

ADAMS COUNTY STORMWATER MANAGEMENT PLAN

Act 167 County-Wide Stormwater Management Plan



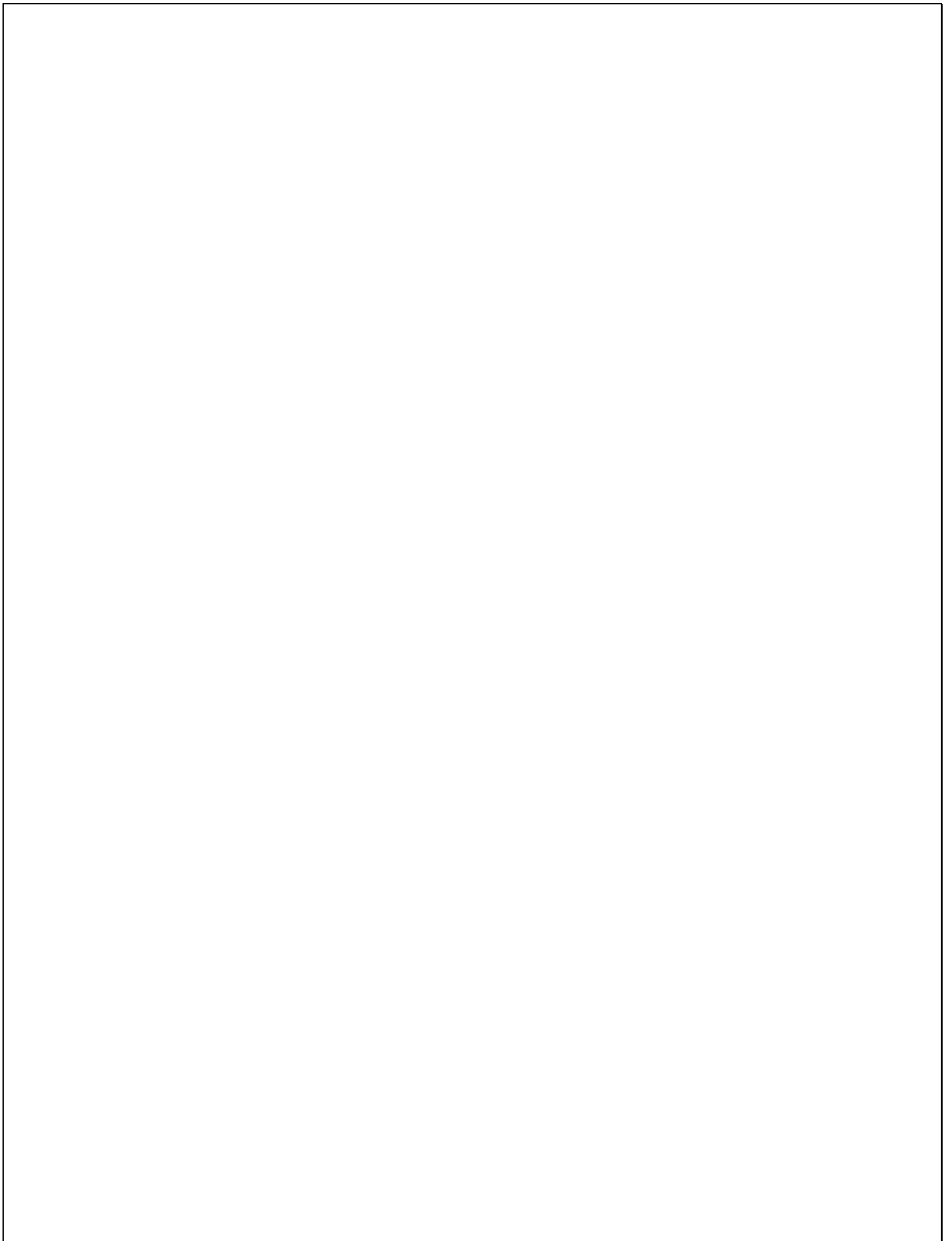
PREPARED BY:

ADAMS COUNTY CONSERVATION DISTRICT

and

ADAMS COUNTY OFFICE OF PLANNING & DEVELOPMENT

November 2011



ADAMS COUNTY STORMWATER MANAGEMENT PLAN

Adams County, Pennsylvania



Adopted:

November 23, 2011

Adams County Commissioners:

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Approved by DEP:

January 27, 2012

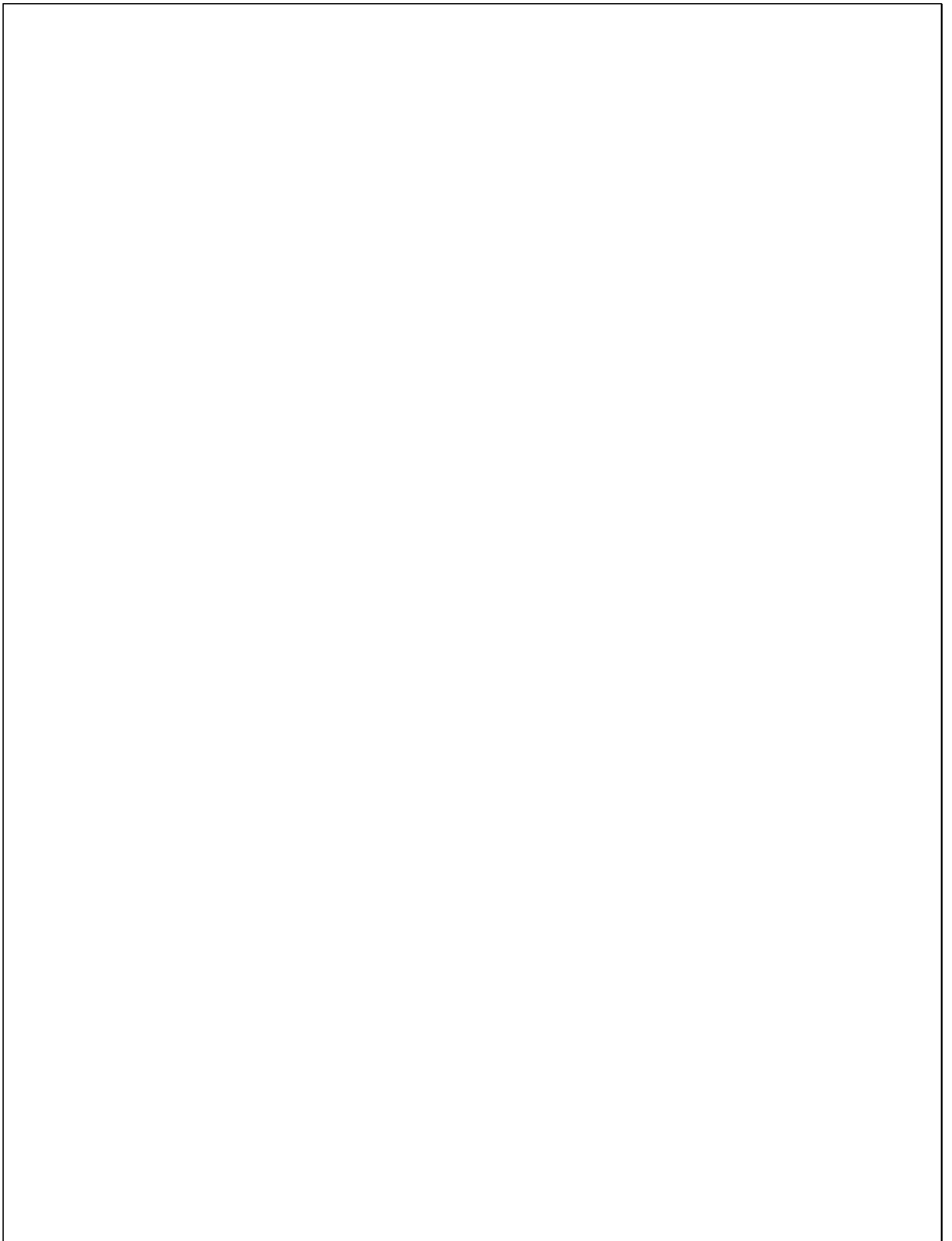


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SECTION I - INTRODUCTION

Introduction

A stormwater management plan for Adams County was prepared to meet the requirements of the *Pennsylvania Storm Water Management Act (Act of October 4, 1978, P.L. 864 No. 167)*. This law is commonly referred to as Act 167 and requires Pennsylvania Counties to prepare and adopt stormwater management plans. It also requires municipalities to amend or adopt stormwater management ordinances consistent with the plan. The Adams County Stormwater Management Plan is the result of a collaborative effort led by the Adams County Conservation District (ACCD) and Adams County Office of Planning & Development (ACOPD), with assistance from the Stormwater Plan Advisory Committee (SPAC). It was developed based on the requirements of Act 167 and the input of the SPAC, municipal Engineers, stakeholders, and the Pennsylvania Department of Environmental Protection (DEP).

The Adams County Stormwater Management Plan is a county-wide plan, covering all Act 167 designated watersheds and municipalities within Adams County. A county-wide approach to stormwater management will allow the County to improve the correlation of stormwater controls with standards enforced by the Adams County Conservation District and DEP, while reducing the costs associated with the production of separate watershed plans and promoting multi-municipal planning. The County's efforts will promote non-point source pollution removal procedures, encourage groundwater recharge, and/or water quality enhancement, recommend methods for facilitating low impact land development practices, stabilize impaired stream channels, and develop quantitative standards for improving the conditions that contribute to extreme flood events. Adams County took advantage of the stormwater planning process to establish a consistent model ordinance across the County. Adams County will experience the benefits of establishing cohesive standards for stormwater runoff quality, groundwater recharge, and peak rate of stormwater runoff.

Why Plan for Stormwater Runoff

The water flowing across the surface of the land during and immediately following a rainfall event is referred to as stormwater runoff. In a watershed subject to land development, the amount of stormwater runoff resulting from a particular rainfall event increases in response to the reduction in pervious land area (i.e., natural land being covered by pavement, concrete, or buildings). Furthermore, the alteration of natural land cover and land contours to accommodate residential, commercial, industrial, and agricultural uses results in decreased infiltration capabilities, increased rates of stormwater runoff, and the overall volume of stormwater runoff.

Improperly planned development projects may lead to significant future challenges associated with an increase in stormwater runoff. Non-management of stormwater runoff

intensifies flooding events; destabilizes stream channels, making them susceptible to erosion and siltation; and diminishes groundwater aquifers due to a reduction in recharge rates.

Individual land development projects have historically been viewed on a stand-alone basis without maintaining sight of the cumulative impact on the environment. This scenario is common when land development occurs in neighboring municipalities. Repeated complaints from downstream property owners regarding damage to their property and increased frequency and severity of flooding have been key indicators to local municipalities of the cumulative impacts resulting from a lack of stormwater management.

Application of proper stormwater management practices requires cooperation between the State, County, and local Municipalities with assistance from their engineering, planning, construction, and maintenance personnel. Preliminary cooperation efforts are focused on education, modification of policy, adoption of new regulations and consistent enforcement. The Adams County Stormwater Management Plan, under the Pennsylvania Stormwater Management Act, will encourage responsible land development to occur by utilizing both structural and non-structural stormwater runoff control measures in every watershed across the entire County.

Background

In 2002, the Adams County Commissioners adopted the Monocacy River Watershed Stormwater Management Plan. The Monocacy River watershed includes seventeen Adams County municipalities and covers 228 of Adams County's 520 square miles. The Adams County Stormwater Management Plan will be considered the five year update of the Monocacy Plan, while addressing the six watersheds of Adams County as listed in the "Index of Designated Watersheds (Stormwater Management)", published by DEP on May 31, 1980 (and subsequently amended), pursuant to Section 14(a)(10) of Act 167. The designated watersheds of Adams County are: Antietam Creek, Conewago Creek (West), Conococheague Creek, Monocacy River, and Mountain Creek. The Adams County Stormwater Management Plan will supersede the current Monocacy River Watershed Stormwater Management Plan, the Antietam Creek Watershed Stormwater Management Plan, and the Conococheague Creek Watershed Stormwater Management Plan.

Adams County received funding from DEP to complete a Scope of Study for a countywide stormwater management plan in 2007. The Study was completed in 2009 and approved by DEP in May of 2010. This Study anticipated that funding would be available to complete an engineered, countywide stormwater management plan. Due to the lack of an appropriation by the Commonwealth for stormwater management planning, Adams County was unable to apply for funding, but decided to proceed with a reduced scope of work, utilizing County staff.

Pennsylvania Storm Water Management Act (Act 167)

The Pennsylvania General Assembly enacted the Stormwater Management Act, P.L. 864, No. 167, October 4, 1978 and found that:

1. Inadequate management of accelerated runoff of stormwater resulting from development throughout a watershed increases flood flows and velocity; 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 floodplain management and floodplain control efforts in downstream communities; reduces groundwater recharge; and threatens public health and safety.
2. A comprehensive program of stormwater management, including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety, and welfare and the protection of the people of the Commonwealth, their resources, and their environment.

The policy and purpose of Act 167 is to:

1. Encourage planning and management of storm water runoff in each watershed which is consistent with sound water and land use practices.
2. Authorize a comprehensive program of storm water management designated to preserve and restore the flood-carrying capacity of Commonwealth streams; to preserve to the maximum extent practicable natural storm water runoff regimes and natural course, current, and cross-section of water of the Commonwealth; and to protect and conserve groundwater and groundwater recharge areas.
3. Encourage local administration and management of storm water consistent with the Commonwealth's duty as trustee of natural resources and the people's constitutional right to the preservation of natural, economic, scenic, aesthetic, recreational, and historic values of the environment.

Act 167 requires Pennsylvania counties to prepare and adopt stormwater management plans that promote management of stormwater runoff in every watershed. The Act gives the Counties discretion regarding the details of how the county manages the preparation and publication of its plans. Within six months following the adoption and approval of a stormwater management plan (SMP), each municipality is required to adopt (or amend) and implement ordinances and regulations as necessary to regulate development and other land alterations that may affect runoff characteristics in a manner consistent with the applicable SMP and the provisions of the Act. The plans must be reviewed and revised at least every five years.

The basic standard for stormwater management as established by Act 167 affects landowners, or any person engaged in the alteration or development of land, which may

affect storm water runoff characteristics. Those developing property shall implement measures consistent with the provisions of the SMP so that changes in land cover and topography will not cause injury or harm health, safety, or property. Such measures shall include actions to assure that the maximum rate of storm water runoff is no greater after development than prior to development activities. In addition, stormwater management plans must also include standards to address water quality, stream channel protection, and groundwater recharge.

The standards for managing stormwater must address runoff volume and groundwater recharge, peak rate of runoff discharge, and the quality of stormwater runoff. New land development activities must incorporate features and facilities that will limit the volume and rate of stormwater discharge. Land development must provide for an acceptable degree of runoff water quality protection and/ or enhancement. The stormwater control standards set forth in this Plan require, to the extent practicable, runoff characteristics from new land development activities to approximate those characteristics that existed prior to the development in terms of groundwater recharge, peak rate of discharge, volume of discharge, and water quality. Stormwater management techniques known as “Best Management Practices” (BMPs) can be used to help satisfy these requirements. The *Pennsylvania Stormwater Best Practices Manual* (DEP) lists BMPs that can be employed to assist in meeting the standards presented in this Plan.

Stormwater Plan Advisory Committee (SPAC)

As required under Act 167, a Stormwater Plan Advisory Committee (SPAC) was formed and provided valuable input throughout the stormwater management planning process. The SPAC met several times during the development of the Plan. Table 1 on page 5 lists the primary representative appointed by the municipality. A list of the attendees at each SPAC meeting is presented in Appendix F. Municipal engineers and consultants were also present at the SPAC meetings and were a very important part of the planning process.

Table 1: Adams County Stormwater Plan Advisory Committee (SPAC)	
Organization	Primary Representative Appointed by Municipality
Adams County Conservation District	Russell Ryan, Larry Martick, Deb Musselman
Adams County Planning Office	Sarah Weigle
ABBOTTSTOWN Borough	Dennis Posey
ARENDTSVILLE Borough	Ken Shafer
BENDERSVILLE Borough	Martha Schriver
BERWICK Township	Dean Hempfing
BIGLERVILLE Borough	Dick Mountfort
BONNEAUVILLE Borough	Rob Czyzewski
BUTLER Township	Adam Anderson
CARROLL VALLEY	Ken Lundberg
CONEWAGO Township	Monique Keefe
CUMBERLAND Township	Tom Shealer
EAST BERLIN Borough	Charles Eisenhart
FAIRFIELD Borough	Francis Cool
FRANKLIN Township	Bicky Redman
FREEDOM Township	Allen Beckett
GERMANY Township	Richard Valko
GETTYSBURG Borough	Dan Hillard
HAMILTONBAN Township	Coleen Reamer
HIGHLAND Township	Craig Rockey
HUNTINGTON Township	Gus Fridenvalds
LATIMORE Township	John Shambaugh
LIBERTY Township	Peter Foscatto
LITTLESTOWN Borough	Tim Topper
MCSHERRYSTOWN Borough	Robert Sharrah
MENALLEN Township	Alan Black
MOUNT JOY Township	David Updyke
MOUNT PLEASANT Township	Barry Stone
NEW OXFORD Borough	Stan Wannop
OXFORD Township	Bill McMaster
READING Township	Kelly Duty
STRABAN Township	Glenn Zepp
TYRONE Township	Emma Seibert
UNION Township	Dean Shultz
YORK COUNTY Planning Commission	Terry Ruby
FRANKLIN CO. Planning Commission	Rochelle Barvinchack
CARROLL CO. Planning Commission	Tom Devilbliss
FREDERICK CO. Planning Commission	Betsy Smith
AC Water Resources Advisory Committee	Bill Hanne

SECTION II – GOALS AND OBJECTIVES

Sound Stormwater Management

The objective of stormwater management is to prevent or mitigate the adverse impacts related to the conveyance of excessive rates and volumes of stormwater runoff. Early efforts in managing storm flows consisted of simple routing of stormwater through gutters and sewer systems with the objective of removing the stormwater as quickly as possible. It has been recognized for some time that simply bypassing storm flows can shift the location of the problem and very often aggravate the problem by compounding flows downstream. The end result is an increase in total flow, peak flow rate, stream velocity, and stream stage in major and minor downstream channels.

A more effective approach to stormwater management often appears to be to maintain natural runoff flow characteristics as much as possible. This can be accomplished either by augmenting the infiltration process, evapotranspiration, or by temporarily storing stormwater for release at controlled rates of discharge. Actual stormwater management techniques can be structural (detention ponds, pipes, etc.) or nonstructural (land-use planning to effectively preserve existing vegetation, drainage swales, perviousness, etc.). Both techniques should be utilized as complementary elements of a management plan. The effectiveness of a given stormwater management program is a function of comprehensive planning and sound engineering design.

Effective stormwater management planning must be done on a regional basis and Act 167 confers to counties the responsibility for development of the stormwater management plans (SMP). Municipalities have an obligation to implement the criteria and standards developed in each SMP by amending or adopting laws and regulations for land use and development. The implementation of stormwater management criteria and standards at the local level is necessary since municipalities are responsible for local land-use decisions and planning. A major goal of the SMP and the attendant municipal regulations is to prevent future drainage problems and avoid aggravation of existing problems.

Any person engaged in the alteration or development of land which may affect stormwater runoff characteristics must implement reasonable provisions which may be necessary to prevent injury to health, safety or other property. Such provisions will assure that the maximum rate of stormwater runoff is no greater after development than prior to development activities, or that the quantity, velocity, and direction of resulting stormwater runoff is managed in a manner which protects health and property.

An important provision of the SMP is the requirement to manage stormwater runoff so that activities in one municipality do not cause problems in other municipalities. The same is true for groundwater and groundwater recharge areas. Poor stormwater management in one municipality should not affect the groundwater resources of another community. Although existing inter-municipal problems may continue, the objective is to prevent aggravation of existing problems.

GOALS AND OBJECTIVES OF THE PLAN

The goal of Adams County Stormwater Management Plan is to provide a consistent, comprehensive, and common sense approach to stormwater management, while satisfying the requirements of Act 167.

The principal purpose of this Plan is to protect health, safety, and property by addressing the impacts associated with the development of land. The Plan also recommends measures to maintain or increase water quality and reduce the impacts of flood damage. The Adams County Stormwater Management Plan provides Adams County municipalities the opportunity to achieve the primary goal and purpose of the Plan while meeting the requirements of Act 167 through the following objectives:

- Present standards that are consistent with Title 25 Pennsylvania Code Chapter 102 and NPDES permit requirements.
- Preserve natural drainage patterns and natural stormwater runoff regimes to the maximum extent possible.
- Protect and restore the flood-carrying capacity of streams and prevent erosion of stream banks and sedimentation in streambeds.
- Manage stormwater close to the source of runoff with as many natural processes as possible.
- Utilize Best Management Practices (BMPs) appropriate for the development site.
- Encourage groundwater recharge, where appropriate to prevent degradation of groundwater supplies and groundwater quality.
- Meet water quality requirements of Title 25 Pennsylvania Code Chapter 93 and Section 303(d) and 305 (b) of the Clean Water Act relating to the protection and restoration of existing and designated uses.
- Protect the quality of those streams designated as Exceptional Value (EV) or High Quality (HQ).

Through the stormwater management planning process several goals, more specific to Adams County, were consistently identified. The goals were compiled from feedback received during SPAC meetings, municipal surveys, and interaction with municipal engineers. The goals and recommended objectives to achieve those goals are discussed in the following paragraphs.

Consistency – Municipal regulation of stormwater can vary from municipality to municipality. Currently, only seventeen (17) Adams County municipalities are covered

under an approved Act 167 stormwater management plan (Monocacy River Watershed SMP, 2002). A countywide approach to stormwater management through the Adams County Stormwater Management Plan and adoption of the model ordinance should allow for greater consistency between the regulation of stormwater at the municipal level.

Currently, many projects are designed to satisfy municipal stormwater management requirements and National Pollutant Discharge Elimination System (NPDES) requirements through a Post Construction Stormwater Management Plan. A second level of consistency achieved by a current, county-wide stormwater management plan is consistency with NPDES for those projects requiring a permit for the discharge of stormwater from construction activities. This would result in the preparation of a single plan to meet both requirements.

Minor Project Concerns – A major concern which arose from the adoption of the Monocacy model ordinance was the cost to homeowners associated with meeting stormwater management requirements for smaller projects, like a shed or addition. The Adams County SMP attempts to provide relief for certain projects through model ordinance criteria and the Stormwater Design Assistance Manual for Minor Land Development Activities - Simplified Approach. The Simplified Approach will allow certain projects to employ simplified administrative procedures instead of a technical approach, which can become costly.

Water Quality –Adams County has streams of elevated water quality, as well as impaired streams. Maintaining and improving water quality will provide benefits to current and future terrestrial and aquatic inhabitants of Adams County. Water quality can be enhanced through the use of BMPs. Enhanced measures to maintain and improve water quality will also be beneficial as the Phase II Chesapeake Bay TMDL Watershed Implementation Plans (WIPs) are executed at the County level.

One recommended BMP which provides many benefits, including water quality, is the establishment and protection of riparian forest buffers. Riparian buffers can be an efficient and economical way of improving water quality, stabilizing and protecting stream channels, reducing fluctuations in stream temperature, providing temporary storage and gradual conveyance of floodwater to the stream and water table, slowing the velocity of stormwater runoff, reducing the level of downstream flooding, filtering and storing sediment from erosion in the watershed, as well as filtering and trapping nutrients and pollution from overland runoff. Priority areas for establishing and maintaining riparian forest buffers are along those streams which are considered Exceptional Value, High Quality, or impaired.

Water Supply - Maintaining a supply of water is essential to the viability of Adams County. The County has limited water resources and protecting what we have, as well as the quality of water, is a priority. Stormwater should be infiltrated in settings appropriate for infiltration.

Identification of Best Management Practices Suitable for Adams County – Adams County is unique in that many areas of the County do not allow for infiltration of stormwater due to soil limitations or geography. An analysis of the BMPs that are suitable in different soil settings within the County would be of great benefit. This analysis was not completed for this Plan but should be a priority if funding becomes available.

Training – The adoption of a county-wide SMP will require the municipalities to implement ordinances or provisions to manage stormwater. Whether the municipality was administering an ordinance consistent with the Monocacy SMP or some other standard, it was clear that a change in regulation would require training and assistance. Many municipal officials felt training opportunities should be part of the implementation of a county-wide SMP Plan. This included training relating to the administration of the ordinance and use of the Simplified Approach Method. The Conservation District will provide training sessions related to the model ordinance and the Simplified Approach Method after the Plan is approved by DEP.

Training on the use of certain BMPs was also identified by the municipal engineers as something that would be of benefit to them professionally, as well as a benefit to the County. Knowledge of techniques appropriate for different areas of the County could be used during site design. BMP training could be pursued if funding opportunities are available. This should be done after an analysis of the BMPs have recognized techniques that can be utilized within the areas of soil limitations in Adams County.

Plan Contents Required by Act 167

Section 5 of Act 167 specifies that a stormwater management plan shall, at a minimum, include the following elements:

- (b.1) **A survey of existing runoff characteristics in small as well as large storms, including the impact of soils, slopes, vegetation and existing development**

Refer to Section III – County Characteristics.

- (b.2) **A survey of existing significant obstructions and their capacities**

A survey of stream obstructions and their estimated capacities for Alloway Creek, Marsh Creek, and Rock Creek was completed for the Monocacy River Stormwater Management Plan (2002) and located in Section VI – Problem Areas & Impairments. Other locations may also be found on the Flood Prone Map in Appendix B.

- (b.3) **An assessment of projected and alternative land development patterns and the potential impact on runoff quantity, velocity and quality**

Preferred and potential land development patterns are depicted in the Future Land Use Plan and Composite Zoning Maps in Appendix B.

- (b.4) **An analysis of present development in flood hazard areas and its sensitivity to damage from future flooding or increased runoff**

The Adams County Hazard Mitigation Plan (2004) identifies the number of parcels in each municipality that are within the floodplain. The Plan also provides a Flood Vulnerability Assessment. Each municipality that participates in the FEMA floodplain program has updated their floodplain ordinance to regulate development in

the floodplain. Future flooding issues due to stormwater runoff from regulated activities will be addressed by implementation and enforcement of the model ordinance by each municipality.

(b.5) A survey of existing drainage problems and proposed solutions

See Section VI – Problem Areas & Impairments and the Flood Prone Locations Map in Appendix B.

(b.6) A review of existing and proposed stormwater collection systems and their impacts

Proposed stormwater management facilities will be designed, reviewed, approved, maintained, and enforced in accordance with the adopted ordinance, which is regulated by each municipality. These systems could be inventoried as part of future updates to the Plan as technology like GPS location and integration of CADD data with County mapping becomes regularly used.

(b.7) An assessment of alternative runoff control techniques and their efficiency in the particular watershed

The Adams County Stormwater Management Plan recommends the use of the PA Stormwater Best Management Practices Manual to assist in meeting runoff volume requirements. Best Management Practice techniques are discussed, as well as assessed, for their contribution toward volume reduction in this Manual. Future updates to this Plan envision an assessment of the BMP techniques to determine which ones are suitable in different geologic settings of Adams County.

(b.8) An identification of existing and proposed State, Federal and local flood control projects located in the watershed and their design capacities

The Adams County Emergency Services Department confirmed that there are no known existing or proposed State, Federal, or local flood control projects located within Adams County.

(b.9) A designation and description of those areas to be served by stormwater collection and control facilities within a ten-year period

The County has no known or proposed major projects to design and construct new stormwater control and collection facilities during the next 10 years. .

(b.10) An identification of flood plains within the watershed

Refer to Section III – Water Features or the Water Features Map in Appendix B.

(b.11) Criteria and standards for the control of stormwater runoff from development activities that is necessary to minimize dangers to property and life and carry out the purposes of Act 167

Refer to Section VII - Model Ordinance Provisions and the model ordinance in Appendix A, which provide criteria and standards for the control of stormwater runoff from development activities consistent with Act 167 and this Plan.

(b.12) Priorities for implementation of action within the plan

Refer to Section IX - Implementation and Update Procedure. The initial step in the implementation of the Adams County Stormwater Management Plan begins with DEP approval. Approval of the Plan sets in motion the mandatory schedule of adoption of municipal ordinance provisions and standards consistent with the Plan. Adams County municipalities will have six (6) months from the date of DEP approval to adopt the necessary ordinance provisions. The Recommendations in the Plan could, upon further consideration by the County or municipality, be implemented as funding or other assistance becomes available.

(b.13) Provisions for periodically reviewing, revising and updating the plan

Refer to Section IX - Implementation and Update Procedure. Act 167 requires that this Plan is reviewed and any necessary revisions made at intervals not exceeding 5 years.

(c.1) Contain such provisions as are reasonably necessary to manage storm water such that development or activities in each municipality within the watershed do not adversely affect health, safety, and property in other municipalities within the watershed and in basins to which the watershed is tributary

Refer to Section VII – Model Ordinance Provisions. The Plan will implement controls for stormwater that are not less protective of public health, safety, property, and the environment than the statewide model ordinance and statewide regulations. These controls also include measures to protect water quality.

(c.2) Consider and be consistent with other existing municipal, county, regional, and State environmental and land use plans

Refer to Section V – Existing Plans and Regulations.

SECTION III – COUNTY CHARACTERISTICS

Adams County Overview

Adams County is located in southern Pennsylvania along the Mason-Dixon Line. It extends 26 miles from east to west and 24 miles from north to south.

In Pennsylvania, much of the governing control is at the municipal level. The municipality is the regulating agency for stormwater management through land use controls. Adams County is comprised of 34 municipalities, 13 boroughs and 21 townships.

Geology

The underlying geologic formations of Adams County can be classified into four physiographic areas. The western portion of the County is known as South Mountain, which is an extension of the Blue Ridge Mountains. The underlying geology consists of Precambrian bedrock, primarily from metarhyolite, Weaverton Formation, Loudon Formation, and metabasalt.

Through the center of the County runs the Gettysburg-Newark Lowland. This section consists primarily of Triassic sandstone from the Gettysburg and New Oxford Formations. Diabase is also present and accounts for the rolling hills and boulder deposits in and around the Gettysburg National Military Park.

The Piedmont Lowland and Piedmont Upland make up the underlying geology in the southeastern portion of Adams County. This is a relatively small area compared to the previous two sections. The Piedmont Lowland is centered around McSherrystown and consists primarily of dolomite, shale, and limestone from the Conestoga, Kinzers, and Ledger Formations. To the north and south of the Piedmont Lowland is the Piedmont Upland consisting primarily of quartz and slate from the Chickies Formation and metabasalt.

It should be noted that diabase intrusions are known to have poor recharge and infiltration capacity. There are also areas of limestone in Conewago, Oxford, and Union Townships and McSherrystown Borough, which are subject to sinkholes. A Geology map is located in Appendix B.

Soils

Soil characteristics indicate the inherent suitability of an area for development or in the case of stormwater, the ability to infiltrate runoff back into the ground. The primary source of soil data for Adams County is the *Soil Survey of Adams County, Pennsylvania*. The latest complete copy of the Adams County Soil Survey available is dated 2005. The current Soil Survey is only available on the US Department of Agriculture's Natural Resources

Conservation Service website under the Web Soil Survey:
<http://websoilsurvey.nrcs.usda.gov/>.

Hydrologic soil groups represent groupings of soils having similar hydrologic properties that directly influence the volume and rate of stormwater runoff. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. The Hydrologic Soil Group map in Appendix B illustrates the location of soils by hydrologic soil group.

The Natural Resources Conservation Service (NRCS) describes the hydrologic soil groups as:

Group A – Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B – Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transfer.

Group C – Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine or fine texture. These soils have a slow rate of water transmission.

Group D – Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Those soils assigned to a dual hydrologic group (B/D), the first letter is for the drained areas and the second is for undrained areas.

Table 2 identifies the percentage of hydrologic soil groups within the County.

Table 2: Hydrologic Soil Groups		
Soil Group	Infiltration Potential	Percentage
A	High Infiltration Rate – Low Runoff Potential	0.5%
B	Moderate Infiltrate Rate	40.2%
C	Slow infiltration rate	45.1%
D	Very Slow Infiltration Rate – High Runoff Potential	10.7%
B/D		3.5%

Slopes

Slopes are often a limitation for development. Disturbance to steep slopes, those which are greater than 15%, often results in accelerated erosion processes from stormwater runoff and sedimentation of water bodies, which can lead to degradation of water quality and loss of aquatic life. In Adams County, slopes greater than 25% are primarily found in the South Mountain area. Several other areas of steep slopes may be found southeast of Gettysburg Borough, in the Pigeon Hills of Berwick Township, and along stream banks. A map of Steep Slopes is located in Appendix B.

Topography for the County is available through the United States Geological Survey (USGS) <http://www.usgs.gov/pubprod/> or the Adams County GIS Department.

Water Features

There are nearly 1,300 miles of streams within Adams County. The streams in the northeastern half of the County drain to the Susquehanna River and those streams in the southwestern half of the County drain to the Potomac River. Both watersheds eventually drain to the Chesapeake Bay.

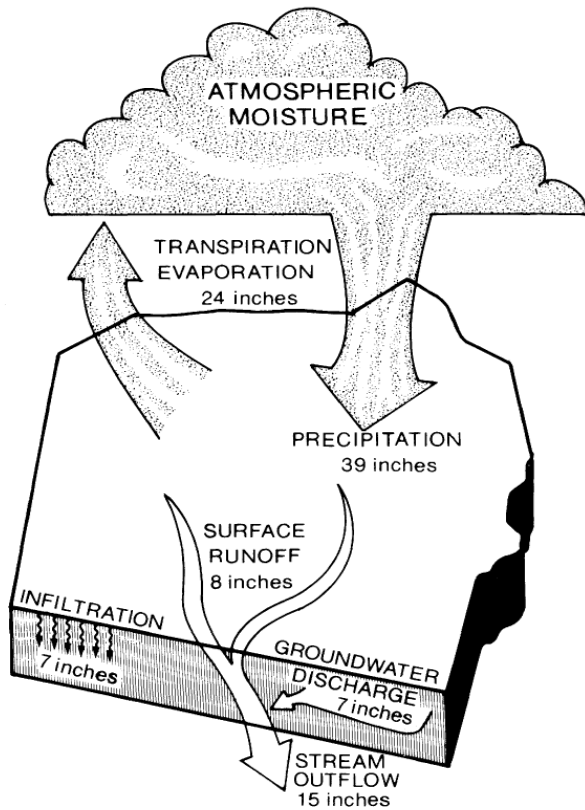
Areas of surface water in Adams County are not very extensive. The two largest areas of surface water are Lake Meade and Lake Heritage. Both of these lakes are man-made and non-potable. Several smaller areas of surface water provide drinking water to adjacent counties.

Floodplains are the areas subject to flooding in heavy storm. Floodplains with vegetative cover are the most suited to absorb stream overflow, resist erosion, and recycle nutrient-rich sediment that may be deposited after a flood. The Pennsylvania Floodplain Management Act (Act 166 of 1978) requires municipalities enact an ordinance which, at a minimum, meets the requirements of the National Flood Insurance Program (NFIP). The Adams County Conservation District performs the responsibilities of floodplain monitoring in Adams County. Floodplain areas in all jurisdictions of Adams County, with the exception of New Oxford Borough, have been mapped by the Federal Emergency Management Agency (FEMA). The most recent floodplain maps were released in February 2009. FEMA depicts flood zones according to varying levels of flood risk.

Wetlands are typically characterized by a high water table, poor drainage, and surface ponding during the year. They are a valuable resource because of the role they play in flood control, water quality, and groundwater recharge. They also support a wide variety of plant and animal species by providing sources of food and refuge. The numerous farm ponds, which dot the landscape, are also considered wetlands according to the National Wetlands Inventory.

Adams County receives an average of 40 inches of rainfall each year, which is fairly evenly distributed throughout the year. Of those 40 inches, only about 7 inches of rainfall infiltrate

the soil to recharge the groundwater supply. The illustration to the left depicts the annual hydrologic cycle for Adams County (Taylor & Royer, 1981: *Summary Groundwater Resources of Adams County, Pennsylvania*).



These features described in this section are mapped on the Water Features and Woodlands Map in Appendix B.

Land Use Evaluation

The basic configuration of land use in Adams County has its roots in the original settlement patterns, with agriculture still the predominant land use activity throughout both the Susquehanna and Potomac River basins. A steadily evolving road network gradually made most of Adams County accessible. Thirteen historic roads converge at Gettysburg, the County seat, located in the Monocacy River watershed. Smaller settlements such as Biglerville and New Oxford developed at significant road crossings within the West Conewago Creek watershed. Mountainous or hilly terrain in the western and northwestern parts of the county serve to discourage large scale development within the headwaters of the Conococheague and Antietam Creek watersheds.

Today, most areas of Adams County are non-urbanized and consist of lands under cultivation, open fields, orchards, woodlands, surface water bodies, and wetlands. Agricultural land, interspersed with small wooded areas, still prevail over much of the county and river basins. Orchards are widespread in the foothills north of Fairfield in the Monocacy River watershed and extend northeast towards Latimore Township in the West Conewago Creek watershed. Extensive woodlands also cover the South Mountain region in the western portion of the County and include Michaux State Forest. The Hanover Shoe

Farms in the southeast portion of the County are another type of specialized agriculture, dedicated to breeding standardbred horses.

Urban land uses are concentrated within and adjoining the boroughs, a few villages, and along major roads. Residential uses predominate, comprising the major land use in the boroughs and villages, as well as along roadways. Within the boroughs, a mix of housing types and densities exist, including single-family detached dwellings, duplexes, rowhomes, and some apartment buildings. Boroughs tend to exhibit a mixed-use character at their hubs, with close intermingling of residential, shopping, and employment facilities.

Since 1990, large-scale (100 units or more) residential developments have emerged on the landscape. These are especially evident in eastern Adams County, adjoining McSherrystown, Littlestown, and New Oxford in the West Conewago Creek and Monocacy River watersheds. A few large-scale mobile home parks have also been developed in rural areas of the County.

Second-home ventures of the 1960s and 1970s (Lake Heritage, Lake Meade, and Charnita) have made a significant impact on the landscape of Adams County. Apart from their flooding of stream valleys to create artificial lakes (in the case of Lake Heritage and Lake Meade), these developments have also evolved into dense agglomerations of housing units, now mostly occupied as year-round permanent residences. The Lake communities still have a few vacant lots remaining, but are almost at capacity. In 1974, more than half of the former Charnita lots were incorporated into Carroll Valley Borough within the Monocacy River watershed. Less than half of the lots located in Carroll Valley have been built upon. An even higher percentage of Charnita lots located outside of Carroll Valley remain vacant.

Commercial activity predominates at the core of major incorporated places, alongside major highways which serve these boroughs, and frequently between built-up areas on US Route 30 and on PA Route 34 north of Gettysburg. During the late 1990s a major “outlet center” was built at the Route 97/15 Interchange and commercial activity along Route 30 within the Monocacy River watershed between Gettysburg and Route 15 greatly intensified. Through the efforts of ACEDC, a business park was developed at Route 30/15 in Straban Township. Approximately 100 acres is devoted to a tourism-related facility known as Gateway Gettysburg. The remainder of the site is under development as a general business park. Currently, the park contains uses such as medical, automobile/motorcycle related businesses, operations centers, and a national manufacturer.

Industrial land uses are found in different parts of the County, such as a small industrial park at Cross Keys and development in Conewago Township’s industrially zoned districts. Three mineral extraction operations occupy significant land areas in either end of the County within the Monocacy River and West Conewago Creek watersheds. Major manufacturing establishments tend to be dispersed. Food processing plants are established in and near the orchards area.

Government and institutional uses exhibit a similar scattered pattern, with a concentration of these uses in Gettysburg within the Monocacy River watershed. Large areas of land are held by the Commonwealth or Federal government in the Gettysburg National Military Park, Michaux State Forest, and State Game Lands.

Adams County's population has increased in recent years. The cost of living in the Baltimore/Washington metropolitan area is one of the highest in the nation, and it is continuing to increase at a time when the federal government is decentralizing many functions. Many of the potential new residents are likely to maintain higher paying jobs in Maryland and commute long distances in exchange for the less expensive, more rural lifestyle offered by Adams County.

Several major new employment centers focusing on research and development, government services, and technology-oriented businesses are planned or under construction in northern Maryland within the Potomac River basin. Build-out of these facilities will place an added burden on Adams County to provide housing and services to a relatively young, skilled workforce. In addition, an aging population will require more non-motorized transportation options and increased opportunities for both active and passive recreation.

In relation to potential future growth of the County, the Adams County Comprehensive Plan (1991) includes a Land Use Plan, illustrating the desired pattern of land use for Adams County. The Land Use Plan featured a "designated growth area" (DGA) concept to provide for the orderly expansion of various types and densities of development in close proximity to existing boroughs and villages, while providing the opportunity to walk or bicycle to various community functions. The Plan also envisioned the conservation and protection of Adams County's agricultural resources and environmentally sensitive areas. A permanent open space system was also provided for, which is related to the conservation of floodplains, stream corridors, steep slopes, and animal habitat areas.

The DGAs, located in areas surrounding boroughs, selected villages, and several crossroads and interchanges, were designated to accommodate most of the County's growth. By designating growth areas, the plan envisioned:

- Maximum protection of agricultural landscapes which sustain the county's agricultural related economy.
- Creation of efficient communities which are less reliant on frequent, long automobile trips than those associated with suburban sprawl.
- Maintaining sustainability and viability of the County's historic boroughs and villages.
- Encouraging new growth and development to locate in areas that could be cost effectively and efficiently served by public services.
- Keeping energy utilization to manageable levels.

Future uses of land and densities are also somewhat dictated by the zoning districts adopted by the municipalities in municipal and county zoning ordinances. Currently, Arendtsville Borough is the only municipality in Adams County without zoning. A Composite Zoning Map was produced to depict categories of zoning throughout the County. Please refer to the individual municipal zoning ordinances for the densities allowed in each district. Refer to Appendix B for the Existing Land Use, Composite Zoning, and Future Land Use Maps.

SECTION IV – WATERSHED CHARACTERISTICS

General Overview

Adams County is divided between two major watersheds - the Potomac River Basin and the Lower Susquehanna River Basin. Both basins are tributary to the Chesapeake Bay. Within the Potomac River basin, there are three sub-basins: Antietam Creek, Conococheague Creek, and Monocacy River. The Lower Susquehanna watershed contains two sub-basins: Conewago Creek (West) and Mountain Creek. Table 3 provides a summary of the land area contain within each watershed. A map of the watersheds is included in Appendix B.

Table 3: Land Area Within Watersheds			
Location	Acreage	Square Miles	% of County
Adams County	333,945	522	100%
<i>Major Watersheds</i>			
Potomac River	162,254	254	49%
Lower Susquehanna River	171,691	268	51%
<i>Sub-Basins</i>			
Conewago Creek (West) (S)	167,838	262	50%
Monocacy River (P)	144,652	226	43%
Conococheague Creek (P)	14,249	22	4%
Mountain Creek (S)	3,853	6	1%
Antietam Creek (P)	3,353	5	1%

Seven townships are split between the Potomac and Susquehanna River Basins. Table 4 lists the municipalities and area within each basin.

Table 4: Municipalities Split by a Major Watershed Basin				
Municipality	Acreage and Percentage within Major Watershed Basin			
	Potomac River		Susquehanna River	
Butler Township	1,582	10%	13,787	90%
Cumberland Township	21,471	>99%	22	<1%
Franklin Township	34,714	79%	9,179	21%
Menallen Township	866	3%	26,599	97%
Mount Pleasant Township	6,436	33%	13,119	67%
Straban Township	11,215	51%	10,895	49%
Union Township	1,845	16%	9,393	84%

The watersheds and the municipalities they encompass, as well as the percentage of each municipality located within the watershed, is listed in Table 5.

Table 5: Sub-Basin Watersheds: Adams County, PA			
Name	Municipality	Acreage of Munic. in each 2nd Order Watershed	% of Munic. within each 2nd Order Watershed
Conewago Creek (West)	Abbottstown Borough	353.5	100%
Conewago Creek (West)	Arendtsville Borough	515.6	100%
Conewago Creek (West)	Bendersville Borough	289.2	100%
Conewago Creek (West)	Berwick Township	4,957.7	100%
Conewago Creek (West)	Biglerville Borough	418.0	100%
Monocacy River	Bonneauville Borough	618.6	100%
Monocacy River	Butler Township	1,777.9	12%
Conewago Creek (West)	Butler Township	13,590.7	88%
Monocacy River	Carroll Valley Borough	3,499.8	100%
Conewago Creek (West)	Conewago Township	6,727.2	100%
Monocacy River	Cumberland Township	21,470.5	>99%
Conewago Creek (West)	Cumberland Township	21.7	<1%
Conewago Creek (West)	East Berlin Borough	461.8	100%
Monocacy River	Fairfield Borough	429.4	100%
Conococheague Creek	Franklin Township	12,402.2	28%
Monocacy River	Franklin Township	22673.3	52%
Conewago Creek (West)	Franklin Township	8,818.0	20%
Monocacy River	Freedom Township	8,996.6	100%
Monocacy River	Germany Township	6,974.4	100%
Monocacy River	Gettysburg Borough	1,064.8	100%
Conewago Creek (West)	Hamilton Township	8,720.1	100%
Antietam Creek	Hamiltonban Township	3,353.0	13%
Conococheague Creek	Hamiltonban Township	1,114.8	5%
Monocacy River	Hamiltonban Township	20,650.6	82%
Monocacy River	Highland Township	7,785.9	100%
Conewago Creek (West)	Huntington Township	16,014.2	100%
Conewago Creek (West)	Latimore Township	13,733.3	100%
Monocacy River	Liberty Township	10,382.8	100%
Monocacy River	Littlestown Borough	963.1	100%
Conewago Creek (West)	McSherrystown Borough	326.0	100%
Conococheague Creek	Menallen Township	732.1	3%
Conewago Creek (West)	Menallen Township	22879.8	83%
Mountain Creek	Menallen Township	3,853.0	14%
Monocacy River	Mount Joy Township	16,800.0	100%

Sub-Basin Watersheds: Adams County, PA			
Name	Municipality	Acreage of Munic. in each 2nd Order Watershed	% of Munic. within each 2nd Order Watershed
Monocacy River	Mount Pleasant Township	6,674.4	34%
Conewago Creek (West)	Mount Pleasant Township	12,880.0	66%
Conewago Creek (West)	New Oxford Borough	396.2	100%
Conewago Creek (West)	Oxford Township	6,219.1	100%
Conewago Creek (West)	Reading Township	17,122.0	100%
Monocacy River	Straban Township	11,610.1	53%
Conewago Creek (West)	Straban Township	10,500.1	47%
Conewago Creek (West)	Tyrone Township	13,798.5	100%
Monocacy River	Union Township	2,279.8	20%
Conewago Creek (West)	Union Township	8,958.0	80%
Conewago Creek (West)	York Springs Borough	137.7	100%

Physical Evaluation of Watersheds

The Conewago Creek (West) Watershed drains 515 mi.² from northern and southeastern Adams towards northeast York County. The watershed encompasses the entire border between Adams and York County. The highest elevation of the watershed is at the northern portion of Adams County at 1,440 ft. This area is part of the Ridge and Valley physiographic province and drains toward the central and eastern Piedmont physiographic province, which is characterized as low, gently rolling hills and shallow streams. The watershed contains deep, well-drained soils formed from materials weathered from igneous and metamorphic rocks suitable for agricultural purposes.

The Monocacy River Watershed drains 744 mi.² and is formed by the confluence of Marsh and Rock Creeks. The highest elevation of the Monocacy River is in the western part of Adams County at the split between the Conococheague Creek and Antietam Creek Watersheds at 400 ft. The southeast corner of the watershed is the next highest elevation. Therefore, the Monocacy drains towards the middle of the county with the lowest elevations at the middle of the Adams County and Maryland border. Soils in the higher elevations range from moderately deep and moderately well-drained, to deep and well-drained with moderate infiltration rates. Additionally, these soils are located in several long strips of land throughout the watershed. The areas in between these soils consist of soils with slower infiltration rates. These slower infiltrating soils makes up approximately 60% of the watershed area.

Portions of the Antietam Creek and Conococheague Creek Watersheds that lie within Adams County have some of the highest elevations within the overall watersheds. Both of these watersheds drain west into Franklin County. Antietam Creek watershed drains 291 mi.², while the Conococheague Creek watershed drains 568 mi.².

Mountain Creek Watershed is part of the mountain chain that contains the higher elevations within the other watersheds. The small portion of this watershed in Adams County drains northeast into Cumberland County. This watershed contains the same deep, well-drained soils that lie within Antietam Creek, Conococheague Creek, and the western portions of the Conewago Creek Watershed. The location of each watershed is depicted in the Watersheds map in Appendix B.

Exceptional Value and High Quality Watersheds

Some Pennsylvania streams receive increased protection against pollution through special protection designation as “high quality” or “exceptional value”. High quality surface waters are those which have a quality exceeding levels necessary to support propagation of fish, shellfish, wildlife, and recreation in and on the water. Exceptional value surface waters are of high quality and satisfy Pennsylvania Code requirements relating to antidegradation. The goals and requirements for water quality in Pennsylvania streams are described in Title 25 Chapter 93 of the Pennsylvania Code.

Special designation watersheds are located in the South Mountain Region of western Adams County. The only Exceptional Value stream in Adams County is Carbaugh Run, located in Franklin Township and a portion of Hamiltonban Township. Subwatersheds of the Monocacy River, Antietam Creek, Conococheague Creek, West Conewago Creek, and Mountain Creek all contain High Quality streams. Their location can be found in the Watersheds map in Appendix B. The water quality of these streams should be maintained and protected, not only from pollution but also thermal impacts of stormwater runoff.

SECTION V – EXISTING PLANS & REGULATIONS

Existing Plans

Adams County Comprehensive Plan (1991)

The County Comprehensive Plan, while adopted in 1991, is still relevant in regard to its approach to Land Use, Growth Management, and Environmental Protection. The Land Use Plan was previously discussed in the Land Use Evaluation of Section III.

The Environmental Protection Component of the Comp Plan recommends that the County, with funding from DEP, should initiate watershed studies with participation from municipalities that focus on potential effects of land development on discharge rates. The studies should include model regulations to assure that developments use the best technology available to minimize stormwater runoff, increase infiltration, minimize discharge of pollutants, and encourage natural filtration functions. Best available technology includes things like retention basins, porous paving, swales, trenches, etc.

The Plan also recommends that municipalities identify stormwater management and control structures that may need repair or replacement, stream segments that may need clearing, bank improvements, and other measures to handle anticipated stormwater flows.

Adams County Water Supply and Wellhead Protection Plan (2001)

The Water Supply Plan recognized several types of regulatory and non-regulatory techniques to assist with the protection of groundwater sources for future consumptive use. One of the techniques included best management practices for stormwater management, including the promotion of pervious surfaces for development.

The Wellhead Protection Plan provides a strategy to protect groundwater quality of public supply wells from potential contaminant threats. Four pilot projects were completed for Abbottstown, Fairfield, Gettysburg, and Littlestown.

Adams County Greenways Plan (2010)

The County Greenways Plan classifies riparian greenways as those which are located along a water course and containing natural vegetation and animal life.

The County Greenways Plan states that riparian greenways provide natural areas for overflow in times of flooding, which may help minimize flood damage. Greenways could be used as a tool by developers to reduce the potential of future flooding.

Greenways can also provide a vegetative buffer between streams and developed areas, which plays a role in the protection of water resources. Greenways, coupled with Best Management Practices, can help control and purify stormwater runoff, reduce soil erosion, conserve water supply, and enhance water quality. Greenways in open spaces can provide recharge areas for groundwater aquifers.

The Plan recommends that conservation riparian greenways be protected as a component of a county stormwater management plan (See Significant Riparian Greenways map in Appendix B).

Conewago Creek River Conservation Plan (2007)

The Conewago Creek River Conservation Plan (RCP) was developed with the intent of providing a long term management strategy for the entire Conewago Creek watershed. The Plan identified issues, concerns, and opportunities and provided recommendations that dealt directly with those issues and concerns. It was envisioned that the Plan would be adopted by the municipalities within the watershed. In Adams County, the Conewago Creek watershed encompasses 50% of the County.

The Conewago Creek RCP recognized that stormwater management was critical to the protection of aquifers, streams, and waterways. However, stormwater was primarily handled on a site specific basis, rather than managed on a regional level. Some of the problems that are created include an increase in energy and quantity of flows after a storm's peak discharge, release of stormwater into conveyances instead of back into the aquifers, and an increased sediment load.

The Plan recommends a potential way of alleviating one of the problems with stormwater is through infiltration. It has been recognized that many Adams County soils do not allow for infiltration of stormwater. However, in those areas of soils that are suitable and appropriate for infiltration, stormwater should be infiltrated to the greatest extent possible using BMPs that maximize infiltration. The Plan further describes several infiltration BMP techniques and recognizes that infiltration should be done in conjunction with a filtration system and not in areas of karst.

Marsh/ Rock Creek Critical Areas Resource Plan (CARP) (In Progress)

A Critical Areas Resource Plan is underway for the Rock Creek and Marsh Creek Watersheds. Pennsylvania deemed this area as having the potential for water demand to exceed supply. This plan is taking a closer look into this issue, as well as water quality, which is also a concern within the watersheds. Recommendations related stormwater management could be implemented, if applicable to the involved municipalities.

Municipal Stormwater Management

The enforcement of stormwater at the municipal level varies between the 34 municipalities in Adams County. Those 17 municipalities within the Monocacy watershed have an adopted ordinance or regulations consistent with the Monocacy River Watershed Stormwater Management Plan. The municipalities were surveyed during the Phase I Scope of Study. Of the 27 municipalities that responded, all but two have an adopted stormwater ordinance. The results of the survey can be found in Appendix E.

Existing State Regulations

Statewide standards for stormwater regulation may be found in *The Pennsylvania Code, Title 25*. Stormwater standards in Pennsylvania meet federal standards and provide a statewide system for the regulation of stormwater. Existing regulations may be found in the following Chapters of *Title 25*.

- 💧 Chapter 92a – National Pollution Discharge Elimination System (NPDES) Permitting, Monitoring, and Compliance
- 💧 Chapter 93 – Water Quality Standards
- 💧 Chapter 96 - Water Quality Standards Implementation
- 💧 Chapter 102 – Erosion and Sediment Control
- 💧 Chapter 105 – Dam Safety and Waterway Management
- 💧 Chapter 106 – Floodplain Management

SECTION VI – PROBLEM AREAS & IMPAIRMENTS

Flood Prone Locations

As part of the municipal survey, municipalities were asked to identify locations that were prone to flooding and the cause of flooding. The results were categorized by the primary cause. Municipalities identified 92 flood-prone locations with roadway or bridge inundation being the most common problem.

Category	# of Occurrences
Roadway/ Bridge Inundation	68
Stormwater Runoff	11
Property Flooding	7
Clogs from Debris	4
Storm Sewer Surcharge	2

Each of the flood-prone locations are listed in Table 7. The Id number in the table corresponds to a mapped location on the Flood Prone Locations map in Appendix B.

Id	Municipality	Location	Problem	Stream Name
1	Bonneauville Boro	Route 116	Storm sewer overflow	Chicken Run
2	Butler Twp	Zeigler Mill/ Russell Tavern Rds	Inundation	W. Branch Conewago Crk
3	Carroll Valley	Blue Spruce Tr	Inundation	Toms Creek
4	Carroll Valley	Fairfield Rd	Property Floods	Toms Creek
5	Conewago Twp	Kindig Ln	Inundation	Trib to S. Branch Conewago
6	Conewago Twp	Race Horse Rd	Inundation	
7	Conewago Twp	Oxford Ave/ Black Ln	Inundation	Trib to S. Branch Conewago
8	Cumberland Twp	Boyd's School - Patriot's Ch.	SW Runoff	
9	Cumberland Twp	Lincoln Estates	SW Runoff	
10	Cumberland Twp	Tiffany Lane	SW Runoff	
11	Cumberland Twp	Water Works Rd	Inundation	Marsh Creek
12	Cumberland Twp	Red Rock Rd	Inundation	Marsh Creek
13	Cumberland Twp	Natural Dam Rd	Inundation	Marsh Creek
14	Cumberland Twp	Mason-Dixon Rd	Inundation	Marsh Creek
15	Cumberland Twp	Horner Rd	Inundation	Marsh Creek
16	Cumberland Twp	Plank Rd	Inundation	Marsh Creek
17	Cumberland Twp	Black Horse Tavern Rd	Inundation	Marsh Creek
18	Cumberland Twp	Black Horse Tavern Rd	Inundation	Marsh Creek
19	Cumberland Twp	Black Horse Tavern Rd	Inundation	Marsh Creek
20	Cumberland Twp	Black Horse Tavern Rd	Inundation	Marsh Creek
21	Cumberland Twp	Black Horse Tavern Rd	Inundation	Willoughby Run
22	Cumberland Twp	Willoughby Run Rd	Inundation	Willoughby Run
23	Cumberland/ Straban	HACC Shopping Center	Property Floods	Rock Creek

Id	Municipality	Location	Problem	Stream Name
24	Franklin Twp	Old Rt 30 to Orrtanna Rd	Inundation	Muskrat Run
25	Hamiltonban Twp	Cold Springs Rd	Inundation	Trib to E. Branch Antietam
26	Hamiltonban Twp	Hickory Bridge Rd	Inundation	Little Marsh Creek
27	Hamiltonban Twp	Cold Springs Rd	Inundation	Trib to Muddy Run
28	Hamiltonban Twp	Cold Springs Rd	Inundation	Trib to Muddy Run
29	Hamiltonban Twp	Carrolls Tract Rd	Inundation	Rattling Run
30	Hamiltonban Twp	Route 116	Inundation	Middle Creek
31	Hamiltonban Twp	Jacks Mountain Rd	Inundation	Miney Branch
32	Hamiltonban Twp	Iron Springs Rd	SW Runoff	
33	Hamiltonban Twp	Iron Springs Rd	Clogs from Debris	Toms Creek
34	Hamiltonban Twp	Wilderness Ln	Inundation	Trib to Middle Creek
35	Hamiltonban Twp	Route 116	Inundation	Toms Creek
36	Hamiltonban Twp	Beechwood Dr/ Route 116	Inundation	
37	Hamiltonban Twp	Polly Farm	Property Floods	Middle Creek
38	Hamiltonban Twp	Across from Mr. Bream	Property Floods	Middle Creek
39	Hamiltonban Twp	Mount Hope Rd	Inundation	
40	Hamiltonban Twp	Bullfrog Rd	Inundation	
41	Hamiltonban Twp	Cold Springs Rd	Inundation	Muddy Run
42	Hamiltonban Twp	Cold Springs Rd	SW Runoff	Trib to Muddy Run
43	Hamiltonban Twp	Cold Springs Rd	SW Runoff	Trib to Muddy Run
44	Hamiltonban Twp	Carrolls Tract Rd	Inundation	Trib to Muddy Run
45	Hamiltonban Twp	Hickory Bridge Rd	Inundation	Little Marsh Creek
46	hamiltonban Twp	Mount Carmel Rd	SW Runoff	
47	Hamiltonban Twp		Clogs from Debris	Trib to E. Branch Antietam
48	Hamiltonban Twp		Clogs from Debris	Trib to E. Branch Antietam
49	Hamiltonban Twp	Sloe Gin Trl	Stormwater Runoff	
50	Highland Twp	Gettysburg Campground	Property Floods	Marsh Creek
51	Highland Twp	Route 116	Inundation	Trib to Marsh Creek
52	Huntington Twp	Willow Ln	Inundation	Trib to Bermudian Creek
53	Littlestown Borough	Baltimore Pike	Inundation	Piney Creek
54	McSherrystown Boro	North St Park/ Walking Tr	Property Floods	Plum Creek
55	Menallen Twp	Celebration Hill Rd	Inundation	Trib to W.B. Conewago Crk
56	Menallen Twp	Boyds Hollow Rd	Inundation	Trib to W.B. Conewago Crk
57	Menallen Twp	Brysonia/ Fairground Rds	Inundation	Pleasant Dale Creek
58	Menallen Twp	Narrows Rd	Inundation	W. Branch Conewago Crk
59	Menallen Twp	Narrows Rd	Inundation	W. Branch Conewago Crk
60	Menallen Twp	Narrows Rd	Inundation	W. Branch Conewago Crk
61	Menallen Twp	Orchard/ Quaker Run Rds	Inundation	Trib to Quaker Run
62	Menallen Twp	Orchard Rd	Inundation	Opossum Creek
63	Menallen Twp	Aspers-Bendersville/Center Mills	Inundation	Opossum Creek
64	Menallen Twp	Creek Rd	Inundation	Opossum Creek
65	Menallen Twp	Back/ Middle/ W. Point Rds	Inundation	Trib to Opossum Creek
66	Mount Joy Twp	Updyke Rd	Inundation	Alloway Creek
67	Mount Joy Twp	Roberts Rd	Inundation	Alloway Creek
68	Mount Joy Twp	Low Dutch Rd	Clogs from Debris	White Run
69	Mt Pleasant Twp	Fleshman Mill Rd	Inundation	S. Branch Conewago Crk
70	Mt. Pleasant Twp	Bridge #56-Stonebridge/ Storm Store Rd	Inundation	Trib to Conewago Creek

Id	Municipality	Location	Problem	Stream Name
71	Mt. Pleasant Twp	Bender Rd	Inundation	S. Branch Conewago Crk
72	Mt. Pleasant Twp	Willow Rd	Inundation	White Run
73	New Oxford Boro	Borough's Center Square	SW Runoff	
74	New Oxford Boro	Bud Ave Subdiv.	Inundation	S. Branch Conewago Crk
75	New Oxford Boro	Borough's Center Square	Inundation	
76	Oxford Twp	Storm Store Rd	Inundation	S. Branch Conewago Crk
77	Oxford Twp	Kohler Mill Rd	Inundation	S. Branch Conewago Crk
78	Oxford Twp	Fish and Game Rd	Inundation	S. Branch Conewago Crk
79	Reading Twp	Staub Rd	Inundation	Conewago Creek
80	Reading Twp	Turkey Pit School Rd	Inundation	Conewago Creek
81	Reading Twp	Fish & Game Rd/ Roland Rd	SW Runoff	Red Run
82	Reading Twp	"Laughman's Bottom"	SW Runoff	
83	Straban Twp	Keller Rd	Inundation	Rock Creek
84	Straban Twp	Riley/ Flickinger Rds	Inundation	Trib to Rock Creek
85	Straban Twp	Goldenville Rd	Inundation	Trib to Rock Creek
86	Straban Twp	New Chester/ Swift Run Rds	Inundation	Swift Run
87	Straban Twp	Zepp/ Clark Rds	Inundation	Beaverdam Creek
88	Straban Twp	Old Harrisburg Rd	Inundation	Trib to Rock Creek
89	Straban Twp	Twin Oaks subdiv.	Storm sewer overflow	
90	Straban Twp	Beaver Run Rd	Inundation	Beaverdam Creek
91	Straban Twp	Pine Tree Rd/ fields	Inundation	Trib to Beaverdam Creek
92	Tyrone Twp	Rupp Rd	SW Runoff	
93	Fairfield Borough	Route 116	Inundation	Spring Run

Correcting the problems at these locations should be further considered in future updates to the stormwater management plan. This Plan provides a framework for the correction of existing problems through the identification of problem locations. The implementation of the Plan should prevent the existing problems from becoming worse. Solutions and corrections could also be looked at on a municipal or state level, especially if an identified problem is located on a roadway scheduled for improvement.

Stream Obstructions

Structures or materials that may impede, retard, or change flood flows are considered stream obstructions. Obstructions typically include bridge crossings, culverts, suspended pipelines, etc. The Monocacy River Stormwater Management Plan (2002) included a list of 86 obstructions on Alloway Creek, Marsh Creek, or Rock Creek (Table 8: Stream Obstructions). The information was collected by field investigations and site visits. The capacity of each obstruction was estimated based upon field measurements and the application of procedures outlined in the Federal Highway Administration publication *Hydraulic Design of Highway Culverts*. The obstructions were compared against peak stream flow rates to produce capacity assessments. At the time, the majority of the obstructions were predominantly sufficient to pass 100-year flood events. It should be noted that accumulation of debris and sediment can reduce capacity and lead to localized flooding. The *Measured Stream Obstructions* map indicating the location of the obstruction may be

found in Appendix B or the Monocacy River SWM Plan. The obstructions table and map are taken directly from the Monocacy River SWM Plan and have not been re-evaluated. Funding constraints prohibited the evaluation of obstructions for the remainder of Adams County.

Table 8: Stream Obstructions

Watershed	Obstruction ID Number	Model Reach Number	Capacity Return Period	Field Notes
Alloway Creek	39	144	Capacity > 100 yr.	Downstream cattle rack needs cleared
Alloway Creek	40	134	Capacity > 100 yr.	Some brush obstructions
Alloway Creek	41	130	Capacity > 100 yr.	
Alloway Creek	42	144	Capacity > 100 yr.	
Alloway Creek	43	58	Capacity > 100 yr.	
Alloway Creek	44	108	Capacity > 100 yr.	
Alloway Creek	45	108	Capacity > 100 yr.	
Alloway Creek	46	34	Capacity > 100 yr.	Slight siltation right opening
Alloway Creek	47	98	Capacity > 100 yr.	Some erosion at wing wall
Alloway Creek	48	98	Capacity > 100 yr.	Riprap replacing wing wall
Alloway Creek	49	78	Capacity > 100 yr.	
Marsh Creek	1	286	Capacity > 100 yr.	Approximately 25% silted
Marsh Creek	2	284	50 yr. <Capacity <100 yr.	Good condition
Marsh Creek	3	288	Capacity > 100 yr.	Good condition
Marsh Creek	4	288	Capacity > 100 yr.	
Marsh Creek	5	289	Capacity > 100 yr.	Good condition
Marsh Creek	6	289	10 yr. < Capacity < 10 yr.	Brush impinging on opening
Marsh Creek	7	289	Capacity > 100 yr.	Some brush and rock obstructions
Marsh Creek	8	94	Capacity > 100 yr.	Slight siltation
Marsh Creek	9	90	Capacity > 100 yr.	Bridge gone
Marsh Creek	10	90	Capacity > 100 yr.	
Marsh Creek	11	174	Capacity > 100 yr.	
Marsh Creek	12	110	Capacity > 100 yr.	Left opening 1/2 silted
Marsh Creek	13	110	Capacity > 100 yr.	Railroad
Marsh Creek	14	103	Capacity > 100 yr.	Metal superstructure
Marsh Creek	15	148	Capacity > 100 yr.	
Marsh Creek	16	144	Capacity > 100 yr.	Slight brush impingement right opening
Marsh Creek	17	420	Capacity > 100 yr.	
Marsh Creek	18	418	Capacity > 100 yr.	3 openings
Marsh Creek	19	307	Capacity > 100 yr.	Road bed is open metal grate
Marsh Creek	20	178	Capacity > 100 yr.	
Marsh Creek	21	334	Capacity > 100 yr.	Some siltation right opening
Marsh Creek	22	437	Capacity > 100 yr.	
Marsh Creek	23	445	Capacity > 100 yr.	Slight siltation left opening
Marsh Creek	24	446	Capacity > 100 yr.	
Marsh Creek	25	448	Capacity > 100 yr.	
Marsh Creek	26	450	Capacity > 100 yr.	Some siltation left opening
Marsh Creek	27	452	Capacity > 100 yr.	
Marsh Creek	28	454	Capacity > 100 yr.	2 concrete pylons, 3 openings
Marsh Creek	29	370	Capacity > 100 yr.	2 round pylons, 3 openings
Marsh Creek	30	370	Capacity > 100 yr.	Covered bridge
Marsh Creek	31	484	Capacity > 100 yr.	Some siltation left opening
Marsh Creek	32	485	Capacity > 100 yr.	
Marsh Creek	33	512	Capacity > 100 yr.	
Marsh Creek	34	552	Capacity > 100 yr.	Slight siltation left and right openings

Watershed	Obstruction ID Number	Model Reach Number	Capacity Return Period	Field Notes
Marsh Creek	35	526	Capacity > 100 yr.	Some siltation left opening
Marsh Creek	36	489	Capacity > 100 yr.	1 concrete pylon
Marsh Creek	37	428	Capacity > 100 yr.	Some siltation right opening
Marsh Creek	38	428	Capacity > 100 yr.	
Rock Creek	50	630	Capacity > 100 yr.	
Rock Creek	51	211	Capacity > 100 yr.	Channelized
Rock Creek	52	211	Capacity > 100 yr.	Channelized starts downstream
Rock Creek	53	211	Capacity > 100 yr.	Channelized
Rock Creek	54	211	Capacity > 100 yr.	8" pipe crossing in opening
Rock Creek	55	211	Capacity > 100 yr.	
Rock Creek	56	211	Capacity > 100 yr.	
Rock Creek	57	211	Capacity > 100 yr.	
Rock Creek	58	211	Capacity > 100 yr.	Channelized
Rock Creek	59	211	Capacity > 100 yr.	Channelized
Rock Creek	60	211	Capacity > 100 yr.	Channelized
Rock Creek	61	211	Capacity > 100 yr.	Shale stream bed
Rock Creek	62	225	Capacity > 100 yr.	Heavily silted with brush
Rock Creek	63	225	Capacity > 100 yr.	Heavily silted with brush
Rock Creek	64	225	Capacity > 100 yr.	
Rock Creek	65	231	Capacity > 100 yr.	
Rock Creek	66	227	Capacity > 100 yr.	Bank erosion and pole obstructions
Rock Creek	67	227	Capacity > 100 yr.	Heavily riprapped upstream side
Rock Creek	68	207	Capacity > 100 yr.	
Rock Creek	69	205	Capacity > 100 yr.	
Rock Creek	70	177	Capacity > 100 yr.	
Rock Creek	71	18	Capacity > 100 yr.	Some sedimentation right bank
Rock Creek	72	63	Capacity > 100 yr.	Some sedimentation left bank
Rock Creek	73	262	Capacity > 100 yr.	Some sedimentation right bank
Rock Creek	74	414	Capacity > 100 yr.	
Rock Creek	75	458	Capacity > 100 yr.	Cattle guard obstruction some sed.
Rock Creek	76	410	Capacity > 100 yr.	
Rock Creek	77	494	Capacity > 100 yr.	
Rock Creek	78	416	Capacity > 100 yr.	
Rock Creek	79	504	Capacity > 100 yr.	Some sedimentation right bank
Rock Creek	80	274	Capacity > 100 yr.	
Rock Creek	81	616	Capacity > 100 yr.	Some sedimentation middle of creek
Rock Creek	82	572	Capacity > 100 yr.	Some sedimentation left side
Rock Creek	83	554	Capacity > 100 yr.	
Rock Creek	84	619	Capacity > 100 yr.	Some siltation left opening
Rock Creek	85	619	Capacity > 100 yr.	
Rock Creek	86	619	Capacity > 100 yr.	Bank erosion evident

Impaired Streams

Pennsylvania DEP is involved in an ongoing program to assess the quality of Pennsylvania's waters as required by the Federal Clean Water Act (1972). DEP identifies those stream segments that are not attaining any of the four designated uses as "impaired". The four uses

include: aquatic life, water supply, fish consumption, and recreation. DEP uses an integrated format for the Clean Water Act Section 305(b) Reporting and 303(d) Listing.

In Adams County, the impaired streams do not support aquatic life, which pertains to maintaining flora and fauna indigenous to aquatic habitats. According to the 2010 Pennsylvania Integrated Water Quality Monitoring and Assessment Report (DEP), approximately 22% of the 1,281 stream miles within the County are classified as impaired. The primary cause of impairment is siltation. The Impaired Streams of Adams County are mapped in Appendix B and the Source/ Cause of impairment is listed in Appendix D.

TMDL

Impaired waters require the development of a Total Maximum Daily Load (TMDL). The amount of pollutant loading that a water body can assimilate and still meet water quality standards is the TMDL. A TMDL is developed for the source and cause of impairment (see Source/ Cause of Impaired Streams in Appendix D).

The first TMDLs in Adams County were approved for the Beaverdam Creek Watershed in Straban Township and the Plum Run Watershed in Tyrone and Reading Townships.

The installation of riparian forest buffers could improve the health of the impaired streams in Adams County by filtering and trapping excess nutrients, sediment, and pollution. Soil conditions, buffer width, and the route and rate of surface and groundwater movement through the buffer all play a role in the effectiveness of buffers as nutrient and sediment filters.

A TMDL was also developed for the Chesapeake Bay by the US Environmental Protection Agency. As part of the implementation of this TMDL, states within the Chesapeake Bay watershed were required to prepare Watershed Implementation Plans (WIP). Pennsylvania DEP prepared the final Phase I WIP for Pennsylvania in January of 2011. The WIP incorporated current DEP stormwater standards as part of the implementation of the Plan. The volume control and water quality requirements will sustain stream base flows and prevent increases in peak runoff rates for larger events (2-year through 100 year storms), which will protect water quality and reduce sediment reaching the Bay. At the time of Plan adoption, Pennsylvania was in the process of developing a Phase II WIP. Adams County is still unsure of the impact of the Chesapeake Bay TMDL, however integrating additional water quality improvements now may make the transition easier in the future if requirements become more stringent.

SECTION VII – MODEL ORDINANCE PROVISIONS

Technical Standards

The current criteria and standards used will be applied to all areas of Adams County. Previous stormwater management standards adopted to be consistent with the Monocacy Plan will be superseded by this Plan. The current standards have been developed to comply with the requirements of the Pennsylvania Storm Water Management Act and are consistent with DEP's *Pennsylvania Stormwater Best Management Practices Manual*. The use of structural and non-structural Best Management Practices (BMPS) in Regulated Activities throughout Adams County will help prevent and reduce flooding, maintain and improve water quality, maintain groundwater recharge, reduce erosion. Additional guidance on the selection and design of BMPs and stormwater methodologies are located in the Pennsylvania Stormwater Best Management Practice Manual. For the purposes of this Plan, Regulated Activities will include any earth disturbance activity or activity that involves the alteration or development of land in a manner that may affect stormwater runoff.

Regulated Activities must incorporate measures to meet these requirements:

- 💧 Protect public health, safety, and property.
- 💧 Minimize the creation of impervious surfaces and where practical, direct
- 💧 Maintain, to the highest extent possible, the hydrologic regime.
- 💧 Minimize water quality impacts.
- 💧 Protect stream and stream banks from erosion and sedimentation.

A model Stormwater Management Ordinance has been included in Appendix A as a guide for municipalities to implement the following technical standards. The model Ordinance is a recommended format. Municipalities may make changes and, in certain sections, consultation with the municipal solicitor is encouraged so that the municipality incorporates procedures they are most comfortable with.

Volume Control

An increase in the volume of stormwater runoff is a product of development. Volume control guidelines are focused on providing protection to stream channels, water quality, and groundwater recharge from the frequent rainfalls that comprise the majority of runoff events. Low impact development practices provided in the BMP Manual shall be used for all Regulated Activities.

Volume controls will be met using the following guidelines:

Design Storm Method (Control Guideline 1, CG-1 in BMP Manual: This method is applicable to a Regulated Activity of any size and requires detailed modeling.

- Regulated Activities do not increase the total runoff volume from the 2-year/ 24 hour event.
- For modeling purposes, CG-1 assumes that existing non-forested pervious areas must be considered meadow (good condition). CG-1 also assumes that twenty percent (20%) of existing impervious area, when present, shall be considered meadow (good condition).

Simplified Method (Control Guideline 2, CG-2 in BMP Manual): This method is independent of site conditions and is used if CG-1 is not followed. CG-2 is **not** applicable to Regulated Activities greater than one (1) acre or for projects that require the design of stormwater storage facilities.

- CG-2 sizes stormwater facilities to capture at least the first two (2) inches of runoff from new impervious surfaces.
- Of the two inches captured, at least the first one (1) inch of stormwater runoff shall be permanently removed from the runoff flow and not discharged into surface waters of the Commonwealth. Removal options include reuse, evaporation, transpiration, and infiltration. If infiltration facilities are used, they should be designed to accommodate as much infiltration as the site will allow. If the soils within the project area do not allow infiltration, other forms of runoff volume control will be necessary to achieve the required capture and removal volumes, such as a vegetated roof or bioretention combined with a capture-and-reuse system or the Infiltration Alternative may be used.

Infiltration Alternative: In cases where it is not possible, or desirable, to accomplish volume control requirements using infiltration BMPs, the following water quality control shall be met.

- Post-development water quality pollutant load reductions will be required for all disturbed areas within the proposed project:

Table 9: Infiltration Alternative Pollutant Removal Efficiencies		
Pollutant Load	Units	Required Removal Efficiency (%)
Total Suspended Solids (TSS)	Pounds	85 %
Total Phosphorus (TP)	Pounds	85 %
Total Nitrate (NO ₃)	Pounds	50 %

- Design guidance from the most current version of the PA Stormwater Best Management Practices Manual is recommended when determining criteria for water quality BMPs.

Peak Rate Control

Peak rate control, for storms up to the 100-year event, is essential to protect against immediate downstream erosion and flooding. Most designs achieve peak rate control through the use of detention structures. Peak rate control may also be integrated into volume control BMPs in ways that eliminate the need for additional peak rate control detention systems. Non-structural BMPs can also contribute to rate control.

- 💧 Post-development discharge rates shall not exceed the pre-development discharge rates for the 1-year through 100-year, 24 hour storms. 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 the 1-year through 100-year, 24 hour storms, then requirements of this section have been met. Otherwise, the applicant shall provide additional controls as necessary to satisfy the peak rate of discharge requirement.
- 💧 For computation of pre-development peak discharge rates, twenty percent (20%) of existing impervious areas, when present, shall be considered meadow.

Water Quality

Water quality control is achieved through the use of various Best Management Practices. BMPs which provide water quality benefits should be placed as close as practical to the discharge point of the impervious surface. It is recommended that as many water quality BMPs as possible are used in Special Protection watersheds and properties which drain to impaired streams.

Adams County recognizes the importance and benefits of riparian buffers and stresses the use of buffers as a BMP whenever possible. All regulated activities should be planned to minimize any impacts to existing riparian corridors. The County supports the retention, expansion, and establishment of riparian forest buffers, especially along Exceptional Value, High Quality, and impaired streams.

Special Management Areas

Certain land use types, considered “Special Management Areas” in the BMP Manual, are places where land disturbance can alter the original natural environment. These areas include brownfields, highways and roads, karst areas, mined lands, water supply well areas, surface water supplies, and Special protection Waters. Chapter 7 of the BMP Manual describes the Special Management Areas in more detail and provides recommendations and suggestions of appropriate BMPs to be used within those areas. Responsibly dealing with stormwater management in three Special Management Areas in particular is a priority for Adams County.

Karst Areas

Karst areas are a concern to several municipalities in Adams County. When addressing stormwater management issues, the complexities of a karst system demand a more rigorous scrutiny than other geologic settings. Successful stormwater management in karst areas can be achieved by developing a strategy for the site that will be best suited to function within the tolerance limits of the natural system. The pre-development hydrologic regime should be maintained and every effort made to use the existing karst drainage features in a safe way. The Basic Principles in Chapter 7 of the BMP Manual must be considered in karst areas. BMP considerations are also listed in Chapter 7.

Water Supply Wells

Considering almost all of Adams County's public water supplies are from ground water sources, it would seem that infiltration in those areas contributing to the recharge of those wells would be logical. However, the BMP Manual recommends against infiltration BMPs within Zone 1 and caution in Zone II wellhead protection areas. This does not seem consistent with other policy and sources. It is recommended that, if located within an appropriate geologic setting, infiltration BMPs, coupled with water quality BMPs, are used in wellhead protection areas and those areas contributing to the recharge of groundwater.

To date, not many wellhead delineations have been preformed. Four pilot projects, delineating the wellhead protection zones of the wells for Abbottstown, Littlestown, Fairfield, and Gettysburg were completed for the Water Supply and Wellhead Protection Plan. Other municipal water suppliers could delineate wellhead protection areas and utilize infiltration BMPs to enhance the contribution to groundwater recharge.

Special Protection Waters

Adams County has several streams that have been designated Exceptional Value or High Quality. These designations should be sustained. Stormwater resulting from projects should be infiltrated to the maximum extent possible and water quality treatment BMPs should be employed for all discharged stormwater. BMPs should be spread out to a number of locations around the site.

Antidegradation requirements for special protection waters will be met if post-construction stormwater infiltration volume equals the pre-construction stormwater infiltration volume, and that any post-construction stormwater discharge is pre-treated and managed so that it will not degrade the physical, chemical, or biological characteristics of the receiving stream.

The Simplified Approach (SA)

One of the objectives of the Adams County Stormwater Management Plan, was to address concerns from residents regarding the costs associated with the preparation of stormwater management plans for smaller projects, like an addition to a home or the placement of a shed on a property. In many cases, the engineering and related approvals associated with stormwater management plans exceeded the actual cost of the minor projects. The Simplified Approach was developed to save applicants time and money.

The Simplified Approach (Appendix C) includes the Stormwater Management Design Assistance Manual, Municipal Stormwater Management Worksheets, and Guide to Choosing Stormwater BMPs. Together, these documents guide applicants and municipalities through a more stream-lined and straightforward process for smaller projects. The Simplified Approach is applicable to many, but not all, residential and accessory structure projects proposing up to 10,000 square feet of impervious area. It is recommended that the Municipal Stormwater Management Worksheets are used to determine if a project is exempt or clarify what is required from the applicant. The Simplified Approach also allows for the preparation of a scaled-down, minor stormwater site plan for certain projects. This allows the applicant the option of choosing BMPs to fit their site and budget. It is recommended that all municipalities utilize the Simplified Approach and the Municipal Stormwater Management Worksheets for consistency throughout the County.

Type of Stormwater Management Plan Required:

Based upon the model ordinance in Appendix A and utilization of the Simplified Approach in Appendix C, Adams County recommends the following in regard to the type of stormwater management plan prepared. Completion of the Municipal Stormwater Management Worksheets (part of the Simplified Approach in Appendix C) will assist the municipality and applicant in determining the project requirements.

Table 10: Type of Stormwater Management Plan Required			
SMP Plan Requirement	Impervious Area	Disturbed Area	Next Steps
Exempt	Up to 1,000 ft ²	Less than 1 acre	File Municipal Stormwater Management Worksheet with municipality*
May be Exempt	1,000 to ≤ 10,000 ft ² , if entirely disconnected from impervious areas	Less than 1 acre	File Municipal Stormwater Management Worksheets with municipality*
Minor Stormwater Site Plan	1,000 ft ² to ≤ 5,000 ft ² IF connected to impervious areas	Less than 1 acre	Prepare a minor stormwater site plan, see SA
Formal Stormwater Management Plan	Greater than 5,000 ft ²	Greater than 1 acre	Consult an Qualified Person

* It is highly recommended that municipalities use the Stormwater Management Worksheets, but it is not required.

Recommended Municipal SWM Plan Review and Approval Process

Each municipality may include language in the stormwater management ordinance based on their preferred method of reviewing formal stormwater management plans. The

recommended municipal review process for formal stormwater management plans includes the following components.

- **Intake:** Upon receipt, the municipal official accepting the SWM Site Plan forwards a copy of the Plan to the municipal engineer and Adams County Conservation District. The official accepting the SWM Site Plan will also include the application on the agenda for the next available Planning Commission meeting.

For projects requiring a General NPDES Permit for the discharge of stormwater from a construction activity, the applicant shall provide municipal engineer and Conservation District with complete NPDES permit package submission as per DEP requirements. Upon the Conservation District's completion and approval of the administrative permit review, the Conservation District shall provide in writing to applicant and municipal engineer, a cover letter of said approval. The approval letter will also inform the applicant as to the remaining process in obtaining the right to use the General NPDES permit.

- **Municipal Engineer Review:** The municipal engineer reviews the SWM Site Plan for compliance with the requirements of the Stormwater Management Ordinance and communicates the review to the municipal Planning Commission and Governing Body.

For projects requiring an NPDES permit, the municipal engineer will conduct a technical review of the SWM. They may choose to utilize the optional Technical Review Checklist included in the Appendix C of the Model Stormwater Management Ordinance and forward the checklist to the Adams County Conservation District. Once the municipality has completed its technical review, the municipality will notify the Conservation District and recommend that the Conservation District proceed with the General NPDES permit process. When both the erosion and sediment control review is completed by the Conservation District and the technical review is completed by the municipality, the District will acknowledge the use of the General NPDES permit.

- **Planning Commission Review:** The municipal Planning Commission reviews the application with the municipal engineer's review and provides a recommendation regarding the SWM Site Plan in writing to the Governing Body.

- **Governing Body Decision:** The Governing Body considers the SWM Site Plan, the municipal engineer's review, and the Planning Commission's recommendation at its next available meeting. Following review of this

information, the Governing Body approves, approves with conditions, or disapproves the SWM Site Plan.

For projects requiring a General NPDES permit, the municipality may conditionally approve a project if the Conservation District has not yet acknowledged the use of the General Permit.

- **Decision Notification Procedure:** In all cases, the decision of the Governing Body to approve, approve with conditions, or disapprove the SWM Site Plan will be in writing. The decision will be delivered to the applicant no later than fifteen (15) days following the decision. If the SWM Site Plan is disapproved, the written decision by the Governing Body shall specify the defects in the application, describe the requirements which were not met, and shall cite the provisions of the Ordinance relied upon. If the SWM Site Plan is approved with conditions, the notification to the applicant shall state the acceptable conditions for approval and the time limit for satisfying conditions.

SECTION VIII – BEST MANAGEMENT PRACTICES

The *Pennsylvania Stormwater Best Practices Manual* provides guidance for stormwater management planning through the use of design standards and planning concepts known as best management practices (BMPs) to control the volume, rate, and water quality of stormwater runoff. The Manual describes an approach to stormwater management that strives to prevent or minimize stormwater problems through comprehensive planning and site development techniques and mitigate any remaining potential problems by employing structural and non-structural BMPs.

Non-Structural Best Management Practices

The emphasis on the integration of site design and planning techniques that preserve natural systems and hydrologic functions is known as Non-Structural Best Management Practices. Non-Structural BMPs maintain the natural functioning landscape, encouraging the treatment, infiltration, and transpiration of precipitation close to where it falls. Through a variety of practices that preserve open space and incorporate existing natural features, non-structural BMPs not only have the ability mitigate impacts related to stormwater but also prevent generation of stormwater.

Extensive site clearing and grading, which result in the destruction of existing vegetation and soil compaction, are typical to conventional land development. The incorporation of Non-Structural BMPs may reduce costs associated with land clearing, grading, and infrastructure while creating desirable, marketable communities.

The PA BMP Manual identifies and provides details in several areas of preventive Non-Structural BMPs. These areas include: Protect sensitive and special value features, cluster and concentrate, minimize disturbance and minimize maintenance, reduce impervious cover, disconnect/ distribute/ decentralize, and source control. Non-Structural BMPs should be the primary consideration when developing a site.

Structural Best Management Practices

Structural BMPs usually bring to mind the often used stormwater management tool, the detention basin. Structural BMPs can also be based on natural features and functions, like vegetation and infiltration, but are more specific to a certain location and explicit in their form. They are referred to as “structural” because they may need to be constructed or engineered.

The BMP Manual describes twenty-one (21) structural BMPs, which are grouped according to their primary stormwater function: Volume/ peak rate reduction by infiltration, volume/ peak rate reduction, Runoff quality, restoration, and other BMPs. There are also two Protocols that have been specifically developed to use with all infiltration BMPs.

Simplified Approach Guide to Choosing BMPS

For those projects that are able to use the Simplified Approach and are required to incorporate best management practices into their site, a guide to choosing BMPs is part of the Simplified Approach in Appendix C. This guide provides details on installing several types of BMPs that are easier for homeowners to install on their own, however any type of BMP may be used if it achieves the required control of stormwater runoff.

SECTION VIII - RECOMMENDATIONS

- 💧 Municipalities are encouraged to update Subdivision and Land Development Ordinances and Zoning Ordinances to be consistent with the adopted stormwater management ordinance. Municipalities, especially those that have opted-in to the Uniform Construction Code, should also be aware of the Pennsylvania Environmental Council document *Impact of Conflicting Codes on Stormwater Management* (Appendix G).
- 💧 Municipalities should consider revising Ordinances to incorporate non-structural best management practice planning techniques as requirements for new subdivisions or land developments. These techniques include, but are not limited to: reducing residential street widths, minimizing the number and imperviousness of cul-de-sacs, curb excess parking space requirements, reducing overall imperviousness of parking lots, etc. as recommended in the Monocacy River Stormwater Management Plan or further described in Chapter 5 of the BMP Manual.
- 💧 Municipal public water suppliers should delineate recharge areas and wellhead protection zones and are encouraged to complete a wellhead protection plan.
- 💧 Utilize infiltration BMPs in areas where soils are suitable for infiltration. Especially in groundwater recharge areas which contribute to public drinking water supplies. If infiltration BMPs are used in areas of groundwater recharge to public water supplies, water quality BMPs should also be used.
- 💧 Promote the establishment and maintenance of riparian forest buffers to satisfy stormwater management requirements, especially along Exceptional Value, High Quality, and impaired streams.
- 💧 Where appropriate, protect natural habitats along proposed riparian greenways, as depicted in the Adams County Greenways Plan (2010) and Significant Riparian Greenways map (Appendix B).
- 💧 Identify areas and opportunities for county and municipal governments to address existing stormwater management problems through retrofitting.
- 💧 If existing flood-prone locations are within areas of roadway that are scheduled for improvement, the existing problems should be evaluated to determine if they can be corrected during the time of road work.
- 💧 Current state law requires the identification of existing stormwater problems but does not include guidance or funding to solve the existing problems or alleviate recurrences. The existing flood-prone locations should be prioritized and a strategy developed to correct existing problems if funding becomes available.

SECTION IX - IMPLEMENTATION & UPDATE PROCEDURE

County Adoption

The Adams County Stormwater Management Plan preparation process is complete with the adoption of the Plan by the Adams County Commissioners. The Adams County Commissioners held a public hearing, pursuant to public notice of not less than 2 weeks, on November 2, 2011. The Plan was adopted by resolution carried by an affirmative vote of the majority of the County Commissioners on November 23, 2011.

DEP Approval of the Plan

Once adopted, the Plan is submitted to the PA Department of Environmental Protection (DEP) for approval. DEP will have ninety (90) days to approve or disapprove the Plan.

Plan Implementation - Municipal Ordinance Adoption

Subsequent to DEP approval of the Adams County Stormwater Management Plan, initial implementation is the responsibility of the municipalities. Adams County municipalities will have six (6) months from the date of DEP approval to adopt the necessary ordinance provisions consistent with the Plan.

The Adams County Conservation District will host two workshops geared toward the use of the model ordinance and the Simplified Approach to assist the municipalities administer the ordinance.

Plan Implementation – Plan Recommendations

Further implementation of the Plan, through the execution of the Recommendations described in Section VIII, may come about through the actions and assistance of Adams County, County organizations, or municipalities, at the discretion of the County or municipality.

Update of the Plan

Section 5(a) of Act 167 states that a stormwater management plan shall be periodically reviewed and revised “at least every five years”. If no significant problems associated with the adopted model ordinance are identified and considerable changes to state legislature have not been made within 5 years, Adams County will re-evaluate the Adams County Stormwater Management Plan and re-activate the SPAC.

SECTION X - REFERENCES

The following references were cited throughout the Adams County Stormwater Management Plan. These documents and publications provide additional sources of valuable information.

- 💧 Pennsylvania Department of Environmental Protection, December 2006: Pennsylvania Stormwater Best Management Practices Manual, Document #363-0300-002.
www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305
- 💧 Adams County Office of Planning & Development, September 2002: Monocacy River Watershed Stormwater Management Plan.
<http://adamscounty.us/MunicipalitiesPlansOrdinances/AdamsCounty.aspx>
- 💧 Adams County Office of Planning & Development, 1991: Adams County Comprehensive Plan.
<http://adamscounty.us/MunicipalitiesPlansOrdinances/AdamsCounty.aspx>
- 💧 Adams County Office of Planning & Development, 2001: Water Supply and Wellhead Protection Plan.
<http://adamscounty.us/MunicipalitiesPlansOrdinances/AdamsCounty.aspx>
- 💧 Adams County Office of Planning & Development, 2010: Adams County Greenways Plan.
<http://adamscounty.us/MunicipalitiesPlansOrdinances/AdamsCounty.aspx>
- 💧 Commonwealth of Pennsylvania, November 2010: Title 25, Chapter 102. Erosion and Sediment Control. <http://www.pacode.com/secure/data/025/chapter102/chap102toc.html>
- 💧 Commonwealth of Pennsylvania, August 2006: Title 25, Chapter 93. Water Quality Standards. <http://www.pacode.com/secure/data/025/chapter93/chap93toc.html>
- 💧 Pennsylvania Department of Environmental Protection, November 2010: Riparian Forest Buffer Guidance, Document #394-5600-001.
www.elibrary.dep.state.pa.us/dsweb/Get/Document-82308/394-5600-001.pdf
- 💧 Pennsylvania Department of Environmental Protection, 2010: 2010 Pennsylvania Integrated Water Quality Monitoring and Assessment Report, Clean Water Act Section 305(b) and 303(d) List.
<http://www.depweb.state.pa.us>, keyword “Water Quality List”
- 💧 Pennsylvania Department of Environmental Protection, January 11, 2011: Pennsylvania Chesapeake Watershed Implementation Plan.
- 💧 U.S. Department of Transportation, Federal Highway Administration, September 2001, rev. May 2005: Hydraulic Design of Highway Culverts, Publication No. FHWA-NHI-01-020. <http://isddc.dot.gov/OLPFiles/FHWA/012545.pdf>
- 💧 Pennsylvania Environmental Council, 2007: Conewago Creek River Conservation Plan.
<http://www.pecpa.org/conewago>

**ADAMS COUNTY
STORMWATER MANAGEMENT PLAN**

ADOPTED at a regular meeting of the

ADAMS COUNTY BOARD OF COMMISSIONERS

On this 23rd day of November, 2011.

George A. Weikert

George Weikert (Name)

Chairman (Title)

R. Glenn Snyder

R. Glenn Snyder (Name)

Vice-chairman (Title)

Lisa Moreno-Woodward

Lisa Moreno-Woodward (Name)

Commissioner (Title)

ATTEST:

Paula V. Neiman

Paula Neiman, Chief Clerk

