LYCOMING CREEK
ACT 167 STORMWATER MANAGEMENT PLAN

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SECTION I – INTRODUCTION

The water that runs off the land into surface waters during and immediately following a rainfall event is referred to as stormwater. In a watershed undergoing urban expansion, the volume of stormwater resulting from a particular rainfall event increases because of the reduction in pervious land area (i.e., natural land being covered by pavement, concrete, or buildings). That is, the alteration of natural land cover and land contours to residential, commercial, industrial and even crop land uses results in decreased infiltration of rainfall and an increased rate and volume of runoff.

As development has increased, so has the problem of dealing with the increased quantity of stormwater runoff. Failure to properly manage this runoff has resulted in greater flooding, stream channel erosion and siltation, as well as reduced groundwater recharge. This process occurs every time the land development process causes changes in land surface conditions.

History has shown that individual land development projects are often viewed as separate incidents, and not necessarily a part of "a bigger picture". This has also been the case when the individual land development projects are scattered throughout a watershed (and in many different municipalities). However, it is now being observed and verified that this cumulative nature of individual land surface changes dramatically affects flooding conditions. This cumulative effect of development in some areas has resulted in flooding of both small and large streams with property damages running into the millions of dollars and even causing loss of life. Therefore, *given the distributed and cumulative nature of the land alteration process, a comprehensive (i.e., watershed-level) approach must be taken if a reasonable and practical management and implementation approach and/or strategy is to be successful.*

The following relevant documents have been prepared and will provide a valuable source of information for the Plan:

- Lycoming County Stormwater Management Plan (Gannett Fleming Corddry and Carpenter, Inc., 1973)
- Pilot Hydrologic Study for the Lycoming Creek Watershed (Associated American Engineers, Inc., June 1982)
- Pilot Hydrologic Study for the Lycoming Creek Watershed: Selection and Calibration of a Rainfall-Runoff Model and Method (Associated American Engineers, Inc., June 1982)
- Act 167 Stormwater Management Plan for Grafius Run, McClures Run, and Miller's Run, September 1999.

SECTION II – ACT 167 WATERSHED LEVEL STORMWATER MANAGEMENT PLANNING AND IMPLEMENTATION

Recognizing the need to deal with the serious and growing problem of extensive damage from uncontrolled stormwater runoff, the Pennsylvania General Assembly enacted Act 167. The statement of legislative findings at the beginning of the Pennsylvania Stormwater Management Act (Act 167) sums up the critical

interrelationship among development, accelerated runoff, and floodplain management. Specifically, this statement points out that:

A. Inadequate management of accelerated runoff of stormwater resulting from development throughout a watershed increases flood flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undermines floodplain management and flood control efforts in downstream communities, reduces groundwater recharge, and threatens public health and safety.

B. 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 the environment.

In recent years, stormwater management had been oriented primarily toward addressing the increase in peak runoff rates discharging from individual development sites to protect property immediately downstream. Minimal attention has been given to the effects on locations further downstream (frequently because they were located in another municipality) or to designing stormwater control within the context of the entire watershed. Management of stormwater has typically been regulated on a municipal level with little or no consistency among adjoining municipalities in the same watershed concerning the types or degree of control to be practiced. Since many municipalities do not have stormwater management ordinances or controls, the impacts from stormwater runoff will only get worse.

Act 167 changed this approach by instituting a comprehensive program of stormwater planning and management – on a watershed level. The Act requires Pennsylvania counties to prepare and adopt stormwater management plans for each watershed located in the county, as designated by the Pennsylvania Department of Environmental Protection (DEP). Most importantly, these plans are to be prepared in consultation with municipalities located in the watershed, working through a Watershed Plan Advisory Committee (WPAC). See Appendix B for a list of WPAC members. The plans are to provide for uniform technical standards and criteria throughout a watershed for the management of stormwater runoff from new land development sites.

The types and degree of controls that are prescribed in the watershed plan need to be based on the expected development pattern and hydrologic characteristics of each individual watershed. The management plan, specifically the standards and criteria, are to be developed from the technical evaluations performed in the planning process, in order to respond to the “cause and effect” nature of existing and potential storm runoff impacts in the watershed. The final product of the Act 167 watershed planning process is to be a comprehensive and practical implementation plan, developed with a firm sensitivity to the overall needs (e.g., financial, legal, political, technical, etc.) of the municipalities in the watershed.

According to the Act, each storm water plan shall include, but is not limited to:

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 of the Plan);
2. A survey of existing significant obstructions and their capacities (refer to Section III of the Plan);
3. An assessment of projected and alternative land development patterns in the watershed, and the potential impact of runoff quantity, velocity and quality (refer to Section III of the Plan);
4. An analysis of present and projected land development in flood hazard areas, and its sensitivity to damages from future flooding or increased runoff (refer to Section III of the Plan);
5. A survey of existing drainage problems and proposed solutions (refer to Section III of the Plan);
6. A review of existing and proposed storm water collection systems and their impacts (refer to Section III of the Plan);
7. An assessment of alternative runoff control techniques and their efficiency in the particular watershed (refer to Section IV of the Plan);
8. An identification of existing and proposed State, Federal and local flood control projects located in the watershed and their design capacities (refer to Section III of the Plan);
9. A designation of those areas to be served by storm water collection and control facilities within a ten-year period, an estimate of the design capacity and costs of such facilities, a schedule and proposed methods of financing the development, construction and operation of such facilities, and an identification of the existing or proposed institutional arrangements to implement and operate the facilities (refer to Section IV of the Plan);
10. An identification of flood plains within the watershed (refer to Section IV of the Plan);
11. Criteria and standards for the control of storm water runoff from existing and new development which are necessary to minimize dangers to property and life and carry out the purposes of this act (refer to Section IV of the Plan);
12. Priorities for implementation of action within each plan (refer to Section VII of the Plan); and
13. Provisions for periodically reviewing, revising and updating the plan (refer to Section VIII of the Plan).

The Act also states that each watershed storm water plan shall:

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 Attachment A - Model Ordinance); and
2. Consider and be consistent with other existing municipal, county, regional and State environmental and land use plans (refer to Section V).

SECTION III – LYCOMING CREEK WATERSHED CHARACTERISTICS

3.1 Present Land Use

The Lycoming Creek Watershed, as illustrated in Figure 1 on page 4, is located in central Lycoming County, Western Sullivan County, and Southern Tioga County.

The Lycoming Creek Watershed is contained within sixteen (16) municipalities in Lycoming, Tioga, and Sullivan Counties as follows:

Lycoming County
City of Williamsport
Loyalsock Township
Old Lycoming Township
Lycoming Township
Hepburn Township
Eldred Township
Cogan House Township
Lewis Township
Gamble Township
Jackson Township
McIntyre Township
McNett Township
Cascade Township

Sullivan County
Fox Township

Tioga County
Liberty Township
Union Township

Lycoming Creek drains a watershed area of approximately 272 square miles. Major tributaries to Lycoming Creek include:

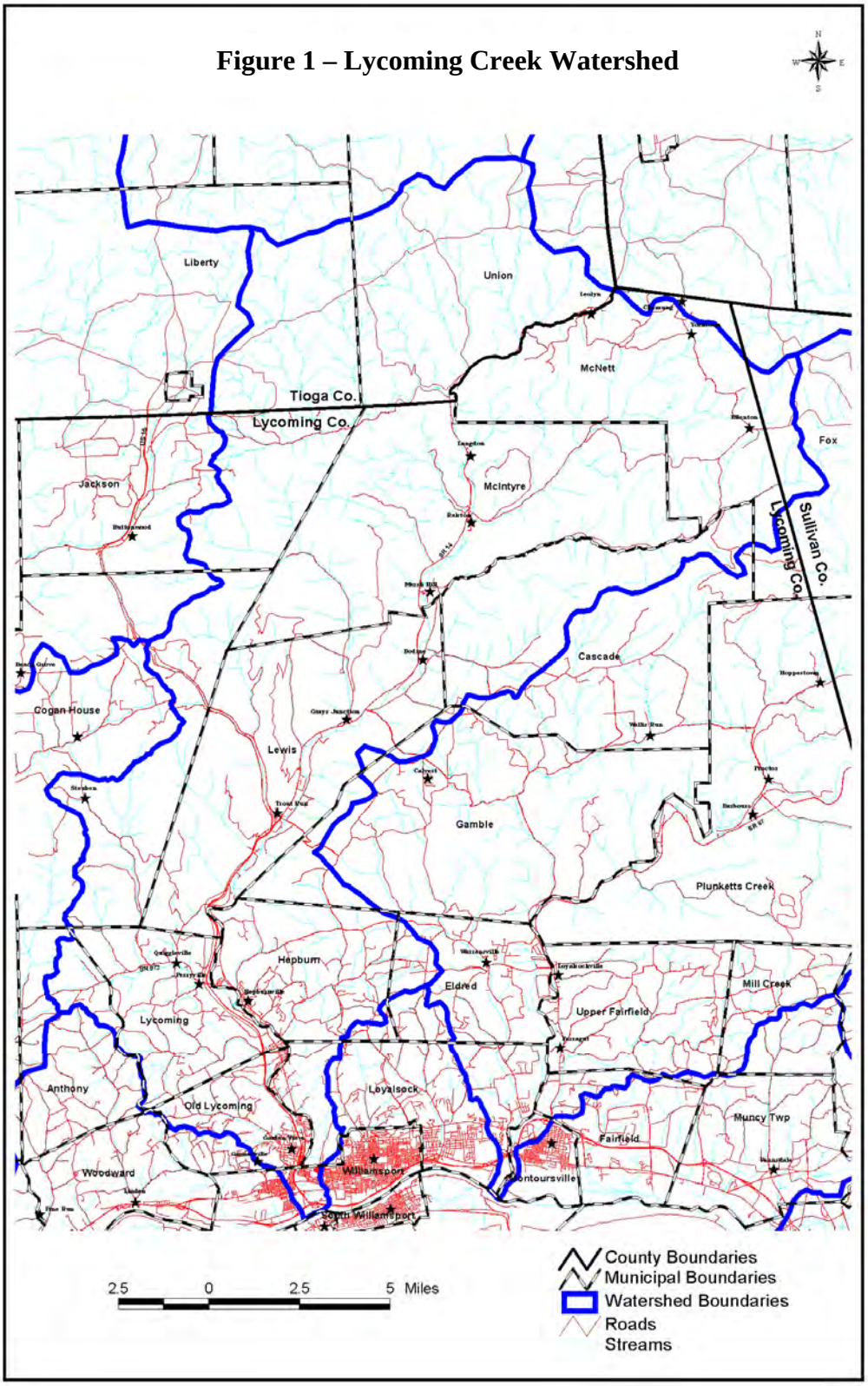
• Hoagland Run	• Grays Run
• Pleasant Run	• Mill Creek
• Rock Run	• Salt Spring Run
• Trout Run/Steam Valley Run	• Sugar Works Run

The Lycoming Creek Watershed and major tributaries are shown in Figure 1 on Page 4. Large scale mapping of the watershed is available for review at the County Planning Department Office.

The traffic routes in the Lycoming Creek Watershed include Routes 15, 14, 973, and 414. Route 15 parallels Lycoming Creek from south to north before turning northwest, and paralleling Steam Valley Run, at the town of Trout Run. Route 14 continues to parallel Lycoming Creek north of Trout Run. Route 973 is an east/west highway that parallels Gap Run and Hoagland Run; and crosses Lycoming Creek at Cogen Station. Route 414 is located in the northern portion of the watershed and crosses the watershed in a northeasterly direction through Tioga County.

Plate 2 delineates the existing land use in the Lycoming Creek watershed. The largest urbanized areas are located in the southern portion of the watershed in the Garden View, Grimesville, and Heshbon Park areas of Williamsport; Old Lycoming, Loyalsock, and Hepburn Townships. The upstream portion of the watershed consists mainly of forested mountains; and steep, narrow valleys, most of which contain tributaries to Lycoming Creek. There are actively tilled agricultural areas in the southern part of the watershed bordering the urbanized areas, and in the headwaters area of Tioga County.

Figure 1 – Lycoming Creek Watershed



The Lycoming Creek Watershed has been broken up in to individual hydrologic soil groups. According to the National Resource and Conservation Service (NRCS), hydrologic soil groups are based on estimates of runoff potential [(1)]. Soils are assigned to one of four (4) 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 soils in the United States are placed in to four groups, A, B, C, and D, and three dual classes, A/D, B/D, and C/D. Definitions are as follows:

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 transmission.

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 texture 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.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), then the first letter is for drained areas and the second is for undrained areas. Only soils that are related D in their natural condition are assigned to dual classes.

A map illustrating the distribution of hydrologic soils groups throughout the watershed can be found in Plate #5 – Hydrologic Soils Map. This map indicates that the majority of the soils north of Powys fall within Soil Group C. South of Powys, mainly in Lycoming and Hepburn Townships, has a Hydrologic Soil Group of B. Even farther south towards Williamsport the soil classification is C and C/D. Table 3.1 lists the infiltration rate, and stormwater runoff potential for each hydrologic soils group.

Table 3.1–Runoff Potential and Infiltration Rate of Hydrologic Soils Groups

Hydrologic Soils Group	***Runoff Potential***	***Infiltration Rate***
A	Low	High
B	Moderate	Moderate
C	Moderate to High	Low
D	High	Very Low

There are ten (10) geological formations which underlay the Lycoming Creek Watershed [(2)], as follows:

1. **Allegheny and Pottsville Formations, undivided**
2. **Brallier and Harrell Formations, undivided**
3. **Burgoon Sandstone**
4. **Catskill Formation**
5. **Hamilton Group**
6. **Huntley Mountain Formation**
7. **Lock Haven Formation**
8. **Mauch Chunk Formation**
9. **Onondaga and Old Port Formations, undivided**
10. **Pottsville Formation**

3.2 Projected Land Developments

Plate 4 depicts the potential future land use for the watershed which is the basis for predicting future runoff. Future development is based upon full build out under existing zoning in Lycoming County, and the pending County Zoning Ordinance in Tioga County. In Sullivan County, where there is no existing or pending zoning, full residential 1 acre lot build out was assumed. Areas which are under State ownership, hunting and fishing clubs, Resource Conservation Zoning (in Lycoming County), under conservation easement, and severe slopes (septic limitation) or floodplains were excluded as potential development areas. This exclusion eliminated most of the central portion of the watershed from projected future development. Additional impervious area was added for the Rt. 15 improvements in Steam Valley.

The main potential development areas are depicted in Plate 4: Future Land Use Changed Map. Much of the southern portion of the watershed was depicted to change to residential 1 acre development, with some portions within the designated Lycoming County Growth Areas (with existing or planned public water or sewer) developing as 1/4 acre lots or commercial/industrial if zoned accordingly. In the northern, Tioga County portion of the watershed, much of the agricultural areas were projected to convert to large lot 2+ acre residential.

The chosen approach for projected land developments is conservative in that it may take more than 20 years for full build out to occur, and may predict higher Stormwater levels than will actually occur from new development. However, Rt. 15 improvements, the PA Wilds Tourism and Marketing Initiatives, increasing utility rates in the City of Williamsport and other urbanized areas, and telecommunication improvements are all factors pointing toward increased development pressures within the watershed. Approximately half the

watershed is excluded from development by the conservation factors listed above. Potential development may also actually reduce the stormwater runoff; for example, the conversion of tilled fields to low density residential development.

Due to the extensive, repetitive flood damages suffered by the residents and businesses of the Lycoming Creek watershed, it is better to err on the side of conservative runoff prediction than to insufficiently plan for runoff from future development. The Plan, and resultant runoff standards, may also be adjusted as certain factors change. For example, projected runoff levels may decrease if additional conservation easements were purchased in developable areas or if the counties and municipalities within the watershed were to expand the conservation zoning outside of designated growth areas.

3.3 Significant Obstructions and Problem Areas

1. Obstructions

An obstruction in a watercourse is defined by Chapter 105 of DEP's Rules and Regulations to be, "Any dike, bridge, culvert, wall, wingwall, fill, pier, wharf, embankment, abutment or other structure located in, along, or across or projecting into any channel or conveyance of surface water having defined bed and banks, whether natural or artificial, with perennial or intermittent flow."

Typically the use of this definition identifies a significant number of potential problematic obstructions, many of which may not pose a problem. Therefore, for the purposes of Act 167, it is necessary to refine the list of obstructions to include only those obstructions that are "significant" on a watershed basis. The following distinction has been used for the Lycoming Creek Watershed Stormwater Management Plan.

"Significant obstructions will be those that are identified in the municipal data questionnaires and which are identified as being areas where insufficient capacity exists for the necessary storm flows or those that would act as impoundments and affect watershed modeling."

During Phase I, a Municipal Data Questionnaire was distributed to each municipality within the Lycoming Creek Watershed. The questionnaires were collected and reviewed during Phase II of this project. The following tables list the problem areas and obstructions identified by the local municipalities. Some proposed solutions were offered by some of the municipalities. Plate 8 identifies the location of the significant obstructions and problem areas.

Table 3.2 – Significant Obstructions and Problem Areas

County	Municipality	Problem Identifier	Obstruction Identifier	Description	Potential Solution*
Lycoming	Lewis Twp	LE-3		Susque Rd – South End	Raise road level
Lycoming	Lewis Twp	LE-4		Dike and Gravel Bar North of Trout Run Mountain Rd Bridge	Remove gravel bar, Raise creek bank, and re-stabilize
Lycoming	Lewis Twp		LE-5	Field Station Dam Bridge	Raise bridge
Lycoming	Lewis Twp	LE-6		Willowan Trailer Park	Buyout
Lycoming	Gamble Twp	G-1		Trout Run Mountain Rd	None identified by Municipality
Lycoming	Gamble Twp	G-2		Field Station Rd	None identified by Municipality
Lycoming	Gamble Twp	G-3		Dubois Hollow	None identified by Municipality
Tioga	Loyalsock Twp	LO-1		Lycoming Creek	None identified by Municipality
Lycoming	City of Williamsport	W-1		Sediment build-up along Levee Toe	None identified by Municipality
Lycoming	Old Lycoming Twp	OL-1		Gravel bar above High St. Bridge	None identified by Municipality
Lycoming	Old Lycoming Twp	OL-2		Round Hill Rd Flooding	None identified by Municipality
Lycoming	Old Lycoming Twp	OL-3		Lower Cottage Ave Flooding	None identified by Municipality
Lycoming	Old Lycoming Twp	OL-4		Zuni Lane flooding	None identified by Municipality
Lycoming	Old Lycoming Twp		OL-5	US Rt.15/ SR3026 Interchange, Bridge opening reduced due to sediment build-up	None identified by Municipality
Lycoming	Old Lycoming Twp	OL-6		Trout Run Park streambank erosion	None identified by Municipality
Lycoming	Lewis Twp	LE-1		Trout Run Park streambank erosion	Put creek back into original flow channel and stabilize bank on west side
Lycoming	Lewis Twp	L-2		Bittner Trailer Park flooding	Dredge stream bed and build dike to protect trailer park

* See Section 3.4 – Suggested Solutions for more options and detail on potential solutions

2. Impaired Waters of Lycoming County

PADEP has an ongoing program to assess the quality of waters in Pennsylvania and identify streams and other bodies of water that are impaired by sediment/siltation, nutrients, metals, and pathogens. Lycoming County has generally excellent water quality as evidenced by the Special Protection High Quality and Exceptional Value watersheds that cover much of the County, as shown on Plate 32 of the Lycoming County Comprehensive Plan. Impaired Lycoming County streams from the 2010 Pennsylvania Integrated Water Quality Monitoring and Assessment Report (formerly the 303d list) are included in Lycoming County's Implementation Plan for the Chesapeake Bay Tributary Strategy, prepared by the Lycoming Conservation District. These streams include portions of Lycoming/Larry's/Antes Creeks, W. Branch Susquehanna River, Loyalsock Creek, Muncy/Little Muncy Creeks, Pine Creek, White Deer Hole Creek, and Fishing Creek. Small residential and urban runoff contributes to water quality problems on several of these stream, as detailed in the Implementation Plan.

Some of these areas of impairment will require the establishment of a Total Maximum Daily Load (TMDL) of pollutants. TMDLs are the maximum amount of pollutants that a waterbody can assimilate and still be able to meet state water quality standards. TMDLs for acid mine drainage have been established by DEP for portions of Loyalsock Creek, Otter Run/Right Fork Otter Run (Lycoming Creek tributary), and the W. Branch Susquehanna. A TMDL for the entire Chesapeake Bay Watershed is currently being drafted by DEP.

3.4 Suggested Solutions

There are several types of general solutions to the existing problem areas within the watershed. Solutions range from structural measures (such as the construction of stormwater detention/infiltration facilities, increasing the capacity of culvert and bridge openings, or armoring stream banks that experience erosion) to operation and maintenance measures (such as enforcing regular inspection for and removal of debris and silt at existing stormwater conveyance structures).

Suggested solutions are intended to restore or increase the current hydraulic capabilities within the watershed. They are not intended to minimize the amount of new controls associated with the additional runoff generated by future development.

Funding for stormwater management programs are available, although it takes creativity, public education, and strategic alliances to make them happen [(2)]. Several funding options include:

1. Enterprise Funds

An enterprise fund is a fund created by local governments for a specific purpose (i.e. providing stormwater services) that is self supporting from the revenues it creates. Examples of such funds are refuse collection, sewer maintenance, water service, and any other designated service. Fees for these services are

charged to consumers by the local governments which create them. Stormwater Enterprise Funds sometimes face controversy when bringing the idea to the taxpayers. This is due in part to residents and businesses not always being able to see the need for such an entity. If an enterprise fund is to be considered, prior public outreach and education is essential.

2. Special Districts

When developing programs within a certain geographical area, special districts, or districts defined and based on legally described physical boundaries, can be considered. Properties within these boundaries are assessed fees for these programs. Landscaping, annual catch basin maintenance, and other Operation and Maintenance activities could all benefit from this fee.

3. Development Fees

Development fees are a one-time fee assessed as part of an action on part of a property. An example of development fees are building permit fees. These fees, however, are limited in that they cannot be used for ongoing maintenance of the system.

4. Bond Financing

Bond financing is essentially a loan with re-payment by the taxpayers. Major infrastructure projects which may be mandated within a municipality by a higher governing body, may find that bonds are the best option. As with enterprise funds, public outreach and education is essential because taxpayers must vote to basically tax themselves.

5. Grants

Funding for stormwater programs are available from various state and federal agencies. Grants can cover anywhere from a small portion of the necessary funds to completely funding the entire project. Websites for several federal agencies providing grant opportunities are listed below.

Also listed below are links to the Department of Environmental Protection (DEP) Grant and Loan Programs website. DEP has grants and loans available to assist individuals, groups, and businesses with a variety of environmental issues, including stormwater. This website lists the available loans and grants, a description of each program, links to applications and eligibility information.

Specific to Pennsylvania and funded through such agencies as DEP, the Department of Conservation and Natural Resources (DCNR), the Pennsylvania Department of Agriculture (PDA), the Department of Community and Economic Development (DCED), the Pennsylvania Fish and Boat Commission (PFBC) and the Pennsylvania Game Commission (PCG), is Growing Greener II, “a voter-approved plan that invests $625 million to clean up rivers and streams; protect natural areas, open spaces and working farms; and shore up key programs to

improve quality of life and revitalize communities across the Commonwealth." A link to this website is listed below.

Available Web Sites:
State: http://www.dep.state.pa.us/grantscenter/GrantAndLoanPrograms.asp, www.depweb.state.pa.us/growinggreener
Federal: www.grants.gov, www.fedgrants.gov, www.cfda.gov
EPA: www.epa.gov, www.grants.gov
www.epa.gov/owow/watershed/funding.html#general
US Bureau of Reclamation: www.usbr.gov
Fish & Wildlife Service: www.fws.gov
USGS: www.usgs.gov
National Oceanic and Atmospheric Administration (NOAA):
www.csa.noaa.gov/funding
USDA: www.csrees.usda.gov/fo/funding.cfm

3.5 Floodplain and Drainage Problems

The lower reaches of the subwatersheds experience repetitive flooding about every two to three years. Major floods causing property damage occurred in 1972, 1975, 1979, 1984, 1994, 1996, and 1997. After these events, the watershed recovers while its channels and banks continue to be weakened and damaged by loss of riparian vegetation and subsequent storm events.

3.6 Stormwater and Flood Management Systems

The United States Army Corps of Engineers has developed a Project Management Plan (PMP) for a 'Flood Damage Reduction Feasibility Study' for the Lower Lycoming Creek, dated August 9, 2004. The purpose of their project is to "develop and implement cost-effective flood damage reduction initiatives to address flooding problems within the lower Lycoming Creek Watershed. The goal of the Feasibility Study is to identify, assess, design and generate (as necessary and appropriate) alternatives to achieve this purpose." The PMP further states that the Lycoming Creek channel often reaches peak capacity, overtopping its banks about every two to three years. During flood events, the PMP reports that, the Lower Lycoming Creek area sustains significant residential and commercial structural damage, damage to municipal infrastructure, loss of mobile homes, inventory losses, personal property losses, vehicle damages, loss of jobs, as well as loss of life. Flooding is caused by many factors, including excessive rainfall precipitation, snowmelt, erosion, sediment and gravel deposition, obstructions and inadequate drainage. It is also stated that Lycoming Creek has the highest number of structures in the floodway for all creek watersheds in the County. About 1,600 structures within the Lower Lycoming Creek are situated in the 100- year floodplain (this represents about 16% of total structures), and over 32 miles of roads are located within the 100-year floodplain in the Lower Lycoming Creek communities.

The PMP also includes discussion of the Weston Five-Point Plan, which was developed for the Lower Lycoming Creek area to suggest flood control and management. It consists of the following:

a. Elevating 800 linear feet of Pleasant Hill Road to divert high velocity floodwater away from residential, commercial, and industrial areas and lowering 1,500 linear feet of Lycoming Creek Road (Old State Route 15) or raising/installing culvert pipes to divert flows back across the Snyder farm eastward toward Lycoming Creek.
b. Improving stream conveyance capacity and lowering the 100-year flood level by constructing an overflow channel parallel to the existing stream channel, beginning about 1,000 feet downstream of the #3 Bridge and proceeding north a total distance of approximately 5,500 feet.
c. Improving the capacity of Bridge #3 by adding a 50-foot span adjacent to the northwest bank of Lycoming Creek.
d. Improving the capacity under the railroad bridge downstream of Bridge #3 by removing the west embankment approach; and
e. Elevating West Cottage Avenue (an average of 3 to 4.5 feet) and installing storm water closures from its intersection with Lycoming Creek Road (Old State Route 15) to its intersection with Deckman Hollow Road.

Also, it was determined by the Army Corp's PMP that additional alternatives to the Weston Plan include:

a. Structural alternatives include, but are not limited to levees, floodwalls, over-bank flow channels, and problems associated with stream crossings.
b. Nonstructural alternatives include, but are not limited to wet and/or dry flood proofing, removal of structures from flood-prone areas, conveyance enhancement, sediment deposition problems, and stream channel restoration/realignment.

In addition to the County's involvement in the Lower Lycoming Creek Flood Damage Reduction Project, other significant initiatives the County has developed include Project Impact, Hazard Mitigation Grant Program/Flood Mitigation Assistance Program (HMGP/FMAP), the Advanced Flood Warning System, and the Lower Lycoming Flood Hazard Reduction Plan. Details of these initiatives can be found in The Project Management Plan for the Lower Lycoming Creek Section 205 Flood Damage Reduction Project.

3.7 Economic Analysis Of Stormwater Management Costs

For the purposes of this analysis, a one-acre undeveloped parcel of land was used. In existing conditions, a runoff curve number (CN) of 58 was used. This was determined using a meadow condition with hydrologic soil group of B, from the United States Department of Agriculture Technical Release 55 (TR-55). Post development conditions assumed that the entire one-acre parcel was converted to the TR-55 designation of Urban District, Commercial and Business, with a CN of 92 and an average of 85% impervious area.

It was determined that satisfaction of the 50% release rate criteria would require a basin with approximately 15,670 cubic feet (CF) of volume, while detention of a traditional 100% release rate would require approximately 12,890 CF. Additionally, the development assumes that both scenarios would require 400 linear feet (LF) of curbing, 4 Type 'C' inlets along the street, 450 LF of 24" HDPE pipe, and 1 headwall. This corresponds to a cost of approximately $48,320 for the pond to treat the 50% release rate and approximately $44,450 to treat the 100% release rate. Therefore, an additional $3,870 is required for construction of the detention facility associated with the 50% release rate. The following table summarizes the findings.

Table 3.3 – Implementation of Release Rates for Traditional Detention

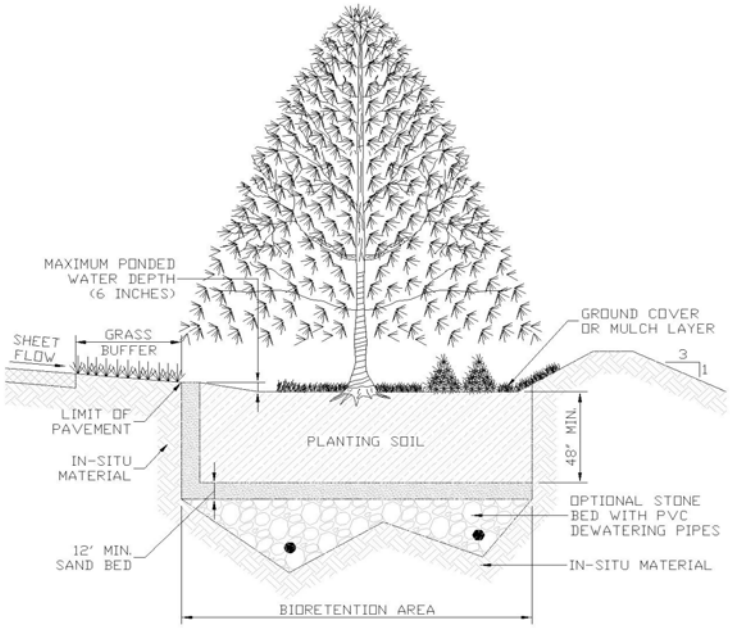
Release Rate	Basin Volume (CF)	Basin Cost ($)
100%	12,890	$ 44,450
50%	15,670	$ 48,320*
% Cost Increase		8.7%

* Costs could be reduced by an estimated $3,360 if the additional excavated soil can be cut and filled into the project site.

A series of BMP practices may be used to satisfy additional requirements of NPDES Phase II permitting. For example, swales, perforated pipe with infiltration, and low impact development may be used wherever practical.

Low impact development practices such as rain gardens (bioretention areas) and infiltration trenches can be applied to this site to withhold the 2 year/24 hour storm event.

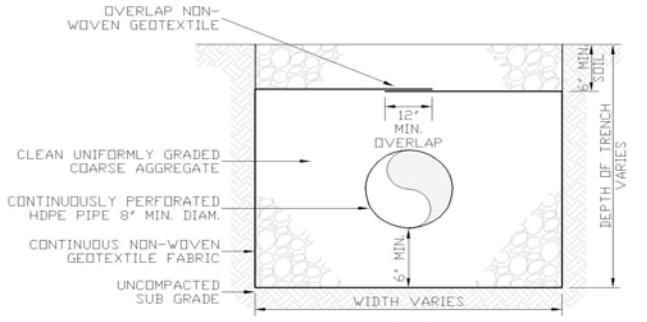
In the case of the rain garden, the approximate cost is $72,910. This value assumes that the curbing along the road, two (2) inlets, and 150 LF of stormwater pipe can be eliminated from the previous scenario. The 2 year/24 hour storm event on this site would generate approximately 6,615 CF of runoff. The rain garden is estimated to cost approximately $6.00/CF per the PA BMP Manual, and therefore adds approximately $27,950 to the total cost of the site development. A sample bioretention cross-section is shown below:



BIORETENTION SECTION

NOT TO SCALE

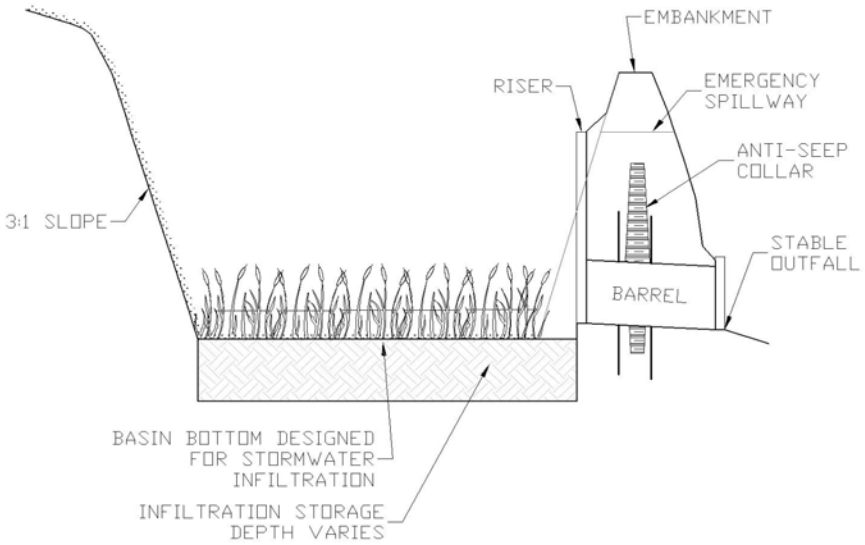
Utilizing an infiltration trench to treat the 2 year/24 hour storm event, at a cost of $6.50/CF, would produce an approximate total cost of $76,875. This unit price was also taken from the PA BMP manual. The trench adds approximately $31,915 to this option. A sample cross-section of a typical infiltration trench is shown below:



INFILTRATION TRENCH

NOT TO SCALE

The most cost-effective approach to treating the 2 year/24 hour storm event would be an infiltration basin. This scenario would require the over-excavation of the stormwater management basin to hold the difference in the 2 year/24 hour volume – which is approximately 6,615 CF. The approximate cost would be $58,460**.** Over-excavation of the basin for infiltration purposes would add an additional $12,620 to this option. A sample cross-section of a typical infiltration basin is shown below:



INFILTRATION BASIN

NOT TO SCALE

The following table summarizes the findings.

Table 3.4 – Cost of Implementing NPDES Requirements

BMP Option	Total Construction Cost ($)	Traditional Detention Cost ($)	Additional Cost For BMP Implementation ($)
Rain Garden	$76,271	$48,320	$27,950
Infiltration Trench	$80,235	$48,320	$31,915
Infiltration Basin	$60,850	$48,320	$12,620

Using a combination of BMPs or individual on-lot infiltration practices may provide a benefit to developers by eliminating the need to have one comprehensive facility. Reducing the footprint of a standalone infiltration facility can provide additional room for development. Refer to Section 4.2 for a list of non-structural and structural BMPs.

SECTION IV – RUNOFF CONTROL TECHNIQUES AND THEIR EFFICIENCIES

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 ground waters and ground-water 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.

To prevent adverse impacts at both individual sites and downstream, this mandate requires the development of criteria and standards for managing stormwater as well as watershed-level comprehensive stormwater planning.

These standards address four (4) aspects of effective stormwater management and are as follows:

1. Peak Discharges
2. Groundwater Recharge
3. Water Quality
4. Streambank Protection

4.1 Application of Assigned Release Rate Percentages

Assigned release rates are a watershed-level stormwater management performance standard developed to address peak discharges. This method will allow an individual applicant to select and design site-specific drainage and outlet control measures in order to meet the applicable release rate for the individual subbasin in which the development is to occur.

An applicant should follow this general sequence of actions in order to employ the release rate percentage method.

1. Determine the pre-development and post-development runoff for the development site based on a 2-, 5-, 10- 25-, 50-, and 100-year storm event (do not include existing or proposed stormwater detention techniques). If the post-development peak runoff rate is less than or equal to the pre-development peak runoff rate, the requirements of this plan and the Act 167 Plan have been met. If the post-development peak runoff rate is greater than the pre-development peak runoff rate then the applicant must proceed to Step 2.

2. Apply site-specific stormwater management techniques to infiltrate, and reduce the amount of impervious surfaces. Determine the new post-development peak runoff rate for the 2-, 5-, 10- 25-, 50-, and 100-year storm events. If the new post-development peak runoff rate is less than or equal to the pre-development peak runoff multiplied by the assigned

release rate, the requirements of this plan and the Act 167 Plan have been achieved. If the post-development peak runoff rate is still greater than the pre-development peak runoff rate multiplied by the assigned release rate, then the applicant must proceed to Step 3.

3. Determine the allowable total peak runoff rate from the individual site by multiplying the pre-development peak runoff rate by the assigned release rate. Design detention/retention or other necessary stormwater management techniques in order to meet the allowable peak runoff rate.

Please note that stormwater discharge can be provided on or off site. Regional facilities may provide a more efficient means to provide the required storage volumes. Both cost and land requirements need to be considered before a determination can be made as to whether to provide on-site or off-site facilities. In many instances several developing areas may share a joint facility. Municipalities may also benefit by maximizing the prime development areas or by providing storage through lakes floodplains or other areas which may not be suitable or accessible for development. Applicants proposing off-site storage facilities must ensure that no flooding or harm will be caused by runoff between the development and the off-site facility.

The following table identifies the five (5) release rate districts within the Lycoming Creek Watersheds (refer to Plate 10, Release Rate Districts Map).

Table 4.1 – Release Rate Districts by Subwatershed

DISTRICT	RATE	SUBWATERSHEDS
A	50%	1, 2, 3, 4, 5, 6, 7, 8, 10, 16, 17, 18, 27, 32, 35, 37, 38, 39, 40, 43, 44, 41, 42, 49, 50, 51, 52, 53, 54, 55, 57, 58, 59, 61, 67, 68, 74, 75, 77, 78, 79, 80, 82, 83, 84, 88, 89, 90, 91, 92
B	60%	14, 15, 85
C	70%	11, 21, 28, 29, 71, 72, 93, 94, 95, 96, 97, 98, 100, 102, 103, 105, 106
D	80%	19, 20
E	90%	30, 31

4.2 Best Management Practices (BMPs)

Best Management Practices (BMPs) are a series of land and water management strategies intended to minimize the adverse impacts on land and water. BMPs include design and techniques that have been shown to be effective in providing treatment or reduction in pollutants from stormwater runoff. BMPs are either “structural” or “non-structural”. Structural BMPs are measures that require the design and physical construction of a facility or feature to help reduce or eliminate a source of pollution.

Structural BMPs are often applied to agricultural operations and stormwater management. Non-structural BMPs are approaches to planning or site design that positively affect the water quality and reduce stormwater runoff. Non-structural BMPs are often applied to planning, design and regulation of land development (e.g., conservation easements). (3)

Examples of 'Non-Structural' BMPs

1. Reducing Imperviousness
2. Maintaining Natural Swales and Filter Strips
3. Protect Sensitive and Special Value Resources
4. Cluster and Concentrate (development)
5. Minimize Disturbance and Minimize Maintenance
6. Disconnect/Distribute/Decentralize (i.e., rooftops and storm sewers)
7. Source Control (i.e., street sweeping)
8. Environmentally Sensitive Development

Examples of 'Structural' BMPs

1. Volume/Peak Rate Reduction by Infiltration BMPs (e.g. pervious pavement, infiltration basin, infiltration trench, rain garden/bioretention, dry well/seepage pit, vegetated swale, vegetated filter strip)
2. Volume/Peak Rate Reduction BMPs (e.g. vegetated roof, runoff capture and reuse)
3. Runoff Quality/Peak Rate BMPs (e.g. constructed wetland, retention basin, dry extended detention basin, water quality filters)
4. Restoration BMPs (e.g. riparian buffer, landscape, floodplain and soils restoration)
5. Other BMPs related to Structural Measures (e.g. level spreader, parking lot and rooftop detention areas)

SECTION V – EXISTING MUNICIPAL ORDINANCE INFORMATION

5.1 Lycoming County Stormwater and Floodplain Management Regulations Summary:

There have been no previous ACT 167 Plans prepared specifically for the Lycoming Creek Watershed. However, the following relevant documents have been prepared and will provide a valuable source of information for the Plan:

- Lycoming County Stormwater Management Plan (Gannett Fleming Corddry and Carpenter, Inc., 1973)
- Pilot Hydrologic Study for the Lycoming Creek Watershed (Associated American Engineers, Inc., June 1982)
- Pilot Hydrologic Study for the Lycoming Creek Watershed: Selection and Calibration of a Rainfall-Runoff Model and Method (Associated American Engineers, Inc., June 1982)

- Act 167 Stormwater Management Plan for Grafius Run, McClures Run, and Miller's Run, September 1999.

Lycoming County Stormwater and Floodplain Management Regulations Summary:

Cogan House Twp*, Gamble Twp, Jackson Twp, McIntyre Twp, & McNett Twp

*****=Driveway Permit Ordinance

-All of these municipalities are under the jurisdiction of the county subdivision and land development ordinance.

The County Subdivision and Land Development ordinance (SLDO) became effective in 1989. The ordinance contains the Stormwater Management Regulations, found in Article IV 4.10. Section 4.104 A., states that stormwater management controls must be designed so that the rate of runoff before development, subdivision, and construction shall not be greater than the rate of runoff in its predevelopment condition. Section 4.104. B., states that improvements to stormwater systems shall be designed to increase the amount of water that infiltrates the soil and to control the rate of runoff being released. This could possibly lead to off-site storage areas. The ordinance also states that stormwater management plans will be reviewed by the Planning Commission and the Municipality. The Planning Commission has the right to require improvements of the stormwater management plan if they deem it inadequate.

The SLDO also contains the Floodplain Management Regulations, found in Article IV 4.11. Development in the floodplain can be approved by the Planning Commission as long as it meets two standards of the National Flood Insurance Program. The new proposal may not cause an increase in flood heights and all new structures must be elevated to or above the one-hundred year floodplain or flood-proofed in accordance with all flood-proofing regulations or techniques by the U.S. Army Corps of Engineers. Section 4.114 A. states that new streets may not be more than one foot below the one-hundred year flood plain and drainage openings may not greatly increase flood heights. Section 4.114. B. states that all new/replacement water and sanitary sewer facilities/systems shall be constructed to minimize or eliminate flood damage and the infiltration of flood waters. Section 4.114 C. states that any part of a sewage system shall not be located within the floodplain. Section 4.114 D. states that all other utilities must be constructed so that the risk of impairment during a flood is minimal. The Subdivision and Land Ordinance Does not contain standards for peak discharge, water quality, and infiltration.

The County Zoning Ordinance was adopted in 1992 and contains floodplain regulations. The list of regulations starts in Article V Section 5160. The purpose of these regulations is protecting the public health, safety, and welfare to remain in a positive condition. The zoning ordinance also reinforces one of the provisions from the National Flood Insurance Program that is required by the county Floodplain Management Regulations. In Section 5160C. 1. c. (1) it states that any new constructions, development, use, activity or encroachment that would cause any increase in flood heights shall be prohibited.

Lycoming County's floodplain regulations exceed the minimum requirements for the National Flood Insurance Program.

The County Zoning Ordinance, adopted in 1992, originally applied to twelve townships. Since that time, three additional Townships and Salladasburg Borough have joined the Partnership, bringing the total number of Municipalities to sixteen, as shown in the attached map. Of the sixteen Municipalities, six rescinded their individual floodplain ordinances and have come under the Floodplain regulations contained within the County Zoning Ordinance. Responsibility for administering the flood plain regulations for those six townships now falls on the County. Additionally, as a result of the Federal Emergency Management Agency's requirement for every municipality to update their flood plain regulations, five additional townships and Salladasburg Borough are actively petitioning the County to assume their floodplain regulation responsibilities.

Jackson and Jordan townships also joined the Floodplain Management Partnership delegating the regulation of their floodplains to County Planning staff.

Cascade Twp

Cascade Township has Stormwater management regulations within their own municipal subdivision and land development ordinance, enacted on 9/4/70. The Township requires that surface water drainage at road intersections adequate to carry normal water runoff, with adequate ditches along each road and approved cross pipes not less than 15 inches in diameter at cross road intersections.

Lycoming Twp

Lycoming Township has stormwater management regulations within their own municipal subdivision and land development ordinance. An objective of these regulations is to provide protection against uncontrolled stormwater runoff, to make sure that downstream property owners and water courses are not affected by increases in stormwater runoff from subdivision and land development. These regulations state that peak discharge can be no greater before development than after. They also state that improvements to systems should be designed to increase the amount of water that infiltrates into the soil and control the rate of runoff offsite through temporary storage. Facilities should be designed to handle surface runoff and carry it to a suitable outlet. Drainage easements by waterways are granted and should be as wide as necessary to preserve the flow of drainage. Plans should also include the anticipated impact from future development. These regulations do not address parking lot regulations, water quality, or channel protection.

Hepburn Twp, Eldred Twp, Loyalsock Twp, & The City of Williamsport

All of these municipalities have a free standing Comprehensive Stormwater Ordinance that was initially developed to implement the Grafius/Miller's/McClure's Run Stormwater Management Plan. These municipalities each have a separate ordinance regarding Stormwater Management. The objective is to manage accelerated stormwater runoff problems at their source by regulating activities that

cause them. Also to provide standards for design, installation, maintenance of stormwater structures to minimize the danger to public health, safety, welfare, and damages to property. Peak discharge cannot be greater after development than it was prior to development. Maximum velocity, runoff values, and time of peak flow must be accounted for. To reduce runoff and encourage groundwater recharge developed areas are permitted to use underground basins, infiltration trenches, and cisterns. Drainage easements are provided and are supposed to conform to the line of watercourses. They should run parallel to the watercourse, drainage way, stream, or channel. The easements prohibit any alterations that may affect the flow of stormwater. A plan is not needed for gardening, home occupations, and agriculture when operated with conservation plans, erosion, and sedimentation control plans. There is no plan needed for forest management operations as long as the DEP's "Soil Erosion and Sedimentation Guidelines for Forestry" and an approved soil, erosion, and sediment pollution control plan are used. It is encouraged that impervious surfaces be minimized and infiltration of stormwater runoff through seepage beds, infiltration trenches, etc, be applied where soil conditions permit. Facilities should permit the unimpeded flow of natural watercourses and insure adequate drainage of low points along the curb line of streets. Storm water detention facilities are to drain within twenty-four hours, detention basins forty-eight hours, and infiltrations facilities seventy-two hours. Roof drains are not allowed to discharge directly into storm sewers. Stormwater facilities should minimize danger to public health, safety, and damages to property. Soil erosion and sedimentation plans are required under this ordinance. The ordinance contains regulations for storm sewers, detention/retention basins, bridges, culverts, sinkhole protection, erosion & sedimentation control, and information regarding impervious surfaces. They do not cover water quality.

Loyalsock Twp and The City of Williamsport have updated their Comprehensive Ordinance to meet MS4 standards for pre and post construction stormwater management and elimination of illegal discharges. They have a list of allowable discharges based on the fact that they do not significantly contribute to the pollution of surface waters. Groundwater recharge capacity of the area being developed is required to be maximized. Best management practices (BMPs) should be designed to protect and maintain uses and level of water quality to protect those uses in streams. There are regulations from the DEP that require municipalities to ensure that the design, implementation, and maintenance of BMP that control runoff from new development and redevelopment after regulated earth disturbance activities are complete. This includes requirements needed to implement post-construction stormwater BMP with assurance of long-term operations and maintenance of those BMPs. These ordinances also contain information regarding groundwater recharge and water quality requirements.

Eldred Township's subdivision and land development ordinance does not contain specific stormwater management regulations but does contain runoff related standards. The objective of these regulations are to require that facilities permit the unimpeded flow of natural water, take surface water from the bottom of vertical grades, lead water away from springs, avoid excess use of cross gutters at street intersections and elsewhere, and to prevent excess runoff onto adjacent properties. It states that storm drainage must be provided within an entire subdivision or land development. Also, drainage easements shall exist where a subdivision is traversed

by a watercourse. When this occurs there will be a drainage easement or right of way conforming to the watercourse and the width (minimum fifteen feet). This easement should be ample enough to maintain natural drainage and not damage adjacent properties. It is a violation in this regulation to alter or relocate a watercourse without obtaining a permit from the Department of Environmental Protection (DEP). All standards of the US Conservation Service and DEP shall be met. The regulation does not contain information on peak discharge, water quality, infiltration, channel protection, or parking lot regulations.

Lewis Twp

Lewis Township does not have stormwater management regulations but has standards within their subdivision and land development ordinance regarding storm drainage. Storm sewers, culvers, etc are to permit the unimpeded flow of natural water, to provide adequate drainage of streets, and to intercept runoff along streets at intervals reasonably related to the extent and grade of the area drained. It states that special consideration should be taken into the design and installation of storm sewers to avoid problems which may arise from concentration of stormwater runoff over adjacent properties. A drainage easement is also granted when a subdivision is traversed by a water course. There is no minimum easement width in Lewis Twp but in Fairfield Twp the minimum width is twenty feet. These regulations do not cover peak discharge, water quality, infiltration, channel protection, or parking lot policies.

Old Lycoming Twp

Old Lycoming Township contains a separate Comprehensive Stormwater Ordinance. The objective of these regulations is to provide protection against uncontrolled stormwater runoff, to make sure that downstream property owners and water courses are not affected by increases in stormwater runoff from subdivision and land development. Improvements made to control drainage and stormwater runoff within a subdivision or land development should be designed to increase the amount of water which infiltrates into the soil and control the rate of runoff released offside through temporary storage. The peak discharge shall be no greater after a subdivision and land development than before unless modified by a stormwater management plan. Peak discharge for storms in excess of a ten year storm may be required if it can be shown that a risk to downstream structures, unique natural areas, or flooding problem would be aggravated. Channel protection must be upheld except where changes can be justified on a basis of other design standards. Excess runoff of natural conditions should be recharged to the ground water table or stored, if possible. Stormwater facilities should be incorporated into the overall design of a subdivision or land development. Examples would be a wildlife area, recreation area, or a fire protection pond. Drainage swales should be designed so the banks will not erode and are able to handle a ten year storm. Detention basins should be designed not to create a hazard, be able to handle a two, ten, and one-hundred year storm. Retention basins and any open channel should be designed to handle a one-hundred year storm. If construction is going to disturb five or more acres a National Pollutant Discharge Elimination System (NPDES) permit from the DEP is needed. Existing trees and shrubs should be preserved and protected to the maximum extent. If a subdivision is traversed by a water course drainage easements shall be necessary and have a minimum width of twenty feet. They also should preserve the

flow of drainage as much as possible. These regulations do not have policies on parking lots or infiltration.

The updated Comprehensive Stormwater Ordinance for Old Lycoming Township contains more stormwater management standards. It states that peak discharge after development is not allowed to be greater than before. Driveways should be designed to handle a ten year storm, Local Streets a twenty-five year, Collector Streets a fifty year, and Arterials a one-hundred year. Plans for erosion and sediment pollution control shall meet the requirements of the Clean Streams Law. Infiltration underground in trenches, basin drains, and cisterns are allowed as long as the right conditions exist (the geologic and water table conditions exist). The township engineer may require downstream impacts to be evaluated at critical locations such as dams, tributaries, existing developments, undersized culverts, and flood prone areas. The municipality may impose water quality control measures to protect against ground and surface water pollution where nature of runoff and soils underlying stormwater control facilities would contribute a substantial risk of contamination. Swales are encouraged because they carry discharge without excessive erosion, increase time of concentration, permit water to percolate into the soil (where appropriate), reduce peak discharge, and peak velocity. The regulations list standards for peak discharges in detention and retention basins. When an elevation of an existing or proposed entrance is lower than the elevation of the public cartway serving that site, a public grading plan must be submitted. Stormwater management plans are required to maximize groundwater recharge. Appendix D of the Old Lycoming Township Ordinance contains a separate section for water quality. Best Management Practices (BMPs) should be designed to protect and maintain uses and level of water quality to protect those uses in streams. There are regulations from the DEP that require municipalities to ensure that the design, implementation, and maintenance of BMP that control runoff from new development and redevelopment after regulated earth disturbance activities are complete. This includes requirements needed to implement post-construction stormwater BMPs with assurance of long-term operations and maintenance of those BMPs.

Liberty Township, Union Township (Tioga County)

Liberty and Union Township are under the jurisdiction of the Tioga County Subdivision and Land Development Ordinance, adopted in 1994.

Sections 402.2.17 & 23 require submittal of drainage pattern information, including Stormwater overflow areas, as part of the required site plan.

Section 602.06 of the Ordinance has the following provision regarding storm drainage:

> "Lots shall be laid out and graded to provide drainage away from buildings and to prevent damage to neighboring lots. The Commission may require plan modifications to ensure that the effects of storm drainage on health, safety and property are minimized. Developers shall strive to keep runoff to a level less than or equal to that occurring before development. PennDOT standards shall be applicable if planned drainage facilities within the subdivision or land development will utilize or ultimately utilize PennDOT drainage facilities."

Section 602.08.7 Street System Layout requires "All provisions for drainage facilities shall be designed to provide for the movement of surface water away from the surrounding drainage area, buildings and pavement.

Section 803 contains standards for curbs and gutters.

Section 806. Storm Drainage, is as follows:

> "Storm sewers, culverts, diversion ditches and related installations shall be provided to permit the unimpeded flow of natural water courses to ensure the drainage of all low points, and to intercept stormwater run-off at intervals reasonably related to the extent and grade of the area drained. Provisions for the care and maintenance of such facilities shall be made to the satisfaction of the Commission and the municipality in which the development is located."

Section 808 provides for the installation of required improvements, including financial sureties.

The Draft Tioga Co. Zoning Ordinance (which would apply to Liberty and Tioga Townships as they currently do not have zoning) has impervious surface limitations for the various zoning districts. Article 17.1.9 of the Supplemental Use Criteria requires that:

> "Stormwater facilities shall be provided which shall be designed to create no increase in the rate of runoff of Stormwater by providing controlled release, infiltration and recharge area; evidence of maintenance and liability responsibilities shall be demonstrated; and the facilities shall not conflict with pedestrians, motor vehicles, and adjacent property owners."

Fox Township (Sullivan County)

Fox Township is under the jurisdiction of the Sullivan County Subdivision and Land Development Ordinance, enacted in 2002. There is no zoning in Sullivan County.

The Ordinance requires the mapping of existing watercourses, floodplains, wetlands, wooded areas, and other significant natural features as part of a required site plan submittal. A Stormwater Management Plan is required in accordance with the requirements of Section 509 of the SLDO as part of the preliminary plan requirements. Final designs of Stormwater control improvements and related documentation is required with Final Plan submittal.

Section 404 provides for installation and guarantee of required improvements.

Section 503.I.3 provides for installation of drainage pipes on streets and driveways.

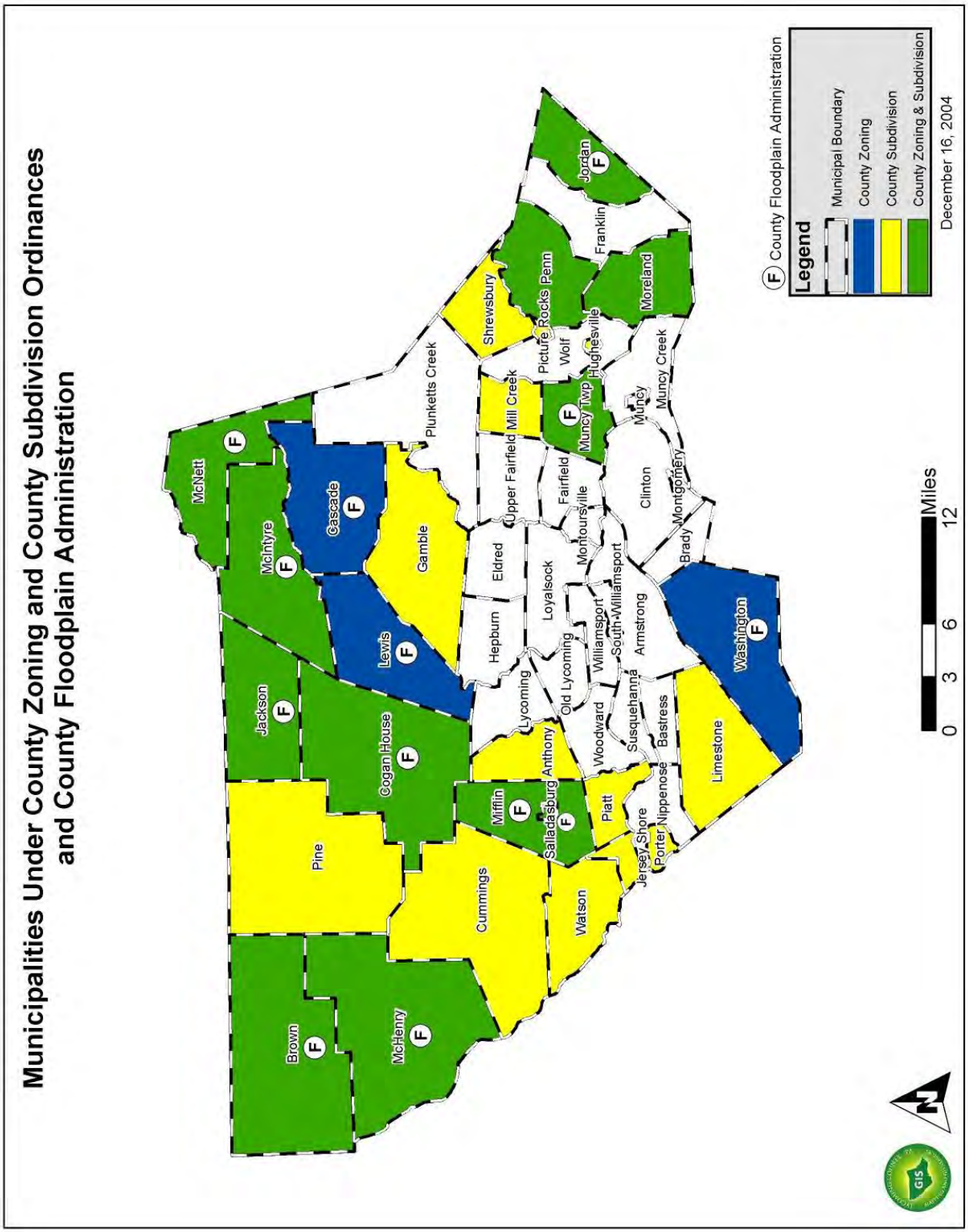
Section 509 Stormwater Management, is as follows:

"The management of stormwater from a site, both during and after any subdivision or land development, shall be accomplished in accordance with the standards and provisions of the PA Stormwater Management Act (Act 167-1978, or as hereafter may be amended) or any Watershed Stormwater Management Plan or Ordinance that may be adopted and implemented hereafter. In addition, all permitting requirements established in the Federal Clean Water Act relating to stormwater discharges shall be met. Evidence that such plans have been prepared where necessary, and have been approved by the County Conservation District, or other designated agency, shall be submitted to the Commission by the developer as part of the subdivision or land development plan submission."

5.2 Summary of Municipal Ordinances:

Stormwater management ordinances are inconsistent in the Lycoming Creek Watershed. The Greater Williamsport Area Municipalities (including Loyalsock Township, Old Lycoming Township, and the City of Williamsport), through the MS4 program, have developed and adopted Comprehensive Ordinances. Hepburn and Eldred Townships have adopted comprehensive Ordinances through the Grafius, McClures, and Miller's Run Act 167 Plan. Old Lycoming Township independently developed a Comprehensive Ordinance prior to the MS4 update. Some of the comprehensive ordinances lack water quality provisions, however. Most of the 16 municipalities in the Lycoming Creek watershed cover stormwater management through sections of the County or municipal zoning or subdivision ordinances, but the ordinances vary widely in scope and coverage. Lack of, or inconsistent, stormwater management contributes to stormwater problems which impact downstream property owners. Stormwater problems are harder to manage after the fact.

Concerned citizens look to municipal officials for help with flooding, streambank erosion/property damage, reduced groundwater recharge and lowering of the water table, and stormwater runoff from utilities and highways. After adoption and approval of an Act 167 Stormwater plan, highways and utilities are required to comply with the watershed stormwater plan. Stormwater problems may originate in one municipality but cause downstream impacts in another municipality.


Municipalities Under County Zoning and County Subdivision Ordinances
and County Floodplain Administration
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County Zoning
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Franklin
Shrewsbury
Penn
Moreland
Picture Rocks
Wolf
Hughesville
Muncy Twp
Mill Creek
Upper Fairfield
Fairfield
Muncy
Muncy Creek
Clinton
Montgomery
Montoursville
Eldred
Loyalsock
Hepburn
Lycoming
Old Lycoming
Williamsport
South Williamsport
Armstrong
Brady
Washington
Limestone
Susquehanna
Bastress
Woodward
Anthony
Salladasburg
Mifflin
Piatt
Jersey Shore
Porter
Nippenose

SECTION VI – DEVELOPMENT OF MODEL STORMWATER ORDINANCE PROVISIONS

DEP has developed a model ordinance that has provided a starting point for the Lycoming Creek Stormwater Ordinance contained in Appendix A of this Plan. The Ordinance provides a basis for consistent stormwater management in the Lycoming Creek watershed. The model Stormwater Ordinance references the DEP Best Management Practices Manual. Stormwater is now considered an asset to be retained on site as much as possible. Recharge to water tables is encouraged through infiltration techniques.

SECTION VII – PRIORITIES FOR IMPLEMENTATION OF TECHNICAL STANDARDS AND CRITERIA

The Pennsylvania Stormwater Management Act, Act 167, provides the framework for improved management of the storm runoff impacts associated with the development of land. The purposes of the Act are to encourage the sound planning and management of storm runoff, to coordinate the stormwater management efforts within each watershed, and to encourage the local administration and management of a coordinated stormwater program.

As required by Act 167, existing municipal stormwater ordinances and related stormwater provisions in zoning and subdivision ordinances will need to be reviewed for consistency with the Lycoming Creek Ordinance, and amended as necessary, within six months of adoption by the County and approval by DEP of the Act 167 Lycoming Creek Stormwater Plan. The municipality is encouraged to adopt the Model Ordinance as a free-standing Ordinance and rescind other inconsistent components. The County & DEP will help municipalities with the ordinance update process through workshops and other technical assistance.

Municipalities are eligible for 75% reimbursement from DEP of stormwater ordinance engineer and solicitor review costs. The County will offer a Stormwater administration option whereby the municipality may delegate administration of the stormwater ordinance to the County, similar to the current Floodplain and Zoning Administration Partnerships. LCPC staff and many local engineers are being trained in low impact stormwater design. The administrative body (municipality or County, if delegated) is also eligible for 75% reimbursement of administrative costs from DEP, although these costs are usually covered by developer fees.

For purposes of Act 167 Stormwater Management Plans (Plans), design policy pertaining to stormwater management facilities for PennDOT and PTC roadways and associated facilities are provided in Sections 13.7 (Antidegradation and Post Construction Stormwater Management Policy) of PennDOT Publication No. 13M, Design Manual Part 2 (August 2009), as developed, updated, and amended in consultation with PADEP. As stated in DM-2.13.7.D (Act 167 and Municipal Ordinances), PennDOT and PTC roadways and associated facilities shall be consistent with Act 167 Plans. DM-2.13.7.B (Policy on Antidegradation and Post Construction Stormwater Management) was developed as a cooperative effort between PennDOT and PADEP. DM-2.13.7.C

(Project Categories) discusses the anticipated impact on the quality, volume, and rate of stormwater runoff.

Where standards in Act 167 Plans are impracticable, PennDOT or PTC may request assistance from DEP, in consultation with the county, to develop an alternative strategy for meeting state water quality requirements and the goals and objectives of the Act 167 Plans.

For purposes of this Act 167 Plan, road maintenance activities are regulated under 25 Pa Code Chapter 102.

SECTION VIII – PLAN REVIEW ADOPTION AND UPDATING PROCEDURES

8.1 Plan Review and Adoption

The opportunity for local review of the draft Stormwater Management Plan is a prerequisite to County adoption of the Plan. The local review of the Plan is composed of four parts, the Watershed Plan Advisory Committee review, Municipal Engineer and Developer's Committee review, municipal review, and County review. Presented below is a chronological listing and brief narrative of the required local review steps through County adoptions.

1. Watershed Plan Advisory Committee (WPAC) Review – This body has been formed to assist in the development of the Lycoming Creek Watershed Plan. Municipal members of the Committee have provided input data to the process in the form of storm drainage area documentation, storm sewer documentation, proposed solutions to drainage problems, etc. The Committee met on 4 occasions to review the progress of the Plan. Municipal representatives on the Committee have reported on the progress of the Plan to their respective municipalities.

2. Municipal Engineers and Developer's Committee Review – This body was formed to educate the Municipal Engineers on the ordinance adoption and implementation requirements of the Plan. The committee met to receive comments and direction in the development of the model ordinance.

3. Municipal Review – Act 167 specifies that prior to adoption of the Plan by the County, the planning commission and governing body of each municipality in the study area must review the Plan for consistency with other plans and programs affecting the study area.

4. County Review and Adoption – Upon completion of the review by the Watershed Plan Advisory Committee, Municipal Engineers and Developer's Committee, and each municipality, the Plan will be submitted to the Lycoming County Planning Commission for their recommendation to the Board of Commissioners.

The Lycoming County review of the Plan will include a detailed review by the County Planning Commission and an opportunity for public input through a Public Hearing by the Board of Commissioners. The Public Hearing on the Plan must be held with a minimum two-week notice period with copies of the Plan available for inspection by the general public. Any modifications to the Plan are made by the County based upon input from the public hearings, comments received from the municipalities in the study area or their own review. Adoption of the Plan by Lycoming County includes a resolution and requires an affirmative vote of the majority of members on the County Board of Commissioners.

The adopted Plan is submitted by Lycoming County to the Department of Environmental Protection (DEP) for their consideration. Accompanying the Plan to DEP would be the review comments of the municipalities.

8.2 Procedure for Updating the Plan

Act 167 specifies that the County must review and, if necessary, revise the adopted and approved study area plan a minimum of every five years. Any proposed revisions to the Plan would require municipal and public review prior to county adoption consistent with the procedures outline above. An important aspect of the plan is a procedure to monitor the implementation of the Plan and initiate review and revisions in a timely manor. The process to be used for the Lycoming Creek Watershed Stormwater Management Plan will be as outlined below.

1. Monitoring of the Plan Implementation – The Lycoming County Planning Commission (LCPC) will be responsible for monitoring the implementation of the Plan by maintaining a record of all development activities within the study area. Development activities are defined and included in the recommended Municipal Ordinance. Specifically, the LCPC will monitor the following data records:

    a. All subdivision and land developments subject to review per the Plan which have been approved within the study area.
    b. All building permits subject to review per the Plan which have been approved within the study area.
    c. All DEP permits issued under Chapter 105 (Dams and Waterway Management) and Chapter 106 (Floodplain Management) including location and design capacity (if applicable).

2. Review of Adequacy of Plan – The Watershed Advisory Committee will be convened periodically to review the Stormwater Management Plan and determine if the Plan is adequate for minimizing the runoff impacts of new development. At minimum, the information to be reviewed by the Committee will be as follows:

    a. Development activity data as monitored by the LCPC.
    b. Information regarding additional storm drainage problem areas as provided by the municipal representatives to the Watershed Advisory Committee.
    c. Zoning amendments within the study area.

d. Information associated with any regional detention alternatives implemented within the study area.
e. Adequacy of the administrative aspects of regulated activity review.

The Committee will review the above data and make recommendations to the County as to the need for revision to the Lycoming Creek Watershed Stormwater Management Plan. Lycoming County will review the recommendations of the Watershed Advisory Committee and determine if revisions are to be made. A revised Plan would be subject to the same rules of adoption as the original Plan preparation. Should Lycoming County determine that no revisions to the Plan are required for a period of five consecutive years, the County will adopt resolutions stating that the Plan has been reviewed and been found satisfactory to meet the requirements of Act 167 and forward the resolution to DEP.

SECTION IX – REFERENCES

1. Pennsylvania Department of Conservation and Natural Resources, Bureau of Topographic and Geologic Survey, the "Pennsylvania Geological Survey". http://www.dcnr.state.pa.us/topogeo/map1/explanation.pdf

2. Stormwater; The Journal for Surface Water Quality Professionals, "Off the Hook, Finding Funding for Stormwater Programs. September/October 2005.

3. Pennsylvania Best Management Practices Manual. The Department of Environmental Protection, Bureau of Watershed Management. Document Number 363-0300-002, Effective December 30, 2006.

4. (USDA), (NRCS). National Engineering Handbook. Part 630: Hydrology, 1969-2001. Original published as National Engineering Handbook, Section 4: Hydrology available online at: http://www.wcc.nrcs.usda.gov/hydro/hydro-techref-neh-630.html.

5. Urban Hydrology for Small Watersheds, Technical Release No. 55 (TR-55, USDA, NRCS).

6. Commonwealth of Pennsylvania, Storm Water Management Act No. 167.

7. PennDOT Drainage Manual, Publication Number 584, as amended.

Insert Plate 1 - Base Map

Insert Plate 2 Existing Land Use

Insert Plate 3 - Future Land Use Map

Insert Plate 4 - Future Land Use Changed Map

Insert Plate 5 - Hydrologic Soils Map

Insert Page 6 - Geology Map

Insert Plate 7 - Sub-Watersheds Map

Insert Plate 8 - Drainage Problem Areas Map

Insert Plate 9 - Storm Sewer Network Map

Insert Plate 10 - Release Rate District Map

ATTACHMENT A

Model Lycoming Creek Watershed Stormwater Ordinance

ATTACHMENT B

Lycoming Creek Watershed Plan Advisory Committee