

Erie County Planning Department

Act 167 County-Wide Watershed
Stormwater Management Plan for Erie County
Phase I – Scope of Study

July 2008



[BUILDING RELATIONSHIPS.
DESIGNING SOLUTIONS.]

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INTRODUCTION

STORMWATER RUNOFF – ITS PROBLEMS AND ITS SOLUTIONS

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 of pervious land area (i.e., natural land covered by pavement, concrete, or buildings). That is, the alteration of natural land cover and land contours by residential, commercial, industrial, forestry, and farmland uses results in decreased infiltration of rainfall and an increased rate and volume of stormwater runoff.

The need for stormwater management in Pennsylvania has been demonstrated repeatedly in the past. As the population of an area increases, land development is inevitable, and the alteration of natural ground surfaces results in decreased infiltration of rainfall. As a result of continued development, the volume and rate of stormwater runoff increases causing environmental impacts including flooding, stream channel erosion and siltation, water quality degradation, and reduced groundwater recharge. Cumulative effects of development in some areas of a watershed can result in flooding of natural watercourses with associated costly property damages.

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

PENNSYLVANIA STORMWATER MANAGEMENT ACT (ACT 167)

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:

“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. 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 past 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 had 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 an 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 regarding 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 may be exacerbated from additional development.

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 (PADEP). Most importantly, these plans are to be prepared in consultation with municipalities located in the county, working through a Watershed Plan Advisory Committee (WPAC). Due to a recent change in PADEP Act 167 policy, in lieu of providing plans for each designated watershed, Act 167 plans are now being created on a county-wide basis. The plans are intended to provide uniform technical standards and criteria throughout the county for the management of stormwater runoff from new land development sites. The new PADEP policy also stresses the opportunity for municipalities to retrofit existing sites to improve existing water quality impairments or existing problem area flooding sources.

The types and degree of control that are prescribed in the stormwater management plan must be based on the expected development pattern and hydrologic characteristics of each individual watershed within the county. The plan, more specifically the standards and criteria, are to be developed from the technical evaluations performed in the analysis process, in order to respond to the "cause and effect" nature of existing and potential storm runoff impacts in each watershed. The final product of the Act 167 planning process will be a comprehensive stormwater management plan, to be developed and implemented with a firm sensitivity to the overall needs (e.g., financial, legal, political, technical, etc.) of the municipalities in Erie County.

ACT 167 PLANNING FOR ERIE COUNTY

Given the above history and information, the county-wide watershed planning process for Erie County must be designed with the individual watershed characteristics in mind, as well as the resources (technical, political, and economic) of the County. The Phase I - Scope of Study presents the concept and approach that has been developed to fully meet these requirements, as well as the specific requirements of Act 167, for this county-wide watershed stormwater management project.

BENEFITS OF THE PLAN

The purpose and benefit of the study and plan is to provide all of the municipalities in Erie County with an accurate and consistent plan implementation strategy and procedures for comprehensive stormwater management. Currently, there is a great deal of variance within the municipalities regarding implementation and enforcement of stormwater management regulations. Given the nature of storm runoff and its impacts, a critical objective of sound stormwater management planning is to provide for consistency of stormwater management requirements throughout Erie County. Therefore, the primary objective of the technical study and planning process is to develop a technical and institutional support document to

encourage and/or support the consistency of regulations based on county-wide and watershed-wide consideration.

The technical and institutional county-wide planning approach recommended by PADEP also provides the municipalities with a considerable amount of useable technical information, such as detailed watershed runoff simulation models, that can be used for other stormwater management purposes. Therefore, as a result of developing the plan, municipalities and Erie County, will realize benefits and/or products that are useable for other planning and engineering purposes. For example, land use updates and environmental data management are necessary for effective planning in a specific watershed. The technical component of the plan will provide unique environmental database management benefits for both the county and municipal use. Another example of the associated benefits of the plan relates to basic public works and/or engineering functions, primarily at the municipal level.

In addition, technical support information provided as a part of specific watershed modeling effort can be used by public works officials in the design and regulatory permitting efforts for bridge replacement and floodplain management analysis. Further, the stream encroachment permit process, which involves the need to supply detailed stream flow data as a part of the application process, can be more efficiently and cost-effectively developed using a calibrated watershed model. Therefore, the benefits of the watershed planning process are extensive, even beyond the important functions of developing comprehensive stormwater management strategies and ordinance provisions.

A new initiative from PADEP indicates that the plan may investigate and provide solutions to correct existing problems. Specifically, the plan will identify and summarize problem areas; provide much of the hydrology that will be required in the design of proposed solutions; provide potential conceptual solutions to correct these problems; and will specify possible funding streams for project implementation.

APPROACH FOR THE DEVELOPMENT OF THE STORMWATER MANAGEMENT PLAN

In order to implement county-wide comprehensive planning and management of stormwater runoff, it was necessary to take a close look at all major watersheds within Erie County during Phase I. Since the Act itself is very dependent on municipal coordination to provide for the planning and management of stormwater throughout their respective municipality, it was necessary to get “buy-in”, endorsement, and involvement from each municipality early in the planning process.

In order to initiate municipal level involvement in the overall development of the plan, a Watershed Plan Advisory Committee (WPAC) was formed and consists of the Erie County Planning Commission, municipalities, the Erie County Conservation District and other interested organizations. Two meetings with the WPAC were held during Phase I to obtain their general commitment to the project and to distribute questionnaires. Discussions from these meetings and an evaluation of the questionnaires, in conjunction with in-house knowledge from Erie County and PADEP, determined to what level this plan should be created.

THE NEED FOR A COMPREHENSIVE APPROACH FOR STORMWATER MANAGEMENT

The goal of Erie County's Act 167 planning process is to provide a county-wide comprehensive program to assist in the planning and management of stormwater. With coordination of the thirty-eight (38) municipalities in Erie County, the resulting stormwater management ordinance will address severe and ongoing stormwater related problems in critical areas throughout the County. Furthermore, cooperating member municipalities will be able to adopt stormwater management controls that will have a collectively beneficial impact on the waters of Erie County and those "problem" areas that presently remain unmanaged.

The Act itself is divided into two phases of which Erie County has received Phase I funding from PADEP and is highly dependent on gaining support from the municipalities in the early stages of plan development. Phase II will result in the final stormwater management plan and model ordinance. More specifically, the development process for the stormwater management plan is as follows:

Phase I - Scope of Study - Establishing procedures used to prepare the Plan. These procedures are determined by an overall survey of:

- Specific watershed characteristics and hydrologic conditions.
- Stormwater related problems and significant obstructions.
- Alternative measures for control.

Phase II - The Plan - The technical assessment and development of the model ordinance that includes:

- Watershed modeling and planning.
- Development of technical standards and criteria for stormwater management.
- Conceptual solutions to identify problem areas.
- Identification of administrative procedures for implementation of the plan.
- Adoption by Erie County.
- Approval by PADEP.
- Adoption by all thirty-eight (38) municipalities.
- Municipal implementation.

PREVIOUS PLAN EFFORTS

There has been one previous Act 167 Plans prepared for Erie County.

- Erie County, *Lake Erie Area Watershed Act 167 Stormwater Management Plan*, June 1996.

In addition, the following relevant documents have been prepared and will provide a valuable source of information for the development of the Plan:

- Erie County Planning Department, *Erie County Community Facilities and Utilities Plan*, December 9, 2003.
- Erie County Planning Department, *Erie County Land Use Plan*, December 9, 2003.
- Erie County Planning Department, *Erie County Natural and Historical Resources Plan*, December 9, 2003.
- French Creek Project, *French Creek Watershed Conservation Plan*, January 2002.

GENERAL COUNTY DESCRIPTION

Located in the northwestern corner of Pennsylvania, Erie County is bordered by Lake Erie to the northwest, New York State to the northeast, and Ohio to the southwest, as well as Crawford and Warren Counties. Erie County is about a two-hour drive from Pittsburgh, Cleveland, or Buffalo. The county has 280,843 residents in its 802 square miles. The land consists of low hills that rise toward the southeast. The county was created in 1800 and named for the Erie Indians. The lakeside city of Erie, the county seat, is Pennsylvania's only port on the St. Lawrence Seaway. The city developed with the opening of the Erie and Pittsburgh Canal and railway construction. Another town, Waterford, is the site of Fort-Le-Boeuf, a French fort used during the French and Indian War. Other Erie County towns and communities include Corry, Edinboro, North East, and Wesleyville.

Attractions include Presque Isle State Park, which is named for Fort-Presque-Isle, built by the French in 1753. Erie carries great historical significance in the French and Indian War and the War of 1812 where Admiral Perry's American Navy defeated the British Navy.

TRANSPORTATION

Transportation in the county has influenced the hydrology of the watersheds. The County is served by two important major transportation routes. Interstate 79, the north-south link from Interstate 80 and Pittsburgh terminates in the City of Erie. Interstate 90 runs east-west through the County and provides access to adjacent states of Ohio (Cleveland) and New York (Buffalo). Other minor transportation routes include United States Highway No. 6 which crosses the County from northwest to southeast, State Route 8 crosses the County from southwest to northeast, State Route 5 crossing the County from west to east (also a seaways corridor), and State Route 19 which runs south to north and is a commercial corridor.

These major thoroughfares and crossroads provide a critical transportation and commuting link for County residents. However, these routes create an increase of impervious surfaces throughout the watershed. These impervious surfaces create more surface runoff and are non-point source pollution during precipitation events. This increases the stress on the drainage systems in the watershed, reduces water quality, and exacerbates streambank erosion, especially at already-known problem areas.

To a lesser extent, rail lines have also influenced the hydrology of the county. Several major railroad lines cross the county, mostly serving the industrial needs. One major airport also serves the County with the Erie International Airport, Tom Ridge Field. In addition, Lake Erie serves as a major transportation route with the Port of Erie.

POLITICAL JURISDICTIONS

The County is comprised of 38 municipalities. The political jurisdictions include 22 townships, 14 boroughs, and the 2 cities of Corry and Erie, the County Seat. Erie County is classified as a third class county and is ranked 13th in the state of 67 counties, with a population of 280,843 according to the 2000 census. The 38 municipalities in Erie County are as follows:

Municipality	Census	Area (mi ²)
CITIES		
Corry	6834	6.1
Erie	103717	22

Municipality	Census	Area (mi ²)
BOROUGHS		
Albion	1607	1.1
Cranesville	600	0.9
Edinboro	6950	2.3
Elgin	236	1.6
Girard	3164	2.4
Lake City	2811	1.8
McKean	389	0.6
Mill Village	412	0.9
North East	4601	1.3
Platea	474	3.3
Union City	3463	1.9
Waterford	1449	1.2
Wattsburg	378	0.3
Wesleyville	3617	0.5

Municipality	Census	Area (mi ²)
TOWNSHIPS		
Amity	1140	28.3
Concord	1361	33
Conneaut	3908	43.4
Elk Creek	1800	34.6
Fairview	10140	29.2
Franklin	1609	28.8
Girard	5133	31.7
Greene	4768	37.5
Greenfield	1909	33.8
Harborcreek	15178	34.2
Lawrence Park	4048	1.9
Le Boeuf	1680	33.7
McKean	4619	36.6
Millcreek	52129	29.5
North East	7702	42.4
Springfield	3378	37.7
Summit	5529	23.9
Union	1663	36.5
Venango	2277	43.6
Washington	4526	45.1
Waterford	3878	50.1
Wayne	1766	38.3

NATURAL CHARACTERISTICS

WATER RESOURCES

One of Erie County's natural resource with great importance to the past, present, and future is water. The 64 miles of Lake Erie shoreline connects Pennsylvania to the Great Lakes system, which contains 95% of the country's fresh surface water and 20% of the world's fresh surface water.

"Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the commonwealth shall conserve and maintain them for the benefit of all the people."
--The Constitution of the Commonwealth of Pennsylvania, Article I, Section 27

WATERSHEDS

The northern and western portion of Erie County drains to Lake Erie. The remainder of the County lies within the Ohio River drainage basin. All precipitation which falls in Erie County is channeled by gravity into six major watersheds which are listed below. Each of these basins drains surface water into the major streams and rivers running through the County.

The PADEP designated watersheds within Erie County included in this study are:

PADEP DESIGNATED WATERSHEDS			
	AREA (miles²)		Portion of County
	Total	Within County	
Lake Erie	347.6	347.6	43.3%
French Creek	672.7	340.1	42.3%
Conneaut Creek	151.8	54.9	6.8%
Brokenstraw Creek	266.2	28.8	3.6%
Cussewago Creek	97.7	16.1	2.0%
Ashtabula River	8.2	7.8	1.0%
Oil Creek	320.1	6.7	0.8%
Muddy Creek	84.5	1.1	0.1%

The PADEP watersheds within Erie County are illustrated in Appendix G.

LAKES & PONDS

Beside Lake Erie itself, Erie County contains three of the nine glacial lakes in western Pennsylvania -- Lake Pleasant, Lake LeBoeuf, and Edinboro Lake. Lake Pleasant is located in Venango Township and is approximately 60 acres in size. Lake Pleasant has been described as the last remaining example of a pristine glacial lake in Northwest Pennsylvania as it avoided problems such as hydrologic alteration, significant pollution or shoreline development, and introduction of invasive species. LeBoeuf Lake is a natural lake approximately 70 acres in size. It is located in Waterford Township immediately adjacent to the Borough of Waterford. Edinboro Lake is located in the Borough of Edinboro. It is approximately 252 acres and flows into Conneauttee Creek, part of the French Creek drainage.

The county also contains numerous other lakes, ponds and impoundments, which include Cranberry Pond, Grahamville Reservoir, Howard Eaton Reservoir (located in both North East and Greenfield Townships and is approximately 246 acres in size), Leisure Lake, Long Pond, Niagara Pond, Ridge Pond, Siegel Marsh Reservoir, Smith Reservoir, and Union City Reservoir.

SURFACE WATER QUALITY

The Pennsylvania Chapter 93 Water Quality Standards classify all surface waters according to their water quality criteria and protected water uses. Selected waterbodies that exhibit exceptional water quality and other environmental features are referred to as "Special Protection Waters", which includes High Quality and Exceptional Value designations. Certain activities in those watersheds that could adversely affect surface water are more stringently regulated to prevent degradation.

The streams within the County with protected use classification are listed below:

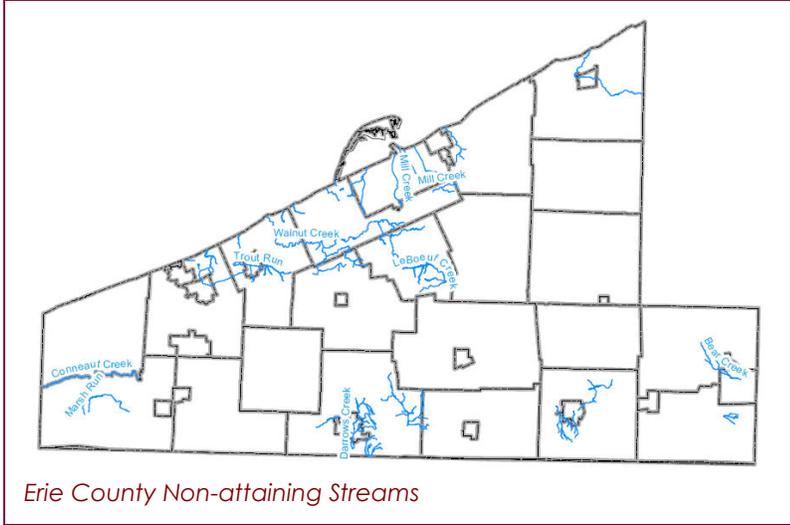
SPECIAL PROTECTION WATERSHEDS			
<i>Exceptional Value Watershed</i>			
Beaver Run			
<i>High Quality Watersheds</i>			
Crooked Creek	Godfrey Run	Hubble Run	Lake Pleasant Outlet
Spring Creek	Thomas Run	Trout Run	Twelvemile Creek

A complete list of all the streams within the County and their Chapter 93 classifications are listed in Appendix G.

IMPAIRED STREAMS

The 2006 *Integrated Water Quality Monitoring and Assessment Report* represents stream assessments in an integrated format for the Clean Water Act Section 305(b) reporting and Section 303(d) listing. Streams are bodies of flowing surface water that collectively form a network that drains a basin. PA DEP protects 4 stream water uses:

- aquatic life
- fish consumption
- potable water supply
- recreation



Erie County Non-attaining Streams

The 305(b) stream segments have been evaluated for attainment of those uses. If a stream segment is not attaining any one of its 4 uses, it is then considered non-attaining. In Erie County, the non-attaining streams all were for aquatic life, fish consumption and recreation.

In May 2007, PA DEP completed the Walnut Creek Watershed Environmental Quality Assessment Report which assessed the features and physical characteristics of the watershed, watershed uses, actual and potential pollutants to the watershed and efforts in place for resource conservation and environmental stewardship. The report identifies many threats to the watershed including urban stormwater runoff which this Act 167 Plan will address.

The following table groups the source cause of non-attaining streams in Erie County as well as the total miles and the percentage of the individual causes:

SOURCE CAUSE	MILES	%
Siltation caused by Municipal/Urban/Residential/Recreation Uses	20.6766	42.6%
Agricultural Related (Siltation, Organic Enrichment/Low D.O., Crop, Grazing, etc.)	17.9250	36.9%
Natural Sources (Unknown cause, Organic Enrichment/Low D.O.; Water/Flow Variability ; Siltation)	5.9285	12.2%
Source Unknown - Mercury	2.6851	5.5%
Source Unknown - Pathogens	0.5537	1.1%
Other - Siltation ; Other - Organic Enrichment/Low D.O.	0.5016	1.0%
Municipal Point Source - Chlorine	0.2525	0.5%
	48.5230	

A complete list of impaired streams (from the 2006 Report) and their causes are included in the Appendix G.

CLIMATE

Erie County is situated in the Northwest Plateau Climatic Divisions and the climate is classified as humid continental. In general, the winters in Erie County are moderately cold and the summers

are warm and somewhat humid. Mean temperature in the summer is about 67°F while the winter mean temperature is about 27°F. Cloudiness is prevalent in winter as a result of the "lake effect" of cold air passing over the relatively warm Lake Erie, picking up moisture and resulting in cloud formation. Annual precipitation is about 39.4" with maximum precipitation occurring in the month of September (3.9") and the minimum precipitation in February (2.1"). The average annual snowfall amounts to about 84 inches a year. Snow is produced as Canadian air masses travel south over unfrozen lake waters. The air masses absorb considerable amounts of moisture and warmth as they move over the Great Lakes. As the warm, moistened lower level air reach land and rise through the cold air above, heavy snow squalls are produced that are capable of depositing one to two feet of snow on the County. Lake Erie is subject to this "lake effect" snowfall during November and December. As the lake surface freezes over, snowfalls of this type become less frequent.

GEOLOGY

Erie County is located within two Physiographic Provinces – the Central and Lowland Province and the Appalachian Plateaus Province.

Central and Lowland Province - The area adjacent to Lake Erie lies within the Eastern Lake Section of the Province. This section consists of a series of northwest-sloping, lake-parallel, low-relief ridges. These ridges are made up of unconsolidated sands and gravels that were deposited during the most recent deglaciation of the area about 18,000 years ago. Steep-sided, narrow valleys cut through these ridges into the underlying shales and siltstones and flow into Lake Erie. Originally, the ridge bordering Lake Erie sloped gently into the lake. However, erosion of the shoreline has caused the lake-land interface to move southeastward so that today there is a steep bluff adjacent to the lake. Continued erosion of this bluff is a primary environmental problem in the area.

Appalachian Plateaus Province – The majority of the County lies within the Northwestern Glaciated Plateau Section of the Appalachian Plateaus Province and consists of much broad, rounded upland cut by long, linear valleys. The uplands have a southeast-oriented linearity that is pronounced in eastern Erie County. The uplands are cut by many flat-floored valleys that are separated from adjacent uplands by steep slopes on one or both sides of the valley. The valleys are very linear and are oriented northwest-southeast for the most part although some valleys are perpendicular to this orientation. The valley floors are often wetlands. There is frequently a considerable depth of unconsolidated material beneath the valley floor.

BEDROCK FORMATIONS

Erie County has been completely covered by at least three glaciers. The last glacier occurred during the Wisconsin stage. The Wisconsin glacier advanced into the county and receded five times. The last glacial advance receded about 10,000 years ago. Glacial scour, deposition, and meltwater from this glacier created the topography and geology from which most of the county's soils formed.

The time-elapse between the early and late stages of the Wisconsin glaciation caused distinct differences in drainage, which have ultimately impacted County land use. Well-developed drainage patterns are associated with the early Wisconsin stage, while poorly drained areas are associated with the late Wisconsin stage. Considerable glacial outwash can be found along the stream valleys.

The majority of the bedrock formations in Erie County belong to the Devonian Age. At the Lake Erie shore, the bedrock formation is the Sands of Presque Isle formation of the Quaternary Age. Along the southern portion of the county, bedrock formations are that of the Cuyahoga Group of the Mississippian Age. The bedrock formations are shown on the following table, with the youngest formations on the top.

Map Symbol	Formation Name	Formation Age	Geologic Description
Qs	Sands of Presque Isle	Quaternary	Fine-grained, unconsolidated sand deposited by lake currents
Mc	Cuyahoga Group	Mississippian	Medium-gray siltstone and dark-gray shale containing interbedded light-gray, flaggy sandstone. Includes, in descending order: Meadville Shale, Sharpsville Sandstone, and Orangeville Shale; marine fossils common.
Dbr	Berea Sandstone through Riceville Formation, undivided	Devonian	Sandstone, siltstone, and shale; mostly light to dark gray, but some sandstone is greenish yellow, and a few reddish shales occur. Includes, in descending order: Berea Sandstone, Bedford Shale, Cussewago Sandstone, and Riceville Shale; marine fossils common.
Dcr	Corry Sandstone through Riceville Formation, undivided		Same as Berea-through-Riceville interval described above, but uppermost sandstone unit is recognized as Corry, not Berea.
Dbv	Berea Sandstone through Venango Formation, undivided		Greenish-yellow and gray sandstone, siltstone, and shale succession, becoming more shaly and more gray downward; bottom of interval is bottom of Panama Conglomerate; Venango not mapped separately because upper key bed (Woodcock Sandstone) is missing. Includes, in descending order: Berea Sandstone, Bedford Shale, Cussewago Sandstone, Riceville Shale, and Venango Formation equivalent; contains marine fossils.
Dv	Venango Formation		Light-gray siltstone interbedded with some flaggy, gray sandstone and some bluish-gray shale; Panama Conglomerate and Woodcock Sandstone are, respectively, the lower and upper key beds defining the formation; referred to as "Cattaraugus" by some workers; includes some red shales where it interfingers to the east and south with the Catskill Formation; marine fossils present.
Dch	Chadakoin Formation		Light-gray or brownish siltstone and some sandstone, interbedded with medium-gray shale; included in Conneaut Group and "Chemung" of earlier workers; marine fossils common; includes "pink rock" of drillers.
Dg	Girard Shale		Argillaceous, ashen-gray, flaky shale and siltstone; included in Conneaut Group and "Chemung" of earlier workers; marine fossils rare.
Dne	Northeast Shale		Medium-gray shale and some thin light-gray siltstone interbeds; included in Canadaway Formation of New York; included in "Chemung" of earlier workers; contains sparse fossil marine fauna.

SLOPES

The slope of the land is an indication of the developability and use of land. Erie County's land area is comprised of varying degrees of slope. The general characteristics and development potentials and limitations of each category of slope are described as follows:

0-8% slope; 642.0 square miles; 80.0% of the County. Flat to moderate; capable of all normal development for residential, commercial, and industrial uses; involves minimum amount of earth moving; suited to row crop agriculture, provided that terracing, contour planting, and other conservation practices are followed.

8-16% slope; 132.8 square miles; 16.6% of the County. Rolling terrain and moderate slopes; generally suited only for residential development; site planning requires considerable skill; care is required in street layout to avoid long sustained gradients; drainage structures must be properly designed and installed to avoid erosion damage; generally suited to growing of perennial forage crops and pastures with occasional small grain plantings.

16-24% slope; 21.5 square miles; 2.7% of the County. Steep slopes; generally unsuited for most urban development; individual residences may be possible on large lot areas, uneconomical to provide improved streets and utilities; overly expensive to provide public services; foundation problems and erosion usually present; agricultural uses should be limited to pastures and tree farms.

24%->slope; 5.7 square miles; 0.7% of the County. Severe and precipitous slopes; no development of an intensive nature should be attempted; land not to be cultivated; permanent tree cover should be established & maintained; adaptable to open space uses (recreation, game farms, & watershed protection).

As demonstrated above, the vast majority of the county is relatively flat. With the exception of very steep slopes (mostly escarpments); slope does not preclude the development potential of the land surface.

SOILS

According to D.C. Taylor's 1960 Soil survey of Erie County, Pennsylvania, there are 10 general soils in the county. Taylor describes these general soil areas as follows:

Silty and clayey soils, chiefly on the lake plain This general area consists of low-lying parts of the lake plain and former lakebeds in the upland. The soils formed in deep lacustrine sediments that settled out of slack lagoon waters. The soils are separated from the lake by beach ridges and escarpments. Escarpments have been cut into the area as a result of stream and lake shoreline erosion;

Sandy soils of the lake plain This general area lies along the shoreline of Lake Erie. The soils have formed in deep, sandy lake sediments. Relief is level to steep. The slopes are uniform



and are as much as 500 feet long. Escarpments have been cut into the areas as the result of stream and lake shoreline erosion. The lake sediment overlies slowly permeable gray, calcareous silty material, locally known as quicksand;

Gravelly and sandy soils of the beach ridges This general area occupies beach ridges along the lake plain from the Ohio border to New York border. The beach ridges consist of thick deposits of gravel and sand that formed the shoreline when the lake was at higher levels. Near the lake the ridges have short, steep slopes. Long, gentle slopes extend inland from the ridge crests. In a few places the gentle slopes contain a series of crests and swales;

Gravelly soils of the outwash terraces This general area is on gravelly outwash terraces that were deposited in the larger valleys formed before the area was covered by the last glacier. As glacial ice melted, gravelly and sandy debris was released. The coarser textured gravelly and sandy materials were deposited where the progress of the ice was blocked by the sides of the valleys. In these places the slope pattern is complex. Small, steep, round hills or kames, are separated by depressions or potholes. The finer textured gravelly and sandy materials were carried by the glacial streams and deposited on an outwash terrace that has a few potholes. The rest of this general area consists of soils on stream terraces and flood plains;

Deep, medium-textured soils in moderately limy fill of the glaciated upland This general area is on an upland that has a mantle of gravelly till. It occurs as hills of medium-textured soils that are surrounded by gravelly material of the outwash terraces. The slopes are long and uniform. Many slopes, one-half mile long, extend from the tops of ridges to the outwash terraces;

Deep, medium-textured soils in slightly limy fill of the glaciated upland This general area consists of upland that is mantled with gravelly till. The slopes are uniform and long and often as much as one-half mile long. The soils contain fragipans, at depths of six to 30 inches, that are slowly permeable to water and air;

Deep, silty and clayey soils of the glaciated upland flats This general area is in the southwestern part of the county. It is on upland that is mantled with glacial till containing almost no gravel. The soils are mainly level to gently sloping. Most of the slopes are short, but some are as much as one-half mile long. At depths of one to two feet, the soils have compact subsoils that are slowly permeable to air and water. After rains, water remains ponded on level places. The soils are calcareous at depths of two to five feet;

Deep, silty and clayey soils of the gently or moderately sloping glaciated upland This general area is on upland that is mantled with glacial till. The individual areas are in the western part of the county between areas of lacustrine deposits and areas of coarse-textured glacial till. Relief is mainly gently sloping to moderately sloping, and the slopes are long and uniform. The soils have compact subsoils, which are slowly permeable to air and water at depths of one to two feet. After rains, water remains ponded on level areas;

Shallow, medium-textured soils of the glaciated upland and the lake plain This general area comprises gently sloping parts of the lake plain and moderately sloping to steep parts of the upland. In most places the soil is shallow over the bedrock and acid shale, which is at depths of 12 to 24 inches. The subsoil consists of dense, acid silts and clays; and

Silty and clayey soils of glacial lakebeds This general area occupies the sites of former glacial lakes. When the glacial ice melted, slack-water lakes formed in the valleys. The soils formed in deep deposits of silts and clays that were deposited by the slack water. The soils are mainly level to nearly level and have uniform slopes. Escarpments have been cut into the area by the streams that drained the lakes. The dense silty and clayey materials making

up these soils are slowly permeable to air and water. After rains, water remains ponded in level areas.

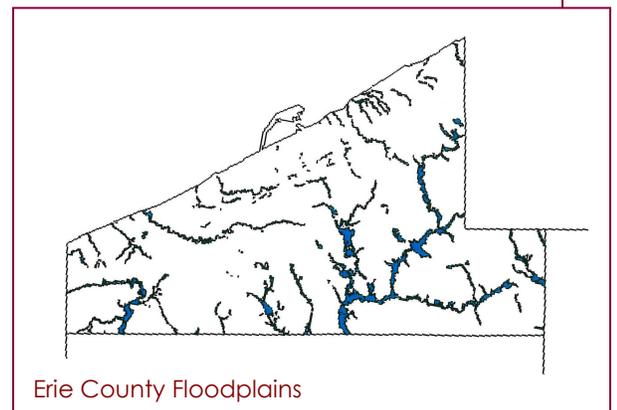
In 2006, the U.S. Department of Agriculture, Natural Resources Conservation Service published the Digital General Soil Map of U.S. It was developed by the National Cooperative Soil Survey and supersedes the State Soil Geographic (STATSGO) data set published in 1994. It consists of a broad based inventory of soils that occur in a repeatable pattern on the landscape and that can be cartographically shown at the scale mapped. The data set was created by generalizing more detailed soil survey maps. Where more detailed soil survey maps were not available, data on geology, topography, vegetation, and climate were assembled, together with Land Remote Sensing Satellite (LANDSAT) images. Soils of like areas were studied, and the probable classification and extent of the soils were determined. The data for Erie County is shown on the following table:

General Soils	Percent of County
CONOTTON-CONNEAUT-TYNER (PA001)	12%
ERIE-LANGFORD-CHIPPEWA (PA002)	32%
SHEFFIELD-PLATEA-HOLLY (PA003)	14%
ERIE-CANADICE-WAYLAND (PA004)	2%
VENANGO-FRENCHTOWN-CAMBRIDGE (PA005)	5%
CHENANGO-CAMBRIDGE-HOLLY (PA006)	22%
VENANGO-MARDIN-LORDSTOWN (PA011)	1%
ERIE-LANGFORD-VOLUSIA (PA091)	7%
ARKPORT-DUNKIRK-PALMYRA (PA095)	3%
CHENANGO-CASTILE-ALLARD (PA096)	2%
CHENANGO-TIOGA-VALOIS (PA097)	3%

The analysis of hydric soils has recently become an important consideration when performing almost any kind of development review. These soils are important to identify and locate because they provide an approximate location where wet areas may be found. Wetland areas are lands where water resources are the primary controlling environmental factor as reflected in hydrology, vegetation, and soils. Thus, the location of hydric soils is one indication of the potential existence of a wetland area. Wetland areas are now protected by the Pennsylvania Department of Environmental Protection and should be examined before deciding on any type of development activity. Refer to the Erie County Soils Survey which graphically depicts the approximate location of hydric soils throughout Erie County.

FLOODPLAIN DATA

With the exception of Platea Borough, all of Erie County's municipalities have FEMA Flood Maps in effect. Most of the County's municipalities have Flood Insurance Study's completed through the Federal Emergency Management Agency. Thirty seven waterbodies within the County have delineated floodplains associated with FEMA Flood Insurance Studies (FIS).



Municipality	Community ID	Effective Date
CITIES		
Corry	420447	2/15/1978
Erie	420449	3/1/1979
BOROUGHES		
Albion	422409	6/19/1989
Cranesville	421356	6/19/1989
Edinboro	420448	6/15/1981
Elgin	422411	9/28/1979
Girard	422413A	6/30/1976
Lake City	422414A	6/30/1976
McKean	422416	9/30/1977
Mill Village	422417	5/19/1981
North East	421359	2/4/1981
Platea		
Union City	420453	9/28/1979
Waterford	420454	12/15/1981
Wattsburg	420455	5/19/1981
Wesleyville	420456	7/16/1981

Municipality	Community ID	Effective Date
TOWNSHIPS		
Amity	421360	11/4/1988
Concord	422410	11/5/1982
Conneaut	421361	11/15/1989
Elk Creek	422412	6/19/1989
Fairview	420450	9/29/1979
Franklin	421362A	10/1/1986
Girard	421363A	6/30/1976
Greene	421364A	2/1/1986
Greenfield	421365	8/2/1990
Harborcreek	421144	9/17/1980
Lawrence Park	420451	9/29/1978
Le Boeuf	422415	5/15/1984
McKean	422623	7/16/1980
Millcreek	420452	4/16/1979
North East	421368	5/19/1981
Springfield	421369	12/1/1982
Summit	422418	9/16/1989
Union	421370	9/16/1981
Venango	421371	9/30/1981
Washington	421372	5/19/1981
Waterford	422419	2/17/1982
Wayne	421373	12/14/1979

WATERBODIES ASSOCIATED WITH A FEMA FLOOD INSURANCE STUDY			
Bear Creek	Darrows Creek	Lilley Run	Trout Run
Bear Run	Eightmile Creek	Little Conneatee Creek	Turkey Creek
Beaver Run	Elk Creek	Marsh Run	Twelvemile Creek
Brandy Run	Elliot's Run	Mill Creek	Twentymile Creek
Brokenstraw Creek	Fourmile Creek	Raccoon Creek	Walnut Creek
Cascade Run	French Creek (incl. SB & WB)	Scott Run	Wheeler Run
Conneatee Creek	Hare Creek	Shenango Creek	Whitney Run
Conneaut Creek (incl. WB & EB)	Hubbel Run	Sixmile Creek	
Crooked Creek	Lake Pleasant Outlet	Sixteenmile Creek	
Cussewago Creek	Le Boeuf Creek (incl. EB)	Temple Creek	

LAND USE

EXISTING LAND USES

The way land is used effects stormwater runoff from its rate and volume to its quality. The 2003 *Erie County Land Use Plan* classified all the land uses within the county as shown on the following table:

2002 Erie County Land Use		
Classification	Area	
	Square Miles	Percentage
Residential	68.85	8.6
Commercial	7.99	1.0
Industrial	6.85	0.9
Public/Institutional	13.79	1.7
Agricultural	213.6	26.5
Open, Wooded, Vacant or Water	434.6	54.2
Roads & Highways	25.3	3.1
Airport & Rail	3.45	0.4
State Lands	28.69	3.6

As shown, just over half of the county's land is undeveloped and over a quarter of the land is in agricultural use. Of the roughly 20% of the land in Erie County that is considered developed, approximately half is covered by residential developments.

The Land Use Plan showed the developed area of the county has been increasing over the past 25 years. The vast majority of that growth occurred from new residential developments.

RESIDENTIAL DEVELOPMENT

According to the 2003 Land Use Plan, much of the increase in residential land use is a direct result of low-density suburbanization patterns. Residents are leaving older urban places, such as Erie City, and relocating to more suburban and rural areas, but often to areas still not too far from jobs and shopping. This accounts for the development of extensive suburbs in Fairview, Harborcreek, McKean, Millcreek, and Summit Townships, as well as expansion of suburban developments into townships adjacent to other urbanized areas such as Edinboro, Girard/Lake City and North East.

This suburban/rural growth is generally at a much lower density than the urban locations. A single suburban dwelling might be placed on a lot from 10,000 square feet to over one acre in size versus the 7,200 square foot size parcel which is typical in the Cities of Erie and Corry. As a result, residential density has changed from 9.3 persons per developed residential acre in 1980 to 6.4 persons in 2002.

FARMLANDS

In an effort to identify the extent and location of important farmlands, the Natural Resources Conservation Service, in cooperation with other interested Federal, State, and local government organizations, has inventoried land that can be used for the production of the Nation's food supply. "Prime farmland" is of major importance in meeting the Nation's short and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our

Nation's prime farmland. This inventory was designed to assist planners and other officials in their decision making to avoid unnecessary, irrevocable conversion of good farmland to other uses. On the United States Department of Agriculture's important farmland inventory map, the farmlands are categorized into four classifications: prime farmland, unique farmland, additional farmland of statewide importance, and additional farmland of local importance. The definitions of each are explained below, with the total acreage of each category contained within Erie County indicated in parenthesis:

Prime Farmland (105,182 acres); Land best suited for producing food, feed, forage, fiber, and oilseed crops. The land could be cropland, pastureland, rangeland, or forest land but cannot be already developed or covered by a waterbody. This farmland has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed, according to modern farming methods.

Unique Farmland (0 acres); Land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables.

Additional Farmland of Statewide Importance (308,791 acres); Land, in addition to prime and unique farmlands, of statewide importance for the production of food, feed, fiber, forage, and oilseed crops. These lands do not qualify for prime and unique farmland, but meet certain soil characteristics standards, as determined by capability classes assigned to each soil type.

Additional Farmland of Local Importance (0 acres); Land identified by local agencies or officials as having local importance in the production of food, feed, fiber, forage, and oilseed crops, even though they were not identified as having statewide importance.

It is calculated that almost 80% of Erie County's land area is classified as "important farmland" and over 20% of the "important farmland" can be labeled "prime farmland". The importance of identifying these areas and planning accordingly is significant. The loss of good farmland is often accompanied by such environmental problems as surface water runoff and interference with the natural recharging of groundwater. Furthermore, when prime agricultural areas are no longer available, farmers will be forced to move to marginal lands, usually on steeper slopes with less fertile soils which are more apt to erode and less likely to produce. Clearly, decision makers must be able to make informed judgments about the development of farmland. Actions that put high quality agricultural areas into irreversible uses should only be initiated if the actions are carefully considered and are clearly for the benefit of public good.

Between 1978 and 2002, the County lost over 26% of agricultural lands. To address this problem, Erie County and its municipalities have active Agricultural Security Area and Farmland Preservation programs as shown below:

- Agricultural Security Areas: 18 participating municipalities, 68,264 acres protected as of 2/2008.
- Clean & Green Program: Over 5,819 parcels totaling about 202,850 acres participate in the program, as of 2/2008.
- Agricultural Easements: Through Erie County Land Preservation Board, 44 easements have been purchased totaling 5,151 acres as of 3/2008.

CURRENT DEVELOPMENT PATTERNS

The existing development patterns in Erie County can be summarized as stated in the 2003 Erie County Land Use Plan:

“...certain overall observations can be made. First, it is readily apparent that Erie City remains the development center of the County. Development radiates outward from the City. A second observation focuses on the attraction of the Lake Plain. Most developed land in Erie County is found north of I-90, in a strip from North East to the Girard-Lake City axis. A second development corridor is found along I-79 in the McKean, Washington, and Edinboro areas. Next are the rural development centers (i.e., Corry, Union City, Waterford, and Albion-Cranesville), which are all focused on one or two major highways. Finally are the patterns of suburban residential development. In the immediate Erie suburban area, land use patterns show nearly continuous ribbons of residential use along nearly all roads. In the more rural areas, and in the prime farmlands such as North East, more traditional land use patterns still prevail. To a large extent, these patterns represent a more limited number of residences along rural, secondary roads.”

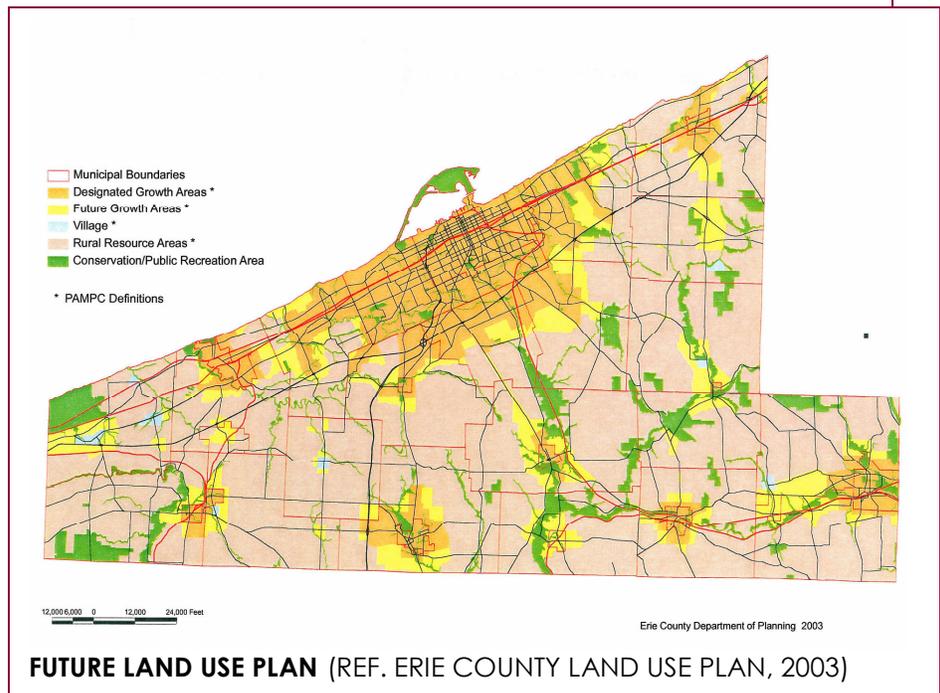
FUTURE LAND USE

The 2003 Erie County Comprehensive Plan identifies future land uses in terms of more intensely developed “Designated (and Future) Growth Areas” and “Villages”, and low intensity “Rural Resource Areas” and “Conservation/Public Recreation Areas”.

The “Designated Growth Areas” reflect the regions in the county that include and surround a city, borough, or village, and within which residential and mixed-use development is permitted or planned for at densities of one unit to the acre or more; commercial, industrial, and institutional uses are permitted or planned for; and public infrastructure services are provided or planned.

These areas include the City of Erie and its surrounding municipalities of Millcreek Township, Lawrence Park Township, and Wesleyville Borough, and portions of Fairview Township, McKean Township, Summit Township, Greene Township and Harborcreek Township.

Other “Designated Growth Areas” include the City of Corry, Union City Borough, Waterford Borough, Edinboro Borough, Albion and Cranestown Borough, Girard and Lake City Borough, Wattsburg Borough and North East Borough as well as adjacent areas.



Surrounding all of these “Designated Growth Areas” are “Future Growth Areas” where development is expected as an orderly extension of the existing core areas. Additionally, “Future Growth Areas” are found along several major transportation corridors in the County, including Interstates 79, 86 & 90, US Routes 6, 19, & 20, and State Routes 8, 18, 89 & 98.

INTEGRATED WATERSHED RESOURCE PLANNING

INTRODUCTION AND PURPOSE

PA DEP's Comprehensive Stormwater Management Policy of 2002 recognizes stormwater as a resource. It is also important to acknowledge that stormwater is our primary source of fresh water. We face many challenges in planning and managing this resource. Runoff quality, stream bank erosion, groundwater recharge, dry weather stream flows and traditional flood control are all typical problems addressed with stormwater planning and management. Recently, there has been an emphasis on managing runoff from construction sites as well as post-construction runoff to address some of the challenges.

As a resource, stormwater is a factor addressed in many other comprehensive planning efforts. The lack of coordination between these comprehensive plans has the potential to conflict with one another when dealing with stormwater. Some of the planning efforts include:

1. Stormwater management plans
2. County comprehensive plans
3. Flood protection / flood plain management plans
4. Hazard mitigation plans
5. Source water protection plans
6. State water plan
7. Recreation plans
8. Transportation plans
9. Utility corridor plans
10. Urban wet weather and Infrastructure (CSS/CSO)
11. Consistency with river basin commission

In addition, there are many legislative acts that effect water resources. The implementation of the provisions of the acts again lack coordination and may lead to conflicts. Some of the legislative acts include:

1. Federal Clean Water Act
2. Federal Safe Drinking Water Act
3. Pennsylvania Clean Streams Law
4. Pennsylvania Safe Drinking Water Act
5. Pennsylvania Stormwater Management Act
6. Pennsylvania Flood Plain Management Act
7. Pennsylvania Sewage Facilities Act
8. Pennsylvania Dam Safety and Encroachments Act
9. Pennsylvania Water Resource Planning Act
10. Pennsylvania Water Rights Act
11. Pennsylvania Conservation District Law
12. Pennsylvania Municipal Planning Code
13. Pennsylvania Municipal Authorities Act
14. Pennsylvania Nutrient Management Act

APPROACH FOR THE DEVELOPMENT OF INTEGRATED WATERSHED RESOURCE PLAN

Recognizing this lack of coordination, PA DEP has initiated pilot testing an Integrated Watershed Resource Planning (IWRP) policy, using the Act 167 Stormwater Management Plan process as the vehicle. The Walnut Creek Watershed has been chosen as one of the pilot test watersheds. The Walnut Creek Integrated Watershed Resource Planning will review the existing planning efforts already completed within the Watershed and provide coordination and consistency. The

IWRP will also review the legislation and the implementation of their regulations for coordination and consistency.

CONSISTENCY AND COORDINATION DISCUSSION

In addition to the previously cited planning efforts that *directly* addressed stormwater planning, other planning efforts have been completed by Erie County, its municipalities and some utility providers to meet requirements promulgated through the regulatory agencies. Those planning efforts include:

ACT 220 WATER PLANNING

The Commonwealth of Pennsylvania is currently implementing the Water Resources Planning Act (Act 220 of 2002), which calls for the State Water Plan to be updated by March 2008, and updated every 5 years thereafter. To carry out the planning provisions of the law, a Statewide Water Resources Committee was formed to help guide the development of the State Water Plan through a collaborative process. As Erie County is located in both the Ohio River Basin and the Lake Erie Basin, they are represented by two of the six regional water resources committees.

Act 220 requires the State Water Plan to contain several key components that pertain to stormwater, including: Surface and groundwater inventories; floodplain and stormwater management problems, water resources required to serve areas, and alternatives to address identified water availability problems; Identification of potential problems with water availability or conflicts among water uses and users, among others.

SOURCE WATER PROTECTION PLANNING

To expand the benefits realized from Wellhead Protection efforts, the 1996 Safe Drinking Water Act reauthorization requires States to develop a Source Water Assessment and Protection (SWAP) Program. The SWAP program assesses the drinking water sources serving public water systems for their susceptibility to pollution. This information will be used as a basis for building voluntary, community-based barriers to drinking water contamination.

Pennsylvania's assessment program will:

- (1) Delineate the boundaries of the areas providing source waters for all public water systems; and
- (2) Identify (to the extent practicable) the origins of contaminants in the delineated area to determine the susceptibility of public water systems to such contaminants.

These assessments are the raw water quality, not the finished water compliance. DEP conducted assessments of community water systems supplied primarily by groundwater and serving a population of 3,300 or more. The groundwater sources of public water systems serving less than 3,300 were assessed using readily available data from the program's GIS.

The County is served by several water suppliers, few of which have completed planning activities studying the source of the water and protection needs. The planning activities need to be expanded for community water supplies, and coordinated with the Plan.

NPDES MUNICIPAL SEPARATE STORM SEWER SYSTEMS (MS4)

Polluted storm water runoff is often transported to municipal separate storm sewer systems (MS4s) and ultimately discharged into local rivers and streams without treatment. EPA's Stormwater Phase II Rule establishes an MS4 stormwater management program that is intended to improve the Nation's waterways by reducing the quantity of pollutants that stormwater picks up and carries into storm sewer systems during storm events.

In 1990, EPA promulgated rules establishing Phase I of the National Pollutant Discharge Elimination System (NPDES) stormwater program for those that generally serve populations greater than 100,000. The Stormwater Phase II Rule extends coverage of the NPDES stormwater program to "small" MS4s which are municipalities located in "urbanized areas" (UAs) as defined by the Bureau of the Census (unless waived by the NPDES permitting authority).

Operators of regulated small MS4s are required to design their programs to:

- (1) Reduce the discharge of pollutants to the "maximum extent practicable" (MEP);
- (2) Protect water quality; and
- (3) Satisfy the appropriate water quality requirements of the Clean Water Act.

Implementation of the MEP standard requires the development and implementation of BMPs and the achievement of measurable goals to satisfy each of the six Minimum Control Measures (MCM). A small MS4 stormwater management program implements the six MCMs in concert to significantly reduce pollutants discharged into receiving waterbodies.

The following table lists all the MS4 communities in the County:

MS4	
City of Erie	Harborcreek Township
Girard Borough	Lawrence Park
Lake City Borough	McKean Township*
Wesleyville Borough	Millcreek Township
Fairview Township	Summit
Girard Township	Penn State Berhend
Greene Township*	

*Permit Waiver Approved

FLOODWAY & FLOODPLAIN MANAGEMENT

Most of the provisions contained in local floodplain management regulations are derived from the minimum requirements of the National Flood Insurance Program (NFIP). However, some of the provisions have also come about as a result of the Pennsylvania Flood Plain Management Act, commonly referred to as Act 166. Although similar to the NFIP requirements, state floodplain management requirements differ by applying only to certain specified activities and by requiring additional precautionary measures against flooding.

The Pennsylvania Flood Plain Management Act, signed into law on October 4, 1978, requires all floodprone municipalities to participate in the NFIP. Participating municipalities must enact local floodplain management regulations that at a minimum comply with federal requirements. In addition to complying with federal requirements, Act 166 also directs municipalities to include provisions that comply with the minimum state floodplain management requirements.

As discussed previously, all Erie County municipalities have enacted required ordinances.

EXPANDED FOCUS OF IWRP CONCEPT

During initial discussions, it was recognized a key to successful stormwater management planning, all municipalities need to be involved. In addition, it was also recognized that many of the challenges in the Walnut Creek Watershed were common in most of the developing lake shore communities. With the support of the WPAC, the Plan will identify an entity that would effectively and efficiently address stormwater management for many communities. With a single entity in charge of stormwater management, resources can be shared, duplication eliminated and standardization promoted.

During Phase 2 of the Act 167 Planning process, a feasibility study will be conducted to identify local needs, economics, benefits, and detractors of creating a central entity or authority to handle:

- MS4 responsibilities.
- Stormwater ordinance plan review and implementation.
- Source water protection planning.
- Floodway and floodplain management.

The benefits to the municipalities can be tremendous. The entity or authority could become a Qualified Local Program whereby many permits typically administered by the Conservation District or DEP could be completed locally. Rural municipalities will benefit as the entity or authority will provide a hassle free, low overhead, and consistent SWM ordinance implementation, review and enforcement. Through an entity or authority, funding will be more accessible to complete projects such as source water protection planning for all Lake Erie/Erie County municipalities.

PHASE I PLANNING PROCESS

AGREEMENT BETWEEN PADEP AND ERIE COUNTY

An agreement for a Phase I Watershed Stormwater Management Plan Grant for all watersheds of Erie County was made between the Pennsylvania Department of Environmental Protection and Erie County on June 29th, 2007.

The agreement was made in order for Erie County to prepare a Stormwater Management Plan in two phases. The first phase (Phase I) is the preparation and submission of a Scope of Study to PADEP for their review and approval. The Scope of Study generally consists of a determination of the level of effort and cost required by Erie County to satisfactorily complete the second phase (Phase II). Phase II includes the preparation and adoption of the Stormwater Management Plan based on the level of effort identified in Phase I.

The Phase I agreement termination date is June 30th, 2008.

ENGINEERING CONSULTANT SELECTION

In order to assist in the preparation of Phase I, Erie County selected Herbert, Rowland & Grubic Inc. to provide stormwater planning services to Erie County and complete this Phase I report.

CREATION AND DISTRIBUTION OF A QUESTIONNAIRE FORM

HRG created the "Erie County Phase I Act 167 Stormwater Management Plan Questionnaire Form" which was distributed by the Erie County Planning Department at the first Watershed Plan Advisory Committee meeting. The Questionnaire along with other material presented at the meeting was provided to committee members missing the meeting. All municipalities and other interested citizen groups and public organizations were encouraged to complete the form. The purpose of the 7-page Questionnaire Form was to gather various pieces of information to help determine the level of commitment from each municipality, to reveal what the major stormwater issues were that affected each municipality, and to determine the location of existing problem areas, significant obstructions, and stormwater management facilities.

ESTABLISHMENT OF A WATERSHED PLAN ADVISORY COMMITTEE (WPAC)

An additional purpose of the Questionnaire Form was to gather contact information for representatives of each of the municipalities as well as other concerned organizations, groups, or citizens that would be interested in participating in the Watershed Plan Advisory Committee (WPAC). The purpose of the WPAC is to serve as an access for municipal input, assistance, voicing of concerns and questions, and to serve as a mechanism to ensure that the inter-municipal coordination and cooperation is secured.

As part of a new initiative by PADEP, it is their position that if a representative from each municipality does not volunteer to join the WPAC, then the head of each governing body will be the appointed member to the WPAC. As an appointed member, that member will be provided all correspondence, be considered an active member, and their name will be included in a list as a member of the WPAC contained within the Plan. The head of each governing body will also be asked to assist their municipality in adoption of the provisions and requirements of the final Plan.

	ORGANIZATION	WPAC MEMBERS
CITY	Corry	Gary Dahl
	Erie	Jon Tushak
BOROUGH	Albion	Robert L. Rabell
	Cranesville	Robert L. Rabell
	Edinboro	TJ Jemetz
	Elgin	Richard Patterson
	Girard	Mark Corey
	Lake City	Joseph L. Legnasky
	McKean	Lawrence Davies
	Mill Village	Mark Corey
	North East	Mike Skrekla
	Platea	Lyne Daniels
	Union City	Greg Bowes
	Waterford	Laura Breon
	Wattsburg	Donna Horn
	Wesleyville	Peter Nye
TOWNSHIP	Amity	Darrell Kimmy
	Concord	Matt Kubich
	Conneaut	Mark Corey
	Elk Creek	Eric S. Legenzoff
	Fairview	Dave Carner
	Franklin	Dennis Howard
	Girard	Paul Pangratz
	Greene	Linda Cagnoli
	Greenfield	Steve Rathmann
	Harborcreek	Joseph Peck
	Lawrence Park	Cindy Gathers
	Le Boeuf	*Richard Gilmore*
	McKean	John Dombrowski
	Millcreek	Rick Morris
	North East	Douglas Sceiford
	Springfield	Blake Holliday
	Summit	Marlin Coon
	Union	Earl Brown/Mark Tomcho
	Venango	Jack Pfadt
	Washington	Frank Stefano
	Waterford	Flory Kondzielski
Wayne	Jill Gibson	
AGENCY	Conservation District	Amy Jo Smith
	Erie County Planning	Jake Welsh
	Erie County Planning	Mat Elwell
	DEP	Tim Bruno

Members - Head of Governing Body – Appointed WPAC Member

WATERSHED PLAN ADVISORY COMMITTEE MEETINGS

Two (2) Watershed Plan Advisory Committee meetings were held during the Phase I process. The purposes of the meetings were to gather information and provide education to the WPAC.

WPAC Meeting #1 was held on December 13th, 2007. The meeting provided an overview of the Act 167 process, provided expectations and potential results and outcomes of the Plan, provided an explanation of the Questionnaire Form, confirmed the formation of the WPAC membership and concluded with a question and answer period. WPAC Meeting #1 also addressed and introduced Integrated Water Resource Planning.

WPAC Meeting #2 was held on April 10th, 2008. Prior to the meeting, a draft copy of the Phase I report was supplied to the WPAC for their review. The purpose of this meeting was to summarize the Phase I report, outline the tasks to be completed during Phase II, and address any comments or concerns of the WPAC from their review of the draft Phase I report.

PHASE I REPORT

The Phase I Report is a scope of study to assist Erie County in the preparation and finalization of a Phase II Act 167 Stormwater Management Plan. This Phase I Report identifies the scope and provides estimated fees to complete the identified Phase II tasks.

SUBMISSION OF PHASE I REPORT TO PADEP

The Phase I Report – Scope of Study will be submitted to the Pennsylvania Department of Environmental Protection for their review and approval in **June 2008**. Finalization of the Phase I Report will lead to an additional contract between Erie County and PADEP for the completion of a Phase II Report.

EXISTING WATERSHED PLAN DISCUSSION

LAKE ERIE AREA WATERSHED (Lake Erie/Elk Creek)

The Plan was sponsored by Erie County and was completed in 1996 and approved in August 1996. The Plan covered 98 square miles and at least a portion if not all of 24 of the County's 38 municipalities:

Conneaut Twp.	Greene Twp.	Millcreek Twp.	Washington Twp.
Elk Creek Twp.	Greenfield Twp.	North East Boro	Waterford Twp.
Erie City	Harborcreek Twp.	North East Twp.	Wesleyville Boro
Fairview Twp.	Lake City Boro	Platea Boro	
Franklin Twp.	Lawrence Park Boro	Springfield Twp.	
Girard Boro	McKean Boro	Summit Twp.	
Girard Twp.	McKean Twp.	Venango Twp.	

MODELING

The watersheds were broken into 27 sub-areas with 1,498 subbasins averaging 133 acres and modeling was completed using Penn State Runoff Model (PSRM). The detailed PSRM model was developed and calibrated using gauging station data for two separate storms.

PERFORMANCE STANDARDS

After analyzing the existing and future conditions, the Plan identifies release rate method as the primary performance standard of control. The watershed was divided into 50 release rate areas each with specific release rate percentages which apply to the 2-, 10-, and 25-year design storms. Release rate percentages range from 70% to 100% of the pre-development peak flow. The 100% release rate areas are generally adjacent to Lake Erie with discharges directly into the lake. The standard also includes the basic post-development not to exceed pre-development peak discharge control standard is to be applied to the 100-year storm for all areas.

MODEL ORDINANCE

The model ordinance contained in the Plan identifies the release rate method as the primary performance standard along with calculation methodology. The Plan also identifies methods to address water quality and groundwater recharge through in the implementation of Best Management Practices. The model ordinance provides design standards for infiltration facilities but contains no water quality or groundwater recharge requirements.

PROBLEM AREAS & OBSTRUCTIONS

The Plan identified 109 problem areas which predominantly dealt with flooding; 20% described as stream bank erosion and 10% attributed to erosion and sedimentation. The Plan suggested solutions to about 2/3's of the problems with improvements to the existing infrastructure the main suggested solution with a significant portion focusing on stream channel improvements. The Plan shows 278 separate stream obstructions with dimensions, conditions and flow capacities identified. The Plan also list 11 existing flood control projects and suggests 13 more.

QUESTIONNAIRE DISCUSSION

QUESTIONNAIRE RESULTS

The Questionnaire was designed to solicit input from each municipality and other interested organizations, relative to specific problem areas throughout Erie County, as well as the needs they may see for stormwater management in their particular municipality. The Questionnaire was distributed, along with an educational handout during the WPAC#1 meeting in Phase I. The Questionnaire included a map of the individual municipalities and was used to identify locations of problem areas, significant obstructions, and existing or proposed stormwater management facilities. (A copy of the Questionnaire is included as Appendix A of this document.) In addition, the information contained within the Questionnaires was instrumental in determining the scope of Phase II planning.

Because the most important part of the Act 167 planning process is the implementation of the final provisions and standards of the PLAN, another reason for utilizing this Questionnaire is to develop interest in stormwater management issues by the municipalities. Attempting to obtain municipal "buy-in" of the project was a key element during the entire Phase I process. Obtaining support from these municipalities early in the process will ensure a better end product and hopefully ease the process of adoption and implementation by each municipality within Erie County.

Questionnaires were received from an overwhelming majority (37 out of the 38 - 97%) of the municipalities in Erie County. All of the thirteen MS4 municipalities responded. When asked "Is your MS4 Municipality interested in cooperating with other MS4 municipalities?" all responded they were interested with the City of Erie responding "maybe". Several non-MS4 municipalities responded they were interested in cooperation.

Through analysis of the results of the Questionnaires it was determined that there were many stormwater issues that were important. One question asked "What is the most important stormwater related issue to your municipality?" The responses were varied due to the particularities of the municipalities, but centered on common themes. Flooding and erosion were the most common themes followed by groundwater recharge, water quality and the implementation of stormwater regulations. Some of the questions used a sliding scale to rate the respondents' attitudes toward stormwater issues. On average, the respondents are fairly supportive of this project (3.8 out of 5). Of the typical types of stormwater issues presented, the most important issues are (in order) Stream Bank Protection, Peak Flow Rates, and Groundwater Recharge. Where questions dealt with the level of severity, both stream bank and property flooding were the leading issues.

The Questionnaire also requested the identification of problem areas, significant obstructions and stormwater management systems. A map was provided to locate the areas. Respondents identified over 117 problem areas, 34 significant obstructions and about 100 stormwater management systems. The City of Erie did not provide their existing systems and Fairview Township provided a GIS layer containing an additional 57 SWM systems. The identified problem areas, as well as the significant obstructions, will form the basis for the watersheds scheduled for detailed study and modeling in Phase II. A review of the listed areas reveals typical problems mostly dealing with flooding and stream bank erosion. Water quality was also an issue with several of the lakes. In addition, beaver activity was cited as a problem common to many areas.

A section of the Questionnaire was dedicated to the existing Lake Erie/Elk Creek Act 167 Plan. Twenty five of the County's thirty eight municipalities are within the watershed. The respondents were mixed in judging its effectiveness with many citing its ineffectiveness and others stating it is very effective.

A summary of the results of the Questionnaires can be found in Appendix B.

PHASE II DISCUSSION

ITEMS TO BE ADDRESSED IN PHASE II

During Phase I, the WPAC made several decisions regarding certain specific items that should be addressed during the Phase II planning process and the Phase II Final Plan. Refer to Appendix C of this report for a detailed breakdown of the Phase II Scope of Work.

A summary of the specific tasks and subtask shall be as follows:

Task A – Data Collection/Review/Analysis

SubTask A.1 – Data Collection

SubTask A.2 – Municipal Ordinance Reviews/Evaluations

SubTask A.3 – Data Preparation for Technical Analysis

Subtask A.4 – Data Collection and Review for IWRP

Task B – Technical Analysis

- SubTask B.1 – Implement Volume Controls
- SubTask B.2 – Implement Rate Controls
- SubTask B.3 – Model Subwatersheds of Designated Watersheds
- SubTask B.4 – Provide Conceptual Solutions for Existing Problem Areas
- SubTask B.5 – Goals, Objectives, and Compilation of All Technical Standards
- SubTask B.6 – Implementation of Technical Standards and Criteria
- SubTask B.7 – Economic Analysis
- SubTask B.8 – Regulations for Activities Impacting Stormwater Runoff
- SubTask B.9 – Water Quality Impairments
- SubTask B.10 – Integrated Water Resource Plan Feasibility Study

Task C – Public/Municipal Participation

Task D – Plan Preparation and Implementation

- SubTask D.1 – PLAN Report Preparation
- SubTask D.2 – Model Ordinance Preparation
- SubTask D.3 – Integrated Water Resource Plan Preparation
- SubTask D.4 – PLAN Adoption

One of the most critical issues during Phase I was the determination of which and how many of the PADEP designated watersheds would be modeled during Phase II. One of the intentions of County-wide stormwater planning is to conduct detailed study of watersheds where it makes sense, i.e. where there are problems or projected problems. The distribution of identified problem areas is:

Watershed	Problem Areas	Obstructions
Lake Erie	69	16
French Creek	32	12
Brokenstraw Creek	7	6
Conneaut Creek	7	1
Cussewago Creek	2	0
Ashtabula River	0	0
Muddy Creek	0	0
Oil Creek	0	0

As shown, Muddy Creek, Oil Creek, Ashtabula River and Cussewago Creek have no identified problem areas or significant obstructions. Detailed study of these watersheds would be unproductive. Likewise, detailed study of the Conneaut Creek watershed would be unproductive. The Brokenstraw Creek watershed problem areas and obstructions are concentrated on the lower reaches of the Hare & Bear Creek subwatersheds. Detailed study of these watersheds can be completed.

The majority of the problems areas fall within the Lake Erie and French Creek watersheds, approximately 60% and 30% respectively. The French Creek problem areas are wide-spread with one concentration around Edinboro. As expected, the problem areas in the Lake Erie watershed seem to radiate from the City of Erie.

GENERAL WORK PLAN

PHASE II AGREEMENT

Upon completion and submission of the Phase I report to PADEP, Erie County and PADEP will enter into an agreement to complete the Phase II portion of the project. Funding for the project should be allocated by PADEP prior to the beginning of any of the Phase II tasks. A 75% reimbursement procedure will be implemented between Erie County and PADEP during the Phase II project.

CONSULTANT SELECTION

It is recommended that Erie County secure an engineering consultant to assist in completing at least the technical analysis task of the Phase II project. A qualified consultant knowledgeable in the Act 167 process (including adoption and implementation procedures), stormwater issues in the County, and municipalities within the County, will benefit the County during the Phase II process.

QUESTIONNAIRE

A Questionnaire Form was distributed during and subsequent to the first WPAC meeting (12/13/2007) during Phase I. The Questionnaire (see Appendix A) solicited information on problem areas, obstructions, existing and proposed stormwater facilities, and flood control facilities. Other information requested relates to municipal ordinances, support for the plan, relative importance of various plan criteria, and interest in best management practices (BMPs). The municipalities were also asked to appoint a WPAC representative. The data collected through the Questionnaire will assist in technical and non-technical aspects of the planning process and in scoping the overall Plan. The problem areas and significant obstructions indicated in the Questionnaires will need to be analyzed during Phase II and will become the basis of required subwatershed area modeling.

WATERSHED PLAN ADVISORY COMMITTEE (WPAC)

During the Phase I portion of this project, a WPAC was formed. Many of the WPAC members indicated their willingness to volunteer to join the committee through the Questionnaire Form. In addition, letters were mailed to each municipality requesting them to appoint at least one person from their individual municipality to become a member of the committee. This letter was in response to Section 6(a) of the Pennsylvania Stormwater Management Act (Act 167), which states "The county shall establish, in conjunction with each watershed stormwater planning program, a watershed plan advisory committee composed of at least one representative from each municipality within the watershed, the county soil and water conservation district and such other agencies or groups as are necessary and proper to carry out the purposes of the committee." Also stated in the letter was PADEP's position that if a representative from a municipality was not appointed, then the head of the governing body will be appointed to the WPAC.

It is intended that the WPAC will continue to serve as the primary source of plan guidance for the overall planning process throughout Phase II. The committee members will also serve as the primary contact point for the municipalities/organizations that they represent. It is anticipated that each of these municipalities/organizations will continue to have representation in the WPAC.

Through the Questionnaire Form, the WPAC identified the following organizations as possible WPAC participants:

- Harborcreek Township Sewer Authority
- PennDOT
- Edinboro Lake Watershed Association
- Clayton Falls, PE – Hill Engineering, Inc.

These organizations and entities were contacted and invited to join the WPAC during Phase I. Additional stakeholders may be identified during Phase II. If appropriate, an invitation to join the WPAC will be extended to these entities.

MUNICIPAL ENGINEERS PARTICIPATION

Two of the WPAC meetings will focus on the more technical aspects of the Plan. These elements include modeling, technical analysis, and development of management criteria. This meeting will be encouraged to be attended by municipal engineers and will focus solely on the engineering aspects of the Plan as opposed to the more general objectives and overall contents of the Plan.

LEGAL ADVISORY PARTICIPATION

Another WPAC meeting will have a purpose to incorporate information between municipal solicitors into the Plan. This committee will focus on implementation of the Model Ordinance from a legal and regulatory framework standpoint.

STANDARDS

The Plan will include criteria for a comprehensive stormwater management strategy that includes two elements:

Peak Rate Control Management – Implementation of Release Rates for various subwatersheds may be developed based on collected data, modeling, engineering judgment, and committee input.

Volume Control Management – Implementation of Control Guidance 1 and Control Guidance 2 from the *Pennsylvania Stormwater Best Management Practices Manual*. It is noted that the existing 167 Plan include the design methods that are inconsistent with the *Pennsylvania Stormwater Best Management Practices Manual*. These standards will be replaced as discussed above. In addition, it is noted that the Provisional No Detention areas in the existing 167 Plan will also be removed.

ROLES OF COUNTY AND CONSULTANT

The division of work and responsibilities between Erie County and the Consultant should be determined prior to the beginning of Phase II tasks. Generally, the County may serve as project coordinator and be responsible for non-technical aspects of the Plan. This may include appropriate data collection, plan composition, ordinance analysis, and assisting the Consultant with field data collection.

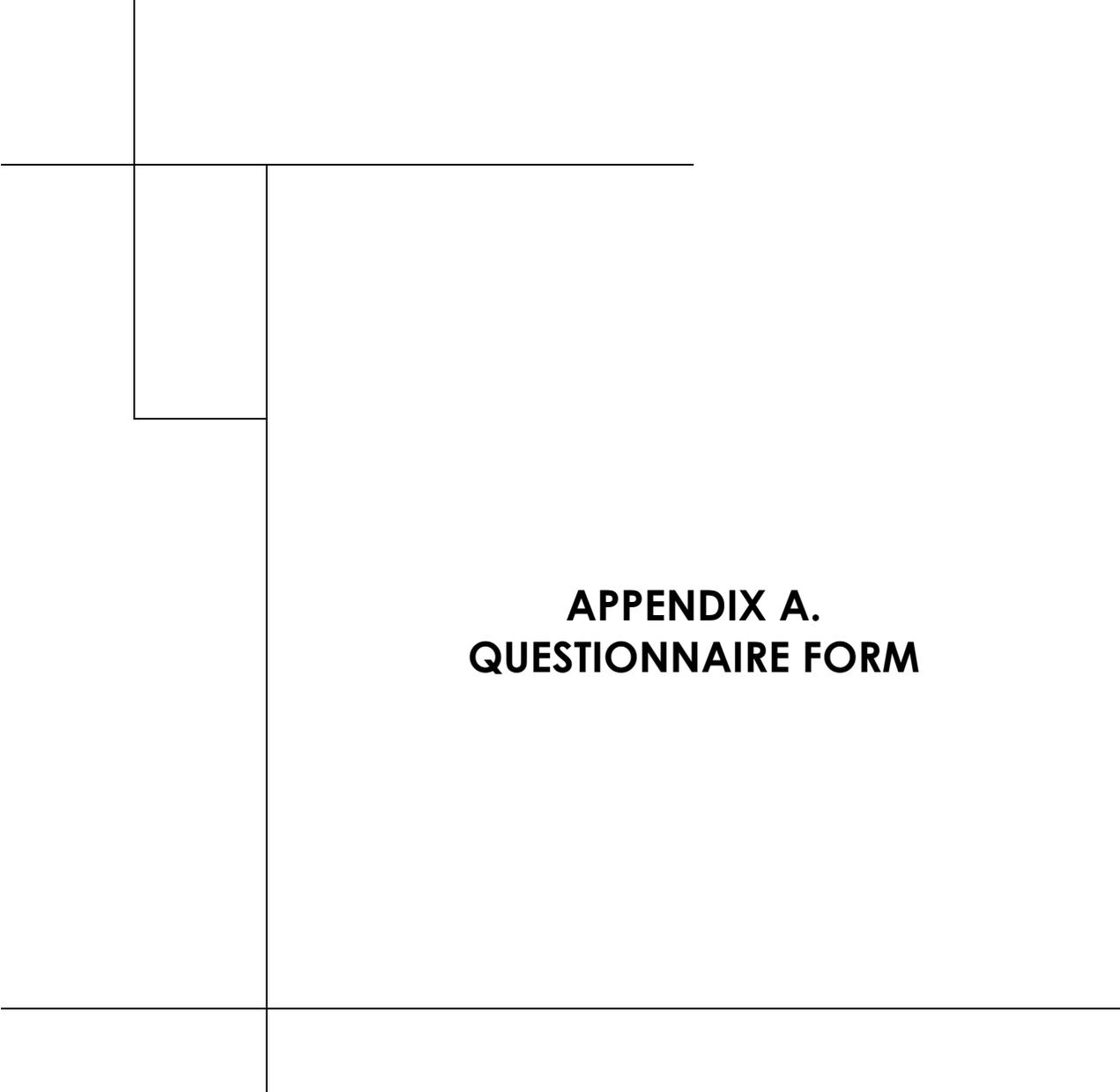
The Consultant would be responsible for technical aspects of the Plan. This includes data review, problem area and significant obstruction analysis, hydrologic modeling, development of technical criteria, and economic analysis. The Consultant would compose technical components of the Plan text and provide draft and final project mapping.

WORK SCHEDULE

A work schedule should be developed early in the Phase II process in conjunction with Erie County and the Consultant. The work schedule will be formulated to set target dates for various tasks with the intention of completing the project for PADEP review within the Phase II contract period.

REFERENCES

1. Erie County, *Lake Erie Area Watershed Act 167 Stormwater Management Plan*, June 1996.
2. Erie County Planning Department, *Erie County Community Facilities and Utilities Plan*, December 9, 2003.
3. Erie County Planning Department, *Erie County Land Use Plan*, December 9, 2003.
4. Erie County Planning Department, *Erie County Natural and Historical Resources Plan*, December 9, 2003.
5. French Creek Project, *French Creek Watershed Conservation Plan*, January 2002.
6. United States Department of Agriculture Soil Conservation Service, *Soil Survey of Erie County, Pennsylvania*, December 1975.
7. Erie County Planning Department, *Erie County Natural Heritage Inventory*, September 1993.
8. Maryland Department of the Environment, *2000 Maryland Stormwater Design Manual Volumes I & II*, 2000.
9. Pennsylvania Association of Conservation Districts, *Pennsylvania Handbook of Best Management Practices for Developing Areas*, November 14, 1997.
10. Pennsylvania Department of Environmental Protection – Bureau of Watershed Management, *Pennsylvania Stormwater Best Management Practices Manual*, December 2006.
11. Pennsylvania Department of Environmental Protection – Bureau of Watershed Management, *Pennsylvania Model Stormwater Management Ordinance*, January 2007.
12. Pennsylvania Geological Survey, *Geologic map of Pennsylvania, 4th ser.*, 1980.
13. Pennsylvania Department of Environmental Protection, *2006 Integrated Water Quality Monitoring and Assessment Report*.
14. Pennsylvania Department of Environmental Protection, *Walnut Creek Watershed Environmental Quality Assessment Report* May 2007.
15. Pennsylvania Code, Title 25 Environmental Protection, *Chapter 93 Water Quality Standards*.



**APPENDIX A.
QUESTIONNAIRE FORM**

3. The Watershed Plan will address five key stormwater considerations. These five are listed below. Please indicate how important you believe it is to address each consideration.

CONSIDERATION		Very Important				Not Important
		5	4	3	2	1
Peak Flows	Increased flows from stormwater runoff contribute to stream erosion, localized ponding and flooding, may cause damage to infrastructure (roads, sewers, etc.).	<input type="checkbox"/>				
Water Quality	Dissolved and un-dissolved pollutants washed off the land surface – negative impacts to recreation, aesthetics and in-stream habitat.	<input type="checkbox"/>				
Groundwater Recharge	Increased runoff decreases amount of rain that becomes groundwater; decreased groundwater supplies may have negative effects on well water supplies and decrease or dry up stream baseflow in dry periods.	<input type="checkbox"/>				
Stream Erosion	Eroding banks and beds may undercut roads and utilities, damages in-stream habitat, clog culverts and bridges.	<input type="checkbox"/>				
Flooding	Larger scale overbank flows such as the 100-year flood associated with extreme storm events	<input type="checkbox"/>				

4. Would you like to see information on any of the following presented at a Watershed Plan Advisory Committee meeting?

	Yes	Maybe	No
Best Management Practices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Model/Implemented Ordinances	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Information on Act 167 reimbursements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other topics you would like to have considered: _____			

5. What is the most important stormwater related issue to your municipality?

6. THE FOLLOWING LISTS THE TYPES OF STORMWATER RELATED PROBLEMS YOUR MUNICIPALITY MAY BE EXPERIENCING. FOR EACH PROBLEM TYPE, PLACE A CHECK MARK IN THE COLUMN THAT BEST DESCRIBES THE SEVERITY, FREQUENCY AND CAUSE. IF YOUR MUNICIPALITY IS EXPERIENCING A PROBLEM NOT LISTED, PLEASE LIST IT IN THE SPACE MARKED "OTHER".

PROBLEM	SEVERITY			FREQUENCY (YEARS)				CAUSE				
	Severe	Moderate	None	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown
Stream Flooding	<input type="checkbox"/>											
Street Flooding	<input type="checkbox"/>											
Property Flooding	<input type="checkbox"/>											
Soil Erosion	<input type="checkbox"/>											
Sediment in Streams	<input type="checkbox"/>											
Stream Bed/Bank Erosion	<input type="checkbox"/>											
Scour at Outfalls	<input type="checkbox"/>											
Property/Infrastructure Damage	<input type="checkbox"/>											
Pollution	<input type="checkbox"/>											
Habitat/Resource Damage	<input type="checkbox"/>											
Other	<input type="checkbox"/>											

7. Stormwater Management plans are required under the Pennsylvania Stormwater Management Act, Act 167. Authorization to proceed with this plan as required by Act 167 has been given by the County. The long-term goal of this plan will be to maintain existing hydrologic conditions including groundwater levels, water quality, stream base flow and stream storm flows. With this in mind, what level of support will your municipality or agency provide for this project?

Strongly Support				Strongly Oppose
5	4	3	2	1
<input type="checkbox"/>				

8. Will your municipality/agency attend Watershed Plan Advisory Committee meetings? Meetings are expected to be held approximately 4 times per year for approximately 2 years. (please circle one)

Yes		No	
If yes, who will attend meetings on behalf of your municipality or organization?			
Name			
Address			
Phone			
e-mail			

9. WOULD YOU SUGGEST ANY OTHER AGENCIES OR ORGANIZATIONS THAT SHOULD BE INCLUDED ON THE WATERSHED PLAN ADVISORY COMMITTEE? IF SO, PLEASE GIVE CONTACT INFORMATION BELOW:

Name	
Organization	
Address	
Phone	
e-mail	

10. DO YOU KNOW OF ANY EXISTING OR PROPOSED FLOOD CONTROL PROJECTS IN YOUR MUNICIPALITY? (please circle one)

Yes	No
If yes, please describe the project(s) below:	

11. ARE EXISTING (PUBLIC OR PRIVATE) STORMWATER MANAGEMENT FACILITIES (OUTFALLS, BASINS, ETC.) BEING MAINTAINED (I.E. REMOVAL OF DEBRIS FROM OUTLET STRUCTURES, ADEQUATE CONTROL OF VEGETATION, CAPACITY MAINTENANCE, ETC.)? (please circle one)

Yes	No
If yes, please describe the locations(s) below:	

12. PLEASE PROVIDE ANY INPUT YOU FEEL IS RELEVANT REGARDING CURRENT WATERSHED MANAGEMENT PROCEDURES.

13. THE FOLLOWING TABLE REQUESTS INFORMATION ON PROBLEM AREAS AND OBSTRUCTIONS. PLEASE PLACE A CHECK MARK IN THE “P” COLUMN IF THE SITE IS A PROBLEM AREA OR PLACE A CHECK MARK IN THE “O” COLUMN IF THE SITE IS AN OBSTRUCTION.

Problem Areas - Areas of ponding or flooding, erosion, stream channel or bank erosion, property damage, safety concerns, etc.

Obstructions - Bridges, pipes, culverts, dams or other physical barriers to stream flow that restrict the channel flow and typically cause ponding or flooding upstream of the structure.

In the “Description” column describe the type, location, & size of the Problem Area or Obstruction, (i.e. “undersized 36-inch CMP where Main Street crosses Sandy Creek”. For each site listed, place the Number of the site at the appropriate location on the enclosed map of your Municipality (attached at the end of this packet). If a solution to the Problem Area or Obstruction is proposed, describe the solution in the “Solution” column. Please copy this sheet if additional space is needed.

Number	Problem	Obstruction	Description	Solution
1	<input type="checkbox"/>	<input type="checkbox"/>		
2	<input type="checkbox"/>	<input type="checkbox"/>		
3	<input type="checkbox"/>	<input type="checkbox"/>		
4	<input type="checkbox"/>	<input type="checkbox"/>		
5	<input type="checkbox"/>	<input type="checkbox"/>		
6	<input type="checkbox"/>	<input type="checkbox"/>		
7	<input type="checkbox"/>	<input type="checkbox"/>		
8	<input type="checkbox"/>	<input type="checkbox"/>		
9	<input type="checkbox"/>	<input type="checkbox"/>		
10	<input type="checkbox"/>	<input type="checkbox"/>		
11	<input type="checkbox"/>	<input type="checkbox"/>		
12	<input type="checkbox"/>	<input type="checkbox"/>		

Please copy this sheet if additional space is needed.

14. THE FOLLOWING REQUESTS INFORMATION ON EXISTING OR PROPOSED STORM SEWER SYSTEMS OR MANAGEMENT FACILITIES. THESE ARE STORM SEWER SYSTEMS, PERMANENT STORMWATER DETENTION PONDS, UNDERGROUND DETENTION FACILITIES OR OTHER SYSTEMS OR FACILITIES INTENDED TO COLLECT, CONVEY OR DETAIN STORMWATER. PLEASE LETTER EACH SITE SEQUENTIALLY AND PLACE THE LETTER CORRESPONDING TO EACH SITE AT THE APPROPRIATE LOCATION ON THE ENCLOSED MAP OF YOUR MUNICIPALITY. PLEASE COPY THIS SHEET IF ADDITIONAL SPACE IS NEEDED.

Letter	Description
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
L	

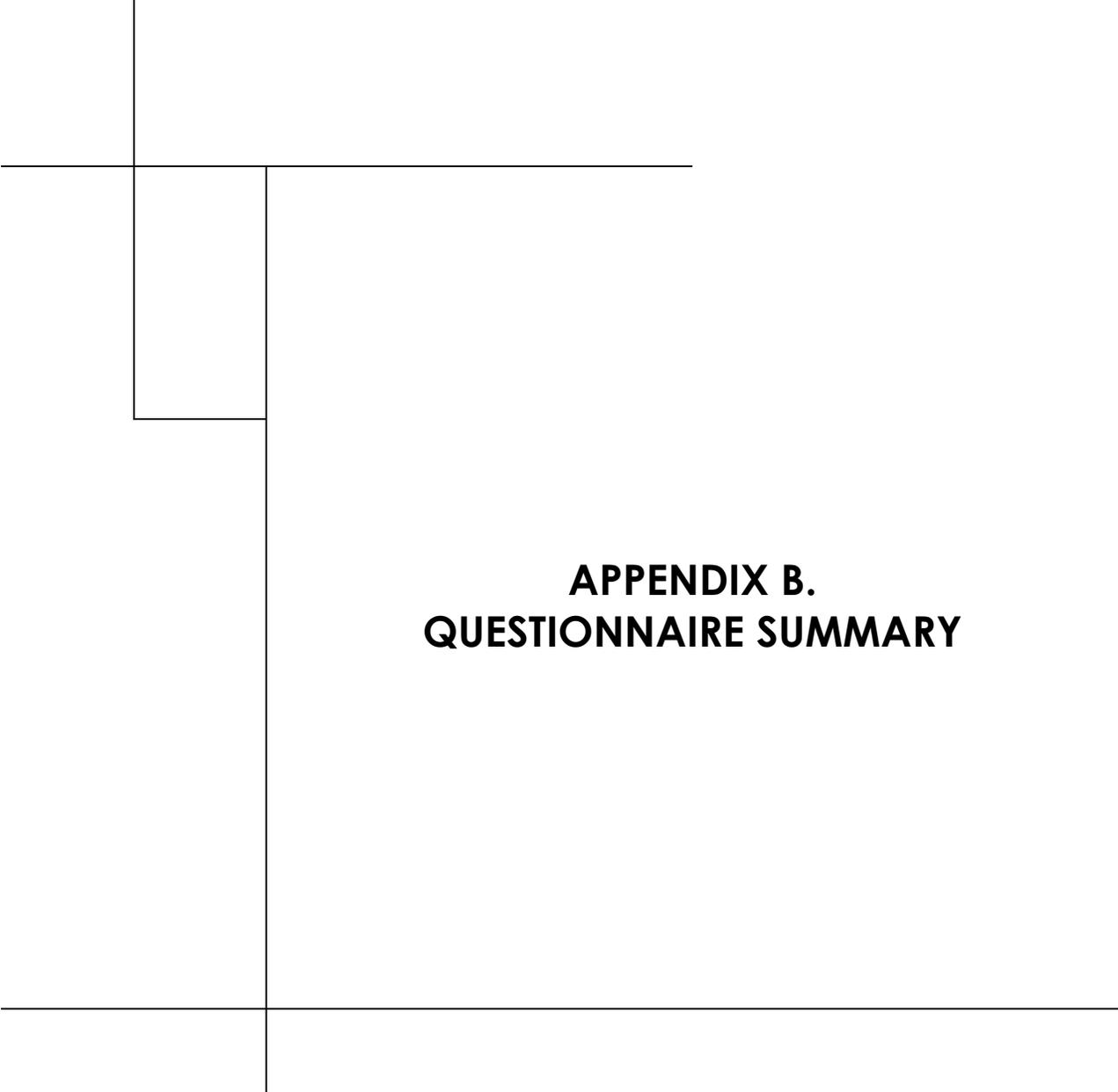
Please copy this sheet if additional space is needed.

PLEASE NOTE THAT THE INTENT OF QUESTIONS 15-17 IS INTENDED TO ASSESS THE EFFECTIVENESS OF THE EXISTING LAKE ERIE/ELK CREEK PLAN. THEREFORE, THERE MAY BE SOME SIMILARITIES TO QUESTIONS ASKED ABOVE.

15. ARE ANY OF THE PROBLEMS LISTED BELOW OCCURRING IN YOUR MUNICIPALITY?		
ISSUE/CONCERN	Yes	No
A. Increased channel erosion/scour at outfalls of stormwater management facilities or storm sewer systems?	<input type="checkbox"/>	<input type="checkbox"/>
B. Increased general channel erosion not associated with outfalls?	<input type="checkbox"/>	<input type="checkbox"/>
C. Increased nuisance flooding?	<input type="checkbox"/>	<input type="checkbox"/>
D. Increased stream flooding?	<input type="checkbox"/>	<input type="checkbox"/>
E. Increased incidence of undersized bridges or culverts?	<input type="checkbox"/>	<input type="checkbox"/>
F. Noticeable increase in sediment deposits in streams?	<input type="checkbox"/>	<input type="checkbox"/>
G. Increase in sediment related problems (sediment deposits, gravel bars, clogged pipes/culverts)?	<input type="checkbox"/>	<input type="checkbox"/>
H. Has there been significant development within your municipality since the existing plan was completed?	<input type="checkbox"/>	<input type="checkbox"/>
I. Are existing stormwater management facilities being maintained (i.e. removal of debris from outlet structures, adequate control of vegetation, capacity maintenance)?	<input type="checkbox"/>	<input type="checkbox"/>

16. THE EXISTING LAKE ERIE/ELK CREEK ACT 167 PLAN CONTAINS CRITERIA FOR PEAK FLOW MANAGEMENT ONLY. HOW WOULD YOU ASSESS THE EFFECTIVENESS OF THE EXISTING PLAN FOR THE WATERSHEDS IN YOUR MUNICIPALITY?		
Effective	Not Effective	Unknown
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. PLEASE PROVIDE ANY INPUT YOU FEEL IS RELEVANT REGARDING THE EFFECTIVENESS OF THE EXISTING PLAN FOR LAKE ERIE/ELK CREEK PLAN.	
A.	
B.	
C.	



**APPENDIX B.
QUESTIONNAIRE SUMMARY**

Summary Table of information provided by the WPAC through the Questionnaire Form:

MUNICIPALITY/AGENCY	Q1							Q2			Q3					Q7	Q8	Q10	Q11
	Comp Plan	Zoning Ord	SALDO	Floodplain Regs	SWM Regs	E&S Regs	Drainage Regs	MS4	In compliance	Cooperation	Peak Flow Rates	Water Quality	Groundwater Recharge	Stream Bank Protection	Flooding	Support Project	WPAC	Flood Control Projects	Maintained SW Facilities
Albion Boro	Y	Y	Y	N	N	N	N	N	N	N	3	2	3	5	3	2	Y	Y	Y
Amity Twp	Y	Y	N	Y	N	N	N	N			4	5	3	5	4	2	Y	N	N
Concord Twp	Y	Y	N	N	N	N	N				3	2	4	5	1	3	Y	N	Y
Conneaut Twp	N	N	N		N	N	N	N			5	2	5	3	4		Y	N	
Corry City	Y	Y	Y	Y	Y	N	N	N	N	N	4	3	4	3	4	4	Y	Y	Y
Cranesville Boro	N	Y	N	N	N	N	N	N		N	2	2	2	4	5	2	Y	N	Y
Edinboro Boro	Y	Y	Y	Y	Y	Y	Y	N			5	5	5	3	5	5	Y	Y	Y
Elgin Boro	N	Y	Y	Y	N	N	N	N			2	5	5	5	2	5	Y	N	N
Elk Creek Twp	Y	N	N	Y	Y	N	N	N			5	4	4	3	3	4	Y	N	N
Erie City	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	5	5	5	5	5	5	Y	N	Y
Fairview Twp	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	4	4	4	4	4	5	Y		Y
Franklin Twp	Y	Y	Y	Y	Y	N	N	N		Y	4	4	5	5	4	5	Y	N	Y
Girard Boro	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	5	3	5	3	5	5	Y	N	Y
Girard Twp	Y	Y	Y	N		N	Y	Y	Y		4	5	4	4	3	5	Y	N	Y
Greene Twp	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	5	5	5	5	4	5	Y	N	Y
Greenfield Twp	Y	Y	Y	Y	Y	N	N	N			3	3	3	1	1	3	Y	N	Y
Harborcreek	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	5	3	4	3	4	5	Y	N	Y

Question 1. Does your Municipality have the following regulations?

Question 2. Is your Municipality considered an MS4? In compliance? Interested in intermunicipal cooperation?

Question 3. How important (5 - Very Important) to (1- Not Important) are the following issues?

Question 7. How much support will your Municipality provide (5- Strongly Support) to (1- Strongly Oppose)?

Question 8. Will your Municipality participate in the WPAC (Yes or No)?

Question 11. Are there existing or proposed flood control projects in your Municipality (Yes or No)?

Question 10. Are existing stormwater management facilities being maintained (Yes or No)?

Summary Table of information provided by the WPAC through the Questionnaire Form:

MUNICIPALITY/AGENCY	Q1							Q2			Q3					Q7	Q8	Q10	Q11
	Comp Plan	Zoning Ord	SALDO	Floodplain Regs	SWM Regs	E&S Regs	Drainage Regs	MS4	In compliance	Cooperation	Peak Flow Rates	Water Quality	Groundwater Recharge	Stream Bank Protection	Flooding	Support Project	WPAC	Flood Control Projects	Maintained SW Facilities
Lake City Boro	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2	5	4	5	2	4	Y	N	Y
Lawrence Park Twp	Y	Y	Y	Y	Y		N	Y	Y	Y	5	5	3	5	3	4	Y	N	Y
LeBoeuf Twp	Y	Y		Y				N	N	N	5	2	4	4	5	3	N	N	N
McKean Twp	Y	Y	Y	Y	Y	N	N	Y	Y	Y	4	4	4	5	5	5	Y	Y	Y
McKean Boro	Y	Y	Y	Y	Y	N	N				3	4	5	3	2	3	N	N	N
Millcreek Twp	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	5	5	4	5	5	5	Y	Y	Y
Mill Village Boro	Y	Y	N	Y	N	N	N	N			5	3	4	4	5	5	Y	N	
North East Boro	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	5	5	5	5	4	4	Y	N	Y
North East Twp	Y	Y	Y	Y	Y		Y	N			5	5	5	3	4	3	Y	N	Y
Platea Boro	N	N	N	N	Y	N	N	N	N	Y	1	2	4	1	3	2	N	N	Y
Springfield Twp	Y	Y	Y	Y	Y	N	N	N			5	4	5	5	3	2	Y	N	Y
Summit Twp	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	5	2	4	4	5	5	Y	Y	Y
Union City Boro	N	Y	Y	N	N	N	N	N			4	1	1	5	5	3	Y	N	Y
Union Twp	Y	Y	Y	Y	N	Y	N	N			2	3	4	2	2	3	Y	N	
Venango Twp	Y	Y	N	Y	Y	N	N	N			4	5	5	4	2	4	Y	N	Y
Washington Twp	Y	Y	Y	Y	Y	Y	Y	N			5	4	4	5	5	2	Y	N	Y
Waterford Boro																			
Waterford Twp	Y	Y						N			5	4	5	5	4	2	Y		Y
Wattsburg Boro	Y	Y	N	Y	N	N	N				5	3	3	5	5	4	Y	N	N
Wayne Twp	Y	Y	N	Y	Y	N	N	N			5	4	3	5	5	5	Y	N	
Wesleyville Boro	Y	Y	Y					Y	Y	Y	3	4	3	4	3	3	Y	N	Y
Conservation District																			

Municipal Response % **97%**

4.1 3.7 4.0 4.1 3.7 3.8

Total Response %

Question 1. Does your Municipality have the following regulations?

Question 2. Is your Municipality considered an MS4? In compliance? Interested in intermunicipal cooperation?

Question 3. How important (5 - Very Important) to (1- Not Important) are the following issues?

Question 7. How much support will your Municipality provide (5- Strongly Support) to (1- Strongly Oppose)?

Question 8. Will your Municipality participate in the WPAC (Yes or No)?

Question 11. Are there existing or proposed flood control projects in your Municipality (Yes or No)?

Question 10. Are existing stormwater management facilities being maintained (Yes or No)?

MUNICIPALITY/AGENCY	Question 5. What is the most important stormwater issue?
Albion Boro	
Amity Twp	Eroding road
Concord Twp	Erosion creek banks
Conneaut Twp	Small stream flooding (peak flows); groundwater recharge
Corry City	
Cranesville Boro	Flooding at Temple Creek
Edinboro Boro	Peak flows, water quality, groundwater recharge & flooding
Elgin Boro	No major issues
Elk Creek Twp	Road washouts
Erie City	
Fairview Twp	
Franklin Twp	Unified swm ordinance for Lake Erie & French Creek
Girard Boro	Small stream, property flooding multiple times/yr. Groundwater recharge
Girard Twp	
Greene Twp	Easier implementation; groundwater w/wells
Greenfield Twp	Over regulation of future development to correct lack of past planning
Harborcreek	Roadside ditch, small stream, property flooding multiple times/yr
Lake City Boro	
Lawrence Park Twp	Bank erosion on Four Mile Creek
LeBoeuf Twp	Flooding
McKean Twp	
McKean Boro	Increase flows to Elk Creek
Millcreek Twp	Eliminate flooding by controlling stormwater and upsizing conveyance
Mill Village Boro	Stream flooding multiple times per year
North East Boro	Keeping storm sewers open/clean & maintenance
North East Twp	Continued implementation of SWM Ord, monitor peaks @ streams
Platea Boro	Lack of education by County
Springfield Twp	Damage to roads and bridge
Summit Twp	Development created - commercial & residential
Union City Boro	
Union Twp	Rare flooding on secondary State Roads
Venango Twp	Water quality, volume, groundwater
Washington Twp	
Waterford Boro	
Waterford Twp	
Wattsburg Boro	Funding, overbank flow, pooling water where drainage is needed
Wayne Twp	Road erosion
Wesleyville Boro	Private property nuisance flooding in flat areas
Conservation District	

Summary Table of Problem Areas provided by the WPAC through the Questionnaire Form:

ID	MUNICIPALITY	LOCATION	DESCRIPTION	PROPOSED SOLUTION
P1	WATTSBURG BORO	North St near Wattsburg Lumber	Ponding along road	drainage via dry sumps; funding
P2	WATTSBURG BORO	French Creek	Overbank flow and flooding	Channel improvement; remove log obstructions
P3	SUMMIT TOWNSHIP	Leboeuf Creek	Beaver dams	trap them
P3	WATERFORD TOWNSHIP	1000' of Himrod Rd	flooding	elevate road & add 1 cross pipes
P4	WATERFORD TOWNSHIP	750' of Flatts Rd	flooding	elevate road & add 1 cross pipes
P5	WATERFORD TOWNSHIP	Sedgwick Road	Beaver dams	increase culvert size
P6	WATERFORD TOWNSHIP	Haugh Road	farm runoff eroding road	diversion ditches
P7	CRANESVILLE BORO	Temple Creek @ John Wms Ave	flooding	reduce upstream runoff
P8	CRANESVILLE BORO	Crosby Circle & John Wms Ave	flooding	replace with larger pipe
P9	MILL VILLAGE BORO	French Creek Trib	loss of stream carrying capacity	stream channel maintenance, dredging
P10	SPRINGFIELD TWP	Tubbs Road	stream migration, mis-alignment with culvert	re-align stream, repair culvert
P11	SPRINGFIELD TWP	Various streams	Beaver dams	remove beavers
P12	HARBORCREEK TWP	Fairfield area		regional solution
P13	HARBORCREEK TWP	Villa Sites Road		neighborhood drainage
P14	HARBORCREEK TWP	Lewis-Mooreheadville Rds Area		regional solution
P15	HARBORCREEK TWP	Beaver Rd - Nagle to Clark		improve Rt 20 drainage
P16	HARBORCREEK TWP	Brookside Area		maintenance of culverts & ditches
P17	HARBORCREEK TWP	Clark Rd - Sixmile Ck to Firman Rd		neighborhood drainage
P18	GIRARD BOROUGH	Lake Erie Trib - Sunset Drive North		stream maintenance; dredging
P19	GREENE TWP	Sampson Rd	properly flooding	floodplain map update
P20	GREENFIELD TWP	German Rd	Beaver dams	
P21	GREENFIELD TWP	Ashton Rd	Beaver dams	
P22	GREENFIELD TWP	Wilson Rd	inlet crushed	pipe will be replaced
P23	GREENFIELD TWP	Wilson Rd	Beaver dams	
P24	GREENFIELD TWP	New Road	Beaver dams	
P25	GREENFIELD TWP	S. Daugan Rd	low area	
P26	GREENFIELD TWP	Raymond Mills	Beaver dams	
P27	GREENFIELD TWP	N of 186	manmade wetland backs up	
P28	VENANGO TWP	French Creek & Knoyle Rd		
P29	FAIRVIEW TWP	Trout Road	open up stream corridor	
P30	FAIRVIEW TWP	Bear Run	open up stream corridor	
P31	FAIRVIEW TWP	PennDOT infrastructure	manage what belongs to them	
P32	FAIRVIEW TWP	Subdivision has combined sewers	association is working on separating	
P33	FAIRVIEW TWP	high collform at some outfalls	sewer needs survey	
P34	FAIRVIEW TWP	Walnut Creek	work jointly to correct	
P35	LA WRENCE PARK TWP	Iroquois Ave - eb lane	flooding in heavy rains	reconstruct pipe to Fourmile Creek
P36	LA WRENCE PARK TWP	Snoopy & Cricket	flooding	fix drainage problem in RR r/w - rww entire watercourse
P37	LA WRENCE PARK TWP	St. Marks Roman Catholic Church	backyard flooding	increase pipe from church to stream; pipe below highwater level

ID	MUNICIPALITY	LOCATION	DESCRIPTION	PROPOSED SOLUTION
P39	LAWRENCE PARK TWP	Stream btwn Croftly, Smithson, Morse, Emmet	stream erosion	upstream detention to control velocity & peak flow
P40	LAWRENCE PARK TWP	Napier playground	flooding	stream peak flows need controlled upstream
P41	LAWRENCE PARK TWP	Four Mile Creek	stream bank erosion	reconstruct retaining walls
P42	LAWRENCE PARK TWP	Four Mile Creek	bank erosion near foot bridges	reconstruct foot bridges or improve stream
P43	FRANKLIN TWP			
P44	PLATEA BORO	Rt 18 & West Peach St.	flooding in heavy rains	PennDOT maintain system
P45	CORRY CITY	E. Columbus & Scotia St	undersized 18" clay pipe	replace w/30"
P46	CORRY CITY	W. Main St	Railroad culvert	
P47	CORRY CITY	E. Columbus	roadway flooding from hillside	install pipe system
P48	CORRY CITY	E. Washnton St	undersized 24" pipe caused flooding	increase pipe size
P49	CORRY CITY	White St	undersized pipe system	increase pipe size
P50	CORRY CITY	Liberty St	undersized pipe system	increase pipe size
P51	CORRY CITY	W. Pledsant St	undersized pipe system	increase pipe size
P52	LAKE CITY BORO	Eagle St	Kelly Run	clean-open up
P53	MCKEAN TWP	Old 99	runoff, flooding driveways/culverts	
P54	MCKEAN TWP	Baron, West, Old 99, Reichert, Windswept, Skinner Rd	flooding	
P55	MCKEAN TWP	Reichert Rd	flooding	bridge being replaced
P56	NORTHEAST TWP	Orchard Beach Creek area		runoff controls
P57	NORTHEAST TWP	Brickyard Rd north of Law Rd		replace bridge w/inadequate opening
P58	EDINBORO BORO	W. Plum & Willow St	flooding/ponding - undersized culvert	retention pond and larger culvert
P59	EDINBORO BORO	Rt 99	flooding by lake water	raise road
P60	EDINBORO BORO	Heather Rd	flooding	increase culvert size
P61	EDINBORO BORO	N of Industrial Dr	Beaver dams	
P62	EDINBORO BORO	Peach St (e of lake)	pollution to lake from WWTP	retention basin, remove livestock, remove treatment facility
P63	EDINBORO BORO	N of Lake	nutrients from Comeaufee & Shenango	retention basin, remove live stock
P64	EDINBORO BORO	Penn Union Site	chemical spill contaminated aquifer	NPDES compliance
P65	EDINBORO BORO	Willow Creek entrance to Lake	sediment deposition	water quality BMPs
P66	EDINBORO BORO	Elm St storm sewer into Lake	sediment deposition	water quality BMPs
P67	EDINBORO BORO	Conneautte/Shanago Watershed into Lake	sediment deposition	water quality BMPs
P68	EDINBORO BORO	Minor trib into Lake	sediment deposition	water quality BMPs
P69	WAYNE TWP	Hill Crest	no swm facilities	
P70	WAYNE TWP	Country Club Road Subdivision	construction impacted ditches	
P71	WAYNE TWP	Route 6 west of hatchery	stormwater on roads	
P72	WAYNE TWP	Dugway stream	bank erosion	
P73	GIRARD TWP	Gloskey Rd Bridge	undersized opening, floods	bigger bridge
P74	GIRARD TWP	Route 20	flooding	PennDOT ditch around field
P75	GIRARD TWP	Route 20	flooding	

ID	MUNICIPALITY	LOCATION	DESCRIPTION	PROPOSED SOLUTION
P76	MILLCREEK TWP	Riviera Estates	2' -4' water in mobile home park	airport project buy-out; pipe to Lake
P77	MILLCREEK TWP	15th & Harper	flooded homes, businesses, in intersections	Marshall Run big pipe to lake
P78	MILLCREEK TWP	Taki Mobile Home Park	flooding	Marshall Run big pipe to lake
P79	MILLCREEK TWP	17th & Harper	business & street flooding	Marshall Run big pipe to lake
P80	MILLCREEK TWP	22nd & James	business & street flooding (lawsuits)	Marshall Run big pipe to lake
P81	MILLCREEK TWP	22nd & Homer to Midland	business, parking lots, street flooding	Marshall Run big pipe to lake
P82	MILLCREEK TWP	EBCO Park	business & parking lot flooding	redirect flows from WB Cascade to Scott Run
P83	MILLCREEK TWP	20th & 23rd, Lowell to Evanston	street & yard flooding	redirect flows from WB Cascade to Scott Run
P84	MILLCREEK TWP	InsulBoard at Colonial & RR tracks	business huge parking lot & truck dock flood	Marshall Run big pipe to lake
P85	MILLCREEK TWP	Sterling Rail - Powell Ave & RR track	business & parking lot flooding	Marshall Run big pipe to lake
P86	MILLCREEK TWP	13th & 14th, Idaho Ave to Marshall Run	yard flooding	Marshall Run big pipe to lake
P87	MILLCREEK TWP	12th St Area, Marshal Run to Peninsula Dr	4 lane hwy, business, home, yard flooding	Marshall Run big pipe to lake
P88	MILLCREEK TWP	Enfield Lane	home & yard flooding	larger storm sewer to Walnut Creek
P89	MILLCREEK TWP	Beaver Run, Walnut Ck to Timber Ridge	road, home & yard flood (large residential area to east)	reduce flows in Walnut & Beaver Run
P90	MILLCREEK TWP	Sandalwood, Shadybrook to Brockhollow	yard flooding	increase collection & conveyance to Walnut
P91	MILLCREEK TWP	Michigan & Oregon, N of 10th	yard flooding	Marshall Run big pipe to lake
P92	MILLCREEK TWP	28th & Contessa area	yard flooding	upsized conveyance
P93	MILLCREEK TWP	Arcadia Ave, S of 26th	home & yard flooding	clean & widen channel; Marshall Run big pipe
P94	MILLCREEK TWP	16th to 18th, Hillborn to Industrial	roads, homes & business flooding	upsized conveyance
P95	MILLCREEK TWP	Budd Dr, Southern Dr, Hidden Lane	yard flooding	upsized conveyance
P96	MILLCREEK TWP	Scarbor, Windsor, Felder Area	yard flooding	upsized channel W of McDowell
P97	MILLCREEK TWP	15th W of Pittsburg @ WB Cascade	roads, parking lot & business flooding	upsized channel & storm sewers
P98	MILLCREEK TWP	S of RR, Colonial to Lowes	business & yard flooding	improve conveyance to Wilkins Run
P99	MILLCREEK TWP	32nd & Zuck	roads, parking lot & yard flooding	improve conveyance to Scott Run
P100	MILLCREEK TWP	32nd, Pittsburg to Zuck	home & yard flooding	improve conveyance to Scott Run
P101	MILLCREEK TWP	Allanfic, 36th to 38th	home & yard flooding	upsized conveyance
P102	MILLCREEK TWP	Rt 99 & Interchange	road floods	upsized conveyance
P103	MILLCREEK TWP	Mill Creek, Conrad Rd to Rt18	parking lot & yard flood	upsized conveyance
P104	MILLCREEK TWP	Home & Glenwood Park Ave	2nd home E Home on S Side floods, yard flooding	upsized conveyance
P105	MILLCREEK TWP	W 23rd Walmart drainage	garage & yard flood	upsized conveyance
P106	MILLCREEK TWP	UNT Mill Creek S Atbuckle Rd	portions of store & parking lot flood	improve conveyance facility to Lake
P107	MILLCREEK TWP	Mooley Road	seasonal flooding	upsized open channel
P108	MILLCREEK TWP	Griffis Road	large pipe - erosion & washout	building-up; provide drainage
P109	MILLCREEK TWP	Temple Creek	flooding during heavy rains	replace structure
P110	MILLCREEK TWP	Hickernell Road	bridge deteriorating	retention pond
P111	MILLCREEK TWP	Ivoray Road	bridge deteriorating	replace
P112	MILLCREEK TWP	Flinger Road	bridge deteriorating	replace
P113	MILLCREEK TWP	N of Carberry Rd	Beaver dams	replace
P114	MILLCREEK TWP	Temple Creek @ Reservoir Rd	Beaver dams	remove beavers
P115	MILLCREEK TWP	Various	deteriorated/inadequate infrastructure	remove beavers
P116	MILLCREEK TWP	Various	basins drain slowly	replace
P117	MILLCREEK TWP	Various	basins drain slowly	replace piping

Summary Table of Obstructions provided by the WPAC through the Questionnaire Form:

ID	MUNICIPALITY	LOCATION	DESCRIPTION
O1	WATTSBURG BORO	Main Street	Collapsed storm drains under Main St.
O2	UNION TOWNSHIP	Union LeBoeuf Rd	Stream debris (trees)
O3	SUMMIT TOWNSHIP	LeBoeuf Creek	Beaver dams
O4	WATERFORD TOWNSHIP	Sedgwick Road	Beaver dams
O5	WATERFORD TOWNSHIP	Juva Valley Road	flooding due to triple culverts
O6	MILL VILLAGE BORO	Depot St Culvert	culvert replacement
O7	MILL VILLAGE BORO	Railroad Culvert #1	culvert removal or replacement
O8	MILL VILLAGE BORO	Railroad Culvert #2	culvert replacement, stream cleaning
O9	HARBORCREEK TWP	Backus Road culvert	new culvert
O10	GREENE TWP	May Road @ gamelands	gamelands retain too much water, flood properties
O11	FAIRVIEW TWP	Trout Road	open up stream corridor
O12	FAIRVIEW TWP	Bear Run	open up stream corridor
O13	LAWRENCE PARK TWP	Iroquois Ave - eb lane	flooding in heavy rains
O14	LAWRENCE PARK TWP	Snoopy & Cricket	flooding
O15	FRANKLIN TWP	Throughout Twp	67 deficient crosspipes & bridges
O16	PLATEA BORO	Platz Road Bridge	Failed culvert
O17	CORRY CITY	Airport Rd Extended	plugged 30" cmp
O18	CORRY CITY	W. Church St	partially plugged 24" cmp
O19	CORRY CITY	Highway bridge at Rt 6	
O20	CORRY CITY	Railroad bridge	
O21	CORRY CITY	Railroad culvert	
O22	CORRY CITY	Corry Middle School	ditch ponding
O23	CORRY CITY	E. Washington St	24" culvert
O24	AMITY TWP	Low Road	Beaver dams
O25	ELGIN BORO	S. Main St	Bridge (to be replaced in 2008)
O26	NORTHEAST TWP	Mouth of 16 Mile & 20 Mile Creeks	Ice jams
O27	NORTHEAST TWP	Baker Run Creek obstructions near NEB Treatment Plant #1	debris and waste concrete
O28	EDINBORO BORO	Water St & Green Oaks	undersized culverts
O29	GIRARD TWP	S. Creek Rd	undersized culverts
O30	GIRARD TWP	Cindy Lane & Daggett	needs culverts
O31	GIRARD TWP	Route 20	undersized culverts
O32	MILLCREEK TWP	Asbury Rd SR4009 underpass	PennDOT remove obstruction
O33	MILLCREEK TWP	Heidler Rd Channel	grossly inadequate channel floods
O34	MILLCREEK TWP	Mill Creek, Cider Mill to Lake Pleasant	stream obstructions

Summary Table of SWM Facilities provided by the WPAC through the Questionnaire Form:

ID	MUNICIPALITY	LOCATION	DESCRIPTION
S1	UNION TOWNSHIP	Arbor Road	SWM Pond
S2	UNION TOWNSHIP	Rt 8	Underground storage @ Dollar General
S3	SUMMIT TOWNSHIP	Various	Development SWM Systems
S4	WATERFORD TOWNSHIP	Rt 19 & 97	Development SWM Systems
S5	WATERFORD TOWNSHIP	11264 Rt 97	Development SWM Systems
S6	WATERFORD TOWNSHIP	10538 Rt 19	Development SWM Systems
S7	WATERFORD TOWNSHIP	11046 Rt 19	Development SWM Systems
S8	CRANESVILLE BORO	S&S P; Mikron Machine	Development SWM Systems
S9	HARBORCREEK TWP	Foxwood Subdivision	Development SWM Systems
S10	HARBORCREEK TWP	Northview Heights	Development SWM Systems
S11	HARBORCREEK TWP	Harbor Ridge	Development SWM Systems
S12	HARBORCREEK TWP	Bernwood	Development SWM Systems
S13	HARBORCREEK TWP	Eaglewood	Development SWM Systems
S14	HARBORCREEK TWP	Fieldstone	Development SWM Systems
S15	HARBORCREEK TWP	Lake Haven Estates	Development SWM Systems
S16	GIRARD BOROUGH	Chardonnary Village PRD	Development SWM Systems
S17	GREENE TWP	Wattsburg Area School	Development SWM Systems
S18	GREENE TWP	Greene Meadows	Development SWM Systems
S19	GREENE TWP	Wintergreen Animal Hospital	Development SWM Systems
S20	GREENE TWP	Beechwood Glen	Development SWM Systems
S21	GREENFIELD TWP	Lake Erie Speedway	
S22	VENANGO TWP	French Creek & Knoyle Rd	
S23	VENANGO TWP	Creek Rd & French Creek	
S24	VENANGO TWP	Weeks Valley Road	
S25	FAIRVIEW TWP	Various	Development SWM Systems
S26	LAWRENCE PARK TWP	Iroquois High School	
S27	LAWRENCE PARK TWP	Iroquois Elementary School	
S28	LAWRENCE PARK TWP	Contine Corporation	
S29	FRANKLIN TWP	Various	184 Crosspipes & bridges
S30	PLATEA BORO	Staley Property on Mill St	
S31	PLATEA BORO	Route 18 & West Peach St	
S32	CORRY CITY	Walmart	Basin
S33	CORRY CITY	Advanced surfaces	Basin
S34	CORRY CITY	Corry Elementary School	subsurface
S35	CORRY CITY	Corry Water Dept. dam	
S36	CORRY CITY	Corry Area Credit Union	retention system
S37	CORRY CITY	Corry Airport	Basin
S38	CORRY CITY	Seneca St	subsurface
S39	CORRY CITY	Mead Park	Alice Lake
S40	CORRY CITY	1st Ward collection & outfall	
S41	CORRY CITY	2nd Ward collection & outfall	
S42	CORRY CITY	3rd Ward collection & outfall	
S43	CORRY CITY	4th Ward collection & outfall	
S44	LAKE CITY BORO	Renee Drive	Detention Pond
S45	LAKE CITY BORO	West Lake Fire Station	Detention Pond
S46	LAKE CITY BORO	Various throughout Boro	Drainage & Outfalls
S47	ELGIN BORO	E. Pleasant St	catch basins & culverts
S48	ELGIN BORO	N. Main St to Beaver Run	culvert

ID	MUNICIPALITY	LOCATION	DESCRIPTION
S49	NORTHEAST TWP	Freeport Village - proposed	Development SWM Systems
S50	NORTHEAST TWP	Vineyard Village	Development SWM Systems
S51	NORTHEAST TWP	Windswept	Development SWM Systems
S52	NORTHEAST TWP	Counrty Creek	Development SWM Systems
S53	NORTHEAST TWP	Holiday Inn Express	Development SWM Systems
S54	NORTHEAST TWP	Roberts Trucking - proposed	Development SWM Systems
S55	NORTHEAST TWP	Dollar General	Development SWM Systems
S56	NORTHEAST TWP	I-90 Welcome	Development SWM Systems
S57	NORTHEAST TWP	Interstate Antique Mall	Development SWM Systems
S58	NORTHEAST TWP	Mercyhurst NE Building	Development SWM Systems
S59	NORTHEAST TWP	Kingdom Hall	Development SWM Systems
S60	NORTHEAST TWP	Stanley Doolittle Car Lot	Development SWM Systems
S61	NORTHEAST TWP	USF Holland	Development SWM Systems
S62	NORTHEAST TWP	NE Fruite Growers	Development SWM Systems
S63	NORTHEAST TWP	Mercyhurst NE Campus	Development SWM Systems
S64	NORTHEAST TWP	Applewood Ridge	Development SWM Systems
S65	NORTHEAST TWP	ED Smith	Development SWM Systems
S66	NORTHEAST TWP	South Washington Street	Development SWM Systems
S67	NORTHEAST TWP	NE School District	Development SWM Systems
S68	NORTHEAST TWP	Corbin - proposed	Development SWM Systems
S69	NORTHEAST TWP	Anderson - proposed	Development SWM Systems
S70	NORTHEAST TWP	Assembly of God - proposed	Development SWM Systems
S71	EDINBORO BORO	Lake dam	dam
S72	EDINBORO BORO	W. Plum St (Coldwell Banker)	Detention Pond
S73	EDINBORO BORO	E Plum St (CVS)	underground detention
S74	EDINBORO BORO	E. Plum St (Ob/Gyn)	underground detention
S75	EDINBORO BORO	Valleyview Subdivision	2 detention basins
S76	EDINBORO BORO	High St (church)	underground detention
S77	EDINBORO BORO	Hillcrest Dr	Detention Pond
S78	EDINBORO BORO	Chestnut Knoll	Detention Pond
S79	EDINBORO BORO	EUP Parking	underground detention
S80	EDINBORO BORO	Erie St (funeral parlor)	underground detention
S81	EDINBORO BORO	N & S of Waterford St	wetlands
S82	EDINBORO BORO	EUP Campus lake	
S83	WAYNE TWP	Scotia Street Industrial Park	SWM system
S84	GIRARD TWP	Sun Lake Estates	Development SWM Systems
S85	GIRARD TWP	Brychdale Sudivision	Development SWM Systems
S86	GIRARD TWP	Fairview Evergreen Nurs.	Development SWM Systems
S87	GIRARD TWP	Cherry Grove	Development SWM Systems
S88	GIRARD TWP	Fox Run Meadows	Development SWM Systems
S89	GIRARD TWP	Elk Creek Access	
S90	GIRARD TWP	Ahlwood Estates	
S91	MILLCREEK TWP	Chestnut Hill	FDB
S92	MILLCREEK TWP	Riviera Estates	FDB - will lose 2/3 capacity w/runway extension
S93	MILLCREEK TWP	Marshall Run FDB	efficiency increase w/runway ext.
S94	MILLCREEK TWP	McDowell Intermediate HS FDB	FDB constructed; need DEP permit
S95	MILLCREEK TWP	Penelec/Pastore	FDB proposed for 2009
S96	MILLCREEK TWP	Glen Meadows/Tuscany	FDB - private
S97	MILLCREEK TWP	Marshall Run big pipe to Lake	proposed, no funding
S98	MILLCREEK TWP	Scott Run storm sewer	proposed, no funding

Albion Boro

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown /Other
Stream Flooding												
Street Flooding												
Property Flooding												
Soil Erosion												
Sediment in Streams												
Stream Bed/Bank Erosion												
Scour at Outfalls												
Property/Infrastructure Damage												
Pollution												
Habitat/Resource Damage												
Other												

Amity Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown /Other
Stream Flooding			X			X		X				
Street Flooding			X	X				X				
Property Flooding		X					X	X				
Soil Erosion			X				X	X				
Sediment in Streams			X		X			X				
Stream Bed/Bank Erosion			X		X			X				
Scour at Outfalls			X									
Property/Infrastructure Damage			X				X	X				
Pollution			X				X	X				
Habitat/Resource Damage			X				X	X				
Other												

Concord Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown /Other
Stream Flooding		X										X
Street Flooding			X									
Property Flooding		X						X				
Soil Erosion		X						X				
Sediment in Streams		X						X				
Stream Bed/Bank Erosion		X						X				
Scour at Outfalls			X									
Property/Infrastructure Damage			X									
Pollution			X									
Habitat/Resource Damage			X									
Other												

Conneaut Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown /Other
Stream Flooding		X		X					X			
Street Flooding			X									
Property Flooding	X			X					X			
Soil Erosion			X									
Sediment in Streams			X									
Stream Bed/Bank Erosion			X									
Scour at Outfalls			X									
Property/Infrastructure Damage		X		X					X			
Pollution			X									
Habitat/Resource Damage			X									
Other			X									

Corry City

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown /Other
Stream Flooding		X			X					X		
Street Flooding		X		X						X		
Property Flooding		X		X						X		
Soil Erosion		X		X				X				
Sediment in Streams			X									
Stream Bed/Bank Erosion			X									
Scour at Outfalls			X									
Property/Infrastructure Damage			X									
Pollution			X		X			X				
Habitat/Resource Damage		X			X			X		X		
Other												

Cranesville Boro

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown /Other
Stream Flooding												
Street Flooding												
Property Flooding												
Soil Erosion												
Sediment in Streams												
Stream Bed/Bank Erosion												
Scour at Outfalls												
Property/Infrastructure Damage												
Pollution												
Habitat/Resource Damage												
Other												

Edinboro Boro

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown /Other
Stream Flooding		X		X				X				
Street Flooding		X			X			X		X	X	
Property Flooding					X			X		X	X	
Soil Erosion			X									
Sediment in Streams		X										
Stream Bed/Bank Erosion			X									
Scour at Outfalls		X		X				X				
Property/Infrastructure Damage		X		X				X				
Pollution		X					X					X
Habitat/Resource Damage		X					X					
Other												

Elgin Boro

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown /Other
Stream Flooding			X		X							X
Street Flooding			X									
Property Flooding			X									
Soil Erosion			X									
Sediment in Streams			X									
Stream Bed/Bank Erosion			X									
Scour at Outfalls			X									
Property/Infrastructure Damage			X									
Pollution			X									
Habitat/Resource Damage			X									
Other			X									

Elk Creek Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown /Other
Stream Flooding		X			X							
Street Flooding		X			X			X				
Property Flooding		X				X			X			
Soil Erosion			X									
Sediment in Streams			X									
Stream Bed/Bank Erosion		X				X		X				
Scour at Outfalls		X					X	X				
Property/Infrastructure Damage			X									
Pollution			X									
Habitat/Resource Damage			X									
Other BEAVER DAMS		X			X							

Erie City

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown /Other
Stream Flooding			X				X					
Street Flooding			X				X					
Property Flooding			X				X					
Soil Erosion			X				X					
Sediment in Streams			X				X					
Stream Bed/Bank Erosion			X				X					
Scour at Outfalls			X				X					
Property/Infrastructure Damage			X				X					
Pollution			X				X					
Habitat/Resource Damage			X				X					
Other												

Fairview Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown /Other
Stream Flooding												
Street Flooding												
Property Flooding												
Soil Erosion												
Sediment in Streams												
Stream Bed/Bank Erosion												
Scour at Outfalls												
Property/Infrastructure Damage												
Pollution												
Habitat/Resource Damage												
Other												

Franklin Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown /Other
Stream Flooding		X				X			X			
Street Flooding		X			X			X				
Property Flooding			X				X					X
Soil Erosion		X				X		X				
Sediment in Streams		X			X			X				
Stream Bed/Bank Erosion		X			X			X				
Scour at Outfalls		X			X			X				
Property/Infrastructure Damage			X				X	X				
Pollution		X			X							X
Habitat/Resource Damage		X			X							X
Other		X			X							

Girard Boro

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		X		X				X				
Street Flooding			X									
Property Flooding	X			X				X				
Soil Erosion			X									
Sediment in Streams			X									
Stream Bed/Bank Erosion			X									
Scour at Outfalls			X									
Property/Infrastructure Damage		X		X				X				
Pollution			X									
Habitat/Resource Damage			X									
Other												

Girard Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		X				X		X				
Street Flooding		X		X					X	X		
Property Flooding		X		X				X		X		
Soil Erosion		X		X				X	X			
Sediment in Streams		X		X				X				
Stream Bed/Bank Erosion		X		X				X				
Scour at Outfalls			X									
Property/Infrastructure Damage												X
Pollution		X			X			X		X		
Habitat/Resource Damage			X									
Other												

Greene Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding			X									
Street Flooding		X		X					X			
Property Flooding		X		X					X			
Soil Erosion		X			X				X			
Sediment in Streams		X				X			X			
Stream Bed/Bank Erosion		X				X						
Scour at Outfalls												
Property/Infrastructure Damage			X	X								
Pollution		X		X								
Habitat/Resource Damage			X									
Other	X											

Greenfield Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		x										
Street Flooding		x								x		
Property Flooding			x									
Soil Erosion												
Sediment in Streams												
Stream Bed/Bank Erosion												
Scour at Outfalls												
Property/Infrastructure Damage			x									
Pollution												
Habitat/Resource Damage												
Other												

Harborcreek

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		x			x							x
Street Flooding			x									
Property Flooding	x			x				x	x		x	
Soil Erosion			x									
Sediment in Streams			x									
Stream Bed/Bank Erosion			x									
Scour at Outfalls			x									
Property/Infrastructure Damage		x		x				x	x			
Pollution			x									
Habitat/Resource Damage			x									
Other												

Lake City Boro

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding			x									
Street Flooding		x							x			
Property Flooding												
Soil Erosion												
Sediment in Streams												
Stream Bed/Bank Erosion												
Scour at Outfalls												
Property/Infrastructure Damage												
Pollution												
Habitat/Resource Damage												
Other												

Lawrence Park Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding												
Street Flooding												
Property Flooding												
Soil Erosion												
Sediment in Streams												
Stream Bed/Bank Erosion												
Scour at Outfalls												
Property/Infrastructure Damage												
Pollution												
Habitat/Resource Damage												
Other												

LeBoeuf Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		X						X				
Street Flooding			X									
Property Flooding		X							X			
Soil Erosion		X										X
Sediment in Streams		X										X
Stream Bed/Bank Erosion		X										X
Scour at Outfalls			X									X
Property/Infrastructure Damage			X									X
Pollution			X									X
Habitat/Resource Damage			X									X
Other												

McKean Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding					X			X				
Street Flooding					X			X				
Property Flooding							X	X				
Soil Erosion						X		X				
Sediment in Streams		X			X			X				
Stream Bed/Bank Erosion	X				X			X				
Scour at Outfalls							X	X				
Property/Infrastructure Damage		X					X	X				
Pollution		X				X		X				
Habitat/Resource Damage			X			X		X				
Other			X					X				

McKean Boro

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding			X									
Street Flooding			X									
Property Flooding			X									
Soil Erosion			X									
Sediment in Streams			X									
Stream Bed/Bank Erosion			X									
Scour at Outfalls			X									
Property/Infrastructure Damage			X									
Pollution			X									
Habitat/Resource Damage			X									
Other												

Millcreek Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding	X			X					X			
Street Flooding	X			X					X			
Property Flooding	X			X					X			
Soil Erosion		X			X			X				
Sediment in Streams		X				X		X				
Stream Bed/Bank Erosion		X			X			X				
Scour at Outfalls		X			X			X				
Property/Infrastructure Damage	X			X					X			
Pollution		X			X			X				
Habitat/Resource Damage		X				X		X				
Other - CHANNEL OBSTRUCTIONS	X			X				TREES				

Mill Village Boro

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding	X			X					X	X	X	
Street Flooding		X				X			X	X		
Property Flooding	X			X					X	X	X	
Soil Erosion			X									
Sediment in Streams	X			X					X	X		
Stream Bed/Bank Erosion			X									
Scour at Outfalls			X									
Property/Infrastructure Damage	X			X					X	X	X	
Pollution			X									
Habitat/Resource Damage			X									
Other												

North East Boro

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		X						X				
Street Flooding		X						X				
Property Flooding			X									
Soil Erosion			X									
Sediment in Streams		X						X				
Stream Bed/Bank Erosion		X						X				
Scour at Outfalls			X									
Property/Infrastructure Damage		X						X				
Pollution			X									
Habitat/Resource Damage		X						X				
Other												

North East Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding							x				x	
Street Flooding							x				x	
Property Flooding							x				x	
Soil Erosion			x									
Sediment in Streams			x									
Stream Bed/Bank Erosion						x				x		
Scour at Outfalls						x						
Property/Infrastructure Damage					x					x		
Pollution			x									
Habitat/Resource Damage			x									
Other			x									

Platea Boro

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		x					x			x		
Street Flooding		x		x					x			
Property Flooding		x		x					x			
Soil Erosion			x									
Sediment in Streams			x									
Stream Bed/Bank Erosion			x									
Scour at Outfalls			x									
Property/Infrastructure Damage		x					x			x		
Pollution			x									
Habitat/Resource Damage			x									
Other												

Springfield Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding			X									
Street Flooding		X			X					X		
Property Flooding			X									
Soil Erosion			X									
Sediment in Streams			X									
Stream Bed/Bank Erosion			X									
Scour at Outfalls		X			X					X		
Property/Infrastructure Damage			X									
Pollution			X									
Habitat/Resource Damage			X									
Other												

Summit Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding			X									
Street Flooding			X									
Property Flooding			X									
Soil Erosion		X										
Sediment in Streams		X										
Stream Bed/Bank Erosion		X										
Scour at Outfalls			X									
Property/Infrastructure Damage			X									
Pollution			X									
Habitat/Resource Damage			X									
Other												

Union City Boro

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding												
Street Flooding												
Property Flooding												
Soil Erosion												
Sediment in Streams												
Stream Bed/Bank Erosion												
Scour at Outfalls												
Property/Infrastructure Damage												
Pollution												
Habitat/Resource Damage												
Other												

Union Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		X			X			X				
Street Flooding			X	X				X				
Property Flooding			X	X					X			
Soil Erosion		X			X			X				
Sediment in Streams		X				X		X				
Stream Bed/Bank Erosion		X				X		X				
Scour at Outfalls		X		X					X			
Property/Infrastructure Damage			X									
Pollution			X									
Habitat/Resource Damage			X									
Other			X									

Venango Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		X		X				X	X			
Street Flooding		X		X				X	X			
Property Flooding		X		X								
Soil Erosion		X		X				X	X			
Sediment in Streams												
Stream Bed/Bank Erosion		X		X				X				
Scour at Outfalls												
Property/Infrastructure Damage			X									
Pollution			X									
Habitat/Resource Damage			X									
Other												

Washington Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding			X									
Street Flooding			X									
Property Flooding		X				X			X	X		
Soil Erosion			X									
Sediment in Streams			X									
Stream Bed/Bank Erosion			X									
Scour at Outfalls			X									
Property/Infrastructure Damage			X									
Pollution			X									
Habitat/Resource Damage			X									
Other			X									

Waterford Boro

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding												
Street Flooding												
Property Flooding												
Soil Erosion												
Sediment in Streams												
Stream Bed/Bank Erosion												
Scour at Outfalls												
Property/Infrastructure Damage												
Pollution												
Habitat/Resource Damage												
Other												

Waterford Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		X		X				X				
Street Flooding		X		X				X	X			
Property Flooding		X		X				X				
Soil Erosion		X		X				X				
Sediment in Streams		X		X				X				
Stream Bed/Bank Erosion		X		X				X	X			
Scour at Outfalls		X		X				X				
Property/Infrastructure Damage		X		X				X	X			
Pollution		X		X				X				
Habitat/Resource Damage												
Other - BEAVER DAMS		X		X					X	X		

Wattsburg Boro

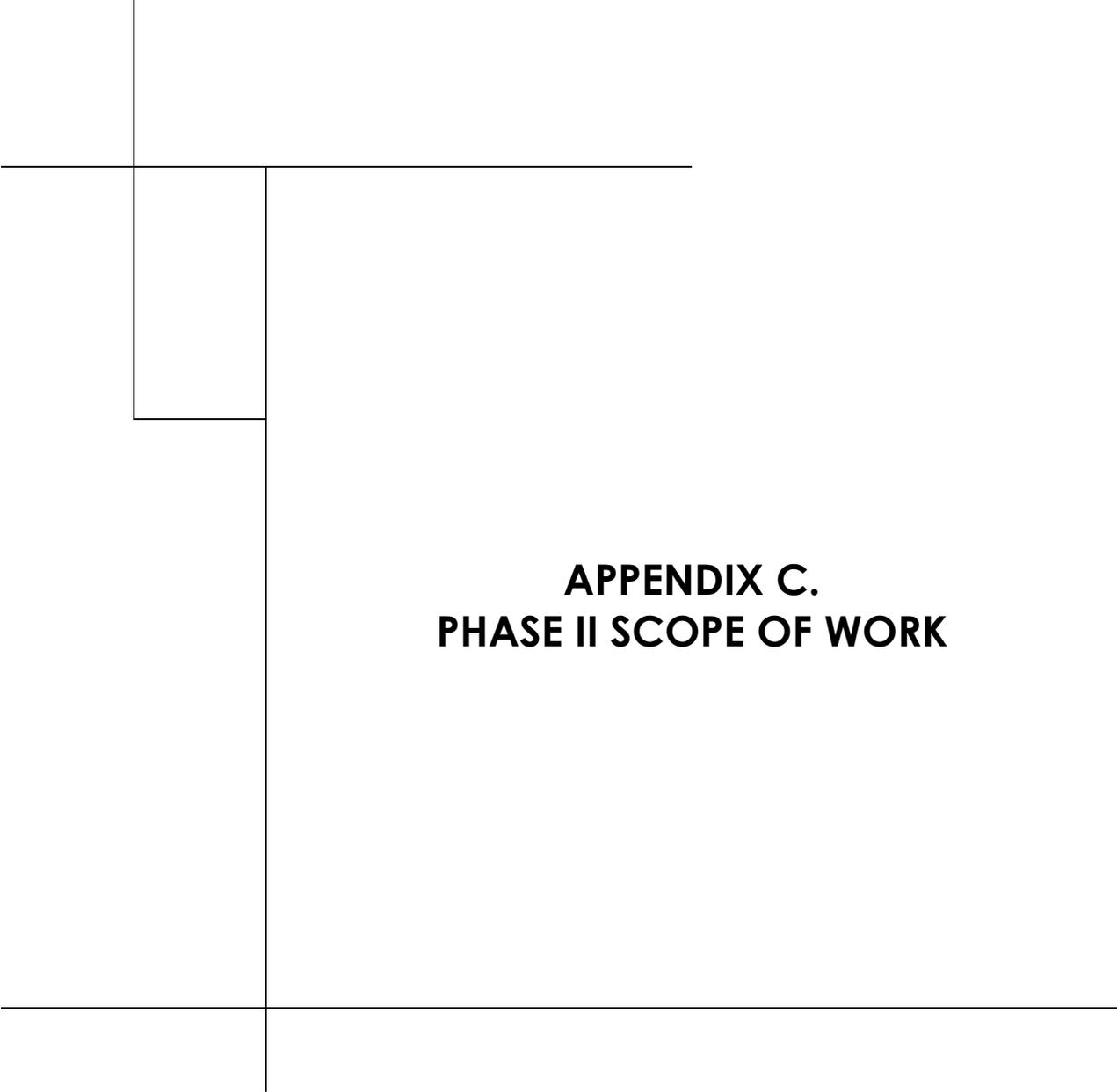
PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		X		X				X	X			
Street Flooding		X		X					X	X		
Property Flooding		X		X					X			
Soil Erosion		X				X						X
Sediment in Streams		X		X				X				
Stream Bed/Bank Erosion	X			X				X				
Scour at Outfalls			X									
Property/Infrastructure Damage		X						X	X			
Pollution			X									
Habitat/Resource Damage			X									
Other												

Wayne Twp

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding		X		X				X				
Street Flooding		X		X				X	X			
Property Flooding		X		X				X				
Soil Erosion		X		X				X				
Sediment in Streams		X		X				X				
Stream Bed/Bank Erosion		X		X				X				
Scour at Outfalls		X			X				X			
Property/Infrastructure Damage		X					X	X				
Pollution			X									
Habitat/Resource Damage			X									
Other												

Wesleyville Boro

PROBLEM	SEVERITY			FREQUENCY (years)				CAUSE				
	severe	moderate	none	<1	1-2	3-6	>6	Increased Runoff	Poor/No Drainage	Undersized Structure	Floodplain Development	Unknown/Other
Stream Flooding			X									
Street Flooding		X		X					X			
Property Flooding		X		X					X			
Soil Erosion			X									
Sediment in Streams			X									
Stream Bed/Bank Erosion			X									
Scour at Outfalls			X									
Property/Infrastructure Damage			X									
Pollution			X									
Habitat/Resource Damage			X									
Other			X									



**APPENDIX C.
PHASE II SCOPE OF WORK**

Phase II Scope of Work

The COUNTY shall prepare Phase II of the PLAN in accordance with the tasks described in this Appendix C. For the purpose of carrying out work described in this Appendix C, the Erie County Planning Commission shall be considered as the COUNTY and shall assume all responsibilities deemed to be assumed by COUNTY. The COUNTY, with the help of the consultant, will accomplish the technical and non-technical components of the PLAN.

The final Phase II Report and associated Model Ordinance shall be considered as the PLAN.

The Pennsylvania Department of Environmental Protection shall be considered as the DEPARTMENT.

The selected engineering firm shall be considered as the CONSULTANT.

The Phase II contract between Erie County and The Pennsylvania Department of Environmental Protection shall be considered as the AGREEMENT.

Project Administration

The COUNTY shall be responsible for, but not limited to, overall administration of all tasks, including the preparation of invoices and progress reports, organizing and/or attending meetings, attending to budgeting and organizational matters, and participating in teleconferences regarding the PLAN.

This task also covers the administrative work required to initiate the AGREEMENT between the DEPARTMENT and the COUNTY, and to initiate selection of a CONSULTANT and, upon selection, to initiate contracts between the COUNTY and the CONSULTANT and to lay out a framework for the critical coordination aspect with the municipalities. Activities include defining the framework for accomplishing various elements of the PLAN, scheduling of time and defining the budget, progress reporting procedures and formats, and finalizing the work schedule. It will also include the preparation for and holding the Phase II start-up meeting between the DEPARTMENT, the COUNTY, and the CONSULTANT.

This task also includes the delineation of work for Phase II between the COUNTY and the CONSULTANT.

Project Billing

The COUNTY shall complete all of the tasks (A through D) and report the progress and status of the PLAN. The COUNTY shall prepare and submit monthly invoices and report the status of work accomplished to the DEPARTMENT pursuant to the terms and conditions specified in the AGREEMENT.

TASK A - Data Collection/Review/Analysis

SubTask A.1 - Data Collection

This task will involve the necessary efforts to gather, review, and analyze the required data to complete the technical and institutional planning steps for the PLAN. The CONSULTANT and COUNTY will work jointly to collect data from county offices, municipalities, and local, state, and federal agencies that will aid in preparation of the PLAN. The data will consist of information concerning existing and future conditions throughout Erie County. All data collection activities will be accomplished by gathering available information from the WPAC or from the Questionnaire Form that was distributed to the municipalities during Phase I.

Data to be collected will include, but may not be limited to (and will be based on available information and/or questionnaire results):

1. Comprehensive land use plans.
2. Existing municipal ordinances.
3. Stormwater-related problems areas and proposed conceptual solutions.
4. Existing and proposed flood control projects.
5. Existing and proposed stormwater control facilities.
6. A listing of existing and proposed stormwater collection and control facilities, including a designation of those areas to be served by stormwater collection and control facilities within a 10-year period, an estimate of the design capacity and costs of such facilities, a schedule and the 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, where this information is readily available.
7. Soils.
8. Geology.
9. Significant water obstructions.
10. Topographic and other readily available mapping.
11. Aerial photographs.
12. Previously completed engineering and planning studies.
13. Stream flow and rain gauge data and other water quality information.
14. FEMA FIS floodplain information.

Necessary field investigations will be accomplished to gather and/or confirm the data. This task also involves the review and preliminary analysis of the technical data that has been obtained for consistency and usability. It also includes the review of the institutional data collected through the Phase I Questionnaire Form process for consistency and usability in the final PLAN.

Problem Areas and Obstructions Inspection/Summary/Proposed Solutions

A detailed investigation will be performed to evaluate any problem areas and obstructions identified during Phase I. Those problem areas and obstructions recognized as "significant" would be field evaluated. Detailed modeling will be completed for the subwatershed where these "significant" problem areas or obstructions occur (SubTask B.3), then these sites shall be designated as points-of-interest, and associated design storm flows will be developed. A collection of past studies/investigations including any PennDOT hydrologic computations, if possible, will be compiled and reviewed for proposed solutions. The PLAN will summarize these problem areas and obstructions, provide proposed solutions, and will specify possible sources of funding to pursue for implementation. The PLAN will make suggestions for other programs/activities to deal

with the issues raised during the planning process. The identification of the problem areas will help in assessing the stormwater management rate controls needed for the subwatersheds.

Although the identification of the problem areas will help in assessing the stormwater management rate controls needed for the subwatersheds, the Act 167 program will not provide funds to correct infrastructure problems or implement conceptual solutions. It will however, provide for a systematic approach and help to identify potential sources of funding to correct the problems, and will, through the preparation and implementation of stormwater ordinances, provide administrative means to correct existing problems and prevent future problems from uncontrolled runoff from future development and activities that may affect stormwater.

Review of Existing Plans/Studies/Reports/Programs

A comprehensive review of related documents and/or programs will be performed and a coordinated list of goals and objectives from each of the documents will be developed. Existing and proposed flood control projects will be reviewed and the projects will be broken out by federal, state, and local, identify the permitted, what the permit allows, and who is responsible for maintenance and when.

Anticipated Product

The product will include the information listed above, gathered and organized in such a way as to be usable for both short and long term municipal and county stormwater planning (including updates). A final data summary will be prepared that will identify and/or catalogue the collected data and funding streams.

SubTask A.2 - Municipal Ordinance Reviews/Evaluations

This task will involve the detailed evaluation of the provided municipal ordinances in order to prepare a municipal ordinance comparison matrix. This matrix is intended to display (for both the actual preparation of the implementation PLAN and also for the municipal education process), the current stormwater management provisions in the various municipal ordinances for all municipalities within Erie County. The objectives and the preparation of the matrix are to easily and effectively see the similarities and differences, as well as the consistency/inconsistency, between the various municipal ordinances in the County. The matrix will be used to develop ordinance provision recommendations for the various municipalities.

Anticipated Product

The product will be a complete matrix of stormwater management ordinance provisions for the municipalities, which identify the current status of ordinance provisions as they relate to stormwater management.

SubTask A.3 - Data Preparation for Technical Analysis

This task involves the engineering work necessary to transform the information collected under SubTask A.1 into a Geographic Information System (GIS) database that can be used for the later technical tasks and map (plate) production. Included will be the preparation of "land characteristics" GIS data layers for modeling and display purposes. All data will be incorporated into the GIS database on an as needed basis.

The GIS data layers will include:

- Base Mapping – Existing base map information (roads, streams, municipal boundaries, text, etc.) will be collected and the most accurate data will be utilized to develop the County's base map. All data will be projected into the coordinate system utilized by Erie County. All data from various sources will be merged into a seamless base map.
- Land Use/Land Cover Information – Current aerial (photographic and/or digital images), available GIS land use files, and zoning maps will be collected and formatted into the format required for hydrologic modeling based on NRCS (formerly SCS) land use classifications. Land development projects completed subsequent to existing data will be added as necessary.
- Future Land Use Conditions – Future projected planning information will be overlaid on the existing land use conditions mapping to determine the future land use scenario for development at a 10-year build-out condition.
- Soils Information – The County Soils Survey maps will be modified and/or prepared to illustrate NRCS hydrologic soils groups instead of individual soil types. Overlay mapping will be necessary to prepare the hydrologic soils group map necessary for modeling.
- Digital Elevation Models – Digital Elevation Models (DEMs) will be utilized and evaluated for watershed and subwatershed delineation and to assign slope category information to the subwatersheds for which detailed modeling will be completed. The DEMs will be merged to form a seamless watershed map and projected to the appropriate coordinate system.
- Digital Raster Graphics (DRGs) – Ortho digital USGS topographical maps will be compiled and utilized to evaluate NRCS land use classifications and to determine the location of significant obstructions and problem areas.
- Geology – If available, digital geologic maps that include pertinent geologic features (limestone, sandstone, etc.) will be developed for the County and be extracted and displayed as part of the PLAN.
- Obstructions – Obstructions will be located on the appropriate base map and data or attributes will be attached or linked to the locations.
- Problem Areas, Flood Control Structures, Stormwater Management Facilities – These items will be located on the appropriate base map and data or attributes will be attached or linked to the locations.
- Floodplains – Available FEMA FIS floodplain data will be transposed to the appropriate base map and displayed with the development in Erie County.

A summary of data sources will be supplied (simplified Metadata) and will include data type (coverage, shape file, image), source, projection, and year.

Delineation of Subwatersheds

As required, the watersheds and subwatersheds will be delineated by the CONSULTANT on a base map at the scale that results in a manageable map size and adequate detail. Subwatersheds will be established based on the collected data and results of field reconnaissance. This breakdown of the watersheds by major tributary drainage courses and points-of-interest will be the basis for the hydrologic and hydraulic analyses. The CONSULTANT will determine the size of the subwatersheds; however delineations of subwatersheds smaller than three (3) square miles requires the COUNTY's concurrence.

The subwatersheds will be delineated based on the following:

1. The location of existing regionally significant stormwater management problems, as identified by the WPAC in the Questionnaire Form, during the field reconnaissance, or from data compiled in any previous studies or reports.
2. The location of significant regional stormwater and flood control obstructions such as highway bridges and culverts, or stormwater control facilities.
3. Confluence points of tributaries, as deemed appropriate and significant relative to regional stormwater management planning based on engineering judgment and good modeling practice.
4. Other points of interest, such as stream gage or water quality monitoring stations, locations of water quality concerns, potential flood control project sites, significant outfall locations downstream of existing developments, or where significant development is anticipated and projected to occur.

This task will also include mapping of relevant regional watershed planning information onto GIS data layers. This mapped information will include:

1. Floodplain Areas - The approximate floodplain limits plotted over the watershed base map or the highlighting of those stream segments for which FEMA detailed or approximate Flood Insurance Studies are available.
2. Regionally significant stormwater obstructions and their capacities - "Significant" obstructions will be those that are identified in the Questionnaire Form and/or which are confirmed by the CONSULTANT as being areas where insufficient capacity exists to pass the necessary storm flows, thereby resulting in a flooding hazard to persons or property, or those obstructions that would act as regionally significant impoundments that may affect watershed modeling and the watershed stormwater response.
3. Storm Sewer Systems - Areas where significant storm sewer systems exist will be indicated generally on the final base map.
4. Existing local, state, and federal flood protection and stormwater management facilities.
5. Proposed stormwater facilities within the 10-year planning period - Where known and confirmed by the municipalities through the Questionnaire Form completions process.
6. Regionally Stormwater Related "Problems" - Those areas indicated in the Questionnaire Form and where confirmed by the CONSULTANT through technical modeling/analysis (for example, flooding points or areas of streambank erosion).

Anticipated Product

The product will be completed GIS watershed data layers and maps. The maps completed for this task will be preliminary and will be modified and finalized as a part of the final PLAN preparation efforts.

SubTask A.4 - Data Collection for Integrated Water Resource Plan

This task will involve the necessary efforts to gather, review, and analyze the required data to complete the technical and institutional planning steps for the IWRP concerning:

- Act 220 Water Planning
- Source Water Protection Planning
- Floodway & Floodplain Management

The CONSULTANT and COUNTY will work jointly to collect data from county offices, municipalities, and municipal authorities, local, state, and federal agencies that will aid in preparation of the PLAN. All data collection activities will be accomplished by gathering available information from the identified parties.

In addition, under this task, the Consultant will collect and analyze data on current stormwater management activities by the 14 MS4 permit holders. A standardized questionnaire will be developed by the Consultant and utilized to gather like data from the permit holders on activities, level of effort and costs, and barriers associated with implementing their current stormwater programs.

The County will be responsible for distributing the questionnaire, conducting follow-up calls, and compiling the information. The Consultant will work with the appropriate County staff in preparation of this activity.

Once the initial questionnaire data has been received, the Consultant will meet either individually or in small groups with representatives of the 14 permit holders to review and validate the information, explore future needs, and discuss potential opportunities/obstacles for cooperative approaches and work sharing with other neighboring municipalities. The County will help with the organization of this activity.

The Consultant will analyze the information to look for gaps and overlaps in order to develop a basis for discussion in the group workshops.

Review of Existing Plans/Studies/Reports/Programs

A comprehensive review of related documents and/or programs will be performed and a coordinated list of goals and objectives from each of the documents will be developed.

Anticipated Product

The product will include the information listed above, gathered and organized in such a way as to be usable for coordinated water resource planning. A final data summary will be prepared that will identify and/or catalogue the collected data.

For the MS4 communities:

- A questionnaire will be developed to standardize information gathering.
- Conference call meeting will be conducted with County personnel in preparation for distributing and handling questions about the questionnaire.
- A data summary report and analysis will be prepared from the collected data.
- A series of two-hour meetings will be held with the 14 permit holders over a 2-3 day period.

TASK B - Technical Analysis

The technical analysis will describe the analytical processes involved with developing a strategy to regulate existing and new land development and activities that may affect stormwater runoff. Since stormwater runoff has a direct impact on flooding, water quality, and groundwater recharge, this analysis will consider the following objectives:

- Implement non-point source pollution removal methodologies.
- Preserve and restore natural stormwater runoff regimes and natural course, current, and cross section of Waters of the Commonwealth, to the maximum extent practicable.
- Preserve, protect, maintain, and restore groundwater recharge and recharge areas.
- Protect stream channel and land areas from erosion.

- Restore and preserve flood carrying capacity of streams.
- Manage extreme flood events.

These objectives will be accomplished under SubTasks B.1 to B.9.

SubTask B.1 - Implement Volume Controls

Establish the Design Storm Method (Control Guidance 1 in *The Pennsylvania Stormwater Best Management Practices Manual*) and the Simplified Method (Control Guidance 2 in *The Pennsylvania Stormwater Best Management Practices Manual*) consistent with the Department of Environmental Protection, Bureau of Watershed Management's *Pennsylvania Model Stormwater Management Ordinance*.

SubTask B.2 - Implement Rate Controls

Establish a minimum 100% release rate for all lands contained within Erie County. More restrictive release rates may be developed in subwatersheds with existing problem areas or intense development pressures.

SubTask B.3 - Model Subwatersheds of Designated Watersheds

This task involves the hydrologic modeling, quantitative computations, and evaluations necessary to analyze runoff characteristics of the subwatersheds under existing and future conditions. It will also establish the need and extent of release rates for the subwatersheds. As the majority of the problems areas fall within the Lake Erie and French Creek watersheds, these watersheds will be modeled to determine peak flow rates. Subwatersheds chosen will be based on existing problem areas or future development pressures based on input provided by the WPAC. Existing and future land use and land cover will be used to determine existing and future peak rates of discharge. Input data including rainfall information, drainage network layouts and capacities, travel times within subwatersheds, significant obstructions, and GIS based data will be added to develop the selected hydrologic model.

Model Calibration

The individual subwatershed models will be run to get preliminary results. The models will be calibrated to verify the results. Calibration efforts will include the adjustment of the model parameters to accurately simulate natural runoff conditions of the subwatershed. Consideration will be given to all calibration techniques including, but not limited to: use of any available gaging information, comparison with rainfall and runoff information from similar watersheds, comparison with Flood Insurance Study information, and regression analyses. As necessary, calibration will be performed at multiple points within the subwatersheds to assure the most accurate modeling.

Design Storm Selection

Subsequent to calibration of the model, the model will be run for the 2-, 10-, 25-, 50- and 100-year storm events under various durations. An analysis on downstream impacts during these storms will be performed to determine the required design storm(s) based on the subwatershed hydrologic response of the five (5) storms.

Model Runs

The calibrated models will be run for the selected subwatersheds under the determined design storm(s) for both the existing and future projected land uses.

This will also involve the detailed evaluation of modeling results to perform a problem identification analysis (i.e., a "cause and effect" analysis). This will concentrate on identifying the downstream storm runoff impacts of projected future land development projects. This evaluation will consider both the increases in current downstream storm runoff problems, as well as anticipated projected downstream runoff problems.

This work step also consists of performing a technical evaluation of the hydrologic analysis for existing and future land use conditions (estimated 10-year build out) and recommending standards and criteria to regulate land development activity which impacts stormwater runoff. This subtask may also involve performing a release rate analysis and a preliminary distributed storage analysis, and developing criteria and standards for the management of both overbank flooding events (2-, 10- and 25-year storms) and the extreme flooding events (50- and 100-year storms), to be determined by the WPAC.

SubTask B.4 - Provide Conceptual Solutions for Existing Problem Areas

Based on the results of SubTask B.3, this information will be used to develop alternative conceptual solutions for the problem areas identified in the Questionnaire Form and other problem areas as identified by the WPAC. Problem areas may generally consist of flooding, stream channel or bank erosion, property damage, detention basin (retrofitting), etc. The developed solutions will be conceptual in nature (i.e. no final engineering or specification will be completed). These conceptual solutions will be presented as recommendations to the municipalities. It will be up to the individual municipality's discretion whether or not to implement the conceptual solutions to the problem areas. The municipality will also be responsible to acquire funding sources to implement the final solutions.

SubTask B.5 - Goals, Objectives, and Compilation of All Technical Standards

Stormwater problems will be restated as goals and objectives for the Act 167 planning process. The goals and objectives need to:

- Satisfy all regulatory requirements (including correcting water quality impairments related to stormwater or urbanization appearing in the EPA 303(b) and (d) lists, or impairments associated with approved TMDLs).
- Meet the purpose and policy of Act 167.
- Meet regulatory and permit requirements associated with the NPDES MS4 program.
- Meet local requirements and objectives established by the WPAC.

When restated as engineering performance standards for the PLAN, the goals and objectives become the basis for the standards and criteria for regulation and control of land development and activities that may affect stormwater.

The standards and criteria will provide a basis for the selection and application of analytical methodologies and BMPs for the implementation of stormwater controls.

The candidate stormwater management strategies that meet the identified goals and objectives (i.e. show how the proposed standards and criteria for the Final Report and Model Ordinance meet the goals and objectives set by the WPAC) will be prepared and presented to the WPAC.

The proposed standards and criteria need to address the following control requirements:

1. Apply to all areas covered by the PLAN.
2. Establish release rate percentages (if applicable) or other levels of control of runoff.
3. Specify design flood frequencies and computational methodologies for design of stormwater management measures.
4. Provide specifications for construction and maintenance of stormwater management systems (if applicable).
5. Provide conceptual solutions to both regional and local problems areas.
6. Summary and prioritization strategies for long-term potential solutions.
7. Identify funding sources for correction of existing problems related to infrastructure.
8. Maintain consistency with concurrent studies including a summary of what tasks will be completed so as to avoid duplication of effort.
9. Provide a fee schedule for: submissions of permit applications, review of permit applications, construction inspections, periodic inspections, and enforcement actions.
10. An implementation strategy, including funding, for retrofit measures, if necessary.

The recommendations will be presented in layman's language, keeping in mind that they are directed towards local municipalities and are to address solutions to stormwater management issues. The technical standards and criteria developed as a part of this task will apply to all areas covered by the PLAN.

Water quality BMP information will be presented including recommendations for the implementation of water quality BMPs for land development and activities to minimize stormwater impacts from land development and activities. This educational effort will primarily involve discussions, presentations, and handouts on BMP technology to municipal officials during regularly scheduled WPAC meetings. Information available from PADEP and other sources will be distributed.

Methods for controlling stormwater runoff quantity and quality will be evaluated and included in the Model Ordinance.

SubTask B.6 - Implementation of Technical Standards and Criteria

This subtask will involve the identification of the necessary ordinance provisions for each municipality. Included will be the modification of the Model Ordinance and/or recommendations for updating existing municipal ordinances, including but not limited to, subdivision and land development, zoning, erosion and sediment control, and building code ordinances to effectively implement the technical standards and criteria for stormwater management throughout Erie County. A design example will be provided to show how to incorporate the various aspects of the Model Ordinance into the stormwater management design process.

Anticipated Product

The product will be the charts, tables, figures, plates, and graphs needed to present the technical analysis including evaluation of both water quantity and water quality requirements. The product will also include modeling results, the technical interpretation of the modeling results, and the definition of the technical standards and criteria for use in the preparation of the PLAN. The product will also include the identification of necessary recommended municipal ordinance provisions to implement the technical standards, including a complete stormwater management Model Ordinance.

SubTask B.7 - Economic Analysis

This subtask will involve an economic analysis of implementing the technical standards and provisions of the PLAN. A design example will be created for each major type of development (residential, commercial and industrial) and estimated costs will be associated with the design examples to demonstrate how implementation of the standards and provisions can be cost effective to developers.

Anticipated Product

The product will be the design example.

SubTask B.8 - Regulations for Activities Impacting Stormwater Runoff

This subtask will involve the research and development of standards and provisions regarding regulating activities that may impact stormwater runoff. These activities may include, but are not limited to: timber harvesting, oil & gas mining, and agriculture. The activities will only be regulated in regards to stormwater management controls and protecting water quality requirements to ensure the protection of health, safety, and property of the people and Waters of the Commonwealth.

Anticipated Product

The product will be a section in the Plan addressing activities that may impact stormwater runoff.

SubTask B.9 - Water Quality Impairments

This subtask involves the research and identification of water quality impairments throughout Erie County from the 303(b) and 303(d) lists and designated Total Maximum Daily Loads (TMDLs).

Anticipated Product

The product will be to identify how to protect the existing uses and for waters not attaining, how to improve the water quality to the designated use.

SubTask B.10 – Integrated Water Resource Plan and Feasibility Study

This subtask involves coordinating water resource planning efforts being conducting associated with Act 220 State Water Plan, Source Water Protection, NPDES MS4 Program, and Floodplain Management. In addition, a feasibility study will be conducted to document the existing stormwater management efforts (administrative, technical, etc.) including the financial costs. The study will also include documentation of the existing MS4 programs efforts. Research will be conducted to identify a potential central stormwater an entity that would effectively and efficiently address stormwater management for many communities, including the formation of a stormwater authority.

Anticipated Product

The product will be a separate Plan for the coordination of water resources that will include the feasibility study. The report will document references to existing Plans and programs detailing the aspects of each program and their inter-relationships. Charts, tables, figures, and graphs needed to present the financial analysis of the existing stormwater management programs. A recommendation section will include criteria for a central entity to implement stormwater management on a community wide basis.

TASK C – Public/Municipal Participation

SubTask C.1 - Meetings

Coordination efforts and/or activities will continue throughout the duration of the project and will be organized to include the necessary meetings with the COUNTY, CONSULTANT, DEPARTMENT, and WPAC.

In addition to the WPAC, several meetings will focus on technical and legal issues. These meetings are to educate and solicit input and comment from the public, municipal governments (elected officials, engineers, and solicitors), and other interest groups such as watershed associations.

As previously indicated, the WPAC consists of representatives from each municipality in Erie County, as well as the Erie County Conservation District, and other interested groups. The WPAC meetings will be held to provide education on the planning process and to receive advice from the municipal officials to assure the PLAN fits the needs of the municipalities while soliciting valuable technical and institutional data and other information. The advisory role of the WPAC during the development of the PLAN is vital to the ultimate adoption and implementation process.

Two meetings of the WPAC will focus on the technical issues focusing on the municipal engineers from each municipality and any invited engineering, technical, or scientific individuals. The meetings will provide a technical forum to assist the COUNTY and CONSULTANT during the preparation of the technical portions of the PLAN by evaluating watershed modeling, water quality efforts, and the establishing of overall technical standards.

Another WPAC meeting will include the solicitors representing each municipality. This meeting will be convened to educate the municipal solicitors on the ordinance adoption and implementation requirements of the PLAN and to receive comments and direction in the finalization of the Model Ordinance.

A BMP Workshop for the municipalities and municipal engineers will be developed and conducted. The presentation of the workshop shall be based on *The Pennsylvania Stormwater Best Management Practices Manual*. The workshop will contain one or more examples showing the design and construction of BMPs, including design calculations, review procedures, and approval of permit applications.

The following describes proposed WPAC meetings and public hearing schedules including the purpose of each meeting:

Please note that WPAC #1 and WPAC #2 Meetings were held during Phase I.

Meeting	Purpose of Meeting	Meeting Schedule
WPAC 3	Review Phase I, discuss problem areas and obstructions from Questionnaire Form, present GIS maps and data, and review overall goals of Phase II.	Beginning of Phase II
WPAC 4 & WPAC-E	Review the project status, review technical aspects of the PLAN, including initial modeling runs, calibration efforts, and review of technical standards (Control Guidance 1 & 2). Purpose is to receive comments and direction in the development of the Model Ordinance.	Middle of Task B

WPAC 5 & WPAC-E	Present final technical modeling results, present technical standards and criteria; discuss water quality issues, and preliminary ordinance provisions for the municipalities. Review final modeling runs and present draft PLAN and address previous comments.	End of Task B
WPAC 7 & WPAC-L & Public Hearing & BMP Workshop	Present final draft and review municipal implementation procedures. Educate the municipal solicitors on the ordinance adoption and implementation requirements of the PLAN. Conduct the public hearing as required by Act 167 to present the final PLAN to the public. Educate municipalities on implementing stormwater quality through the BMP Workshop.	End of Phase II
Municipal Workshop	Municipal Implementation Workshop: Provide assistance to municipalities on implementation of the PLAN including adaptation, enactment, and implementation of the ordinances and other action items.	Within 3 months of DEP's approval of the PLAN
Public Workshop	Public Implementation Workshop: Provide introduction and overview of the PLAN to public.	Within 6 months of DEP's approval of the PLAN

This task will also involve the production and distribution of a meeting agenda and meeting minutes updating the WPAC members, municipal officials, interest groups and the public on the program, status, and issues of the PLAN. The agenda and minutes will be created for each meeting during Phase II.

Anticipated Product

The product will include correspondence and meeting notes/minutes from the individual committee meetings. In addition, the presentation materials prepared for the individual committee meetings will constitute a defined product of this subtask for the overall project.

SubTask C.1 - Workshops

The Consultant will conduct up to six (6) workshops with representatives from the 14 MS4 permit holders, the Erie County Conservation District, and other interested parties such as the more rural municipalities, forming the Integrated Water Resources Management Workgroup. The goal of this task is to identify options and develop consensus among the participants on the best structure for managing stormwater within the watershed and potential options for coordinating and integrating permitting requirements.

The workshops will generally address the following:

- Present questionnaire findings; Validate current stormwater activities and future needs
- Identify benefits/opportunities of coordination; Identify expectations and potential challenges
- Identify organizational options to overcome barriers (including policy, legal, and data management issues);
- Develop consensus framework and recommendations
- Identify key actions for moving forward

Anticipated Product

- Conduct up to six workshops
- Materials developed for each workshop

- Summary of each workshop

TASK D - PLAN Preparation and Implementation

SubTask D.1 - Final Phase II Report Preparation

Components of the previous task and subtasks will be included, or at least referred to in the PLAN. In this way the PLAN shall contain such provisions as are reasonably necessary to manage stormwater such that storm runoff from land development or other activities in each municipality shall not adversely affect health, safety, property, and water quality. In addition, the PLAN shall consider and be consistent with other existing municipal, county, regional and state environmental and land use plans and local and state laws and regulations. The PLAN shall include the following:

- A description of the hydrologic characteristics of the subwatersheds; the existing and future land uses and their impacts on stormwater runoff and stormwater collection systems; the available runoff control techniques and their efficiencies in the subwatersheds; a list of significant obstructions; and available FEMA FIS floodplain information. The available floodplain information will either be included in the PLAN or their sources will be referenced.
- Based upon the results of the subwatershed modeling, the technical evaluation resulting in the criteria and standards governing the use of stormwater management controls throughout the subwatersheds. An important aspect of the technical components of the PLAN will be the delineation of subwatersheds with specific management strategies. This determination will be accomplished based upon an evaluation of any land development activities on critical drainage points throughout Erie County. Peak discharge tables will be compiled for the critical drainage points from the hydrologic model runs involved in the modeling effort. BMP tables and data on their effectiveness and applicability will be presented or referenced.
- The tables for the rainfall depths for various frequency durations which are computed as part of the hydrologic modeling.
- Approximate floodplain limits for areas where detailed FIS studies are available. Where detailed flood control engineering plans for proposed remedial measures are available from municipality, county, or private agencies, a summary analysis and evaluation of those plans will be included in the PLAN. Where detailed plans are not available, preliminary recommendations relating to such measures will be provided.
- Recommendations for solutions to the existing drainage problems will only be conceptual in nature indicating the type of approach needed and inter-municipal cooperation issues. Identification of sites for potential restoration and/or protection projects that would qualify for Pennsylvania's "Growing Greener" Funds will be identified.
- Recommendations for new drainage facilities to prevent future problems due to new land development and a discussion regarding inter-municipal arrangements for funding the projects will also be discussed.

- **Priorities for Implementation.** The conclusions and recommendations of the goals and objectives of the PLAN will be summarized. Recommended actions will be listed according to agency, municipality, or individual responsible for each action. Priority of recommended actions will be based on chronological order, importance, hydrologic significance, or other factors as may be appropriate. This will include type and location of potential watershed projects that could be considered under Pennsylvania's "Growing Greener" grant program.
- **PLAN Update.** As a part of the implementation strategy for the PLAN, specific steps and/or procedures will be established for pursuing and completing the PLAN as required by Act 167. Specific circumstances will be identified and described in the PLAN document that will "trigger" a decision to update. For example, land development circumstances (such as major changes in the type and/or amount of proposed land development, and in excess of that which was assumed for the preparation of the original PLAN) will be identified as reasons for pursuing an update of the PLAN prior to the required 5-year time frame identified in Act 167.

The preliminary outline for the PLAN is as follows:

Part I

- Section I - Introduction
- Section II - Erie County Description
- Section III - Significant Problem Areas and Obstructions
- Section IV - Watershed Level Stormwater Management Planning
- Section V - Technical Analysis
- Section VI - Existing Municipal Regulations
- Section VII - Economic Impact of Stormwater Management Standards
- Section VIII - Goals, Objectives, and Additional Recommendations
- Section IX - PLAN Implementation and Update Procedures
- Section X - References

Part II

Integrate Water Resources Plan

Part III

Model Ordinance

Plates:

- Existing Land Use Basemap.
- Future (10-year) Land Use Basemap.
- Subwatersheds used for hydrologic analysis including information on applicable release rate management strategies.
- Hydrologic soil groups and development and floodplains.
- Stream obstructions, flooding, and problem areas.
- Areas where storm sewer networks exist (if available) and projected future storm sewer networks.

Anticipated Product

The product will be the final Phase II Report. The Phase II Report will be prepared in both digital and paper formats.

SubTask D.2 - Model Ordinance Preparation

A Model Ordinance which includes the provisions and standards developed during Phase II will be created consistent with the Department of Environmental Protection Pennsylvania Model Stormwater Management Ordinance. The WPAC will make a determination on whether drainage and construction standards will be included.

Anticipated Product

The product will be the final Model Ordinance. The Model Ordinance will be prepared in both digital and paper formats.

SubTask D.3 – Integrated Water Resource Plan Preparation

The Integrated Water Resource Plan will be created documenting the coordination of the various water resource planning activities and efforts including a summary and analysis from the data gathered, the recommendations of the Integrated Water Resources Management Workgroup. It will also include the feasibility study documenting existing stormwater management and MS4 efforts as well as recommendations for a central entity to implement stormwater management efforts including an MS4 program for interested municipalities. The Plan will also include suggestions for next steps to move the process forward.

Anticipated Product

The product will be the draft and final Integrated Water Resource Plan. The Plan will be prepared in both digital and paper formats.

SubTask D.4 - PLAN Adoption

The PLAN will include the final Phase II Report and the Model Ordinance. One copy of the draft PLAN will be transmitted to the official agency and governing body of each involved municipality, each member of the WPAC, and the DEPARTMENT by official correspondence. The involved municipalities, WPAC, and DEPARTMENT will then review the draft PLAN. Their review will include an evaluation of the PLAN's consistency with other plans and programs affecting stormwater management. The reviews and comments will be submitted to the COUNTY by official correspondence. The review comments will be received, tabulated, and responded to appropriately and the draft PLAN will be revised accordingly.

Prior to final PLAN adoption, and as necessary, meetings will be held with each municipality individually as identified in WPAC meetings and municipal training schedule; to identify specific ordinance changes and method(s) of incorporation of the standards and criteria into municipalities' existing ordinance framework. In addition, the meeting(s) can also serve to provide clarification of any remaining questions or concerns that municipalities may have concerning the implementation of the PLAN.

The COUNTY will hold a public hearing concerning the PLAN. A notice for the public hearing will be published at least two (2) weeks before the hearing date. The public hearing notice will contain a brief summary of the principal provisions of the PLAN and a reference to the sites and/or website where copies of the PLAN may be examined or purchased at cost. The COUNTY will review the comments received at the public hearing and appropriate modifications in the PLAN will be made as applicable.

The Erie County will vote by resolution on the adoption of the PLAN. The resolution will have to be carried by an affirmative vote of at least a majority of the Commissioners, and should refer expressly to the maps, charts, textual matter, and other materials intended to comprise the PLAN. Upon positive resolution, this action will then be recorded on the adopted PLAN.

The COUNTY will then submit to the DEPARTMENT a letter of transmittal, and three (3) copies of the adopted PLAN, along with a digital version and GIS data layers, the review by the official Planning agency and/or governing body of each municipality, Erie County Planning Commission, regional Planning agencies (Section 6(c) of Act 167), public hearing notice and minutes (Section 8(a) of Act 167), and the resolution of adoption of the PLAN by the COUNTY (Section 8(b) of Act 167). The letter of transmittal will state that the COUNTY has complied with all procedures outlined in Act 167 and will request DEPARTMENT to approve the adopted PLAN. The COUNTY will also submit to the DEPARTMENT a current list of all names, addresses, and phone numbers of the municipalities, municipal engineers, and solicitors located in Erie County. Subsequent to the DEPARTMENT's approval of PLAN, fifty (50) copies of PLAN will be printed and distributed.

As desired by the County, the adopted PLAN could be posted on the COUNTY's and/or CONSULTANT's websites.

All backup material including hydrologic and hydraulic analyses of the subwatersheds will be retained at the COUNTY office for future use during PLAN updates or any other reference.

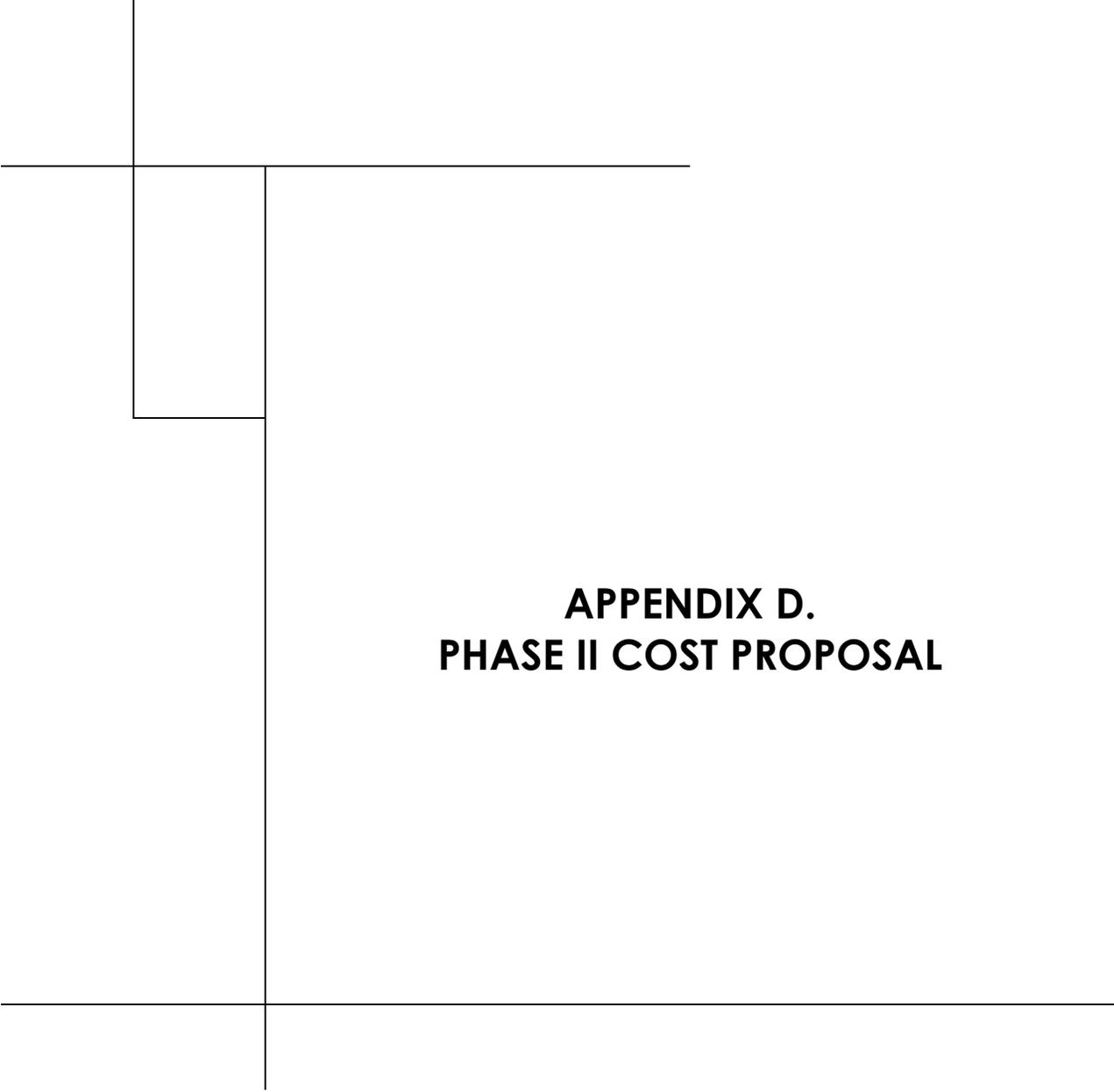
Anticipated Product

The product of this subtask will include the official documentation regarding PLAN adoption and implementation process, including the necessary documentation from the COUNTY certifying the adoption of the PLAN, an adopted PLAN, and associated Plates.

The Plan will contain, at a minimum, the following items:

1. A survey of existing runoff characteristics in minor as well as large storms, including the impact of soils, slopes, vegetation, and existing development.
2. A survey of existing significant obstructions, their capacities, and associated storm return periods.
3. An assessment of projected and alternative land development patterns in Erie County, and the potential impact of runoff quantity, velocity, and quality.
4. An analysis of existing and future development in flood hazard areas, and its sensitivity to damages from future flooding or increased runoff.
5. A survey of existing drainage problems and proposed conceptual solutions.
6. A review of existing and proposed stormwater collection systems and their impacts.
7. An assessment of alternative runoff control techniques and their efficiency in the individual subwatershed.
8. An identification of existing and proposed local, State, and Federal flood control projects located in Erie County and their design capacities.
9. A designation of those areas to be served by stormwater collection and control facilities within a ten (10) 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.

10. An identification of FIS delineated floodplains throughout Erie County.
11. Criteria and standards for the control of stormwater runoff from existing and future development which are necessary to minimize dangers to property and life and carry out the purposes of Act 167.
12. A BMP Workshop to inform engineers and local officials about enhanced water quality and groundwater recharge stormwater management techniques (information on BMPs is also to be included or referenced in the PLAN).
13. Priorities for implementation of conceptual solutions.
14. Provisions for periodically reviewing, revising, and updating the PLAN.
15. Provisions as are reasonably necessary to manage stormwater such that land development or activities in each municipality do not adversely affect health, safety, and property in other municipalities of Erie County and in drainage basins to which the watershed is tributary.
16. Consideration for consistency with other existing municipal, county, regional, and State environmental and land use plans.

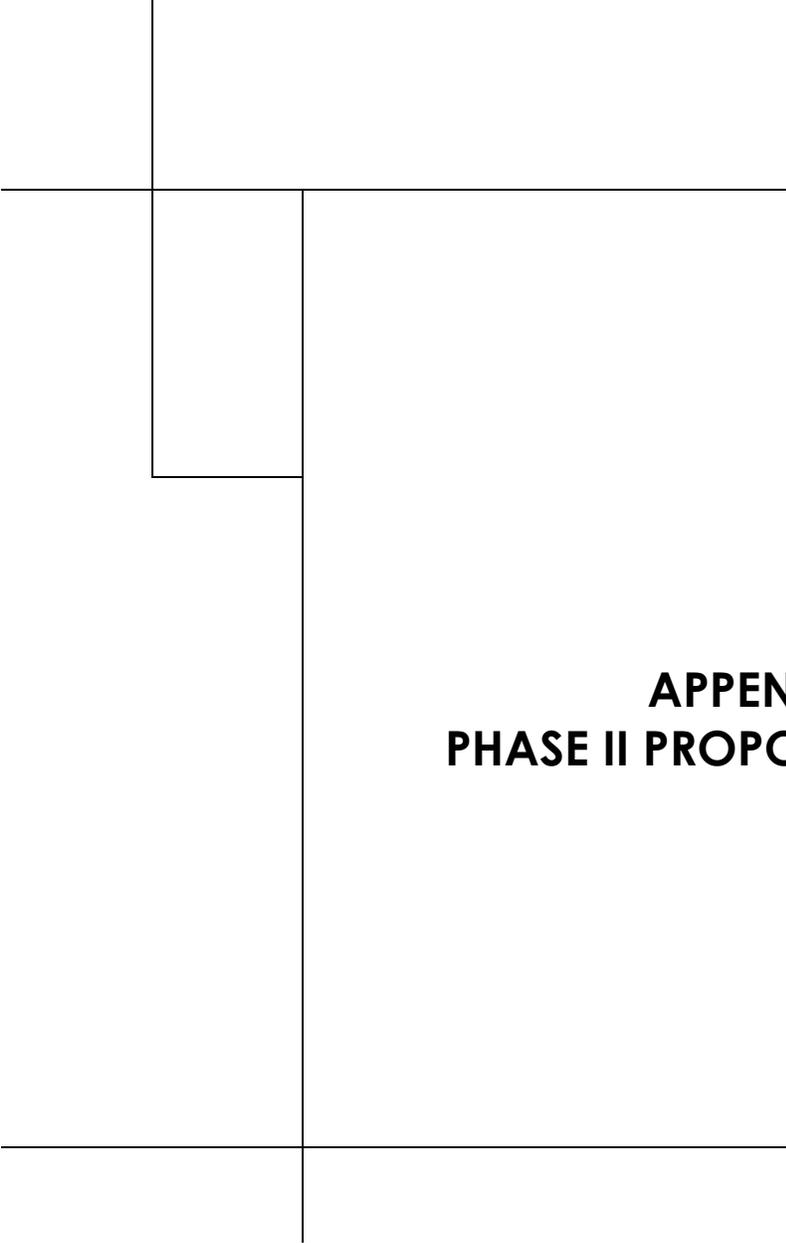


**APPENDIX D.
PHASE II COST PROPOSAL**

Phase II Cost Proposal

The estimated cost associated with completing the Phase II work is Dollars (\$00) as per the following breakdown:

COST ESTIMATE BY TASK			
	TIME	EXPENSES	TOTAL
<i>Task A – Data Collection/Review/Analysis</i>	\$43,237.00	\$13,300.00	\$56,537.00
<i>Task B – Technical Analysis</i>	\$163,980.00	\$1,700.00	\$165,680.00
<i>Task C – Public/Municipal Participation</i>	\$55,628.00	\$44,000.00	\$99,628.00
<i>Task D – PLAN Preparation and Implementation</i>	\$41,900.00	\$11,400.00	\$53,300.00
<i>Task E – Project Management & Administration</i>	\$62,404.00	\$7,500.00	\$69,904.00
PHASE II PROJECT TOTALS	\$367,149.00	\$77,900.00	\$445,049.00
COST ESTIMATE BY FISCAL YEAR			
<i>Fiscal Year</i>			
2008-2009	\$122,400.00	\$26,000.00	\$148,400.00
2009-2010	\$122,400.00	\$26,000.00	\$148,400.00
2010-2011	\$122,349.00	\$25,900.00	\$148,249.00
PHASE II PROJECT TOTALS	\$367,149.00	\$77,900.00	\$445,049.00



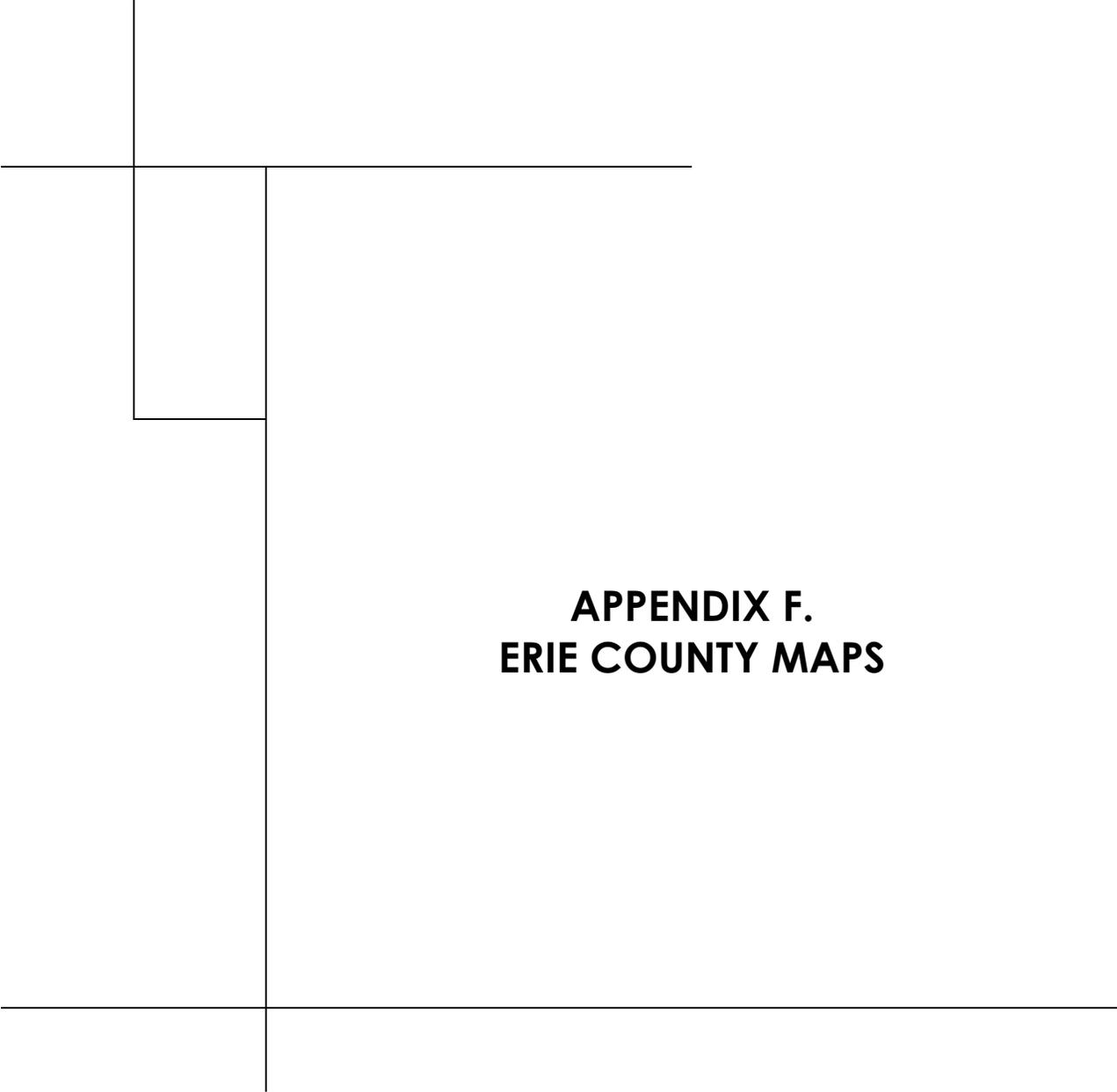
**APPENDIX E.
PHASE II PROPOSED SCHEDULE**

Phase II Proposed Schedule

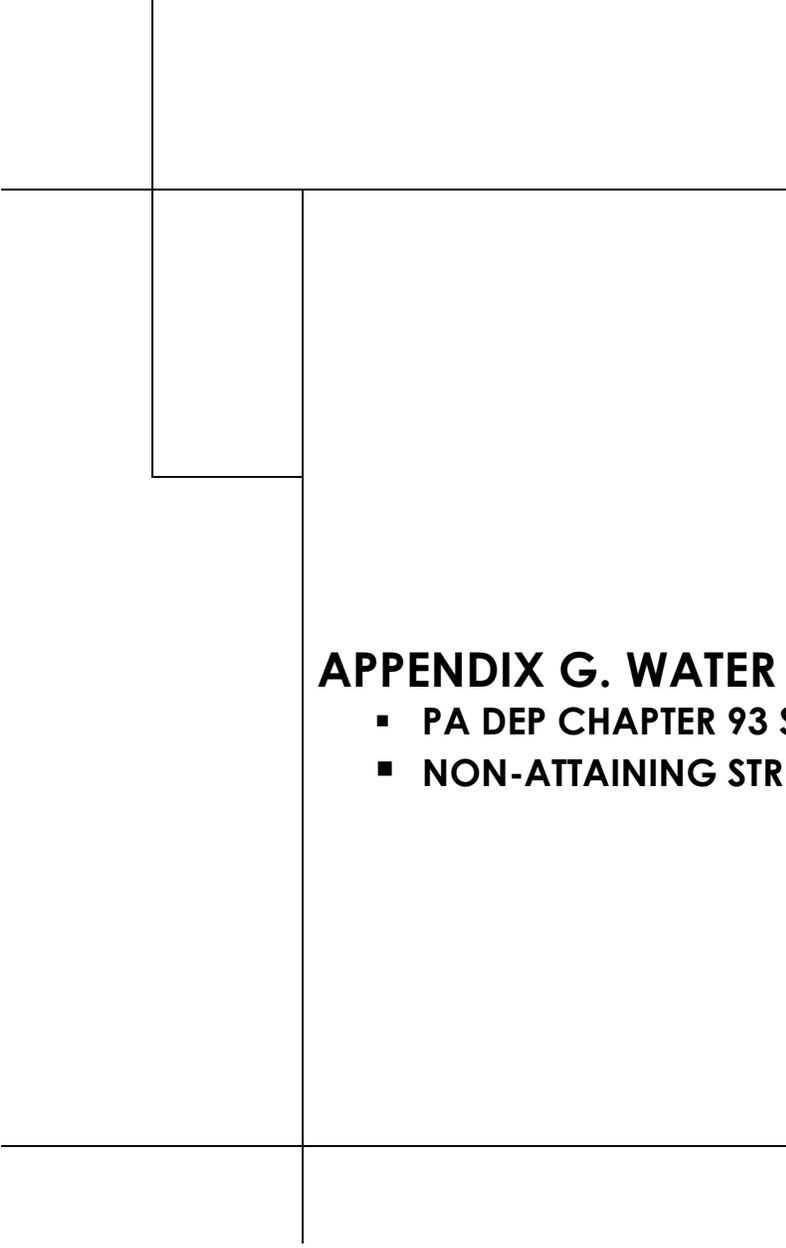
The proposed Phase II Schedule is as follows:

ANTICIPATED DATE	MILESTONE
August 2008	PADEP and Erie County Phase II Contract Executed
September 2008	WPAC Meeting #3
August – September 2008	Field View of Problem Areas/Modeling
October – November 2008	IWRP Focus Group – Questionnaire/follow-up
February 2009	Conceptual Solutions to Problem Areas
April 2009	WPAC Meeting #4 and WPAC-E #1
October 2009	Draft Phase II Report
December 2009	Draft Model Ordinance
January 2010	WPAC Meeting #5 and WPAC-E #2
March 2010	Finalize Phase II Report, Model Ordinance, and Plates
August 2010	WPAC Meeting #6, WPAC-L#1, and BMP Workshop
October 2010	Public Hearing
November 2010	County Approval of Phase II Plan
December 2010	Phase II Report Submission to PADEP
January 2011 - June 2011	Implementation workshops
	PADEP and Erie County Phase II Contract Expires

This schedule will be re-evaluated at the beginning of Phase II and adjusted as needed.



**APPENDIX F.
ERIE COUNTY MAPS**



APPENDIX G. WATER QUALITY DATA

- **PA DEP CHAPTER 93 STREAM DESIGNATIONS**
- **NON-ATTAINING STREAMS**

PA DEP CHAPTER 93 STREAM DESIGNATIONS

§ 93.9x. Drainage List X.		Lake Erie
Stream	Zone	Water Uses Protected
1—Lake Erie	All sections of lake in PA except Outer Erie Harbor and Presque Isle Bay	CWF
1—Lake Erie (Outer Harbor and Presque Isle Bay)	Portion of lake bordered by Presque Isle on west, longitude 80°10'18" on north, except harbor area and central channel dredged and maintained by United States Army Corps of Engineers.	WWF
1—Lake Erie (Outer Harbor and Presque Isle Bay)	Harbor area and central channel dredged and maintained by United States Army Corps of Engineers	WWF, <i>Delete</i> WC
2—UNT's to Lake Erie	Basins (all sections in PA), PA-OH State Border to Presque Isle	CWF, MF
2—Ashtabula River (OH)		
3—East Branch Ashtabula River	Basin (all Sections in PA)	CWF; MF
3—Ashtabula Creek	Main Stem, Source to PA-OH State Border	WWF
4—UNT's to Ashtabula Creek	Basins, (all sections in PA) Source to PA-OH State Border	CWF; MF
3—Ashtabula Creek (OH)		
4—UNT's to Ashtabula Creek	Basins (all sections in PA), PA-OH State Border to Mouth	CWF, MF
2—Conneaut Creek	Main Stem, Source to PA-OH State Border	WWF; MF
3—Unnamed Tributaries	Basins, (all sections in PA) Source to PA-OH State Border	CWF; MF
3—Stone Run	Basin	CWF; MF
3—West Branch Conneaut Creek	Basin (all Sections in PA)	CWF; MF
3—Marsh Run	Basin	CWF; MF
3—East Branch Conneaut Creek	Basin	CWF; MF
2—Conneaut Creek (OH)		
3—UNT's to Conneaut Creek	Basins (all sections in PA), PA-OH State Border to Mouth	CWF, MF
2—Turkey Creek	Main Stem, Source to PA-OH State Border	CWF
3—UNT's to Turkey Creek	Basins, (all sections in PA), Source to PA-OH State Border	CWF, MF
2—Turkey Creek (OH)		
3—UNT's to Turkey Creek	Basins, (all sections in PA), PA-OH State Border to Mouth	CWF, MF
2—Raccoon Creek	Basin	CWF; MF
2—Crooked Creek	Basin	HQ-CWF; MF
2—Elk Creek	Main Stem	WWF; MF
3—UNT's to Elk Creek	Basins	CWF; MF
3—Lamson Run	Basin	CWF; MF
3—Goodban Run	Basin	CWF; MF
3—Falk Run	Basin	CWF; MF
3—Little Elk Creek	Basin	CWF; MF
3—Brandy Run	Basin	CWF; MF
3—Halls Run	Basin	CWF; MF
2—Godfrey Run	Basin	HQ-CWF; MF
2—Trout Run	Basin	CWF; MF
2—Walnut Creek	Main Stem	CWF; MF
3—UNT's to Walnut Creek	Basins	CWF; MF
3—Bear Run	Basin	CWF; MF
3—Thomas Run	Basin	HQ-CWF; MF
2—UNT's to Lake Erie	Basins, Presque Isle to UNT at RM 23.22	WWF; MF
2—UNT to Lake Erie at RM 23.22	Basin	CWF; MF
2—UNT's to Lake Erie	Basins, UNT at RM 23.22 to Longitude 80°01'50"	WWF; MF
2—Cascade Creek	Basin	WWF; MF

2—Mill Creek	Basin	WWF; MF
2—Fourmile Creek	Basin	WWF; MF
2—UNT's to Lake Erie	Basins, Longitude 80°01'50"to PA-NY State Border	CWF; MF
2—Sixmile Creek	Basin	CWF; MF
2—Sevenmile Creek	Basin	CWF; MF
2—Eightmile Creek	Basin	CWF; MF
2—Twelvemile Creek	Basin	HQ-CWF; MF
2—Sixteenmile Creek	Basin, (all sections in PA) Source to I-90	CWF; MF
2—Sixteenmile Creek	Basin, I-90 to Mouth	WWF; MF
2—Twentymile Creek (NY)		
3—UNT's to Twentymile Creek	Basins (all sections in PA), Source to PA-NY State Border	CWF, MF
2—Twentymile Creek	Main Stem, PA-NY State Border to Mouth	CWF
3—UNT's to Twentymile Creek	Basins (all sections in PA), PA-NY State Border to Mouth	CWF, MF
	Basins	CWF; MF
§ 93.9q. Drainage List Q.	Ohio River Basin in Pennsylvania	
	Allegheny River	
4—UNT's to Brokenstraw Creek	Basins (all sections in PA), Source to PA-NY State Border	CWF
3—Brokenstraw Creek	Main Stem, PA-NY State Border to Mouth	CWF
4—UNT's to Brokenstraw Creek	Basins (all sections in PA), PA-NY State Border to Mouth	CWF
5—UNT's to Hare Creek	Basins, Scotia Street Bridge to Mouth	CWF
3—French Creek (NY)		
4—UNT's to French Creek	Basins (all sections in PA), Source to PA-NY State Border	WWF
4—Cutting Brook	Basin (all sections in PA)	WWF
4—Herrick Creek	Basin (all sections in PA)	WWF
4—UNT's to French Creek	Basins (all sections in PA), PA-NY State Border to Mouth	WWF
4—Hubble Run	Basin (incl. Wattsburg Fen), Source to 1350 Contour Line (Union City 7.5 Quad)	HQ-WWF
4—Hubble Run	Basin, 1350 ft. Contour Line to Mouth	WWF
4—West Branch French Creek (NY)		
5—UNT's to West Branch French Creek	Basins (all sections in PA), Source to PA-NY State Border	WWF
4—West Branch French Creek	Main Stem, PA-NY State Border to Mouth	WWF
5—UNT's to West Branch French Creek	Basins (all sections in PA), PA-NY State Border to Mouth	WWF
5—Darrow Brook	Basin (all sections in PA)	WWF
5—Townley Run	Basin	WWF
5—Alder Brook	Basin	WWF
5—Bailey Brook	Basin	WWF
4—Lake Pleasant Outlet	Basin	HQ-CWF
4—Alder Run	Basin	CWF
4—South Branch French Creek	Basin, Source to Beaver Run	CWF
5—Beaver Run	Basin	EV
4—South Branch French Creek	Basin, Beaver Run to Mouth	CWF
4—Wheeler Creek	Basin	WWF
4—Le Boeuf Creek	Basin, Source to Trout Run	TSF
5—Trout Run	Basin	HQ-CWF
4—LeBoeuf Creek	Basin, Trout Run to Mouth	TSF
4—Conneauttee Creek	Basins, Source to Outlet of Edinboro Lake	WWF
4—Conneauttee Creek	Main Stem, Outlet of Edinboro Lake to Erie-Crawford County Border	TSF
5—UNT's to Conneauttee Creek	Basins, Outlet of Edinboro Lake to Erie-Crawford County Border	WWF

West Branch Cascade Creek	Aquatic Life	Urban Runoff/Storm Sewers - Siltation	0.8957
Unnamed Tributary	Aquatic Life	Agriculture - Siltation ; Agriculture - Organic Enrichment/Low D.O.	0.3649
Unnamed Tributary	Aquatic Life	Natural Sources - Water/Flow Variability ; Natural Sources - Siltation	0.8866
Unnamed Tributary	Aquatic Life	Agriculture - Siltation ; Natural Sources - Water/Flow Variability	1.1059
Unnamed Tributary	Recreational	Source Unknown - Pathogens	0.4944
Unnamed Tributary	Aquatic Life	Upstream Impoundment - Siltation	0.3413
Unnamed Tributary	Aquatic Life	Grazing Related Agric - Siltation ; Grazing Related Agric - Organic Enrichment/Low D.O.	0.3327
Unnamed Tributary	Aquatic Life	Road Runoff - Siltation	0.9006
Unnamed Tributary	Aquatic Life	Agriculture - Siltation ; Grazing Related Agric - Nutrients	1.3921
Unnamed Tributary	Aquatic Life	Natural Sources - Organic Enrichment/Low D.O.	0.6206
Unnamed Tributary	Aquatic Life	Municipal Point Source - Chlorine	0.1685
Unnamed Tributary	Aquatic Life	Urban Runoff/Storm Sewers - Siltation	3.0894
Unnamed Tributary	Aquatic Life	Small Residential Runoff - Siltation	1.7328
Unnamed Tributary	Aquatic Life	Road Runoff - Siltation	0.7365
Unnamed Tributary	Aquatic Life	Urban Runoff/Storm Sewers - Siltation	1.3090
Unnamed Tributary	Aquatic Life	Recreation and Tourism - Siltation	0.2896
Unnamed Tributary	Aquatic Life	Bank Modifications - Siltation	0.5119
Unnamed Tributary	Aquatic Life	Small Residential Runoff - Siltation ; Road Runoff - Siltation	1.2975
Unnamed Tributary	Aquatic Life	Urban Runoff/Storm Sewers - Siltation	0.3667
Unnamed Tributary	Aquatic Life	Agriculture - Siltation	2.5398
Unnamed Tributary	Aquatic Life	Golf Courses - Siltation	0.2922
Unnamed Tributary	Aquatic Life	Urban Runoff/Storm Sewers - Siltation	0.7205
Unnamed Tributary	Aquatic Life	Small Residential Runoff - Siltation	0.1985
Unnamed Tributary	Aquatic Life	Urban Runoff/Storm Sewers - Siltation	0.3195
Unnamed Tributary	Aquatic Life	Other - Siltation ; Other - Organic Enrichment/Low D.O.	0.0655
Unnamed Tributary	Aquatic Life	Agriculture - Siltation ; Grazing Related Agric - Nutrients	0.4030
Unnamed Tributary	Aquatic Life	Urban Runoff/Storm Sewers - Siltation	2.9730
Unnamed Tributary	Aquatic Life	Agriculture - Siltation	3.3650
Unnamed Tributary	Aquatic Life	Natural Sources - Cause Unknown	0.4996
Unnamed Tributary	Aquatic Life	Agriculture - Siltation	0.3417
Unnamed Tributary	Aquatic Life	Agriculture - Nutrients	2.1418
Unnamed Tributary	Aquatic Life	Crop Related Agric - Nutrients ; Crop Related Agric - Siltation	1.3387
Unnamed Tributary	Recreational	Source Unknown - Pathogens	0.0594