's regulated small municipal separate storm sewer systems (MS4s) and/or to the waters of the Commonwealth.

Section 103. Purpose

The purpose of this Ordinance is to promote health, safety, and welfare within the City and its watershed by minimizing the harms and maximizing the benefits described in Section 102 of this Ordinance, through provisions designed to:

A. Provide standards to meet NPDES permit requirements.

B. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code 93 to protect, maintain, reclaim, and restore the existing and designated uses of the waters of this Commonwealth.

C. Preserve the natural drainage systems as much as possible.

D. Maintain groundwater recharge to prevent degradation of surface and groundwater quality and to otherwise protect water resources.

E. Prevent scour and erosion of stream banks and streambeds.

F. Provide proper operation and maintenance of all facilities and all SWM BMPs that are implemented within the municipality.

Section 104. Statutory Authority

The City also is empowered to regulate land use activities that affect runoff by the authority of the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended.

Section 105. Applicability

All activities related to proper operation and maintenance of approved stormwater management BMPs and all activities that may contribute non-stormwater discharges to a regulated small MS4 and/or to the waters of the Commonwealth are subject to regulation by this Ordinance.

Section 106. Repealer

Any other ordinance provision(s) or regulation of the City inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

Section 107. Severability

The provisions of this ordinance are hereby declared to be severable. If any provision, clause, sentence, or paragraph of this ordinance shall be held invalid, such invalidity shall not affect the other provisions.

Section 108. Compatibility with Other Requirements

Actions taken under this Ordinance do not affect any responsibility, permit or approval for any activity regulated by any other code, law, regulation, or ordinance.

ARTICLE II - DEFINITIONS

For the purposes of this Ordinance, certain terms and words used herein shall be interpreted as follows:

A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.

B. The word "includes" or "including" shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.

C. The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.

Best Management Practice (BMP) – Activities, facilities, designs, measures, or procedures used to manage stormwater impacts from regulated activities, to meet state water quality requirements, to promote groundwater recharge, and to otherwise meet the purposes of this Ordinance. Stormwater BMPs are commonly grouped into one of two broad categories or measures: "structural" or "nonstructural." In this Ordinance, nonstructural BMPs or measures refer to operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to, a wide variety of practices and devices, from large-scale retention ponds and constructed wetlands, to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or forested buffers, sand filters, detention basins, and manufactured devices. Structural stormwater BMPs are permanent appurtenances to the project site.

Conservation District – The Westmoreland Conservation District, a conservation district, as defined in Section 3(c) of the Conservation District Law (3 P. S. § 851(c)) that has the authority under a delegation agreement executed with DEP to administer and enforce all or a portion of the regulations promulgated under 25 Pa. Code 102.

DEP – The Pennsylvania Department of Environmental Protection.

Earth Disturbance Activity – A construction or other human activity which disturbs the surface of the land, including, but not limited to: clearing and grubbing; grading; excavations; embankments; road maintenance; building construction; and the moving, depositing, stockpiling, or storing of soil, rock, or earth materials. Earth disturbance activity is subject to regulation under 25 Pa. Code 92, 25 Pa. Code 102, or the Clean Streams Law.

Municipality – City of Monessen, Westmoreland County, Pennsylvania.

Non-Stormwater Discharge – Any discharge to the storm drain or the waters of the Commonwealth that is not composed entirely of stormwater.

NRCS – USDA Natural Resources Conservation Service (previously SCS).

Regulated Activities – Any activity that may affect stormwater runoff and any activity that may contribute non-stormwater discharges to a regulated small MS4 or the waters of the Commonwealth.

State Water Quality Requirements – The regulatory requirements to protect, maintain, reclaim, and restore water quality under Title 25 of the Pennsylvania Code and the Clean Streams Law.

Stormwater – Any surface flow, runoff, and drainage consisting entirely of water from the surface of the land resulting from natural precipitation or snow or ice melt.

USDA – United States Department of Agriculture.

Waters of this Commonwealth – Any and all rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

ARTICLE III – STORMWATER MANAGEMENT REQUIREMENTS

Section 301. General Requirements

A. For all regulated earth disturbance activities, erosion and sediment control BMPs shall be designed, implemented, operated, and maintained during the regulated earth disturbance activities (e.g., during construction) to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code and the Clean Streams Law. Various BMPs and their design standards are listed in the *Erosion and Sediment Pollution Control Program Manual* (E&S Manual)[2], No. 363-2134-008 (April 15, 2000), as amended and updated.

B. Stormwater flows onto adjacent property shall not be created, increased, decreased, relocated, or otherwise altered without written notification of the adjacent property owner(s) by the developer. Such stormwater flows shall be subject to the requirements of this Ordinance.

C. For all regulated activities, SWM BMPs shall be implemented, operated, and maintained to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code, the Clean Streams Law, and the Storm Water Management Act.

D. Various BMPs and their design standards are listed in the BMP Manual[1].

ARTICLE IV - OPERATION AND MAINTENANCE

Section 401. Responsibilities of Developers and Landowners

A. Facilities, areas, or structures used as Stormwater Management BMPs shall be enumerated as permanent real estate appurtenances and recorded as deed restrictions or conservation easements that run with the land.

B. Operation and Maintenance (O&M) Plans for stormwater management approved pursuant to 25 Pa. Code §102 after the date of this Ordinance shall be recorded as a restrictive deed covenant that runs with the land.

C. The City may take enforcement actions against an owner for any failure to satisfy the provisions of this Ordinance.

Section 402. Operation and Maintenance Agreements

A. Prior to completing construction of a SWM Site Plan, the property owner shall sign and record an O&M Agreement (see Appendix A) covering all stormwater control facilities which are to be privately owned.

1. The owner, successor and assigns shall operate and maintain all facilities in accordance with the approved schedule(s) in the SWM Site Plan.

2. The owner shall convey to the City conservation easements to assure access for periodic inspections by the City and maintenance, as necessary.

3. The owner shall keep on file with the City the name, address, and telephone number of the person or company responsible for operation and maintenance activities. In the event of a change, new information shall be submitted by the owner to the City within ten working days of the change.

B. The owner is responsible for operation and maintenance (O&M) of the SWM BMPs. If the owner fails to adhere to the O&M Agreement, the City may perform the services required and charge the owner appropriate fees. Nonpayment of fees may result in a lien against the property.

ARTICLE V - PROHIBITIONS

Section 501. Prohibited Discharges and Connections

A. Any drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter a regulated small MS4 or to enter the waters of this Commonwealth is prohibited.

B. No person shall allow, or cause to allow, discharges into a regulated small MS4, or discharges into waters of this Commonwealth, which are not composed entirely of stormwater, except (1) as provided in Subsection C below and (2) discharges allowed under a state or federal permit.

C. The following discharges are authorized unless they are determined to be significant contributors to pollution a regulated small MS4 or to the waters of this Commonwealth:

- Discharges from firefighting activities, and other discharges specified in writing by the City as being necessary to protect public health and safety.	- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used
- Potable water sources including water line flushing	- Uncontaminated water from foundations or from footing drains
- Irrigation drainage	- Lawn watering
- Routine external building wash down (which does not use detergents or other compounds)	- Dechlorinated swimming pool discharges
- Springs	- Uncontaminated groundwater
- Flows from riparian habitats and wetlands	- Water from individual residential car washing
- Air conditioning condensate	- Water from crawl space pumps
Diverted stream flows	

D. In the event that the City or DEP determines that any of the discharges identified in Subsection C significantly contribute pollutants to a regulated small MS4 or to the waters of this Commonwealth, the municipality or DEP will notify the responsible person(s) to cease the discharge.

Section 502. Roof Drains and Sump Pumps

Roof drains and sump pumps shall discharge to infiltration or vegetative BMPs.

ARTICLE VI - ENFORCEMENT AND PENALTIES

Section 601. Right-of-Entry

Upon presentation of proper credentials, the City may enter at reasonable times upon any property within the City to inspect the condition of the stormwater structures and facilities in regard to any aspect regulated by this Ordinance.

Section 602. Inspection

SWM BMPs should be inspected by the landowner, or the owner's designee (including the City for dedicated and owned facilities), according to the following list of minimum frequencies:

1. Annually for the first 5 years following construction.
2. Once every 3 years thereafter.
3. During or immediately after the cessation of a 10-year or greater storm.

Section 603. Enforcement

It is unlawful for any person to modify, remove, fill, landscape, or alter any approved SWM BMPs, facilities, areas, or structures without the written approval of DEP or WCD, and the City.

Section 604. Suspension and Revocation

A. Any approval or permit issued by the City may be suspended or revoked for:

1. Non-compliance with or failure to implement any provision of an approved SWM Site Plan or O&M Agreement.
2. A violation of any provision of this Ordinance or any other applicable law, ordinance, rule, or regulation relating to a Regulated Activity.
3. The creation of any condition or the commission of any act which constitutes or creates a hazard, nuisance, pollution, or endangers the life or property of others.

B. A suspended approval may be reinstated by the City when:

1. The City has inspected and approved the corrections to the violations that caused the suspension.
2. The City is satisfied that the violation has been corrected.

C. An approval that has been revoked by the City cannot be reinstated. The applicant may apply for a new approval under the provisions of this Ordinance.

D. If a violation causes no immediate danger to life, public health, or property, at its sole discretion, the City may provide a limited time period for the owner to correct the violation. In these cases, the City will provide the owner, or the owner's designee, with a written notice of the violation and the time period allowed for the owner to correct the violation. If the owner does not correct the violation within the allowed time period, the City may revoke or suspend any, or all, applicable approvals and permits pertaining to any provision of this Ordinance.

Section 605. Penalties

A. Anyone violating the provisions of this Ordinance shall be guilty of a summary offense, and upon conviction, shall be subject to a fine of not more than $1,000.00 for each violation, recoverable with costs. Each day that the violation continues shall be a separate offense and penalties shall be cumulative.

B. In addition, the City may institute injunctive, mandamus, or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus, or other appropriate forms of remedy or relief.

Section 606. Appeals

A. Any person receiving a Notice of Violation may appeal the determination of the City. The Notice of Appeal must be received within three (3) calendar days from the date of the Notice of Violation. Hearing on the appeal before Council, or Council's designee shall take place within three (3) business days from the date of receipt of the notice of appeal. The decision of Council, or Council's designee, shall be final.

B. Any person aggrieved by any decision of the City, relevant to the provisions of this Ordinance, may appeal to the Westmoreland County Court of Common Pleas within thirty (30) days of the City's decision.

ARTICLE VII - REFERENCES

1. Pennsylvania Department of Environmental Protection. No. 363-0300-002 (December 2006), as amended and updated. *Pennsylvania Stormwater Best Management Practices Manual.* Harrisburg, PA.

2. Pennsylvania Department of Environmental Protection. No. 363-2134-008 (April 15, 2000), as amended and updated. *Erosion and Sediment Pollution Control Program Manual.* Harrisburg, PA.

MS4 Operations and Maintenance Ordinance

(Ordinance Number)

ENACTED and **ORDAINED** at a regular meeting of the

_____

on this _____ day of _____, 20_____.

This Ordinance shall take effect immediately.

_____	_____
(Name)	(Title)
_____	_____
(Name)	(Title)
_____	_____
(Name)	(Title)

ATTEST:

_____
Secretary

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APPENDIX A

OPERATION AND MAINTENANCE (O&M) AGREEMENT STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES (SWM BMPs)

THIS AGREEMENT, made and entered into this _____ day of _____, 20_____, by and between _____, (hereinafter the "Landowner"), and The City of Monessen, Westmoreland County, Pennsylvania, (hereinafter "City");

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property as recorded by deed in the land records of _____ County, Pennsylvania, Deed Book _____ at page _____. (hereinafter "Property").

WHEREAS, the Landowner is proceeding to build and develop the Property; and

WHEREAS, the SWM BMP Operation and Maintenance (O&M) Plan approved by the Municipality (hereinafter referred to as the "O&M Plan") for the property identified herein, which is attached hereto as Appendix A and made part hereof, as approved by the City, provides for management of stormwater within the confines of the Property through the use of BMPs; and

WHEREAS, the City, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the City and the protection and maintenance of water quality require that on-site SWM BMPs be constructed and maintained on the Property; and

WHEREAS, the City requires, through the implementation of the SWM Site Plan, that SWM BMPs as required by said SWM Site Plan and the City Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, successors, and assigns.

NOW, THEREFORE, in consideration of the foregoing promises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The Landowner shall construct the BMPs in accordance with the plans and specifications identified in the SWM Site Plan.

2. The Landowner shall operate and maintain the BMPs as shown on the SWM Plan in good working order in accordance with the specific operation and maintenance requirements noted on the approved O&M Plan.

3. The Landowner hereby grants permission to the City, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper credentials, to inspect the BMPs whenever necessary. Whenever possible, the City shall notify the Landowner prior to entering the property.

4. In the event the Landowner fails to operate and maintain the BMPs per paragraph 2, the City or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). It is expressly understood and agreed that the City is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the City.

5. In the event the City, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the City for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the City.

6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMPs by the Landowner; provided, however, that this Agreement shall not be deemed to create or affect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.

7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the City from all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or City.

8. The City intends to inspect the BMPs at a minimum of once every three years to ensure their continued functioning.

This Agreement shall be recorded at the Office of the Recorder of Deeds of Westmoreland County, Pennsylvania, and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs, and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the City:

_____

For the Landowner:

_____

ATTEST:

_____ (City, Borough, Township)

County of _____, Pennsylvania

I, _____, a Notary Public in and for the county and state aforesaid, whose commission expires on the _____ day of _____, 20_____, do hereby certify that _____ whose name(s) is/are signed to the foregoing Agreement bearing date of the _____ day _____, 20_____, has acknowledged the same before me in my said county and state.

GIVEN UNDER MY HAND THIS _____ day of _____, 20_____.

_____ _____

NOTARY PUBLIC **(SEAL)**

ORDAINED AND ENACTED into law this 21st day of April, 2016.

ATTEST:

By _____
Holly Minno
City Clerk

CITY OF MONESSEN

By _____
Louis Mavrakis
Mayor

STORMWATER MANAGEMENT

ORDINANCE

MS4 STORMWATER MANAGEMENT ORDINANCE

ORDINANCE NO. 2-2017

CITY OF MONESSEN

WESTMORELAND COUNTY, PENNSYLVANIA

Adopted at a Public Meeting
Held on

NOVEMBER 21, 2017

ARTICLE I - GENERAL PROVISIONS

Section 101. Short Title

This Ordinance shall be known and may be cited as the "City of Monessen MS4 Stormwater Management Ordinance."

Section 102. Statement of Findings

The governing body of the municipality finds that:

A. Inadequate management of accelerated runoff of stormwater resulting from development throughout a watershed increases runoff volumes, flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undermines flood plain management and flood control efforts in downstream communities, reduces groundwater recharge, threatens public health and safety, and increases nonpoint source pollution of water resources.

B. A comprehensive program of stormwater management (SWM), including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety, and welfare and the protection of people of the Commonwealth, their resources, and the environment.

C. Stormwater is an important water resource that provides groundwater recharge for water supplies and supports the base flow of streams.

D. The use of green infrastructure and low impact development (LID) are intended to address the root cause of water quality impairment by using systems and practices which use or mimic natural processes to: 1) infiltrate and recharge, 2) evapotranspire, and/or 3) harvest and use precipitation near where it falls to earth. Green infrastructure practices and LID contribute to the restoration or maintenance of pre-development hydrology.

E. Federal and state regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES) program.

Section 103. Purpose

The purpose of this Ordinance is to promote health, safety, and welfare within the municipality and its watershed by minimizing the harms and maximizing the benefits described in Section 102 of this Ordinance, through provisions designed to:

A. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code 93 to protect, maintain, reclaim, and restore the existing and designated uses of the waters of this Commonwealth.

B. Preserve natural drainage systems.

C. Manage stormwater runoff close to the source, reduce runoff volumes and mimic predevelopment hydrology.

D. Provide procedures and performance standards for stormwater planning and management.

E. Maintain groundwater recharge to prevent degradation of surface and groundwater quality and to otherwise protect water resources.

F. Prevent scour and erosion of stream banks and streambeds.

G. Provide proper operation and maintenance of all stormwater best management practices (BMPs) that are implemented within the municipality.

H. Provide standards to meet NPDES permit requirements.

Section 104. Statutory Authority

The municipality is empowered to regulate land use activities that affect runoff by the authority of the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended, and/or the Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et seq., as amended, The Stormwater Management Act.

Section 105. Applicability

All regulated activities and all activities that may affect stormwater runoff, including land development and earth disturbance activity, are subject to regulation by this Ordinance.

Section 106. Repealer

Any other ordinance provision(s) or regulation of the municipality inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

Section 107. Severability

In the event that a court of competent jurisdiction declares any section or provision of this Ordinance invalid, such decision shall not affect the validity of any of the remaining provisions of this Ordinance.

Section 108. Compatibility with Other Requirements

Approvals issued and actions taken under this Ordinance do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other code, law, regulation or ordinance.

Section 109. Erroneous Permit

Any permit or authorization issued or approved based on false, misleading or erroneous information provided by an applicant is void without the necessity of any proceedings for revocation. Any work undertaken or use established pursuant to such permit or other authorization is unlawful. No action may be taken by a board, agency or employee of the Municipality purporting to validate such a violation.

Section 110. Waivers

A. If the Municipality determines that any requirement under this Ordinance cannot be achieved for a particular regulated activity, the Municipality may, after an evaluation of alternatives, approve measures other than those in this Ordinance, subject to Section 110, paragraphs B and C.

B. Waivers or modifications of the requirements of this Ordinance may be approved by the Municipality if enforcement will exact undue hardship because of peculiar conditions pertaining to the land in question, provided that the modifications will not be contrary to the public interest and that the purpose of the Ordinance is preserved. Cost or financial burden shall not be considered a hardship. Modification may be considered if an alternative standard or approach will provide equal or better achievement of the purpose of the Ordinance. A request for modifications shall be in writing and accompany the Stormwater Management Site Plan submission. The request shall provide the facts on which the request is based, the provision(s) of the Ordinance involved and the proposed modification.

C. No waiver or modification of any regulated stormwater activity involving earth disturbance greater than or equal to one acre may be granted by the Municipality unless that action is approved in advance by the Department of Environmental Protection (DEP) or the delegated county conservation district.

ARTICLE II – DEFINITIONS

For the purposes of this Ordinance, certain terms and words used herein shall be interpreted as follows:

A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.

B. The word "includes" or "including" shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.

C. The words "will", "shall" and "must" are mandatory; the words "may" and "should" are permissive.

These definitions do not necessarily reflect the definitions contained in pertinent regulations or statutes, and are intended for this Ordinance only.

Agricultural Activity – Activities associated with agriculture such as agricultural cultivation, agricultural operation, and animal heavy use areas. This includes the work of producing crops including tillage, land clearing, plowing, disking, harrowing, planting, harvesting crops or pasturing and raising of livestock and installation of conservation measures. Construction of new buildings or impervious area is not considered an agricultural activity.

Applicant – A landowner, developer, or other person who has filed an application to the municipality for approval to engage in any regulated activity at a project site in the municipality.

Best Management Practice (BMP) – Activities, facilities, designs, measures, or procedures used to manage stormwater impacts from regulated activities, to meet state water quality requirements, to promote groundwater recharge, and to otherwise meet the purposes of this Ordinance. Stormwater BMPs are commonly grouped into one of two broad categories or measures: "structural" or "non-structural." In this Ordinance, non-structural BMPs or measures refer to operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff, whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to, a wide variety of practices and devices, from large-scale retention ponds and constructed wetlands, to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or forested buffers, sand filters, detention basins, and manufactured devices. Structural stormwater BMPs are permanent appurtenances to the project site.

City - City of Monessen, Westmoreland County, Pennsylvania.

Conservation District – A conservation district, as defined in Section 3(c) of the Conservation District Law (3 P. S. § 851(c)) that has the authority under a delegation agreement executed with DEP to administer and enforce all or a portion of the regulations promulgated under 25 Pa. Code 102.

Design Storm – The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g., a 5-year storm) and duration (e.g., 24 hours) used in the design and evaluation of stormwater management systems. Also see Return Period.

Detention Volume – The volume of runoff that is captured and released into the waters of the Commonwealth at a controlled rate.

DEP – The Pennsylvania Department of Environmental Protection.

Development Site (Site) – See Project Site.

Disturbed Area – An unstabilized land area where an earth disturbance activity is occurring or has occurred.

Earth Disturbance Activity – A construction or other human activity which disturbs the surface of the land, including, but not limited to: clearing and grubbing; grading; excavations; embankments; road maintenance; building construction; and the moving, depositing, stockpiling, or storing of soil, rock, or earth materials.

Erosion – The natural process by which the surface of the land is worn away by water, wind, or chemical action.

Existing Condition – The dominant land cover during the 5-year period immediately preceding a proposed regulated activity.

FEMA – Federal Emergency Management Agency.

Floodplain – Any land area susceptible to inundation by water from any natural source or delineated by applicable FEMA maps and studies as being a special flood hazard area. Also includes areas that comprise Group 13 Soils, as listed in Appendix A of the Pennsylvania DEP Technical Manual for Sewage Enforcement Officers (as amended or replaced from time to time by DEP).

Floodway – The channel of the watercourse and those portions of the adjoining floodplains that are reasonably required to carry and discharge the 100-year flood. Unless otherwise specified, the boundary of the floodway is as indicated on maps and flood insurance studies provided by FEMA. In an area where no FEMA maps or studies have defined the boundary of the 100-year floodway, it is assumed--absent evidence to the contrary--that the floodway extends from the stream to 50 feet from the top of the bank of the stream.

Forest Management/Timber Operations – Planning and activities necessary for the management of forestland. These include conducting a timber inventory, preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation, and reforestation.

Green Infrastructure – Systems and practices that use or mimic natural processes to infiltrate, evapotranspire, or reuse stormwater on the site where it is generated.

Hydrologic Soil Group (HSG) – Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four HSGs (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. The NRCS defines the four groups and provides a list of most of the soils in the United States and their group classification. The soils in the area of the development site may be identified from a soil survey report that can be obtained from local NRCS offices or conservation district offices. Soils become less pervious as the HSG varies from A to D (NRCS[1,2]).

Impervious Surface (Impervious Area) – A surface that prevents the infiltration of water into the ground. Impervious surfaces (or areas) shall include, but not be limited to: roofs; additional indoor living spaces, patios, garages, storage sheds and similar structures; and any new streets or sidewalks. Decks, parking areas, and driveway areas are not counted as impervious areas if they do not prevent infiltration.

Karst – A type of topography or landscape characterized by surface depressions, sinkholes, rock pinnacles/uneven bedrock surface, underground drainage, and caves. Karst is formed on carbonate rocks, such as limestone or dolomite.

Land Development (Development) – Inclusive of any or all of the following meanings: (i) the improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving (a) a group of two or more buildings or (b) the division or allocation of land or space between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups, or other features; (ii) any subdivision of land; (iii) development in accordance with Section 503(1.1) of the PA Municipalities Planning Code.

Low Impact Development (LID) – Site design approaches and small-scale stormwater management practices that promote the use of natural systems for infiltration, evapotranspiration, and reuse of rainwater. LID can be applied to new development, urban retrofits, and revitalization projects. LID utilizes design techniques that infiltrate, filter, evaporate, and store runoff close to its source. Rather than rely on costly large-scale conveyance and treatment systems, LID addresses stormwater through a variety of small, cost-effective landscape features located on-site.

Municipality – Monessen, Westmoreland County, Pennsylvania.

NRCS – USDA Natural Resources Conservation Service (previously SCS).

Peak Discharge – The maximum rate of stormwater runoff from a specific storm event.

Pervious Area – Any area not defined as impervious.

Project Site – The specific area of land where any regulated activities in the municipality are planned, conducted, or maintained.

Qualified Professional – Any person licensed by the Pennsylvania Department of State or otherwise qualified by law to perform the work required by this Ordinance.

Regulated Activities – Any earth disturbance activities or any activities that involve the alteration or development of land in a manner that may affect stormwater runoff.

Regulated Earth Disturbance Activity – Activity involving earth disturbance subject to regulation under 25 Pa. Code 92, 25 Pa. Code 102, or the Clean Streams Law.

Retention Volume/Removed Runoff – The volume of runoff that is captured and not released directly into the surface waters of this Commonwealth during or after a storm event.

Return Period – The average interval, in years, within which a storm event of a given magnitude can be expected to occur one time. For example, the 25-year return period rainfall would be expected to occur on average once every 25 years; or stated in another way, the probability of a 25-year storm occurring in any one year is 0.04 (i.e., a 4% chance).

Riparian Buffer – A permanent area of trees and shrubs located adjacent to streams, lakes, ponds and wetlands.

Runoff – Any part of precipitation that flows over the land.

Sediment – Soils or other materials transported by surface water as a product of erosion.

State Water Quality Requirements – The regulatory requirements to protect, maintain, reclaim, and restore water quality under Title 25 of the Pennsylvania Code and the Clean Streams Law.

Stormwater – Drainage runoff from the surface of the land resulting from precipitation or snow or ice melt.

Stormwater Management Facility – Any structure, natural or man-made, that, due to its condition, design, or construction, conveys, stores, or otherwise affects stormwater runoff. Typical stormwater management facilities include, but are not limited to: detention and retention basins; open channels; storm sewers; pipes; and infiltration facilities.

Stormwater Management Site Plan – The plan prepared by the owner, developer or his representative indicating how stormwater runoff will be managed at the development site in accordance with this Ordinance. **Stormwater Management Site Plan** will be designated as **SWM Site Plan** throughout this Ordinance.

Subdivision – As defined in The Pennsylvania Municipalities Planning Code, Act of July 31, 1968, P.L. 805, No. 247.

USDA – United States Department of Agriculture.

Waters of this Commonwealth – Any and all rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

Watershed – Region or area drained by a river, watercourse, or other surface water of this Commonwealth.

Wetland – Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.

ARTICLE III – STORMWATER MANAGEMENT STANDARDS

Section 301. General Requirements

A. For all regulated activities, unless preparation of an SWM Site Plan is specifically exempted in Section 302:

1. Preparation and implementation of an approved SWM Site Plan is required.

2. No regulated activities shall commence until the municipality issues written approval of an SWM Site Plan, which demonstrates compliance with the requirements of this Ordinance.

B. SWM Site Plans approved by the municipality, in accordance with Section 406, shall be on site throughout the duration of the regulated activity.

C. The municipality may, after consultation with DEP, approve measures for meeting the state water quality requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, state law including, but not limited to, the Clean Streams Law.

D. For all regulated earth disturbance activities, erosion and sediment control BMPs shall be designed, implemented, operated, and maintained during the regulated earth disturbance activities (e.g., during construction) to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code and the Clean Streams Law. Various BMPs and their design standards are listed in the *Erosion and Sediment Pollution Control Program Manual* (E&S Manual[3]), No. 363-2134-008, as amended and updated.

E. Impervious areas:

1. The measurement of impervious areas shall include all of the impervious areas in the total proposed development even if development is to take place in stages.

2. For development taking place in stages, the entire development plan must be used in determining conformance with this Ordinance.

3. For projects that add impervious area to a parcel, the total impervious area on the parcel is subject to the requirements of this Ordinance; except that the volume controls in Section 303 and the peak rate controls of Section 304 do not need to be retrofitted to existing impervious areas that are not being altered by the proposed regulated activity.

F. Stormwater flows onto adjacent property shall not be created, increased, decreased, relocated, or otherwise altered without written notification to the adjacent property owner(s). Such stormwater flows shall be subject to the requirements of this Ordinance.

G. All regulated activities shall include such measures as necessary to:

1. Protect health, safety, and property.

2. Meet the water quality goals of this Ordinance by implementing measures to:

a. Minimize disturbance to floodplains, wetlands, and wooded areas.

b. Maintain or extend riparian buffers.

c. Avoid erosive flow conditions in natural flow pathways.

d. Minimize thermal impacts to waters of this Commonwealth.

e. Disconnect impervious surfaces by directing runoff to pervious areas, wherever possible.

3. Incorporate methods described in the *Pennsylvania Stormwater Best Management Practices Manual* (BMP Manual[4]).

H. The design of all facilities over karst shall include an evaluation of measures to minimize adverse effects.

I. Infiltration BMPs should be spread out, made as shallow as practicable, and located to maximize use of natural on-site infiltration features while still meeting the other requirements of this Ordinance.

J. Normally dry, open top, stormwater storage facilities should completely drain both the volume control and rate control capacities over a period of time not less than 24 and not more than 72 hours from the end of the design storm.

K. The design storm volumes to be used in the analysis of peak rates of discharge should be obtained from the latest version of the Precipitation-Frequency Atlas of the United States, National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Hydrometeorological Design Studies Center, Silver Spring, Maryland.

NOAA's Atlas 14[5] can be accessed at: http://hdsc.nws.noaa.gov/hdsc/pfds/.

The following design storms shall be used for analysis of the pre- and post-development conditions. These values are applicable to the Soil Cover Complex Method:

Twenty-Four-Hour Peak Flows

Return Period (Years)	24-Hour Storm (Inches)
1	1.99
2	2.37
10	3.32
25	3.93
100	4.94

L. For all regulated activities, SWM BMPs shall be designed, implemented, operated, and maintained to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code, the Clean Streams Law, and the Storm Water Management Act.

M. Various BMPs and their design standards are listed in the BMP Manual[4].

Section 302. Exemptions

A. Regulated activities that result in cumulative earth disturbances less than 5,000 square feet are exempt from the requirements in Section 303, Section 304, and Article IV of this ordinance.

B. Agricultural activity is exempt from the SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.

C. Forest management and timber operations are exempt from the SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.

D. Exemptions from any provisions of this Ordinance shall not relieve the applicant from the requirements in Sections 301.D. through K.

E. The Municipality may deny or revoke any exemption pursuant to this Section at any time for any project that the Municipality believes may pose a threat to public health and safety or the environment.

Section 303. Volume Controls

The green infrastructure and low impact development practices provided in the BMP Manual[4] shall be utilized for all regulated activities wherever possible. Water volume controls shall be implemented using the *Design Storm Method* in Subsection A or the *Simplified Method* in Subsection B below. For regulated activity areas equal or less than one acre that do not require hydrologic routing to design the stormwater facilities, this Ordinance establishes no preference for either methodology; therefore, the applicant may select either methodology on the basis of economic considerations, the intrinsic limitations on applicability of the analytical procedures associated with each methodology and other factors.

A. The *Design Storm Method* (CG-1 in the BMP Manual[4]) is applicable to any size of regulated activity. This method requires detailed modeling based on site conditions.

1. Do not increase the post-development total runoff volume for all storms equal to or less than the 2-year 24-hour duration precipitation.

2. For modeling purposes:

   a. Existing (predevelopment) non-forested pervious areas must be considered meadow in good condition.

   b. 20% of existing impervious area, when present, shall be considered meadow in good condition in the model for existing conditions.

B. The *Simplified Method* (CG-2 in the BMP Manual[4]) provided below is independent of site conditions and should be used if the *Design Storm Method* is not followed. This method is not applicable to regulated activities greater than one acre or for projects that require design of stormwater storage facilities. For new impervious surfaces:

1. Stormwater facilities shall capture at least the first two (2) inches of runoff from all new impervious surfaces.

2. At least the first one inch of runoff from new impervious surfaces shall be permanently removed from the runoff flow, i.e., it shall not be released into the surface waters of this Commonwealth. Removal options include reuse, evaporation, transpiration, and infiltration.

3. Wherever possible, infiltration facilities should be designed to accommodate infiltration of the entire permanently removed runoff; however, in all cases at least the first 0.5 inch of the permanently removed runoff should be infiltrated.

4. This method is exempt from the requirements of Section 304, Rate Controls.

Section 304. Rate Controls

A. For areas not covered by a release rate map from an approved Act 167 Stormwater Management Plan:

Post-development discharge rates shall not exceed the pre-development discharge rates for the 1-, 2-,10-, 25-, and 100-year, 24-hour storm events. If it is shown that the peak rates of discharge indicated by the post-development analysis are less than or equal to the peak rates of discharge indicated by the pre-development analysis for 1-, 2-,10-, 25-, and 100-year, 24-hour storms, then the requirements of this section have been met. Otherwise, the applicant shall provide additional controls as necessary to satisfy the peak rate of discharge requirement.

B. For areas covered by a release rate map from an approved Act 167 Stormwater Management Plan:

For the 1-, 2-,10-, 25-,and 100-year, 24-hour storm events, the post-development peak discharge rates will follow the applicable approved release rate maps. For any areas not shown on the release rate maps, the post-development discharge rates shall not exceed the pre-development discharge rates.

ARTICLE IV – STORMWATER MANAGEMENT (SWM) SITE PLAN REQUIREMENTS

Section 401. Plan Requirements

The following items shall be included in the SWM Site Plan:

A. Appropriate sections from the municipal's Subdivision and Land Development Ordinance, and other applicable local ordinances, shall be followed in preparing the SWM Site Plans. In instances where the Municipality lacks Subdivision and Land Development regulations, the content of SWM Site Plans shall follow the Westmoreland County's Subdivision and Land Development Ordinance.

B. The Municipality shall not approve any SWM Site Plan that is deficient in meeting the requirements of this Ordinance. At its sole discretion and in accordance with this Article, when a SWM Site Plan is found to be deficient, the municipality may either disapprove the submission and require a resubmission, or in the case of minor deficiencies, the Municipality may accept submission of modifications.

C. Provisions for permanent access or maintenance easements for all physical SWM BMPs, such as ponds and infiltration structures, as necessary to implement the Operation and Maintenance (O&M) Plan discussed in paragraph E.9 below.

D. The following signature block for the municipality:

"(Municipal official or designee), on this date (Signature date), has reviewed and hereby certifies that the SWM Site Plan meets all design standards and criteria of the Municipal Ordinance No. (number assigned to ordinance)."

E. The SWM Site Plan shall provide the following information:

1. The overall stormwater management concept for the project.

2. A determination of site conditions in accordance with the BMP Manual[4]. A detailed site evaluation shall be completed for projects proposed in areas of carbonate geology or karst topography, and other environmentally sensitive areas, such as brownfields.

3. Stormwater runoff design computations and documentation as specified in this Ordinance, or as otherwise necessary to demonstrate that the maximum practicable measures have been taken to meet the requirements of this Ordinance, including the recommendations and general requirements in Section 301.

4. Expected project time schedule.

5. A soil erosion and sediment control plan, where applicable, as prepared for and submitted to the approval authority.

6. The effect of the project (in terms of runoff volumes, water quality, and peak flows) on surrounding properties and aquatic features and on any existing stormwater conveyance system that may be affected by the project.

7. Plan and profile drawings of all SWM BMPs, including drainage structures, pipes, open channels, and swales.

8. SWM Site Plan shall show the locations of existing and proposed on-lot wastewater facilities and water supply wells.

9. The SWM Site Plan shall include an O&M Plan for all existing and proposed physical stormwater management facilities. This plan shall address long-term ownership and responsibilities for O&M as well as schedules and costs for O&M activities.

Section 402. Plan Submission

Five copies of the SWM Site Plan shall be submitted as follows:

1. Two copies to the municipality.
2. One copy to the municipal engineer.
3. One copy to the County Conservation District.
4. One copy to the County Planning Commission/Office.

Section 403. Plan Review

A. SWM Site Plans shall be reviewed by the municipality for consistency with the provisions of this Ordinance.

B. The Municipality shall notify the applicant in writing within 45 days whether the SWM Site Plan is approved or disapproved. If the SWM Site Plan involves a Subdivision and Land Development Plan, the notification shall occur within the time period allowed by the Municipalities Planning Code (90 days). If a longer notification period is provided by other statute, regulation, or ordinance, the applicant will be so notified by the municipality.

C. If the Municipality disapproves the SWM Site Plan, the Municipality will state the reasons for the disapproval in writing. The Municipality also may approve the SWM Site Plan with conditions and, if so, shall provide the acceptable conditions for approval in writing.

Section 404. Modification of Plans

A modification to a submitted SWM Site Plan that involves a change in SWM BMPs or techniques, or that involves the relocation or redesign of SWM BMPs, or that is necessary because soil or other conditions are not as stated on the SWM Site Plan as determined by the Municipality shall require a resubmission of the modified SWM Site Plan in accordance with this Article.

Section 405. Resubmission of Disapproved SWM Site Plans

A disapproved SWM Site Plan may be resubmitted, with the revisions addressing the Municipality's concerns, to the Municipality in accordance with this Article. The applicable review fee must accompany a resubmission of a disapproved SWM Site Plan.

Section 406. Authorization to Construct and Term of Validity

The Municipality's approval of an SWM Site Plan authorizes the regulated activities contained in the SWM Site Plan for a maximum term of validity of 5 years following the date of approval. The Municipality may specify a term of validity shorter than 5 years in the approval for any specific SWM Site Plan. Terms of validity shall commence on the date the Municipality signs the approval for an SWM Site Plan. If an approved SWM Site Plan is not completed according to Section 407 within the term of validity, then the Municipality may consider the SWM Site Plan disapproved and may revoke any and all permits. SWM Site Plans that are considered disapproved by the Municipality shall be resubmitted in accordance with Section 405 of this Ordinance.

Section 407. As-Built Plans, Completion Certificate, and Final Inspection

A. The developer shall be responsible for providing as-built plans of all SWM BMPs included in the approved SWM Site Plan. The as-built plans and an explanation of any discrepancies with the construction plans shall be submitted to the Municipality.

B. The as-built submission shall include a certification of completion signed by a qualified professional verifying that all permanent SWM BMPs have been constructed according to the approved plans and specifications. The latitude and longitude coordinates for all permanent SWM BMPs must also be submitted, at the central location of the BMPs. If any licensed qualified professionals contributed to the construction plans, then a licensed qualified professional must sign the completion certificate.

C. After receipt of the completion certification by the Municipality, the Municipality may conduct a final inspection.

ARTICLE V – OPERATION AND MAINTENANCE

Section 501. Responsibilities of Developers and Landowners

A. The Municipality shall make the final determination on the continuing maintenance responsibilities prior to final approval of the SWM Site Plan. The municipality may require a dedication of such facilities as part of the requirements for approval of the SWM Site Plan. Such a requirement is not an indication that the municipality will accept the facilities. The municipality reserves the right to accept or reject the ownership and operating responsibility for any portion of the stormwater management controls.

B. Facilities, areas, or structures used as SWM BMPs shall be enumerated as permanent real estate appurtenances and recorded as deed restrictions or conservation easements that run with the land.

C. The O&M Plan shall be recorded as a restrictive deed covenant that runs with the land.

D. The Municipality may take enforcement actions against an owner for any failure to satisfy the provisions of this Article.

Section 502. Operation and Maintenance Agreements

A. Prior to final approval of the SWM Site Plan, the property owner shall sign and record an Operation and Maintenance (O&M) Agreement (see Appendix A) covering all stormwater control facilities which are to be privately owned.

   1. The owner, successor and assigns shall maintain all facilities in accordance with the approved maintenance schedule in the O&M Agreement.

   2. The owner shall convey to the Municipality conservation easements to assure access for periodic inspections by the Municipality and maintenance, as necessary.

   3. The owner shall keep on file with the Municipality the name, address, and telephone number of the person or company responsible for maintenance activities; in the event of a change, new information shall be submitted by the owner to the Municipality within ten (10) working days of the change.

B. The owner is responsible for operation and maintenance (O&M) of the SWM BMPs. If the owner fails to adhere to the O&M Agreement, the Municipality may perform the services required and charge the owner appropriate fees. Nonpayment of fees may result in a lien against the property.

Section 503. Performance Guarantee

For SWM Site Plans that involve subdivision and land development, the applicant shall provide a financial guarantee to the Municipality for the timely installation and proper construction of all stormwater management controls as required by the approved SWM Site Plan and this Ordinance in accordance with the provisions of Sections 509, 510, and 511 of the Pennsylvania Municipalities Planning Code.

ARTICLE VI – FEES AND EXPENSES

Section 601. General

The Municipality may include all costs incurred in the review fee charged to an applicant.

The review fee may include, but not be limited to, costs for the following:

A. Administrative/clerical processing.

B. Review of the SWM Site Plan.

C. Attendance at meetings.

D. Inspections.

ARTICLE VII – PROHIBITIONS

Section 701. Prohibited Discharges and Connections

A. Any drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter a regulated small MS4 or to enter the surface waters of this Commonwealth is prohibited.

B. No person shall allow, or cause to allow, discharges into a regulated small MS4, or discharges into waters of this Commonwealth, which are not composed entirely of stormwater, except (1) as provided in paragraph C below and (2) discharges authorized under a state or federal permit.

C. The following discharges are authorized unless they are determined to be significant contributors to pollution a regulated small MS4 or to the waters of this Commonwealth:

1. Discharges or flows from firefighting activities.

2. Discharges from potable water sources including water line flushing and fire hydrant flushing, if such discharges do not contain detectable concentrations of Total Residual Chlorine (TRC).

3. Non-contaminated irrigation water, water from lawn maintenance, landscape drainage and flows from riparian habitats and wetlands.

4. Diverted stream flows and springs.

5. Non-contaminated pumped ground water and water from foundation and footing drains and crawl space pumps.

6. Non-contaminated HVAC condensation and water from geothermal systems.

7. Residential (i.e., not commercial) vehicle wash water where cleaning agents are not utilized.

8. Non-contaminated hydrostatic test water discharges, if such discharges do not contain detectable concentrations of TRC.

D. In the event that the municipality or DEP determines that any of the discharges identified in Subsection C significantly contribute pollutants to a regulated small MS4 or to the waters of this Commonwealth, the municipality or DEP will notify the responsible person(s) to cease the discharge.

Section 702. Roof Drains and Sump Pumps

Roof drains and sump pumps shall discharge to infiltration or vegetative BMPs wherever feasible within areas of new development or redevelopment.

Section 703. Alteration of SWM BMPs

No person shall modify, remove, fill, landscape, or alter any SWM BMPs, facilities, areas, or structures that were installed as a requirement of this Ordinance without the written approval of the Municipality.

ARTICLE VIII – ENFORCEMENT AND PENALTIES

Section 801. Right-of-Entry

Upon presentation of proper credentials, the municipality or its designated agent may enter at reasonable times upon any property within the municipality to inspect the condition of the stormwater structures and facilities in regard to any aspect regulated by this Ordinance.

Section 802. Inspection

The landowner or the owner's designee (including the Municipality for dedicated and owned facilities) shall inspect SWM BMPs, facilities and/or structures installed under this Ordinance according to the following frequencies, at a minimum, to ensure the BMPs, facilities and/or structures continue to function as intended:

1. Annually for the first 5 years.

2. Once every 3 years thereafter.

3. During or immediately after the cessation of a 10-year or greater storm.

Inspections should be conducted during or immediately following precipitation events. A written inspection report shall be created to document each inspection. The inspection report shall contain the date and time of the inspection, the individual(s) who completed the inspection, the location of the BMP, facility or structure inspected, observations on performance, and recommendations for improving performance, if applicable. Inspection reports shall be submitted to the Municipality within 30 days following completion of the inspection.

Section 803. Enforcement

A. It shall be unlawful for a person to undertake any regulated activity except as provided in an approved SWM Site Plan, unless specifically exempted in Section 302.

B. It shall be unlawful to violate Section 703 of this Ordinance.

C. Inspections regarding compliance with the SWM Site Plan are a responsibility of the Municipality.

Section 804. Violations

It shall be unlawful for any person to violate any provision or fail to comply with any of the requirements of this ordinance. It is unlawful for any person to modify, remove, fill, landscape, or alter any approved SWM BMPs, facilities, areas, or structures without the written approval of the City. Any person who has violated or continues to violate the provisions of this ordinance, may be subject to the enforcement actions outlined in this section or may be restrained by injunction or otherwise abated in a manner provided by law.

In the event the violation constitutes an immediate danger to public health or public safety, the City is authorized to enter upon the subject private property, without giving prior notice, to take any and all measures necessary to abate the violation and/or restore the property. The City is authorized to seek costs of the abatement as outlined in this ordinance.

Section 805. Warning Notice

When the City finds that any person has violated, or continues to violate, any provision of this ordinance, or any order issued under this ordinance, the City may serve upon that person a written Warning Notice, specifying the particular violation believed to have occurred and requesting the discharger to immediately investigate the matter and to seek a resolution whereby any offending discharge will cease. Investigation and/or resolution of the matter in response to the Warning Notice in no way relieves the alleged violator of liability for any violations occurring before or after receipt of the Warning Notice. Nothing in this subsection shall limit the authority of the City to take any action, including emergency action or any other enforcement action, without first issuing a Warning Notice.

Section 806. Notice of Violation

Whenever the City finds that a person has violated a prohibition or failed to meet a requirement of this ordinance, the City may order compliance by written notice of violation to the responsible person.

A. The Notice of Violation shall contain:

1. The name and address of the alleged violator;

2. The address when available or a description of the building, structure or land upon which the violation is occurring, or has occurred;

3. A statement specifying the nature of the violation;

4. A description of the remedial measures necessary to restore compliance with this ordinance and a time schedule for the completion of such remedial action;

5. A statement of the penalty or penalties that shall or may be assessed against the person to whom the notice of violation is directed;

6. A statement that the determination of violation may be appealed to the City by filing a written notice of appeal within three (3) days of service of notice of violation; and

7. A statement specifying that, should the violator fail to restore compliance within the established time schedule, the work will be done by the City or a designated contractor and the expense shall be charged to the violator.

B. Such notice may require without limitations:

1. The performance of monitoring, analyses, and reporting;

2. The elimination of illicit connections or discharges;

3. That violating discharges, practices, or operations shall cease and desist;

4. The abatement or remediation of storm water pollution or contamination hazards and the restoration of any affected property;

5. Payment of a fine to cover administrative and remediation costs; and

6. The implementation of source control or treatment BMPs.

Section 807. Compensatory Action

In lieu of enforcement proceedings, penalties, and remedies authorized by this ordinance, the City may impose upon a violator alternative compensatory actions, such as storm drain stenciling, attendance at compliance workshops creek cleanup, etc.

Section 808. Suspension and Revocation

A. Any approval or permit issued by the Municipality pursuant to this Ordinance may be suspended or revoked for:

1. Non-compliance with or failure to implement any provision of the approved SWM Site Plan or O&M Agreement.

2. A violation of any provision of this Ordinance or any other applicable law, ordinance, rule, or regulation relating to the Regulated Activity.

3. The creation of any condition or the commission of any act during the Regulated Activity which constitutes or creates a hazard, nuisance, pollution, or endangers the life or property of others.

B. A suspended approval may be reinstated by the Municipality when:

1. The Municipality has inspected and approved the corrections to the violations that caused the suspension.

2. The Municipality is satisfied that the violation has been corrected.

C. An approval that has been revoked by the Municipality cannot be reinstated. The applicant may apply for a new approval under the provisions of this Ordinance.

D. If a violation causes no immediate danger to life, public health, or property, at its sole discretion, the Municipality may provide a limited time period for the owner to correct the violation. In these cases, the Municipality will provide the owner, or the owner's designee, with a written notice of the violation and the time period allowed for the owner to correct the violation. If the owner does not correct the violation within the allowed time period, the municipality may revoke or suspend any, or all, applicable approvals and permits pertaining to any provision of this Ordinance.

Section 809. Penalties

A. Anyone violating the provisions of this Ordinance shall be guilty of a summary offense, and upon conviction, shall be subject to a fine of not more than $ 1,000.00 for each violation, recoverable with costs. Each day that the violation continues shall be a separate offense and penalties shall be cumulative.

B. In addition, the municipality may institute injunctive, mandamus, or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus, or other appropriate forms of remedy or relief.

Section 810. Appeals

A. Any person aggrieved by any action of the Municipality or its designee, relevant to the provisions of this Ordinance, may appeal to the Municipality within 30 days of that action.

B. Any person aggrieved by any decision of the Municipality, relevant to the provisions of this Ordinance, may appeal to the County Court of Common Pleas in the county where the activity has taken place within 30 days of the Municipality's decision.

Section 811. Enforcement Measures After Appeal

In the event of an appeal if the violation has not been corrected, in accordance with the requirements set forth in the Notice of Violation, within five (5) business days of the decision of Council or Council's designee upholding the decision of the City, then representatives of the City shall enter upon the subject private property and are authorized to take any and all measures necessary to abate the violation and/or restore the property. It shall be unlawful for any person, owner, agent or person in possession of any premises to refuse to allow the City or designated contractor to enter upon the premises for the purposes set forth above.

Section 812. Cost of Abatement of the Violation

Within thirty (30) calendar days after abatement of the violation, the owner of the property will be notified of the cost of abatement, including administrative costs. The property owner may file a written protest objecting to the amount of the assessment within five (5) calendar days. The City shall respond in writing within five (5) business days to the written protest of the property owner with a final determination. If the amount due is not paid within a thirty (30) calendar days or by the expiration of the time in which to file an appeal, the charges shall be a special assessment against the property and shall constitute a lien on the property for the amount of the assessment.

Section 813. Violations Deemed a Public Nuisance

In addition to the enforcement processes and penalties provided, any condition caused or permitted to exist in violation of any of the provision of this ordinance is a threat to public health, safety, and welfare, and is declared and deeded a nuisance, and may be summarily abated or restored at the violator's expense, and/or a civil action to abate, enjoin, or otherwise compel the cessation of such nuisance may be taken.

Section 814. Remedies Not Exclusive

The remedies listed in this ordinance are not exclusive of any other remedies available under any applicable federal, state or local law and it is within the discretion of the City to seek cumulative remedies.

The City may recover all attorney's fees, court costs and other expenses associated with enforcement of this ordinance, including sampling and monitoring expenses.

ARTICLE IX – REFERENCES

1. U.S. Department of Agriculture, National Resources Conservation Service (NRCS). *National Engineering Handbook.* Part 630: Hydrology, 1969-2001. Originally published as the *National Engineering Handbook*, Section 4: Hydrology. Available from the NRCS online at: http://www.nrcs.usda.gov/.

2. U.S. Department of Agriculture, Natural Resources Conservation Service. 1986. *Technical Release 55: Urban Hydrology for Small Watersheds*, 2nd Edition. Washington, D.C.

3. Pennsylvania Department of Environmental Protection. No. 363-0300-002 (December 2006), as amended and updated. *Pennsylvania Stormwater Best Management Practices Manual*. Harrisburg, PA.

4. Pennsylvania Department of Environmental Protection. No. 363-2134-008 (March 31, 2012), as amended and updated. *Erosion and Sediment Pollution Control Program Manual.* Harrisburg, PA.

5. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Hydrometeorological Design Studies Center. 2004-2006. *Precipitation-Frequency Atlas of the United States, Atlas 14*, Volume 2, Version 3.0, Silver Spring, Maryland. Internet address: http://hdsc.nws.noaa.gov/hdsc/pfds/.

(Ordinance Name) MS4 STORMWATER MANAGEMENT ORDINANCE

(Ordinance Number) 2-2017

ENACTED and **ORDAINED** at a regular meeting of the

CITY OF MONESSEN COUNCIL

on this 21st day of NOVEMBER, 2017.

This Ordinance shall take effect immediately.

Nou Mavrakis (Name)	MAYOR (Title)
Ronald F. Chiarandelle (Name)	Director of accts & Finance (Title)
(Name)	(Title)

ATTEST:

Judith L. Taylor
~~Secretary~~
CITY ADMINISTRATOR/CLERK

APPENDIX A

OPERATION AND MAINTENANCE (O&M) AGREEMENT
STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES (SWM BMPs)

THIS AGREEMENT, made and entered into this day of _____, 20_____, by and between _____ (hereinafter the "Landowner"), and _____, _____ County, Pennsylvania (hereinafter "Municipality");

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property as recorded by deed in the land records of _____ County, Pennsylvania, Deed Book _____ at page _____,
(hereinafter "Property").

WHEREAS, the Landowner is proceeding to build and develop the Property; and

WHEREAS, the SWM BMP Operation and Maintenance (O&M) Plan approved by the Municipality (hereinafter referred to as the "O&M Plan") for the property identified herein, which is attached hereto as Appendix A and made part hereof, as approved by the Municipality, provides for management of stormwater within the confines of the Property through the use of BMPs; and

WHEREAS, the Municipality, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the Municipality and the protection and maintenance of water quality require that on-site SWM BMPs be constructed and maintained on the Property; and

WHEREAS, the Municipality requires, through the implementation of the SWM Site Plan, that SWM BMPs as required by said SWM Site Plan and the Municipal Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, successors, and assigns.

NOW, THEREFORE, in consideration of the foregoing promises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The Landowner shall construct the BMPs in accordance with the plans and specifications identified in the SWM Site Plan.

2. The Landowner shall operate and maintain the BMPs as shown on the SWM Site Plan in good working order in accordance with the specific operation and maintenance requirements noted on the approved O&M Plan.

3. The Landowner hereby grants permission to the Municipality, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper credentials, to inspect the BMPs whenever necessary. Whenever possible, the Municipality shall notify the Landowner prior to entering the property.

4. In the event the Landowner fails to operate and maintain the BMPs per paragraph 2, the Municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.

5. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Municipality for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the Municipality.

6. The intent and purpose of this Agreement is to ensure the proper maintenance of the on-site BMPs by the Landowner; provided, however, that this Agreement shall not be deemed to create any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.

7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the Municipality from all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Municipality.

8. The Municipality intends to inspect the BMPs at a minimum of once every three years to ensure their continued functioning.

This Agreement shall be recorded at the Office of the Recorder of Deeds of _____ County, Pennsylvania, and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs, and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

_____

For the Landowner:

_____

ATTEST:

_____ (City, Borough, Township)

County of _____, Pennsylvania

I, _____, a Notary Public in and for the county and state aforesaid, whose commission expires on the _____ day of _____, 20_____, do hereby certify that _____ whose name(s) is/are signed to the foregoing Agreement bearing date of the _____ day _____, 20_____, has acknowledged the same before me in my said county and state.

GIVEN UNDER MY HAND THIS _____ day of _____, 20_____.

_____ _____

NOTARY PUBLIC **(SEAL)**