

Stormwater Management Handbook



www.stormwaterresourcesformunicipalities.com

Produced by



Pocono Northeast
Resource Conservation and Development Council



Introduction

The Pocono Northeast Resource Conservation & Development (RC&D) Council is a nonprofit organization whose mission is: *“To enhance and improve the ecological, cultural, and economic characteristics of the Pocono Northeast RC&D Area through projects and programs that promote the management, protection, and sustainable utilization of the Area’s resources.”* In an attempt to fulfill our mission, the Pocono Northeast RC&D Council has partnered with County Conservation Districts and municipalities to provide information to communities in our service area on stormwater management.

Stormwater runoff from impervious surfaces is now recognized as a leading cause of impairment to our shared water resources. Studies conducted across the continent have shown that detectable degradation of streams, rivers and reservoirs begins with as little as 10% of a watershed being covered with impervious surfaces. While federal and state policies drive stormwater management, the ultimate responsibility lies with municipal officials.

One of the key goals of this project was the production of this stormwater handbook to provide information that municipalities will need to address serious issues concerning stormwater management. This publication is not intended to be a legal document or an all-inclusive informational manual. This handbook is intended to provide information in an easy-to-use format on stormwater management and as a reference guide to assist municipalities and local communities.

A complete list of project partners can be found in Appendix #4 on page 38 of this handbook. Valerie Taylor, EPCAMR’s Office of Surface Mining/VISTA developed the informative and easy to use website (www.stormwaterresourcesformunicipalities.com).

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Frequently Asked Questions Regarding Stormwater Management

What is stormwater?

Answer: (Chapter 1) Stormwater is water from precipitation such as rain, sleet, or melting snow.

What is stormwater management?

Answer: (Chapter 1) Stormwater management involves the control of “run off” from precipitation

Why is stormwater management important?

Answer: (Chapter 1) Stormwater management is important to prevent physical damage to persons and property from flooding and to maintain the ecological integrity, quality and quantity of our water resources. Stormwater can also be considered a resource that provides benefits such as groundwater recharge and flood protection. Stormwater management also assists with the reduction and prevention of many different sources of pollution, which enter local waterways.

Stormwater management can provide economic benefits to local communities as well. Proper management can result in reduced costs and/or fees for remediation of adverse impacts to stream channels, water quality, property damage and loss of life created by increased stormwater runoff.

Who is responsible for regulating stormwater?

Answer: (Chapter 2) In communities and watersheds across PA, federal and state regulations place requirements on development, but stormwater management is the responsibility of municipal governments and individual property owners.

How does uncontrolled stormwater affect me?

Answer: (Chapter 1, 2, and 5) Uncontrolled stormwater can affect people in many different ways. There are implications with non-point source pollution in stormwater that affect everyone. There are also responsibilities of individual homeowners and municipalities that are necessary to deal with stormwater.

How does one start the stormwater management process?

Answer: (Chapters 1-7) The stormwater management process begins at the local level. Education about stormwater management, and who is responsible for managing stormwater is critical. Anyone within the local community could start the process by asking municipal or county planning commissions how they are currently managing stormwater. Understanding how communities are connected by watersheds and not just sharing adjoining political boundaries is critical to mutual agreement on the need to address stormwater issues on a watershed scale.

How does one start the Stormwater Management Act (Act 167) process?

Answer: (Chapter 5) The Act 167 Stormwater Management Plan can be started by anyone within a local community. According to Act 167, *“each county shall prepare and adopt a watershed stormwater management plan for each watershed located in the county as designated by the department.”* Therefore, the county must prepare and adopt the plan, but anyone (citizens, municipalities, watershed associations, etc.) can present the idea to the County Planning Commission and the County Commissioners that stormwater management plans are essential for the safety and health of communities and their residents.

What are some best management practices (BMP’s) that will help to minimize stormwater problems?

Answer: (Chapter 3) Stormwater management BMP’s that can help to reduce stormwater runoff could either be nonstructural or structural. Nonstructural BMP’s can be described as preventive measures used most often during planning and design phases, but they can be incorporated into post construction stormwater management programs also. Structural BMP’s are often on-the-ground projects that require design and engineering in order to be completed. The BMP’s are site specific and are constructed to deal with stormwater issues.

Is there funding that will address my stormwater problem?

Answer: (Chapter 7) Funding is available from the PA Department of Environmental Protection for stormwater management planning. There are several sources of funding for stormwater infrastructure improvements.

Chapter One

What Is Stormwater?

Stormwater is precipitation such as rain, sleet, or melting snow. In a natural setting only a small percentage becomes surface runoff, but as development occurs this percentage increases. (Figure 1) This runoff usually flows into the nearest stream, creek, river, lake, or wetland.

What Is Stormwater Management?

Stormwater management involves the control of that surface runoff. The volume and rate of runoff both substantially increase as land development occurs. Construction of impervious surfaces, such as roofs, parking lots, and roadways, and the installation of storm sewer pipes which efficiently collect and discharge runoff, prevent the infiltration of rainfall into the soil. Management of stormwater runoff is necessary to compensate for possible impacts of impervious surfaces such as decreased groundwater recharge, increased frequency of flooding, stream channel instability, concentration of flow on adjacent properties, and damage to transportation and utility infrastructure. It is also now known that non-point source pollution washed off from those impervious surfaces is the 3rd leading cause of impairment to Pennsylvania's streams.

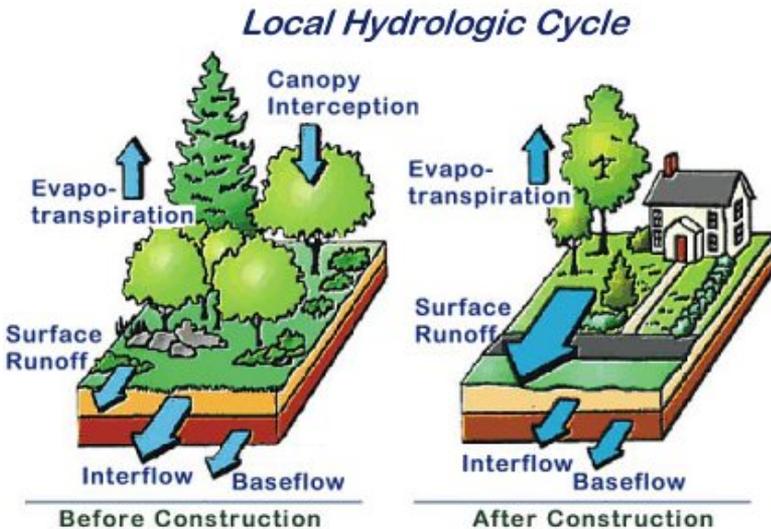


Figure 1. Hydrologic cycle showing stormwater runoff.

Why is Stormwater Management Important?

Stormwater management prevents physical damage to persons and property from flooding, and also prevents polluted run-off from negatively impacting local waterways. The installation of impervious surfaces interrupts the natural hydrologic cycle, and causes less infiltration, interception, and evapotranspiration than was present before any development occurred. (Figure 2) Therefore, the volume and rate of flow of stormwater produced by the land surface have been greatly increased. The result of this larger amount of stormwater runoff significantly contributes to flooding, sediment deposition, erosion, non-point source pollution and stream channel instability.

Stormwater should be considered a resource that provides benefits such as groundwater recharge, which maintains flows in streams.

Stormwater management also reduces the frequency and severity of flooding. Traditional stormwater management takes surface runoff and diverts it to a detention pond, which holds the water and releases it at a constant rate over time. This approach allows the water to be returned to the watercourse at a high volume over a longer period of time, which does not necessarily rectify the problem and may actually create another. If stormwater is recharged into the groundwater, it can protect against erosion, flooding, and water quality degradation

Stormwater runoff is classified as one of the major sources of non-point source pollution impairment to waterways within Pennsylvania. According to the Pennsylvania Department of Environmental Protection (DEP), through September 2003 of the 82% of PA's streams assessed for water quality impairments, stormwater runoff has been documented as impairing over 1,700 miles of stream (Source: DEP's 305B Report). The number of miles of impaired waters could rise once all the streams have been assessed or new reaches of streams become degraded by uncontrolled stormwater. Non-point source pollution is defined as pollution that originates from diffuse sources, and one cannot physically point to the exact, specific source.

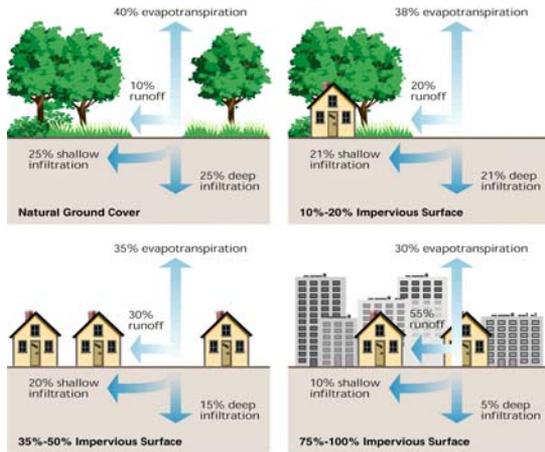


Fig. 3.21 -- Relationship between impervious cover and surface runoff. Impervious cover in a watershed results in increased surface runoff. As little as 10 percent impervious cover in a watershed can result in stream degradation.
 In Stream Corridor Restoration: Principles, Processes, and Practices (1996).
 By the Federal Interagency Stream Restoration Working Group (FISRWG) (15 Federal agencies of the U.S.)

Figure 2. Stormwater runoff shown for percentages of impervious surfaces.

Common Non-point Source Pollution from Stormwater Runoff

Sediment

- Sediment constitutes the largest pollutant load associated with stormwater runoff in an urban setting. The loadings are exceptionally high in the case of construction activity without erosion controls.
- Sediment increases turbidity, harms aquatic and benthic habitat, and reduces capacity of impoundments.
- A number of other pollutants often attach to, and are carried by, sediment particles.

Nutrients

- The nutrients in stormwater runoff are phosphorus and nitrogen.
- In surface waters nutrient loads can lead to heavy algae growth, (especially in impoundments), and low dissolved oxygen levels.
- Nutrients enter the urban system in runoff from lawn and garden fertilizers (commercial and home), leaks from sanitary sewers and septic systems, and animal wastes.

Organic Matter

- Various forms of organic matter may be carried by stormwater in urban areas. Decomposition of this material by organisms in surface waters depletes oxygen levels.
- Low levels of dissolved oxygen severely impact water quality and life within surface waters.
- Sources of organic matter include leaking septic systems, garbage, and yard waste

Bacteria

- High bacterial levels in stormwater runoff come from leaking sanitary systems, garbage and animal waste.
- Bacteria in surface water affects recreational uses and aquatic life as well as imposes health risks.

Oil and Grease

- Oil, grease, fuels and lubricating agents from spills or leaks are readily transported by stormwater.
- The intensity of activities, including vehicle traffic, maintenance and fueling activities, and manufacturing processes in an urban setting, contributes to the level of these pollutants present in adjacent surface waters.

Toxic Substances

- Toxic substances associated with urban stormwater include metals, pesticides, herbicides, and hydrocarbons.
- Toxic compounds affect biological systems and accumulate in bottom sediments of surface waters.

Heavy Metals

- Heavy metals such as copper, lead, zinc, arsenic, chromium, and cadmium have been found in urban stormwater runoff.
- Metals in stormwater are toxic to some aquatic life and may accumulate in aquatic animals.
- Urban sources of metals in stormwater include automobiles, paints, preservatives, motor oil, and construction materials among others.

Temperature

- Stormwater runoff increases in temperature as it flows over impervious surfaces. In addition, water stored in shallow, unshaded ponds and impoundments increases in temperature.
- Removal of the tree canopy opens up water bodies to direct solar radiation.
- Elevated water temperatures impact a water body's ability to support certain fish and aquatic organisms due to decreases in dissolved oxygen levels.

Stormwater management provides economic benefits to local communities as well. Proper maintenance of stormwater management facilities can lead to reduced costs for stream channel restoration and pollution mitigation in the future. Culverts, stormwater drop inlets, and detention basins can become full of sediment and debris carried by runoff. The maintenance of the structures can be costly, but if stormwater is managed properly, these costs can be avoided.

Chapter Two

Who is responsible for Stormwater Management?

Stormwater runoff prevention is the key to stormwater management!

Federal and state regulations place permit requirements on new development, and in PA stormwater management requirements also are implemented locally by municipal governments.

Individual property owners and homeowners are responsible for controlling stormwater runoff from their own homes and properties. With proper planning and preparation, stormwater runoff can be handled appropriately through best management practices (BMP's).

Responsibilities of Municipalities

Municipalities have a very important role in stormwater management in Pennsylvania. Municipal regulation of stormwater can be located in codes such as a municipal subdivision and land development ordinance (SALDO), a zoning ordinance, a building code, or an erosion and sediment control ordinance. If land use is controlled by a County subdivision and land development ordinance, then the County Planning Commission has some ability to regulate stormwater.

Municipalities are responsible for regulating stormwater runoff from all new and existing development within their boundaries. Some municipalities may require retrofits of stormwater BMP's. Municipal stormwater ordinances differ from community to community. The stormwater ordinance could be a stand-alone stormwater ordinance, located within the subdivision and land development ordinance, within another ordinance, or part of the BOCA Basic Building Code.

When the County has developed a watershed based stormwater management plan under the Pennsylvania Stormwater Management Act (1978 Act 167), municipalities are required to adopt a stormwater ordinance that is consistent with the Plan within six months following DEP's approval of the Plan.

Environmental Advisory Councils

Municipalities have the authority to establish an Environmental Advisory Council (EAC) through Act 177 of 1996, originally Act 148 of 1973. An

Environmental Advisory Council is a group of 3-7 community residents, appointed by local elected officials, that advises the local planning commission, park and recreation board, and elected officials on the protection, conservation, management, promotion, and use of natural resources within its territorial limits. This could be a mechanism by which municipalities can gather information on stormwater and stormwater management. Information on EACs can be found at:

<http://www.greentreks.org/eacnetwork/eacintro.asp>

The following link explains Act 177 and the responsibilities of an EAC:

http://www.dep.state.pa.us/dep/local_gov/EACHandbook/Ntbook14.htm#E12E15

County Responsibilities

Act 167 requires counties to develop, and municipalities to implement, Stormwater Management Plans on a watershed basis. This recognition of watersheds as the appropriate planning scale for stormwater management was extremely innovative when the Stormwater Management Act was passed in 1978 and in the intervening years the wisdom of that requirement has become evident.

In The Pocono Northeast RC&D 10-county region, watershed based stormwater plans have been developed for watersheds in 7 counties.

Watershed based Stormwater Management Plans are developed by the County(ies) with the help of a consultant and with the advice of a watershed plan advisory committee (WPAC) that consists of the County Planning Commission, the County Conservation District, representatives of each municipality, and other members of the public or stakeholders in the watershed appointed by the County(ies). All the members of the WPAC can bring their own areas of expertise to the project. Municipal input to stormwater plans is especially important since municipal officials know where stormwater problems occur within their boundaries and they are required to implement the Plan following DEP's approval of the Plan.

Erosion and Sedimentation Control

In new land developments in non-Special Protection waters, where more than 5000 square feet of earth disturbance is planned, the developer is required by state regulations to prepare an Erosion and Sedimentation Control Plan. In Special Protection waters, any earth disturbance requires

an E&S Plan. The E&S Plan is a plan to show how erosion of soils from the site, and the resulting sedimentation of soils in streams, will be prevented. The E&S Plan is NOT a stormwater management plan.

The authority to require E&S Plans comes from the federal Clean Water Act, Pennsylvania Clean Streams Law, and Chapters 93 and 102 of the PA Code, which provide the implementing regulations with regard to erosion and sediment.

County Conservation Districts

County Conservation Districts may play a role in implementing the provisions of Chapter 102, Erosion and Sediment Control, if the Conservation District has a certified delegation agreement with DEP.

There are three different levels of the delegation agreement, which relate to the degree of authority that the Conservation District has to regulate and enforce Erosion and Sediment Control requirements. In the Pocono Northeast RC& D Region, all counties, except Monroe County, have Level 2 delegation agreements, which mean they review E&S Plans and inspect construction sites. Monroe County has a Level 3 agreement, which means it can assess penalties for violations of the Chapter 102 requirements.

Erosion and sedimentation controls, through planning and proper implementation, work best when municipalities and conservation districts work closely to see that regulations are compatible and complied with by developers, and E&S Plans are in place before earth disturbance occurs.

What is the NPDES/NPDES Phase II Program?

Mandated by Congress under the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) Stormwater Program is a comprehensive program that addresses non-agricultural sources of stormwater discharges, which adversely affect the quality of our nation's waters. The program uses the NPDES permitting mechanism to require the implementation of controls designed to prevent pollutants from being carried into local water bodies by stormwater runoff.

The NPDES stormwater permit regulations, promulgated by the EPA, cover the following classes of stormwater discharges on a nationwide basis:

- Operators of multiple separate storm sewer systems (MS4s) located in "urbanized areas" as delineated by the Bureau of the Census may be required to obtain an MS4 Permit. (See Appendix 5 for a list of MS4 communities in the Pocono Northeast region)
- Industrial facilities in any of 11 categories that discharge to an MS4 or to waters of the United States, all categories of industrial activity (except construction) may certify to a condition of "no exposure" if their industrial materials and operations are not exposed to stormwater, thus eliminating the need to obtain stormwater permit coverage.
- Operators of construction activity that disturbs one or more acres of land; construction sites less than one acre also are covered if part of a larger plan of development.

In Pennsylvania, the NPDES Phase II program requires any earth disturbance activity proposed for one acre or more over the life of the project to have a NPDES Construction Stormwater Permit that includes both an Erosion and Sedimentation Control Plan and a Post Construction Stormwater Management Plan. The Post Construction Stormwater Management Plans require that stormwater best management practices (BMP's) to protect water quality and control rate and volume of run-off after the construction phase is complete. The plan also must be consistent with Act 167 stormwater management plans (if present), municipal ordinances, and MS4 requirements.

In Special Protection areas, (sections of streams that are designated High Quality or Exceptional Value streams under 25 Pa.Code Chapter 93), an Individual Permit is required by 25 Pa.Code Chapter 92 regulations. In other streams, a General Permit may be used.

In the Northeast Region of PA DEP, the NPDES Construction Stormwater Permit is filed with the County Conservation District which reviews it for completeness and then forwards the Post Construction Stormwater Management Plan to DEP. The County Conservation District does the technical review of the E&S Control Plan. Post Construction Stormwater Management Plans are reviewed by DEP after E&S Plans are reviewed and approved by the county conservation district. The permit is issued by DEP.

For further information on NPDES Phase II requirements, visit the EPA's website:

<http://cfpub.epa.gov/npdes/stormwater/swfinal.cfm>

For more information from PA DEP on NPDES Phase II use the DEP home website and enter keyword: "NPDES Permits."

<http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm>

NPDES Phase II/Municipal Separate Storm Sewer Systems (MS4's)

The regulatory definition of an Multiple Separate Storm Sewer System (MS4) (40 CFR 122.26(b)(8)) is

" 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 to or pursuant to state law) 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 Clean Water Act that discharges into waters of the United States; (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."

In practical terms, operators of MS4s can include municipalities and local sewer districts, state and federal departments of transportation, public universities, public hospitals, military bases, and correctional facilities. The Stormwater Phase II Rule added federal systems such as military bases and correctional facilities by including them in the definition of small MS4s.

For regulatory purposes, EPA's NPDES Stormwater Program regulates "medium," "large," and "regulated small MS4s."

A medium MS4 is a system that is located in an incorporated place or a county with a population between 100,000 - 249,999. A large MS4 is a system that is located in an incorporated place or a county with a population of 250,000 or more. In addition, some MS4s that serve a population below 100,000 have been brought into the Phase I program by an NPDES permitting authority and are treated as medium or large MS4s, independent of the size of the population served.

A regulated small MS4 is any small MS4 located in an "urbanized area" (UA), as defined by the Bureau of the Census, or located outside of a UA and brought into the program by the NPDES permitting authority.

The operator of an MS4 covered by the NPDES Stormwater Program must obtain a National Pollutant Discharge Elimination System (NPDES) permit.

For a list of MS4 communities in the Pocono Northeast Region see Appendix 5.

For more information from PA DEP visit the DEP home website and enter the keyword: "NPDES Permits."

<http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm>

Laws and Regulations relating to Stormwater Management and Erosion and Sedimentation Control

MUNICIPAL AUTHORITY

A municipality is empowered to regulate land use activities that affect runoff, surface, and groundwater quality and quantity by the Stormwater Management Act - October 4, 1978 32 P.S., P.L. 864 (Act 167) Section 680.1 et seq.; the Water Resources Management Act of 2002, as amended; the Pennsylvania Municipalities Planning Code, Act of 1968, P.L. 805, No. 247, as amended; the Second Class Township Code, 53 PS Section 66501 et seq., 66601 et seq. and the Borough Code 53 PS Section 46201 et seq.

COUNTY RESPONSIBILITY

Stormwater Management Act (1978 Act 167). Section 5(a)- Within two years following the promulgation of guidelines by the department pursuant to section 14, each county shall prepare and adopt a watershed stormwater

management plan for each watershed located in the county as designated by the department, in consultation with the municipalities located within each watershed, and shall periodically review and revise such plan at least every five years. The department may, for good cause shown, grant an extension of time to any county for the preparation and adoption of a watershed stormwater management plan. On May 14, 1985 DEP promulgated guidelines under Section 14 of the Act.

Regulations

The *Pennsylvania Code* is an official publication of the Commonwealth of Pennsylvania. It contains regulations and other documents implementing Pennsylvania laws.

Title 25, Chapter 102 titled “Erosion & Sedimentation Control” requires:

§ 102.31. Applicability.

The Department of Environmental Protection or a county conservation district may enforce this chapter under The Clean Streams Law (35 P. S. § § 691.1—691.1001).

Permanent stabilization is defined as follows:

§ 102.22. Permanent stabilization.

(a) Upon completion of an earth disturbance activity or any stage or phase of an activity, the site shall be immediately seeded, mulched or otherwise protected from accelerated erosion and sedimentation.

(b) Erosion and sediment control BMP’s shall be implemented and maintained until the permanent stabilization is completed.

(c) For an earth disturbance activity or any stage or phase of an activity to be considered permanently stabilized, the disturbed areas shall be covered with one of the following:

(1) A minimum uniform 70% perennial vegetative cover, with a density capable of resisting accelerated erosion and sedimentation.

(2) An acceptable BMP, which permanently minimizes accelerated erosion and sedimentation.

§ 102.41. Administration by county conservation districts.

(a) The Department may delegate by written agreement the administration and enforcement of this chapter to county conservation districts if they have adequate and qualified staff, and are or will be implementing the program identified in the delegation agreement.

(b) An acceptable program shall have the concurrence and approval of the governing body of the county in which the county conservation district operates.

(c) The Department will retain program administration and enforcement over projects, which cross the political boundaries of county conservation districts unless otherwise authorized by the Department.

***EVERYONE IS INVOLVED WITH
STORMWATER MANAGEMENT!***



Department of
Environmental Protection



Individual Homeowner



County Planning Commission

Chapter Three

Stormwater Best Management Practices (BMP's)

Best Management Practices (BMP's) are suggested for use by local authorities, planners, contractors, and others involved with stormwater management, earth disturbance, and other development activities. BMP's have been designed, evaluated, and used by various agencies and organizations; they have been proven to be efficient and effective. Therefore, the BMPs listed below, as a general rule of thumb, are commonly accepted by local, state, and federal regulatory agencies.

Stormwater management BMP's can be categorized as either Non-structural or Structural. Non-structural BMP's are land use planning and design approaches that have the ability to lessen and prevent stormwater. In other words, they minimize the amount of runoff generated prior to mitigating the impacts. Structural BMP's are specific practices or structures that are designed and engineered to address post construction stormwater impacts due to increased impervious surfaces.

Non-structural BMP's

Non-structural stormwater BMP's can be described as preventive measures. Even though these are considered preventive measures and are used most often during planning and design phases, but they can be incorporated into post construction stormwater management programs. Non-structural measures include concepts such as:

Protection of Sensitive Areas

The protection of sensitive areas can include: (1) identification and mapping of floodplains, wetlands, vernal pools, riparian areas, steep slopes, and woodlands; (2) the recognition of development areas, avoidance areas, and other sensitive areas; and (3) the use of natural drainage features to minimize the disturbance of these areas.

Smart Growth Practices and Conservation Design

Conservation Design and Smart Growth can be utilized to direct development in a way that reduces impacts as much as possible in the most environmentally friendly manner. This can be accomplished by minimizing earth disturbance, reducing the number of lots, lot size, lot distribution and location within the development. Conservation

Design also provides for open-space areas that can be used as buffers, infiltration, detention, or reduction areas.

Minimize Disturbance

Minimizing disturbance can be accomplished through many different methods. Reducing lot size, minimizing excavation and grading, avoiding soil compaction, and proper planning and placement of soil stockpile and storage areas can minimize disturbance. An additional way to minimize disturbance is through the revegetation of disturbed areas as soon as possible after construction.

Reduce “Man-made” Impacts

The reduction of man-made impacts such as roadways, parking lots, and roof leaders/drains can help considerably to minimize stormwater impacts. Roadways can have their length and width reduced within developments to lessen the amount of impervious surface. Parking lots can be reduced in size by using smaller parking spaces, layout changes, and incorporating infiltration aspects to each lot. Parking lots can also be paved with pervious surface material to allow water infiltration into the lot, or the water can be conveyed off-site to a recharge area. Roof leaders/drains can be directed to storage areas where the water can be contained and reused for other purposes. The water can also be directed to infiltration or recharge areas.

Structural BMP's

Structural BMP's are often on-the-ground projects that require design and engineering in order to be completed. The BMP's are site specific and are constructed to deal with stormwater issues, and thus can be considered mitigative measures. Structural BMP's incorporate several methods or means to deal with stormwater, which include contours, soils, vegetation, existing geology, and other factors in their design and function. Structural BMP's can be categorized as follows:

- *Infiltration*
- *Reduction*
- *Restoration*

Infiltration

Infiltration of stormwater can be accomplished in several ways. Retaining stormwater runoff in trenches, pits or rain gardens allows it an opportunity to percolate into the soil. Infiltration is limited by the soil structure of the areas where infiltration will be directed or targeted. Soils have varying percolation and water holding capacities, which influence both the amount and rate at which water can be infiltrated into the ground.

Some examples of infiltration BMP's include:

Porous surfaces, also called porous pavement, can either be asphalt or concrete that is underlain by a uniform bed of coarse aggregate, most often stone. (Figure 3) The stone bed should not be compacted to allow larger pore spaces that can be occupied by stormwater runoff. The stone bed is placed on a non-woven geotextile fabric to prevent soil migrating into the bed.



Figure 3. Shows porous pavement and the ability for the stone bed to hold stormwater

Infiltration basins, beds, and trenches can be utilized to allow stormwater runoff to percolate into the soil. (Figure 4) These basins and beds can utilize the existing soils and topography to infiltrate stormwater runoff, but they can also be constructed using beds of aggregate to allow more water retention. These basins and beds can utilize underground piping that aid in stormwater conveyance to and from an area as well as infiltration to existing soils, much as an infiltration trench does. Infiltration trenches use

a perforated pipe to convey water either to or from an area. A bed of stone or other aggregate encapsulated by a geotextile fabric surrounds the pipe. Since the pipe is perforated, it allows stormwater runoff to seep out of the pipe into the existing soils.



Figure 4. An infiltration basin/bed utilizing vegetation to make the structure look more aesthetically pleasing.

Other infiltration BMP's such as rain gardens (Figure 4), constructed wetlands, vegetative swales (Figure 5), filter strips, and others can be used successfully to infiltrate stormwater runoff and reduce overland flow that can cause flooding.



Figure 5. A vegetative swale using a sod base with a rock filter at the end of the swale.

Reduction

Stormwater reduction is a successful way a property owner can help their community by not allowing the stormwater to become runoff. Utilizing or capturing the stormwater allows homeowners and businesses to use it for other purposes. There are several ways to reduce stormwater runoff.

Rain barrels are an easy and effective way for reducing stormwater runoff. (Figure 6) Rain barrels are nothing more than a container that catches roof top runoff from a house or building. Therefore, any stormwater that is collected by the rain gutter or down spout will be directed into the container and stored for a period of time until it can be used elsewhere. Examples where water from the rain barrel or container can be used, are watering plants or gardens, washing items such as cars or windows, and even filling a swimming pool.



Figure 6. A rain barrel collects water from a downspout and can be utilized for watering elsewhere.

A vegetated roof is another BMP that could be used to reduce the amount of stormwater runoff generated by a building or home. Vegetated roofs consist of a waterproof membrane or liner that is placed on the roof, and then a soil or growth media placed on the liner and seeded with grasses or other plants. Vegetated roofs can be made more complex by including some insulation or piping system. The piping system can be installed in case a precipitation event is very large; in this event the piping can convey the water to another collection system or to a downspout. Vegetative roofs allow the vegetation to utilize the precipitation and reduce or eliminate the amount of stormwater leaving the roof.

For more information on green roofs, visit www.greenroofs.net

Restoration

Restoration BMP's can be used to reduce the amount and impact of stormwater runoff. Restoration BMP's can be referred to as reclamation of disturbed sites to natural landscapes that will effectively reduce stormwater runoff. These BMP's include riparian buffers, (Figure 7 and 8) proper forest management, and proper land management techniques.



Figure 7. A riparian buffer planted with native grasses and trees within protective tree shelters.

Riparian buffers are defined as areas around or situated next to bodies of water that act as buffers or cushions to that water body. In certain areas development may already extend to the edge of streams, rivers, lakes, or other waterways. This development is impacting that waterway because of direct stormwater runoff into it. By restoring a riparian buffer, a cushion to the waterway can be established to filter out pollutants that may be in

the stormwater before it reaches the waterway. Riparian buffers will also assist with keeping the stream or lakeshore stabilized and lessen the erosion potential of that area.



Figure 8. A forested riparian buffer established around a stream.

Proper forest and land management techniques that can be utilized to reduce stormwater runoff are accomplished through planning and implementation. Clear cutting a forest is sometimes a necessary practice to achieve certain goals, but clear cutting the vegetation increases stormwater runoff from the affected area. Techniques such as immediately seeding logging roads; establishing, or preserving, riparian buffers; and implementing BMP's such as silt fencing, waterbars, and soil berms can all minimize or reduce stormwater runoff until the area can be revegetated. Areas that are barren should be seeded with vegetation that can grow under present landscape conditions. The more vegetation that can be established the greater the reduction in stormwater runoff.

Stormwater BMP's whether they are Non-structural or Structural must be utilized with careful consideration for every application. Every BMP may not be suitable for every site because of site constraints and/or limitations. Soil type and geology may limit infiltration capacity of stormwater and may not be conducive to certain BMP's.

Stormwater BMP's Relating to Abandoned Mine Land

Mining has affected hundreds of thousands of acres in Pennsylvania. Mining operations have created large underground voids that may be fractured and/or lead directly into mine pool complexes. These areas often are filled with surface water runoff, captured clean headwater tributary streams off the mountainsides, or they serve as water-filled reservoirs. The underlying groundwater areas filled with acid mine water are often referred to as "mine pool complexes." These mine pool complexes found throughout the State contain large volumes of underground storage capacity of water that typically has low pH, large amounts of dissolved metals, coal fines and/or coal sediments, and other contaminants.

Careful consideration needs to be given to abandoned mine lands in order to prevent further contamination of mine pool complexes, increases in volume of surface water runoff into the mine pool complexes, and increases in the formation of abandoned mine discharge. These problems can result from the use of abandoned mine lands, strip mine pits or former siltation basins for stormwater control. If stormwater management is not planned correctly in these areas, it is possible that stormwater will be unknowingly infiltrated into the mine pool complexes and contribute to one of PA's largest non-point source pollution problems, abandoned mine drainage (AMD).

In abandoned mine areas, infiltration should be avoided or reduced and alternative stormwater BMP's should be encouraged to restore stream channels, relocate or create diversions around abandoned strip mine pits and coal silt basins, and to promote stream restoration efforts on mining impacted lands. Restored stream channels that previously flowed into abandoned stripping pits and are now flowing on the surface need to be carefully engineered and designed to avoid downstream nightmares.

For technical assistance in these areas, municipalities should contact the Eastern PA Coalition for Abandoned Mine Reclamation. Two very informative websites that should be seriously considered by local government officials who are dealing with AMD or abandoned mine land impacts within their communities and watersheds are:

www.amrcleanringhouse.org and www.orangewaternetwork.org

Pennsylvania BMP Manuals Relating to Stormwater

- *Pennsylvania Stormwater Best Management Practices Manual*, 2005-2006.
- *Pennsylvania Handbook of Best Management Practices (BMP's) for Developing Areas*, Spring 1998.
- *Pennsylvania Soil and Water Conservation Technical Guide*, March 1983, revised October 1986.
- *DEP-Erosion and Sedimentation Pollution Control Program Manual*, March 2000.

The *Pennsylvania Stormwater Best Management Practices Manual* is being developed under guidance by the Pennsylvania DEP and an advisory committee to improve stormwater management across the Commonwealth. The *BMP Manual* is intended to provide technical guidance on methods and materials to prevent, reduce, and minimize the impacts of stormwater runoff. Both non-structural and structural management solutions for dealing with stormwater are included in the Manual. The *BMP Manual* can be found on the DEP website at the following address:
<http://www.dep.state.pa.us/dep/deputate/watermgmt/wc/subjects/stormwatermanagement/default.htm>

The *Pennsylvania Handbook of Best Management Practices (BMP's) for Developing Areas* can be used as a reference for stormwater BMP's. The manual was a collaborative effort between several agencies and organizations including the PA Association of Conservation Districts, Keystone Chapter of the Soil and Water Conservation Society, PA DEP, and US Dept. of Agriculture's Natural Resources Conservation Service. The manual is intended to be a comprehensive guide targeting accelerated soil erosion and sedimentation along with managing stormwater runoff. Information on the manual can be found by either contacting your local County Conservation District or PACD at:
http://www.pacd.org/products/bmp/bmp_handbook.htm

The USDA's Natural Resources Conservation Service's *Pennsylvania Soil and Water Conservation Technical Guide* has many BMP's for managing stormwater runoff. The technical guide has design standards and specifications for all of the BMP's that are found within the guide. This guide can be a very useful tool for planners, designers, contractors, and municipal and county officials. This guide is located at each NRCS office within the state and can be used as a reference.

The *Erosion and Sedimentation Pollution Control Program Manual* lists various BMP's and design standards that are acceptable in Pennsylvania. BMP's, when designed according to the manual's standards, and properly implemented and maintained, will achieve the regulatory standard of minimizing the potential for accelerated erosion and sedimentation. This manual is important in reference to stormwater management because stormwater is the reason why these BMP's are designed the way they are described in the manual. When referencing erosion and sedimentation controls BMP's are designed and referred to as being able to handle the two, ten, fifty, or one hundred year storm events, or in other words, varying degrees of stormwater runoff. This manual can be acquired from the local County Conservation District or Regional DEP Office (see Appendices 2 & 3).

Many other organizations and agencies have produced guides, handbooks, and manuals that address stormwater management BMP's. Each of these documents is valuable to citizens, planners, designers, contractors, etc., but there are too many to list here. Most of the BMP manuals that have been produced will most likely have very similar information to the versions listed above.

Chapter Four

Stormwater Management Act (Act 167)

In 1978, Pennsylvania adopted the Stormwater Management Act (Act 167 of 1978) to provide for the regulation of land and water use for flood control and stormwater management purposes.

The Stormwater Management Act's purpose and policy is to:

- 1) Encourage planning and management of stormwater runoff in each watershed, which is consistent with sound water and land use practices.
- 2) Authorize a comprehensive program of stormwater management designated to preserve and restore the flood carrying capacity of Commonwealth streams, to preserve natural stormwater runoff regimes and natural course, current, and cross-section of waters.
- 3) Encourage local administration and management of stormwater consistent with the Commonwealth's duty as trustee of the natural resources, and the people's constitutional right to environmental preservation.

The Stormwater Management Act also includes:

Section 5(a) Within two years following the promulgation of guidelines by the Department pursuant to Section 14, each county shall prepare and adopt a watershed stormwater management plan for each watershed located in the county as designated by the Department, in consultation with the municipalities located within each watershed, and shall periodically review and revise such plan at least every five years. The Department may, for good cause shown, grant an extension of time to any county for the preparation and adoption of a watershed stormwater management plan.

As indicated in Section 5(a) above, a stormwater management plan must be prepared for each watershed located within the county. Therefore, the concept of watersheds must be understood. A watershed is defined as an area of land that water can drain across, over, or under to a common point on a stream, river, lake, or wetland. Therefore, by definition, watersheds comprise all of the land area within a County or the State, not just an area that provides drinking water or area around a drinking water reservoir. Therefore an entire County should be covered by stormwater management plans for several different watersheds.

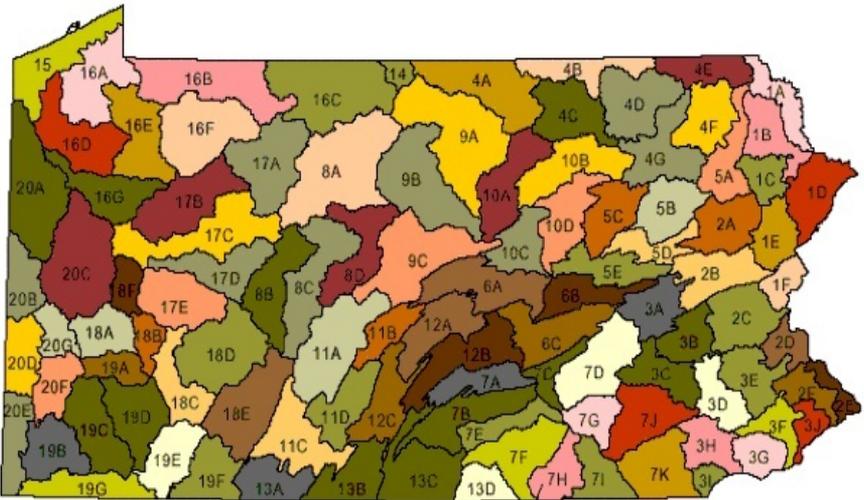


Figure 9. Shows Pennsylvania’s priority planning watersheds (Source: DEP)

Stormwater Management Plans that are to be completed by each county are to identify, survey, and inventory existing conditions that affect stormwater runoff; and should address the issues of peak flows, flooding, groundwater recharge, stream erosion, and water quality along with several other considerations. The plans are also to have public involvement and input throughout the process.

Pennsylvania has invested funding to assist counties to complete stormwater management plans. Pennsylvania has adopted Chapter 111 to the Pennsylvania Code that allows the state to assist or reimburse the costs up to, but to not exceed, 75% of the costs of the plan (refer to Chapter Seven for more detail).

For additional details on Pennsylvania’s Stormwater Management Act, the program, and guidelines, refer to the following website:

<http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralInformation/default.htm>

Chapter Five

Stormwater Ordinances

According to the Stormwater Management Act, Water Resources Planning Act, and Pennsylvania Code, all stormwater runoff is regulated through either municipal or county ordinances.

Because of the diversity of the municipalities and counties across Pennsylvania, many differences exist in ordinances that have been adopted. Therefore all the municipalities and counties across Pennsylvania could have ordinances that accomplish relatively the same thing, but each ordinance might be written differently for each entity. A municipality or county may have a stormwater ordinance, but it could be written differently and located at different places in each set of municipal ordinances.

Municipalities and counties may address stormwater through their ordinances in a variety of ways:

- 1) Develop and adopt a single purpose stormwater ordinance
 - A single purpose stormwater ordinance is designed to address and provide stormwater controls over a wide range of land development and land disturbance activities.
- 2) Amendment to a subdivision and land development ordinance
 - If a municipality or county does not have a specific stand-alone stormwater ordinance, then this is where stormwater regulation is most often addressed.
- 3) Amendment to a zoning ordinance
 - Many municipalities or counties do not allow development in a floodplain because of the potential of flooding and destruction of property as a result of stormwater runoff. Stormwater ordinances can be linked and associated with zoning.
- 4) Amendment to the BOCA Basic Building Code

Any proposed amendments or changes to ordinances regulating stormwater should be referenced and reviewed with any comprehensive planning that has been completed within the municipality and/or county. It is required that the ordinance be consistent with any recommendations made in an Act 167 Stormwater Management Plan that has been developed for the watershed in which the municipality is located

Municipalities and counties can seek assistance with developing ordinances from County Planning Commissions, County Conservation Districts, watershed associations, and/or engineering firms. These agencies and organizations have experience working with stormwater, erosion and sedimentation, water quality, and best management practices (BMP's) to address stormwater management.

Several municipalities across Pennsylvania have adopted stormwater ordinances, whether they are single purpose stormwater ordinances or amendments to existing ordinances. Some examples of stormwater ordinances can be found at:

Pennsylvania DEP website (stormwater model ordinances)

<http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralInformation/default.htm>

EPA website

<http://www.epa.gov/owow/nps/ordinance/stormwater.htm>

Monroe County Conservation District (Pennsylvania)

http://www.mcconservation.org/assistance_resources.html

Chester County Water Resources Authority (Pennsylvania)

<http://dsf.chesco.org/water/cwp/view.asp?a=3&q=612062>

NOTE: If a municipality or county chooses to use any model ordinance to implement stormwater management, it is highly recommended that the ordinance be submitted and reviewed by their solicitor and engineer.

Chapter Six

Funding Sources for Stormwater Planning and Improvements

Funding sources for stormwater management need to be differentiated between funding for stormwater planning projects and for stormwater infrastructure improvement projects. There are certain funding sources that will fund stormwater planning activities but not infrastructure improvement projects and vice versa.

Funding sources for stormwater management planning are available to municipalities and counties. Some funding sources may not provide the entire amount needed to complete an entire stormwater management plan.

Potential opportunities for funding could be through a collaborative effort between municipalities and County Planning Commissions. Municipal cooperation with other municipalities and/or County Planning Commissions could result in a cooperative effort to combine funding for projects that would benefit everyone involved with the project.



Potential Funding for Stormwater Management Planning:

Pennsylvania DEP-Growing Greener Grants

<http://www.depweb.state.pa.us/growinggreener/site/default.asp?growinggreenerNav=>

Pennsylvania DEP

<http://www.pacode.com/secure/data/025/chapter111/chap111toc.html>

Pennsylvania Department of Community & Economic Development

<http://www.newpa.com/default.aspx?id=223>

PENNVEST (Pennsylvania Infrastructure Investment Authority)
<http://www.pennvest.state.pa.us/pennvest/site/default.asp>

Pennsylvania League of Women Voters
<http://wren.palwv.org/grants.html>

Canaan Valley Institute
http://www.canaanvi.org/canaanvi_web/community.aspx

Surdna Foundation
<http://www.surdna.org/>

William Penn Foundation
<http://www.williampennfoundation.org/>

Mellon Foundation
<http://www.mellon.org/index.html>

Potential Funding for Stormwater Infrastructure Improvements:

Pennsylvania DEP-Growing Greener Grants
<http://www.depweb.state.pa.us/growinggreener/site/default.asp?growinggreenerNav=|>

Pennsylvania Department of Community & Economic Development
<http://www.newpa.com/default.aspx?id=223>

PENNVEST (Pennsylvania Infrastructure Investment Authority)
<http://www.pennvest.state.pa.us/pennvest/site/default.asp>

United States Dept. of Agriculture (USDA)- Rural Development
http://www.rurdev.usda.gov/pa/Programs_Available.htm

Pennsylvania League of Women Voters
<http://pa.lwv.org/wren/grants.html>

Canaan Valley Institute
http://www.canaanvi.org/canaanvi_web/community.aspx

Surdna Foundation
<http://www.surdna.org/>

William Penn Foundation

<http://www.williampenfoundation.org/>

Mellon Foundation

<http://www.mellon.org/index.html>

Funding sources will always have an application or specific procedure for requesting funding. Each potential funding source should be contacted by the requesting party regarding its procedures. Then, a discussion between the potential grantee and grantor should take place to make sure that the project fits the grantor's guidelines and requirements. This will also allow the grantee to explain in detail the project to be funded. The more that the grantor knows and understands about the project, the better chance the grantee has of receiving funds.



***Proper planning and preparation can
make the difference!***

Stormwater Handbook Appendices

Appendix #1-Conservation District/Agency Contact Info

- Carbon County
 - Conservation District (610) 377-4894 ext.4
 - NRCS Field Office (610) 377-6143 ext.3

- Columbia County
 - Conservation District (570) 784-1062 ext.5
 - NRCS Field Office (570) 784-1062 ext.3

- Lackawanna County
 - Conservation District (570) 281-9495 ext.5
 - NRCS Field Office (570) 282-8732 ext.3

- Luzerne County
 - Conservation District (570) 674-7991
 - NRCS Field Office (570) 779-0645 ext.3

- Monroe County
 - Conservation District (570) 629-3060
 - NRCS Field Office (610) 377-6143 ext.3

- Montour County
 - Conservation District (570) 271-1140
 - NRCS Field Office (570) 784-1062 ext.3

- Northumberland County
 - Conservation District (570) 286-7114 ext.4
 - NRCS Field Office (570) 286-7114 ext.3

- Pike County
 - Conservation District (570) 226-8220
 - NRCS Field Office (570) 282-8732 ext.3

- Schuylkill County
 - Conservation District (570) 622-3742 ext.5
 - NRCS Field Office (570) 622-1312 ext.3

- Wayne County
 - Conservation District (570) 253-0930
 - NRCS Field Office (570) 282-8732 ext.3

Visit the Pennsylvania Association of Conservation Districts (PACD) website at <http://www.pacd.org> for information on any other Conservation District across the state.

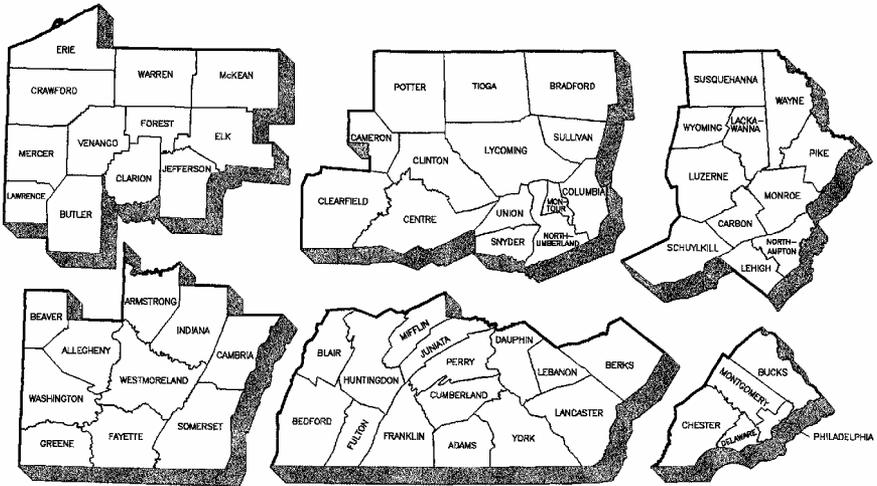
Appendix #2

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Northwest Regional
Office
230 Chestnut St.
Meadville, PA
16335-3481
814-332-6848

Northcentral Regional
Office
208 W. Third St., Suite 101
Williamsport, PA
17701-6448
570-327-3423

Northeast Regional
Office
2 Public Square
Wilkes-Barre, PA
18711-0790
570-826-2511



Southwest Regional
Office
400 Waterfront Drive
Pittsburgh, PA
15222-4745
412-442-4000

Southcentral Regional
Office
909 Elmerton Avenue
Harrisburg, PA
17110-8200
717-705-4700

Southeast Regional
Office
Two East Main Street
Norristown, PA 19401
484-250-5900

Appendix #3

Pennsylvania & Federal Laws with ties to stormwater:

Clean Streams Law (Act 394 of 1937, as amended) - regulates discharges to waters of the Commonwealth, both surfacewater and groundwater.

Municipalities Planning Code (Act 247 of 1968, as amended) - authorized municipalities to regulate land use, including provisions regarding water supply and water resources including stormwater.

Pennsylvania Code (Act 240 of 1968, as amended) - authorized Department of Environmental Protection (DEP) the ability to regulate erosion & sedimentation control practices, which includes stormwater from a current, ongoing construction site.

Federal Water Pollution Control Act Amendments of 1972 (Clean Water Act) - established the basic structure for regulating discharges of pollutants into the waters of the United States, and continued requirements to set water quality standards for all contaminants in surface waters.

Stormwater Management Act (Act 167 of 1978) - requires counties to develop watershed based stormwater management plans that address surface water and ground water concerns.

Water Resources Planning Act (Act 220 of 2002) - requires that the state water plan be updated by 2008 and every five years after that. The act includes surface and ground water inventories, assessment and projections of water withdrawals, and identification of potential water problems.

Appendix #4

Project Partners

**Pocono Northeast Resource Conservation & Development
(RC&D) Council**

Pennsylvania League of Women Voters

Pennsylvania Department of Environmental Protection (DEP)

Clarks Green Borough, Lackawanna County

Dallas Borough, Luzerne County

Delaware Township, Pike County

Port Clinton Borough, Schuylkill County

Lackawanna College

**Eastern Pennsylvania Coalition for Abandoned Mine
Reclamation (EPCAMR)**

Carbon County Conservation District

Lackawanna County Conservation District

Luzerne County Conservation District

Monroe County Conservation District

Northumberland County Conservation District

Schuylkill Conservation District

Appendix #5

Municipal Separate Storm Sewer Systems (MS4s) within Urbanized Areas in Pennsylvania (Pocono Northeast RC&D Area)

County Name	Municipality Name	Urbanized Area Name
Carbon	Banks Twp.	Hazleton
Carbon	Beaver Meadows Boro	Hazleton
Carbon	Bowmanstown Boro	Allentown/Bethlehem
Carbon	East Penn Twp.	Allentown/Bethlehem
Carbon	Franklin Twp.	Allentown/Bethlehem
Carbon	Lehighon Boro	Allentown/Bethlehem
Carbon	Lower Towamensing Twp.	Allentown/Bethlehem
Carbon	Mahoning Twp.	Allentown/Bethlehem
Carbon	Palmerton Boro	Allentown/Bethlehem
Carbon	Parryville Boro	Allentown/Bethlehem
Carbon	Weissport Boro	Allentown/Bethlehem
Lackawanna	Abington Twp.	Scranton
Lackawanna	Archbald Boro	Scranton
Lackawanna	Blakely Boro	Scranton
Lackawanna	Carbondale City	Scranton
Lackawanna	Carbondale Twp.	Scranton
Lackawanna	Clarks Green Boro	Scranton
Lackawanna	Clarks Summit Boro	Scranton
Lackawanna	Dalton Boro	Scranton
Lackawanna	Dickson City Boro	Scranton
Lackawanna	Dunmore Boro	Scranton
Lackawanna	Fell Twp.	Scranton
Lackawanna	Jermyn Boro	Scranton
Lackawanna	Jessup Boro	Scranton
Lackawanna	Lackawanna County	Scranton
Lackawanna	Mayfield Boro	Scranton
Lackawanna	Moosic Boro	Scranton
Lackawanna	Newton Twp.	Scranton
Lackawanna	Old Forge Boro	Scranton
Lackawanna	Olyphant Boro	Scranton
Lackawanna	Ransom Twp.	Scranton
Lackawanna	Scott Twp.	Scranton
Lackawanna	Scranton City	Scranton
Lackawanna	South Abington Twp.	Scranton

County Name	Municipality Name	Urbanized Area Name
Lackawanna	Taylor Boro	Scranton
Lackawanna	Throop Boro	Scranton
Lackawanna	Vandling Boro	Scranton
Lackawanna	West Abington Twp.	Scranton
Luzerne	Ashley Boro	Scranton
Luzerne	Avoca Boro	Scranton
Luzerne	Bear Creek Twp.	Scranton
Luzerne	Butler Twp.	Hazleton
Luzerne	Conyngham Twp.	Hazleton
Luzerne	Courtdale Boro	Scranton
Luzerne	Dallas Boro	Scranton
Luzerne	Dallas Twp.	Scranton
Luzerne	Dupont Boro	Scranton
Luzerne	Duryea Boro	Scranton
Luzerne	Edwardsville Boro	Scranton
Luzerne	Exeter Boro	Scranton
Luzerne	Exeter Twp.	Scranton
Luzerne	Forty Fort Boro	Scranton
Luzerne	Foster Twp.	Hazleton
Luzerne	Freeland Boro	Hazleton
Luzerne	Hanover Twp.	Allentown/Bethlehem
Luzerne	Hanover Twp.	Scranton
Luzerne	Harveys Lake Boro	Scranton
Luzerne	Hazle Twp.	Hazleton
Luzerne	Hazleton City	Hazleton
Luzerne	Hughestown Boro	Scranton
Luzerne	Jackson Twp.	Scranton
Luzerne	Jeddo Boro	Hazleton
Luzerne	Jenkins Twp.	Scranton
Luzerne	Kingston Boro	Scranton
Luzerne	Kingston Twp.	Scranton
Luzerne	Laffin Boro	Scranton
Luzerne	Larksville Boro	Scranton
Luzerne	Laurel Run Boro	Scranton
Luzerne	Lehman Twp.	Scranton
Luzerne	Luzerne Boro	Scranton
Luzerne	Luzerne County	Scranton
Luzerne	Nanticoke City	Scranton
Luzerne	Newport Twp.	Scranton
Luzerne	Pittston City	Scranton
Luzerne	Pittston Twp.	Scranton

County Name	Municipality Name	Urbanized Area Name
Luzerne	Plains Twp.	Scranton
Luzerne	Plymouth Boro	Scranton
Luzerne	Plymouth Twp.	Scranton
Luzerne	Pringle Boro	Scranton
Luzerne	Sugar Notch Boro	Scranton
Luzerne	Sugarloaf Twp.	Hazleton
Luzerne	Swoyersville Boro	Scranton
Luzerne	Warrior Run Boro	Scranton
Luzerne	West Hazleton Boro	Hazleton
Luzerne	West Pittston Boro	Scranton
Luzerne	West Wyoming Boro	Scranton
Luzerne	Wilkes Barre City	Scranton
Luzerne	Wilkes Barre Twp.	Scranton
Luzerne	Wyoming Boro	Scranton
Luzerne	Yatesville Boro	Scranton
Schuylkill	Kline Twp.	Hazleton
Schuylkill	McAdoo Boro	Hazleton
Wayne	Canaan Twp.	Scranton
Wayne	Clinton Twp.	Scranton

MS4s outside UAs that might be potentially designated for inclusion in the Phase II program:

County Name	Municipality Name	Urbanized Area Name
Columbia	Berwick Boro	N/A
Columbia	Bloomsburg Boro	N/A
Northumberland	Sunbury City	N/A
Schuylkill	Pottsville City	N/A

Appendix #6

References

Commonwealth of Pennsylvania, Act 1968, P.L.805, No. 247 as reenacted and amended. Pennsylvania Municipalities Planning Code.

Commonwealth of Pennsylvania, Stormwater Management Act 1978, P.L.864, No. 167 as amended by Act 63.

Commonwealth of Pennsylvania Department of Environmental Protection, March 2000. Erosion and Sedimentation Pollution Control Program Manual.

Commonwealth of Pennsylvania Department of Environmental Protection and Cahill Associates, 2005-2006. Pennsylvania Stormwater Best Management Practices Manual.

Federal Interagency Stream Corridor Restoration Working Group, October 1998. Stream Corridor Restoration: Principles, Processes, and Practices.

Pennsylvania Association of Conservation Districts, Inc., Keystone Chapter, Soil and Water Conservation Society, Pennsylvania Department of Environmental Protection, and United States Department of Agriculture- Natural Resources Conservation Service, Spring 1998. Pennsylvania Handbook of Best Management Practices for Developing Areas.

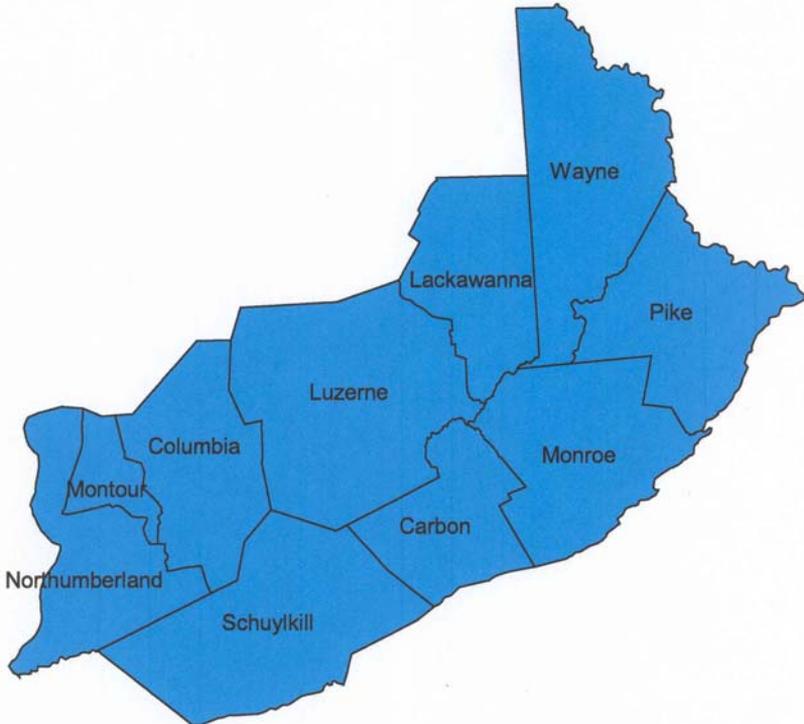
United States Department of Agriculture- Natural Resources Conservation Service, March 1983, revised October 1986. Pennsylvania Soil and Water Conservation Technical Guide.

United States Environmental Protection Agency, January 2000. Storm Water Phase II Final Rule, Fact Sheet 1.0.



Pocono Northeast

Resource Conservation and Development Council



www.pnercd.org

Mission Statement

To enhance and improve the ecological, cultural, and economic characteristics of the Pocono Northeast RC&D Area through projects and programs that promote the management, protection, and sustainable utilization of the Area's resources

Counties Served

Carbon, Columbia, Lackawanna, Luzerne, Monroe, Montour, Northumberland, Pike Schuylkill, and Wayne

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