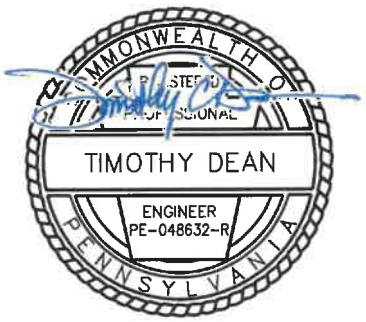
Beaver County Planning Commission

Beaver, Pennsylvania

Act 167 Scope of Study for Beaver County Stormwater Management Plan



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PHASE 1 – SCOPE OF STUDY

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ACKNOWLEDGEMENTS

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I. INTRODUCTION

Purpose

This report was prepared in accordance with a reimbursement agreement between the Pennsylvania Department of Environmental Protection (PADEP) and Beaver County to conduct a countywide Act 167 Stormwater Management Plan Phase 1. This report presents the results of the Phase 1 effort, which includes:

- A summary of County watershed characteristics
- An inventory of relevant problems
- A proposed Scope of Study, schedule and budget for completion of the Phase 2 Plan project.

Stormwater Runoff Problems and 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 land use conversion or urban expansion, the volume of stormwater resulting from a particular rainfall event increases because of the reduction in pervious land area (i.e., natural land cover being changed to pavement, concrete, buildings, or unmanaged cropland). These surface changes can also substantially degrade stormwater runoff water quality, increasing the pollutant load to the rivers and streams. The alteration of natural land cover and land contours to residential, commercial, industrial, and crop land uses results in decreased infiltration of rainfall, an increased rate and volume of runoff, and increased pollutant loadings to surface watercourses.

As the population of an area increases, land development is inevitable. As land disturbance and development increases, so does the problem of dealing with the increased quantity and decreased quality of stormwater runoff. Failure to properly manage this runoff results in greater flooding, stream channel erosion and siltation, degraded water quality, as well as reduced groundwater recharge. The cumulative effects of development in some areas of a watershed can result in flooding of natural watercourses with associated costly property damages, and can also have a negative impact on wastewater treatment plant operations. These impacts can be minimized if the practices associated with land use and development incorporate appropriate runoff and stormwater management systems and designs.

Individual land disturbance/development projects have historically been viewed as independent or discrete events or impacts, rather than as part of a larger watershed process. This has also been the case when the individual land development projects are scattered throughout a watershed (and in many different municipalities). However, individual land surface changes can dramatically affect runoff and flooding conditions. These cumulative effects of development and land disturbance in some areas have resulted in flooding of both small and large streams with the associated property damages and, in some cases, loss of life. Therefore, given the distributed and

cumulative nature of the land alteration process, a comprehensive approach must be taken for a reasonable and practical management and implementation approach or strategy to be successful.

Pennsylvania Stormwater Management Act (Act 167)

Recognizing the need to address this serious and growing problem, the Pennsylvania General Assembly enacted Act 167 of 1978. The statement of legislative findings at the beginning of the Pennsylvania Stormwater Management Act (Act 167) sums up the critical interrelationship among land development, accelerated runoff, and floodplain management. Specifically, this statement of legislative findings points out that:

1. Inadequate management of accelerated stormwater runoff resulting from development throughout a watershed increases flood flows and velocity, contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undermines floodplain management and floodplain control efforts in downstream communities, reduces groundwater recharge, and threatens public health and safety.
2. A comprehensive program of stormwater management, including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety, and welfare and the protection of the people of the Commonwealth, their resources, and their environment.

The policy and purpose of Act 167 is to:

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

Until the enactment of Act 167, stormwater management had been oriented primarily towards addressing the increase in peak runoff rates discharging from individual land development sites to protect property immediately downstream. Management of stormwater throughout the state paid minimal attention to the effects on locations further downstream (frequently because they were located in another municipality) or to designing stormwater controls within the context of the entire watershed. Stormwater management has also typically been regulated at the municipal level, with little or no design consistency (concerning the types or degree of storm runoff control to be practiced) between adjoining municipalities in the same watershed.

Act 167 changed this approach by instituting a comprehensive program of watershed stormwater management planning. The Act requires Pennsylvania counties to prepare and adopt stormwater management plans for each designated watershed within the county; and recent changes in PADEP Act 167 policy now provide for Act 167 planning efforts on a county-wide basis. Perhaps most significantly, Act 167 plans are to be prepared in consultation with municipalities located in the county, working through a Watershed Plan Advisory Committee (WPAC). The plans are to provide technical standards and criteria throughout the County's watersheds for the management of stormwater runoff from new land development sites. The Act 167 Plan must now also address retrofits of existing sites to improve existing water quality impairments and existing sources of flooding problems.

The types and degree of controls that are prescribed in the stormwater management plan must be based on the development pattern and hydrologic characteristics of each individual watershed. The final product of the Act 167 watershed planning process is to be a comprehensive and practical implementation plan, developed with a firm sensitivity to the overall needs (financial, legal, political, technical, etc.) of the municipalities in Beaver County.

Act 167 Planning for Beaver County

Based on the above history and information, the county-wide watershed planning process for Beaver County must be designed with the individual watershed characteristics in mind, as well as the resources (technical, political, and economic) of the County. This Phase 1 - Scope of Study presents the concept and approach that has been developed to meet these requirements, as well as the specific requirements of Act 167 for this countywide watershed stormwater management project.

The goal of Beaver County's Act 167 planning process is to provide a county-wide comprehensive program for the planning and management of stormwater. With coordination from the fifty-four (54) municipalities in Beaver County, the resulting stormwater management ordinance will address stormwater related problems in critical areas throughout the County. Furthermore, all County municipalities must adopt the resulting stormwater management ordinance, or amend and implement ordinances and regulations as necessary to regulate development in a manner consistent with the proposed Plan and the provisions of Act 167. The stormwater management controls addressed in the stormwater management ordinance will collectively have a beneficial impact on the waters of Beaver County and those "problem" areas that presently remain unmanaged.

Beaver County has received Phase 1 Scope of Study funding from PADEP. The Phase 2 efforts will generate the final stormwater management plan and model ordinance.

Plan Benefits

1. Consistency in Stormwater Management Planning, Regulation, and Implementation

   The purpose is to complete the identified goals in the County Comprehensive Plan and the County Greenways and Trails Plan. The benefit of the study and implementation plan is to provide all of the municipalities in the County with an accurate and consistent implementation strategy and procedures for comprehensive stormwater management. As identified in the above-mentioned plans, current stormwater management regulations, strategies, and enforcement criteria vary widely among the municipalities. Given the nature of storm runoff and its impacts, as described earlier in this document, a critical objective of sound stormwater management planning is to provide for consistency of implementation requirements throughout the watershed. 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 for implementation of effective stormwater management based on watershed-wide consideration.

2. Integrated Stormwater Management Plan

   Water resources are one integrated resource, connected through the hydrologic cycle. Stormwater runoff is a major component of this cycle. Surface water and groundwater are interconnected. The Beaver County Stormwater Management Plan will not only address water quantity or peak flows, but will also take a more holistic approach to watershed management by also evaluating the interaction between surface water and groundwater, where and how water quality concerns should be addressed, and how stormwater management (or lack thereof) affects stream bank erosion. The results will be a Plan to preserve and enhance Beaver County's water resources though proper stormwater management. This plan will strive to achieve the goals and objectives in the County Comprehensive Plan and the County Greenways and Trails Plan, specifically the goals and objectives as they relate to Stormwater and Water Quality.

3. Usable Technical Information in GIS Format

   The County has active GIS staff that updates and maintains the most current available data. The plan will include these layers in hard copy maps but will be available as needed. Many of the maps used in the County Comprehensive Plan and County Greenways and Trails Plan will be utilized in this document. The technical component of the plan, primarily the water resources geodatabase for the watershed, will provide the County and municipalities with a tool to perform a range of environmental assessments, such as future water quality impact studies after the plan is completed.

4. Technical Information for Future Hydrologic and Hydraulic Analysis and Regulatory Activities

The County will include all available data and will, after the public participation, determine the highest priority watersheds where limited data is available to study further. This item will be completed by a professional firm (Task B.2).

The benefits of the watershed planning process are extensive, even beyond the important functions of developing comprehensive stormwater management strategies and ordinance provisions.

The plan will investigate and provide solutions to correct existing problems. Specifically, the plan will identify and summarize problem areas; provide conceptual solutions to correct these problems; and will specify possible funding streams for project implementation.

Stormwater Management Planning Approach

In order to implement countywide comprehensive planning and management of stormwater runoff, it was necessary to take a close look at all major watersheds within Beaver County during Phase 1. Since the goals of the Act itself depend on municipal coordination and participation to provide for the planning and management of stormwater throughout their respective municipality, it is helpful 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 Beaver County Planning Commission, municipalities, the Beaver County Conservation District, and other interested agencies or organizations.

The development process for the stormwater management plan is as follows:

1. Phase 1 - 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.
    - Goals, objectives, solution strategies, and estimated costs for the Phase 2 Plan.
2. Phase 2 - The Plan - The technical assessment and development of the model ordinance that includes:
    - Watershed planning.
    - Development of technical standards and criteria for stormwater management.
    - Alternative measures for control.
    - Conceptual solutions to identified problem areas.
    - Identification of administrative procedures for implementation of the plan.
    - Public hearing by Beaver County.

- Adoption of Plan by Beaver County.
- Approval of Plan by PADEP.
- Adoption and implementation of stormwater management ordinances by all municipalities.
- Municipal implementation and enforcement of stormwater management ordinances.

Previous Stormwater Management and Related Planning Efforts

No previous Act 167 Planning has been conducted in Beaver County.

The following relevant documents will provide a valuable source of information for the development of the Plan:

1. Beaver County Comprehensive Plan, Beaver County Planning Commission, 2010.
2. Beaver County Comprehensive Recreation and Parks Plan, 2003, Pashek Associates
3. Beaver County Greenways and Trails Plan, 2007, Pashek Associates
4. Beaver County Natural Heritage Inventory, October 1993

II. GENERAL COUNTY DESCRIPTION

Beaver County covers 277, 893 acres and, according to the 2000 census, has a population of 181,412. The largest municipality in Beaver County is Hopewell Township with a population of 13,254. The City of Aliquippa is the second largest in population with 11,734.

Political Jurisdictions

The County is comprised of fifty-four municipalities. The political jurisdictions include twenty-two townships, thirty boroughs, and two cities.

Townships	Boroughs		Cities
Brighton	Ambridge	New Brighton	Aliquippa
Center	Baden	New Galilee	Beaver Falls
Chippewa	Beaver	Ohioville	
Darlington	Big Beaver	Patterson Heights	
Daugherty	Bridgewater	Rochester	
Franklin	Conway	Shippingport	
Greene	Darlington	South Heights	
Hanover	East Rochester	West Mayfield	
Harmony	Eastvale		
Hopewell	Economy		
Independence	Ellwood City		
Marion	Fallston		
New Sewickley	Frankfort Springs		
North Sewickley	Freedom		
Patterson	Georgetown		
Potter	Glasgow		
Pulaski	Homewood		
Raccoon	Hookstown		
Rochester	Industry		
South Beaver	Koppel		
Vanport	Midland		
White	Monaca		

Refer to Figure 1 for a County Base Map.

NPDES Phase 2 Involvement

Municipalities within Urbanized Areas (UA) as designated by the 2000 U.S. Census are required to comply with the National Pollutant Discharge Elimination System (NPDES) Phase 2 requirements for operators of municipal separate storm sewer systems (MS4s).

Those municipalities that fall within an Urbanized Area as defined above are shaded and listed in boldface in the following table:

Townships	Boroughs		Cities
Brighton	**Ambridge**	**New Brighton**	**Aliquippa**
Center	**Baden**	New Galilee	**Beaver Falls**
Chippewa	**Beaver**	Ohioville	
Darlington [2]	**Big Beaver**	**Patterson Heights**	
Daugherty	**Bridgewater**	**Rochester**	
Franklin	**Conway**	Shippingport	
Greene	**Darlington**	**South Heights**	
Hanover	**East Rochester**	**West Mayfield**	
Harmony	**Eastvale** [2]		
Hopewell	**Economy**		
Independence	Ellwood City [1]		
Marion	**Fallston**		
New Sewickley	Frankfort Springs		
North Sewickley	**Freedom**		
Patterson	Georgetown		
Potter	Glasgow		
Pulaski	**Homewood**		
Raccoon	Hookstown		
Rochester	**Industry**		
South Beaver	**Koppel**		
Vanport	Midland		
White	**Monaca**		

1. General Permit
2. Permit Waiver

General Development Patterns

Beaver County experienced growth until the collapse of the nation's steel industry in the 1970s significantly affected Beaver County and the region. The closure of the County's primary industrial facilities resulted in significant job loss and emigration. This emigration is attributed primarily to limited economic opportunities. Since 1980, the County's population losses have slowed as its service-based industries have strengthened. However, Beaver County's population is dispersing without growing. From 1990 to 2000, the County's population decreased by 9.5 percent, while the number of single-family housing units increased by 3.6 percent.

The majority of the County's new development is occurring east of Route 60. However, due to limited infrastructure, steep slopes, and public sentiment, this growth has kept development from rapidly expanding.

Recent growth and development in Cranberry Township, Butler County, has provided major economic growth opportunities for the eastern region of Beaver County.

Land Use

According to the Beaver County Comprehensive Plan (1999), the highest concentrations of development exist throughout the river valleys as former steel industrial centers located along the Ohio and Beaver Rivers. The County's existing land uses at that time revealed 76 percent of the County remains in agricultural or forested use. However, recent growth patterns show an increase in the number of new single family and multifamily residential developments extending onto the plateau areas above the river valley communities. These development patterns are consistent with statewide land use patterns where cities and boroughs are experiencing an outward movement of their populations into the suburban and rural townships.

Beaver County's agricultural land uses are in decline as the strength and viability of the County's agricultural industry has waned. In an attempt to preserve Agricultural lands in Beaver County, the Beaver County Agricultural Land Preservation Board has preserved over 1,200 acres of agricultural land through the County's agricultural easement purchase program.

Physiography

Beaver County lies completely within the Appalachian Plateaus Province. The Appalachian Plateaus Province is divided into ten physiographic sections. The County is located within the Pittsburgh Low Plateau Section. The highest elevation is 1,383 feet above Mean Sea Level (MSL) at Big Knob in New Sewickley Township, and the lowest point in Beaver County is 665 feet, at the Ohio River's edge where it leaves the county and becomes the state boundary between Ohio and West Virginia. Underlying rock types include shale, siltstone, sandstone, limestone, and coal. Current and former strip mines have significantly altered a portion of the region's topography.

Uneven topography is prevalent throughout Beaver County and occurs in each portion of the County except the Northwestern corner. In the Northwestern corner, the County has numerous narrow steep walled valleys with ridge tops ranging from broad to very narrow and the hilltops are undulating to rolling. The Beaver and Ohio Rivers have carved broad valleys throughout this area.

Variations in aspect, slope, and elevation combine to create a number of different microenvironments throughout the County. Numerous soil types influenced by weathering of underlying bedrock, slope, organic material and climate and sometimes the bedrock itself create the ecological foundation for Beaver County.

Beaver County is mostly underlain by bituminous coal that has been deep and strip-mined. Terraces within the Ohio and Beaver River Valleys serve as a source for sand and gravel obtained from glacial outwash deposits. While oil and gas were produced in Beaver County until the 1950's, as of 1975, Beaver County ranked 15th among the 18 petroleum producing counties in Pennsylvania.

Soils

Soils in Beaver County are formed from glacial till, alluvium, and siltstone, shale, acid shale, and sandstone. Many of the Beaver County soils that qualify as Prime Farmland are characterized as deep, well drained and are level to nearly level soils. There are ten soil associations identified in Beaver County.

Ravenna-Canfield-Frenchtown Association - Deep, moderately well drained to poorly drained, nearly level to moderately steep soils and formed in glacial till. They occupy smooth to rolling uplands and associated depressions and drainageways in the County.

Canfield-Ravenna-Loudonville Association - Moderately deep and deep, well drained to somewhat poorly drained soils, nearly level to very steep soils, and formed in glacial till. They are generally located on hilly uplands and associated drainageways.

Conotton-Chili-HollyAssociation - Deep, excessively drained and poorly drained, nearly level to very steep soils formed in glacial outwash and alluvium. They are generally found in undulating to hilly uplands and adjacent flood plains near the North Fork of the Little Beaver Creek.

Canadice-Frenchtown-Holly Association - Deep, poorly drained, nearly level and gently sloping, and are formed in glacial lake sediment, glacial till and alluvium in upland areas.

Udorthents-Canfield-Ravenna Association - Deep, excessively drained to somewhat poorly drained soils, nearly level to very steep, formed in material from strip mines and glacial till, and located on hummocky and hilly areas and smooth to rolling uplands and associated drainageways in the northwestern part of the County.

Urban Land- Monongahela-Tyler Association - Deep, moderately well drained to somewhat poorly drained soils, urban land and nearly level to sloping, and are formed in old alluvium. They are located on smooth to rolling terraces and flood plains and some adjacent uplands, and are found along the Beaver and Ohio Rivers and in Raccoon, Brush, and Conoquenessing Creeks and includes most major urban and industrial areas.

Gilpin-Wharton-Weikart Association - Shallow to deep, well drained to moderately well drained soils, nearly level to very steep, and are formed in material weathered from acid shale, siltstone and sandstone. They are found on undulating, broad and narrow ridgetops, side slopes, and hillsides of highly dissected uplands; and are the majority of the soils underlying the northern two thirds of Beaver County.

Gilpin-Upshur-Welkert Association - Shallow to deep, well-drained soils, gently sloping to very steep, and are formed in residual material from acid shale, siltstone, sandstone and nonacid red shale. They are found on undulating and rolling ridges and hillsides of dissected uplands in the southern half of Beaver County.

Gilpin-Guernsey-Culleoka Association - Moderately deep and deep, well drained and moderately well drained soils, gently sloping to very steep, and are formed in residual material from acid and nonacid shale, siltstone, sandstone. They are found on undulating and rolling, broad and narrow ridgetops, side slopes, and hillsides of dissected uplands in southwestern Beaver County.

Gilpin-Weikart Association - Shallow and moderately deep, well drained soils, gently sloping to very steep, and are formed in residual material from acid shale, siltstone, sandstone. They are found on ridges and hills in highly dissected uplands in west central Beaver County.

Water Resources

Various river and stream valleys cut through the landscape of Beaver County. All of these either form or are tributaries to the Ohio River or Beaver River.

Designated Act 167 watersheds in Beaver County include:

Beaver River
Big Sewickley Creek
Brady Run
Connoquenessing Creek
Flaugherty Run
Little Beaver Creek
Ohio River
Raccoon Creek
Service Creek
Slippery Rock Creek
Traverse Creek

PA Chapter 93 Stream Classifications

A summary table of the 2008 PA Chapter 93 stream water quality classifications for streams in Beaver County is presented below:

Classification	County Stream Miles	Percent
High Quality – Cold Water Fishes	55.67	19.63%
Cold Water Fishes	11.95	4.21%
Warm Water Fishes	179.65	63.34%
Trout Stocking	36.33	12.81%

Impaired Waterways

The following table identifies the water quality impairment sources and extents for those streams within Beaver County that are currently on the PADEP 2006 Integrated Non-Attaining List. This Table shows only non-attaining segments. This List represents stream assessments for the Clean Water Act Section 305(b) reporting and Section 303(d) listing. The PADEP protects four stream water uses: aquatic life, fish consumption, potable water supply, and recreation. These data represent stream segments that have been evaluated for attainment of those uses. If a stream segment is not attaining any one of its four uses, it is considered impaired.

Impairment	Stream/Reach Name	Miles
AMD- Cause Unknown-pH	Unnamed	2.42
AMD-Metals	Thompson Run	1.38
	Brush Run	7.49
	Unnamed	0.96
AMD-Metals, pH	Raccoon Creek	8.50
	Connoquenessing Creek	3.27
	Unnamed	0.88
Agriculture - Siltation; Erosion from Derelict Land - Siltation	Unnamed	2.89
Agriculture - Siltation ; Road Runoff - Siltation	Unnamed	4.88
	Service Creek	4.21
Combined Sewer Overflow - Suspended Solids	Unnamed	0.51
	McKinley Run	1.57
Erosion from Derelict Land - Siltation	Jordan Run	4.56
	Unnamed	8.07
	Clarks Run	3.50
Grazing Related Agric - Organic Enrichment/Low D.O.	Madden Run	0.78
	Unnamed	1.33
	McCautry Run	3.42
Habitat Modification - Siltation	Unnamed	1.05
	Little Blue Run	4.43
Highway, Road, Bridge Const. - Siltation ; Road Runoff - Siltation	Unnamed	2.61
Land Disposal - Siltation ; Erosion from Derelict Land - Siltation	Unnamed	3.26
Municipal Point Source - Organic Enrichment/Low D.O.	Brush Creek	9.95
	Unnamed	0.04
Other - Other Habitat Alterations	Unnamed	0.69
Other - pH	Mill Creek	0.11
Other - Water/Flow Variability	Unnamed	0.42
Removal of Vegetation - Siltation; Road Runoff - Siltation	Rag Run	1.99
	Haden Run	1.17
	Unnamed	0.54
Road Runoff - Siltation	Brady Run	1.07

Impairment	Stream/Reach Name	Miles
	Unnamed	3.64
Road Runoff - Siltation ; Removal of Vegetation - Siltation	Unnamed	0.87
	Twomile Run	2.26
Small Residential Runoff - Organic Enrichment/Low D.O.; Habitat Modification - Siltation; Road Runoff - Siltation	Unnamed	2.23
	Trampmill Run	2.50
Source Unknown - Cause Unknown	Beaver River	0.46
Source Unknown - Mercury	Traverse Creek	6.15
Source Unknown - Metals	Beaver River	2.51
Source Unknown - Pathogens	Ohio River	25.15
	Brush Creek	6.21
	Unnamed	0.04
	Little Beaver Creek	0.05
	Beaver River	0.67
Source Unknown - PCB	Beaver River	12.45
Source Unknown - PCB ; Source Unknown - Dioxins	Ohio River	24.55
Source Unknown - Salinity/TDS/Chlorides ; Source Unknown - Nutrients	Connoquenessing Creek	9.18
	Unnamed	0.77
Urban Runoff/Storm Sewers - Organic Enrichment/Low D.O. ; Removal of Vegetation - Siltation ; Road Runoff - Siltation	Unnamed	11.15
Urban Runoff/Storm Sewers - Siltation	Unnamed	8.68
	Blockhouse Run	2.39
Urban Runoff/Storm Sewers - Siltation; Habitat Modification - Water/Flow Variability	Walnut Bottom Run	4.69
Urban Runoff/Storm Sewers - Siltation; Habitat Modification - Water/Flow Variability	Unnamed	4.64
	Total Impaired Stream Miles:	**220.96**

Dams and Impoundments

Existing dam locations are listed below.

PADEP Dam No.	Dam Name	Municipality	Stream Name
04-003	Eastvale	Beaver Falls City	Beaver River
04-004	Koppel Reservoir	Big Beaver Borough	Stockman Run
04-007	Koppel Reservoir	Koppel Borough	Stockman Run
04-011	Homewood	Homewood Borough	Tr Clarks Run
04-019	Country Club Dam	Franklin Township	Connoquenessing Creek
04-023	Camp Kon-O-Kwee Dam	Marion Township	Tr Connoquenessing Creek
04-031	Group Camp	Hanover Township	Traverse Creek
04-034	Raccoon Creek	Hanover Township	Traverse Creek
04-035	Bradys Run	Brighton Township	South Branch Brady Run
04-037	Barnes	Hanover Township	Tr Little Traverse Creek
04-038	Lakewood Development Dam	Center Township	Tr Moon Run
04-041	Unnamed Dam	Marion Township	Tr Connoquenessing Creek
04-042	J C Bacon	Independence Township	Service Creek
04-047	Lower Hereford Manor	Franklin Township	Doe Run
04-048	Upper Hereford Manor	Franklin Township	Doe Run
04-049	Little Blue Run	Greene Township	Little Blue Run
04-051	Clarks Run Detention Pond	Beaver Borough	Clarks Run
04-052	Industrial Wastes Sediment Pond	Darlington Township	Tr East Fork Stateline Creek
04-053	Industrial Wastes, Inc Pond #1	Darlington Township	Tr East Fork Stateline Creek
04-054	Industrial Wastes, Inc Pond #2	Darlington Township	Tr East Fork Stateline Creek
04-055	Industrial Wastes, Inc South Pond	Darlington Township	Tr East Fork Stateline Creek
04-058	Husar Dam	Economy Borough	Tr N Fork Big Sewickley Creek
04-059	North Low Dissolved Solids Imp	Shippingport Borough	Wtrshd Ohio River
04-060	South Low Dissolved Solids Imp	Shippingport Borough	Wtrshd Ohio River
04-062	West High Dissolved Solids Imp	Shippingport Borough	Wtrshd Ohio River
04-063	Unnamed	South Beaver Township	Painter Run
04-064	Hughes Lake	Hanover Township	Laurence Run
04-065	Wischerman	South Beaver Township	Unt North Fork Little Beaver
04-066	Hudak	Big Beaver Borough	Wallace Run

04-067	Upper Southside Sport Dam	Hanover Township	Tr Traverse Creek
04-068	Little Blue Saddle	Greene Township	Tr Mill Creek

Abandoned Mine Discharges (AMD)

Coal mining has been and still is an integral part of Beaver County's economy. Unfortunately, drainage from abandoned coal mines is the single biggest contributor to water pollution problems in Beaver County.

Interestingly, the stakeholder surveys did not note AMD as a significant problem.

Floodplains

All municipalities within the County participate in the National Flood Insurance Program except for those in boldface and shaded below:

Townships	Boroughs		Cities
Brighton	Ambridge	New Brighton	Aliquippa
Center	Baden	New Galilee	**Beaver Falls**
Chippewa	Beaver	Ohioville	
Darlington	Big Beaver	Patterson Heights	
Daugherty	Bridgewater	Rochester	
Franklin	Conway	**Shippingport**	
Greene	**Darlington**	South Heights	
Hanover	East Rochester	**West Mayfield**	
Harmony	Eastvale		
Hopewell	Economy		
Independence	Ellwood City		
Marion	Fallston		
New Sewickley	Frankfort Springs		
North Sewickley	Freedom		
Patterson	Georgetown		
Potter	Glasgow		
Pulaski	**Homewood**		
Raccoon	Hookstown		
Rochester	Industry		
South Beaver	Koppel		
Vanport	Midland		
White	Monaca		

Climate

Winters are cold and snowy at the higher elevations in the County. They are frequently cold in the valleys, but intermittent thaws preclude a long-lasting snow cover. Summers are fairly warm on the mountain slopes. Some days are very warm and occasionally

very hot in the valleys. Rainfall is heavier in April through September and appreciably heavier on the windward, west-facing slopes than in the valleys. The normal annual precipitation is adequate for all crops, although the summer temperature and the length of the growing season, particularly at the higher elevations, may be inadequate for some crops.

In winter, the average temperature is 30 degrees F and the average daily minimum temperature is 41.5 degrees. The lowest temperature on record is -25 degrees F on February 12, 1899. In Summer the average daily maximum temperature is 70.8 degrees F. The highest recorded temperature is 115 degrees on August 5, 1936.

The total annual precipitation is about 38 inches. Of this, about 22 inches, or nearly 60 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 17 inches. The heaviest 1-day rainfall during the period of record was 5.07 inches on June 10,1983. Thunderstorms occur on about 36 days each year.

The average seasonal snowfall is about 38 inches. The greatest snow depth in any one storm during the period of record was 22 inches. On the average, 24 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in mid-afternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 60 percent of the time possible in summer and 35 percent in winter. The prevailing wind is from the southwest. Average wind speed is highest, 12 miles per hour, in winter.

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III. ACT 167 PLANNING FOR BEAVER COUNTY

This section of the Phase 1 Scope of Study presents the concept and approach that has been developed to meet the Act 167 requirements for this countywide watershed stormwater management project.

PADEP and Beaver County Agreement

The Pennsylvania Department of Environmental Protection and Beaver County entered into a reimbursement agreement for a Phase 1 Watershed Stormwater Management Plan for all watersheds of Beaver County.

The agreement was made in order for Beaver County to prepare a Stormwater Management Plan in two phases. Phase 1 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 to complete the second phase (Phase 2). Phase 2 includes the preparation and adoption of the Stormwater Management Plan based on the level of effort identified in Phase 1.

Survey Creation and Distribution

A map-based Stormwater Management Plan Survey was distributed by the Beaver County Planning Commission early in the Phase 1 process. All municipalities and other interested citizen groups and public organizations were encouraged to complete the form. The purpose of the Survey was to gather various pieces of information to determine what stormwater issues affect each municipality, and to determine the location of existing problem areas, significant obstructions, and stormwater management facilities.

Watershed Plan Advisory Committee (WPAC)

The WPAC was formed by the Beaver County Planning Commission, in conjunction with the Beaver County Conservation District, and consists of the required municipalities, the County Conservation District, and other agency or group representatives appointed by the county.

If a municipality does not appoint a representative to the WPAC, then the head of the governing body will be the appointed by the county 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.

WPAC Member	Organization	Stormwater Survey Returned?
Frank Mancini	Beaver County Planning Commission	---
Doniele Andrus	Beaver County Planning Commission	---
Marty Warchol	Beaver County Conservation District	---

WPAC Member	Organization	Stormwater Survey Returned?
	Cities	
Gregg DelPrincipe	Aliquippa	**Y**
Patrick Burdine	Beaver Falls	**Y**
	Boroughs	
Daniel Jovanovich. PE	Ambridge	**Y**
Kim Villella	Baden	**Y**
Head of Governing Body	Beaver	**Y**
Rosalind Miller	Big Beaver	**Y**
Head of Governing Body	Bridgewater	**N**
Daniel Jovanovich, PE	Conway	**Y**
Craig A. Baker, PE	Darlington	**Y**
Head of Governing Body	East Rochester	**Y**
Pam Cupac	Eastvale	**Y**
Randy Kunkle	Economy	**Y**
NA – Covered Under Lawrence County 167	Ellwood City	**N**
Theodore Smakosz	Fallston	**Y**
Head of Governing Body	Frankfort Springs	**N**
Head of Governing Body	Freedom	**Y**
Head of Governing Body	Georgetown	**N**
Head of Governing Body	Glasgow	**Y**
Head of Governing Body	Homewood	**N**
Head of Governing Body	Hookstown	**N**
Nicholas Yanosich	Industry	**Y**
Tom Vanoy	Koppel	**Y**
Diane Kemp	Midland	**Y**
Mario Leone	Monaca	**Y**
Head of Governing Body	New Brighton	**N**
Henry Podbielski	New Galilee	**Y**
Head of Governing Body	Ohioville	**Y**
Head of Governing Body	Patterson Heights	**Y**
Head of Governing Body	Rochester	**N**

WPAC Member	Organization	Stormwater Survey Returned?
Head of Governing Body	Shippingport	N
Roberta Jones	South Heights	Y
Wendy Harker	West Mayfield	Y
	Townships	
Head of Governing Body	Brighton	Y
William DiCioccio	Center	Y
Mark Taylor	Chippewa	Y
Craig A. Baker, PE	Darlington	Y
David Lodovico	Daugherty	Y
William Hummel	Franklin	Y
Head of Governing Body	Greene	Y
John Hudack	Hanover	Y
Daniel Jovanovich, PE	Harmony	Y
Don Swan	Hopewell	Y
Head of Governing Body	Independence	Y
Doug Rice	Marion	Y
Al Horn	New Sewickley	Y
William Hummel	North Sewickley	Y
Greg DeLuca	Patterson	Y
Vic Gurinowitsch	Potter	Y
Head of Governing Body	Pulaski	Y
Head of Governing Body	Raccoon	N
Carolyn Verszyla	Rochester	Y
Carol Miller	South Beaver	Y
Head of Governing Body	Vanport	Y
Wayne Cain	White	Y
	Agencies and Stakeholders	
Victoria Michaels	Independence Conservancy	Y

Watershed Plan Advisory Committee Meetings

Two Watershed Plan Advisory Committee meetings were held during the Phase 1 process. The purposes of the meetings were to exchange information and to provide opportunities for intermunicipal and county agency coordination.

WPAC Meeting 1 was held on July 28, 2009. The presentations included an overview of the Act 167 planning process plus a summary of the expectations and potential results and outcomes of the Plan. The municipal/agency surveys were distributed to the WPAC members, and the meeting concluded with a question and answer period.

WPAC Meeting 2 was held on March 22, 2010. The purpose of this meeting was to summarize the Phase 1 Scope of Study, outline the tasks to be completed during Phase 2, and address any comments or concerns of the WPAC from their review of the draft Phase 1 document.

IV. STORMWATER MANAGEMENT SURVEY RESULTS

The Survey was designed to solicit input relative to specific stormwater problem areas throughout Beaver County from each municipality and other interested stakeholders. The Survey was distributed to those present at the WPAC No. 1 meeting. Beaver County distributed the remaining surveys shortly after the initial Phase 1 WPAC Meeting. The GIS-based Survey included a map of the individual municipalities to be used to identify locations and types of problem areas, significant obstructions, and existing or proposed stormwater management facilities. A copy of the Survey document is included as Appendix A. The information contained within the Surveys helped to determine the scope of Phase 2 planning.

Completed Surveys were received from 44 of the 54 municipalities in Beaver County. Information also was obtained from the Beaver County Conservation District and the Independence Conservancy. A geodatabase was then constructed and used to summarize and analyze the Survey results in sufficient detail for determining the Scope for the Phase 2 Plan. A summary of the survey results is presented in Appendix B. Figure 2 presents an overview of the Stormwater Problem Types returned through the survey process.

Stormwater Problem Prioritization

An analysis of the Survey results showed that the two most common stormwater problem types are generalized flooding and flooding caused by inadequate infrastructure. County staff also gave a high priority to stream channel and bank restoration recommendations for Walnut Bottom Run and Elkhorn Run/Moon Run watersheds. All other stormwater problem types returned through the survey process are identified in Appendix B.

Although the Phase 2 Plan effort will initially focus on the primary stormwater problems identified above, the planning effort will also include further refinement and prioritization of stormwater problem solutions and strategies. This prioritization effort will be based on WPAC input and a more detailed review and verification of the stormwater problem information collected by Survey during the Phase 1 effort.

The identification of the problem areas will help in assessing the stormwater management controls needed in the future.

Modeling Needs Assessment

The following paragraphs provide a summary and rationale for the Modeling Needs Assessment. Modeling is not included in the technical and price proposal for Phase 2 of this study. This work should be included in future updates to the plan that will be prepared in Phase 2 of this study.

Designated Watershed	Detailed Modeling Necessary?	Rationale	Focus of Modeling Effort
Beaver River	Yes - Partial	Growth pressure and existing stormwater management problems; recurrent flooding problems.	Hydrologic modeling of Wallace Run, Walnut Bottom Run, Thompson Run, Bennett Run, Blockhouse Run, and McKinley Run watersheds. Detailed hydraulic modeling of Walnut Bottom Run stream channel focusing on streambank and channel restoration.
Big Sewickley Creek	Yes - Partial	Recurrent flooding problems	Hydrologic modeling of North Fork tributary watershed
Brady Run	Yes	Recurrent flooding problems, growth pressure area	Hydrologic modeling of designated watershed
Connoquenessing Creek	Yes - Partial	Recurrent flooding problems, growth pressure area	Hydrologic modeling of Brush Creek watershed
Flaugherty Run	No	Majority of watershed lies within Allegheny County	---
Little Beaver Creek	Yes - Partial	Growth pressure along Route 251 corridor.	Hydrologic modeling of Brush Run and partial North Fork Little Beaver Creek watersheds
Ohio River	Yes - Partial	Numerous tributaries experiencing growth pressure and damage from excess runoff volume and peak rate flows.	Hydrologic modeling of Elkhorn Run/Moon Run watershed, and detailed hydraulic modeling of Elkhorn Run stream channel focusing on streambank and channel restoration. Hydrologic modeling of Two Mile Run, Poorhouse Run, Rag Run, Lacock Run, Fosburg Run, Dutchman Run, Crows Run, Legionville Run, Logtown Run, and unnamed tributary watersheds identified on Figure 3.
Raccoon Creek	No	Lack of significant growth pressure.	---

Designated Watershed	Detailed Modeling Necessary?	Rationale	Focus of Modeling Effort
Service Creek	No	Lack of significant growth pressure.	---
Slippery Rock Creek	No	Majority of watershed lies within Butler and Lawrence Counties.	---
Traverse Creek	No	Controlled by dam, minimal growth pressure	---

Figure 3 presents the subwatersheds or watersheds where detailed hydrologic and in two cases, detailed hydraulic modeling should be performed. Modeling is not included in the technical and price proposal for Phase 2 of this study.

Recommended High Priority Goals and Objectives for Future Work (Not included in Phase 2 of this study)

- Hydrologic and hydraulic modeling of Walnut Bottom Run and Elkhorn Run may be necessary to prepare estimates of the size and scope of necessary stream restoration and channel stabilization work.
- Hydrologic modeling and peak rate analysis of other candidate watersheds is indicated in Figure 3
- Protection of County watersheds from additional unregulated stormwater impacts.
- Assess and verify existing identified obstructions and other structure-related stormwater management issues.
- Assess stormwater impacts from those areas identified by the County as Growth Areas. Future development and growth patterns will be refined with the County and other stakeholders before starting the engineering evaluations.

V. PHASE 2 SCOPE DISCUSSION

Refer to Appendix C for a copy of the Phase 2 Scope of Work anticipated to be issued by the PADEP in Beaver County's Phase 2 Agreement.

As part of the Phase 2 work, a Model Ordinance will be created which includes the standards and provisions of the Plan. An important part of the Model Ordinance will be the inclusion of regulations for activities that may affect stormwater runoff. These regulations are not meant to discourage the activities, but rather to ensure that they are completed in a proper manner with due regard to stormwater management.

General Work Plan

Phase 2 Agreement	Upon completion and submission of the Phase 1 report to PADEP, Beaver County and PADEP will communicate on funding avenues to complete the Phase 2 portion of the project.
Survey	During the Phase 2 the County and/or Consultant where appropriate shall address items listed in Act 167 Section 5(b) and 5(c)
Watershed Plan Advisory Committee (WPAC)	During Phase 1, a WPAC was formed. The County requested each municipality to appoint at least one person from their individual municipality to the WPAC. These requests were in response to Section 6(a) of the Pennsylvania Management Act (Act 167), which states "The county shall establish, in conjunction with each watershed stormwater planning program, a WPAC 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." It is intended that the WPAC will continue to serve as the advisory panel for the overall planning process throughout Phase 2. 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.

WPAC Engineering Meetings

Certain WPAC meetings will focus on the more technical aspects of the Plan. These elements include technical analysis, and development of management criteria. Municipal engineering representatives should attend and the agenda will focus on the engineering aspects of the Plan as opposed to the more general objectives and overall Plan contents.

WPAC Legal Meetings

Certain WPAC meetings will focus on the legal aspects of the Plan. Municipal solicitors should attend and the agenda will focus on implementation of the Model Ordinance from a legal and regulatory framework standpoint.

Standards

The Plan will include criteria and standards for a comprehensive stormwater management strategy that includes the elements listed below. The criteria and standards established in the plan will be mandatory for municipal implementation through the local ordinances.

1. Peak Rate Control Management - Implementation of Peak Rate Controls for various subwatersheds will be developed based on collected data, modeling, engineering judgment, and committee input.
2. Volume Control Management - Implementation of Control Guidance 1 and Control Guidance 2 from the Pennsylvania Stormwater Best Management Practices Manual.
3. Water Quality Management – Implementation of non-point source pollution removal methodologies that meet the requirements of:
    - State Water Quality Chapter 93
    - Pennsylvania Clean Streams Law
    - TMDL pollutant reduction (Clean Water Act)
4. Establish stream bank anti-erosion requirements using an analysis of streams and their channels within the watershed.
5. Establish groundwater recharge/infiltration requirements
6. Establish channel protection requirements based on management of the 2-year design storm.

Work Schedule

A work schedule will be developed early in the Phase 2. The work schedule will set target dates for various tasks with the intention of completing the project for PADEP review and approval, and municipal implementation within the Phase 2 preparation period.

REFERENCES

1. Beaver County Comprehensive Plan, Beaver County Commissioners and Beaver County Planning Commission, 1999 update of 1968 Plan

   The Final Draft of the Phase 1 Plan was completed prior to Beaver County adoption of the 2010 Comprehensive Plan.

2. Beaver County Natural Heritage Inventory, October 1993
3. Beaver County Comprehensive Recreation and Parks Plan, 2003, Pashek Associates
4. Beaver County Greenways and Trails Plan, 2007, Pashek Associates
5. Soil Survey of Beaver and Lawrence Counties, Pennsylvania, United States Department of Agriculture Soil Conservation Service
6. Maryland Stormwater Design Manual Volumes I & II, Maryland Department of the Environment, 2000.
7. Pennsylvania Handbook of Best Management Practices for Developing Areas, Pennsylvania Association of Conservation Districts, November 14, 1997
8. Pennsylvania Stormwater Best Management Practices Manual, Pennsylvania Department of Environmental Protection – Bureau of Watershed Management, December, 2006
9. Pennsylvania Model Stormwater Management Ordinance, Pennsylvania Department of Environmental Protection – Bureau of Watershed Management, March, 2009

APPENDIX A
STORMWATER SURVEY FORMS

See Attached CD

APPENDIX B

STORMWATER SURVEY SUMMARY

See Attached CD

APPENDIX C
PHASE 2 SCOPE OF WORK

PHASE 2

SCOPE OF WORK

(ACTUAL SCOPE MAY DIFFER WHEN ISSUED BY THE PADEP)

Work Elements for Preparation of the PLAN

Three (3) major work elements are required to prepare the PLAN. These are: I, project administration; II, preparation of the PLAN; and III, managing public participation including the Watershed Plan Advisory Committee (WPAC).

I. Project Administration

The COUNTY is responsible for the overall administration of all work required to complete the PLAN. This includes, but is not limited to all of the administrative efforts described in this section of the Agreement.

Project administration includes, but is not limited to, the following activities:

1. Organize and/or attend meetings.
2. Define a framework for accomplishing all tasks associated with preparation of the PLAN.
3. Prepare and submit invoices and progress reports pursuant to the terms and conditions specified in this AGREEMENT.
4. Manage the work schedule for the completion of the PLAN.
5. Participate in telephone discussions.
6. Attend to COUNTY budgeting and organizational matters.
7. Initiation of this AGREEMENT between the DEPARTMENT and the COUNTY.
8. If the COUNTY employs a consultant, the COUNTY shall initiate selection of the consultant and, upon selection, prepare and initiate contracts between the COUNTY and the Consultant.
9. Prepare and conduct the Phase II start-up meeting among the DEPARTMENT, the COUNTY and the COUNTY's selected consultant (if any consultant is used).
10. Manage work according to the budget established herein
11. Participate in other activities, as appropriate, regarding the preparation and submission of the PLAN.

II. Preparation of the PLAN

The COUNTY is responsible for overseeing the preparation and submission of the PLAN to ensure that the PLAN will meet all applicable requirements as identified herein. This work includes Tasks A through C, plus associated subtasks, as described below.

Task A

A.1 Data Collection; Data Review; Data Analysis; Goals, Objectives and Requirements

This task involves work to gather, review and analyze data and information regarding existing and future conditions in the watershed. The data collection will be accomplished by gathering available information from local, state, and federal agencies.

The level of effort expended for this task will be commensurate with the objectives and purposes of the PLAN. Existing data will be reviewed and updated as necessary and incorporated into the PLAN in the most appropriate manner, e.g. by copy or by reference.

Data to be collected may include, but may not be limited to (and will be based on available information including the results of the questionnaires collected during Phase I):

1. Comprehensive land use plans;
2. Existing municipal ordinances;
3. Existing and anticipated stormwater problems, including quality and quantity problems, impaired stream segments, and previously proposed solutions;
4. Existing and proposed flood control projects;
5. 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 proposed 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;
6. Storm sewer outfalls;
7. Soils;
8. Geology;
9. Significant flow obstructions;
10. Topographic mapping;
11. Aerial photographs;
12. Engineering and planning studies;
13. Streamflow data;
14. Floodplain information.

Field investigations will be accomplished to gather or confirm the data, only when necessary. This task also includes review and evaluation of the data that is collected for consistency and usability in the PLAN.

Problem Area Inspection, Summary, and Proposed Solutions

When necessary, field investigations will be performed to evaluate areas with significant problems in terms of water quality or quantity. The PLAN will summarize these problem areas, identify and evaluate proposed solutions, and identify the preferred solution based on feasibility, benefits, and costs. In addition, the PLAN will identify strategies for funding the preferred solutions.

This task will be coordinated closely with the results of the data questionnaires collected from the municipalities during Phase I.

The preferred solutions to the problems identified in the PLAN will be the solutions that best satisfy the regulatory requirements in Pennsylvania Code Title 25 and the Clean Streams Law to protect, maintain, reclaim, and restore water quality. These preferred solutions will be incorporated into the technical standards and criteria of the PLAN, into the PLAN's Model Ordinance, and into priorities for implementation of action items.

Review of Existing Plans, Studies, Reports, and Programs

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

Goals, Objectives, and Requirements of the PLAN

The goals, objectives, and requirements for the PLAN will incorporate the policy, purpose, and requirements in Act 167, requirements in the Pennsylvania Clean Streams Law, requirements in the State Water Quality Standards, requirements to address water quality impairments pursuant to stream impairment data listed pursuant to Sections 305(b) and 303(d) of the Clean Water Act, pollutant reduction requirements in TMDLs, and the list of problems identified by the COUNTY and the PAC. The PLAN shall be prepared in a manner consistent with the approved Phase I Report, (i.e. the Scope of Work). Inclusively, the goals, objectives, and requirements of the PLAN will be called hereinafter the PURPOSE of the PLAN.

Anticipated Product

The work product for this task includes a summation of the information listed above, organized in such a way as to establish and support the PURPOSE of both short-term and long-term watershed planning (including updates to the PLAN).

A.2 Municipal Ordinance Reviews and Evaluations

This task involves the evaluation, comparison, and tabulation of existing municipal ordinances. The purpose of the table is to present a summary of changes to ordinances that will be necessary in each municipality to implement the PLAN as

required by Act 167. The table also will be helpful during the preparation of the Model Ordinance(s) for the PLAN.

Anticipated Product

The product of this task will be a table showing a summary and comparison of existing stormwater management provisions in existing municipal ordinance.

A.3 Data Preparation For Technical Analysis

This task involves the work to transfer data into a geographic information system (GIS) that will be used during the technical analysis associated with preparation of the PLAN and for presentation of graphical content in the PLAN.

The level of effort expended for this task will be commensurate with the goals, objectives, and requirements of the PLAN. Data will be incorporated into the PLAN in the most appropriate and efficient manner, e.g. by copy or by reference.

Detailed GIS data layers will be prepared to the extent necessary for the technical analyses and graphical content of the PLAN:

1. Base Mapping – Existing base map information (roads, streams, municipal boundaries, text, etc.) will be compiled into a base map showing the indexed watersheds within the COUNTY. Data will be projected into the coordinate system preferred by the COUNTY.
2. Land Use/Land Cover Information – Existing aerial maps will be utilized to prepare map data in an appropriate format for hydrologic modeling, where necessary. Recent land developments will be added as necessary. Prepared GIS layers will be field checked for accuracy, when necessary.
3. Future Land Use Conditions – Maps of future land use and land cover based on zoning information and the current County Comprehensive Plan will be used to estimate future land use for the planning horizon of the PLAN.
4. Soils Information – Digital County soil data will be utilized. Soil data will be obtained from the NRCS. Original overlay mapping will be prepared only where necessary to support the hydrologic modeling.
5. Digital Elevation Models – Existing USGS digital elevation models (DEMs) will be used to obtain elevation and slope information for areas where detailed hydrologic modeling will be performed.
6. Digital Raster Graphics (DRGs) – Existing ortho digital USGS topographical maps will be used for locating and displaying obstructions and problem areas, where necessary.
7. Wetlands – Wetlands data will be compiled from the National Wetlands Inventory (NWI) Maps.
8. Geology – Existing digital geologic maps will be used for the watersheds within the COUNTY. Geologic features pertinent to the watershed, i.e., limestone,

sandstone, etc., will be considered in hydrologic models, where necessary, and incorporated into PLAN by reference, or by copy, as necessary.

9. Obstructions – Locations and critical attributes of obstructions associated with significant stormwater problems will be shown on the appropriate base map.
10. Problem Areas, Flood Control Structures, Stormwater Management Facilities, etc. – The locations and critical attributes of these items, when they are expected to produce a significant effect on stormwater runoff, will be shown on the appropriate base map.
11. Floodplains – FEMA Q3 data will be incorporate into the PLAN by reference, or by copy when necessary. Floodplains in other areas will be identified in the PLAN and shown on the base map when necessary.
12. Environmental Characteristics – Environmental characteristics, such as open-space, buffers, etc. that are expected to produce a significant effect on stormwater runoff will be displayed on the appropriate base map when necessary.

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

Delineation of Subwatersheds

Designated watersheds will be delineated on a base map at a scale that results in a manageable map size and adequate detail. When necessary for preparation of the PLAN, watersheds will be broken into subwatersheds and subareas in a manner consistent with the guidance that accompanies the applied models. Sub-areas delineated for hydrologic modeling purposes should not be less than 5 square miles in area; however, areas of less than 5 square miles may be used when necessary based on engineering judgment.

The delineation of sub-watersheds may be based on the following:

1. The guidance associated with the applied model and sound engineering judgment.
2. The location of identified problems related to the PURPOSE of the PLAN.
3. The location of obstructions; primarily bridges, culverts, or stormwater control facilities with a significant effect on stormwater runoff.
4. Other points of interest, such as stream gages or water quality monitoring stations, locations of water quality impairment or concern, anticipated future flood project sites.

Where significant effects on stormwater runoff are produced, this task also may include delineation and mapping of:

1. Storm sewer systems: areas where storm sewer systems currently exist.
2. Existing state, federal or local flood protection and stormwater management facilities.

3. Stormwater facilities proposed by municipalities for construction within the 10-year planning period.
4. Stormwater related problems - areas indicated in the municipal data questionnaires, in state water quality assessments (e.g. 303(d), or 305(b) lists), or in TMDL documents, as being susceptible to flooding problems or as not meeting state water quality standards.

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.

Task B - Technical Analysis

The technical analysis consists of developing alternative strategies to manage stormwater runoff consistent with the PURPOSE of the PLAN. This will be accomplished under the following subtasks.

B.1 Evaluate Water Quality, peak flow, stream stability, and groundwater recharge requirements as follows:

Water quality, peak flow, stream stability, and groundwater recharge requirements are satisfied by the Methods in Section 303 of DEP's draft Model Ordinance (copy provided separately). If other methods are to be utilized, the PLAN shall provide:

1. A water quality capture volume computational methodology acceptable to DEP to meet State Water Quality Standards pursuant to Chapter 93 regulations;
2. A streambank erosion standard (for example, detain 1 year, 24-hr storm event and discharge over 24-hr to 72-hour period from the end of the storm). This work may involve an analysis of the erodibility of soils in and along streams and their channels within the watersheds;
3. Methodologies for computing stormwater capture volumes for groundwater recharge and infiltration;
4. Methodologies for control of peak runoff rates for the 1-, 2-, 5-, 10-, 25-, 50- and 100-year storm events.

Methodologies must be applicable for design of post construction stormwater management BMPs as well as retrofit BMPs that may be required to address existing stormwater problems. The methodologies need to ensure that retrofits as well as new development projects are consistent with the PURPOSE of PLAN.

B.2. Modeling

This task is not included in the budget for this study (Appendix D). This task involves the use of detailed hydrologic modeling, quantitative computations and evaluations necessary to analyze runoff characteristics of watersheds or sub-watersheds under existing and future conditions to evaluate alternative solutions to identified existing or anticipated future problems and meet the PURPOSE of the PLAN. It will establish the need and the level of stormwater quality and peak rate controls for the 1-, 2-, 5-, 10-, 25-, 50- and 100-year 24-hour events (25 and 50-year events are optional). Sub-areas delineated for hydrologic modeling purposes should not be less than 5 square miles in area; however, areas of less than 5 square miles may be used when necessary based on engineering judgment.

Modeling would be based on rainfall data from NOAA Atlas 14, or equivalent.

Hydrologic models should be calibrated using rain gage records, stream gage records, USGS regression models for Pennsylvania, and anecdotal historical information. If HEC-HMS is used, the internal optimization routines should be used to the greatest extent practical

The purposes of hydrologic modeling include development, evaluation, and selection of standards and criteria for the regulation of development and activities that may affect stormwater runoff for watersheds or sub-watersheds where implementation of DEP's draft Model Stormwater Management Ordinance alone is unlikely to be sufficient to meet the PURPOSE of the PLAN.

B.3 Compilation of All Technical Standards

Standards and criteria will be compiled and presented to show:

1. A detailed list of specific standards and criteria for stormwater control;
2. Where within watersheds and sub-watersheds the various standards and criteria apply;
3. A list of applicable stormwater management controls methodologies and the design procedures associated with each;
4. Performance criteria for design of stormwater management facilities;
5. Locations where cluster or regional stormwater management facilities will be required;
6. Cost estimates for construction of new stormwater management facilities to correct existing problems;
7. A summary of funding sources for new facilities;
8. An analysis of what problems will, and what problems will not, be solved by implementation of the PLAN; and
9. Evaluation of existing floodplain ordinances and recommendations for changes where necessary.

Standards and criteria will be consistent to the greatest practical extent within municipalities and across the COUNTY.

Charts, tables and graphs will be prepared and presented to show the results of modeling including an explanation of how the proposed technical standards and criteria meet the PURPOSE of the PLAN.

B.4 Implementation of Technical Standards and Criteria

The final standards and criteria will be incorporated into a model municipal stormwater management ordinance that will be included in the PLAN. Where necessary, the ordinance provisions will be varied to meet differing requirements, or conditions, among the watersheds and municipalities in the COUNTY. If necessary, more than one model ordinance can be provided.

Task C - Plan Preparation and Implementation

C.1 Plan Report Preparation

The products of each previous task will be included in the PLAN. The PLAN will contain provisions as necessary to meet the PURPOSE of the PLAN. Whenever appropriate, material readily available from existing sources should be included by reference only, not by copy. In each case, and for each watershed and sub-watershed, the level of detail should be commensurate with the PURPOSES of the PLAN and the strategies anticipated for managing stormwater runoff in a manner consistent with the PLAN. The contents of the PLAN shall comply with the requirements of 1978 Act 167. At a minimum, the PLAN must include the following list of items paraphrased from Section 5 of Act 167. In cases where the information is readily available from existing sources, the PLAN may include the required content either by reference or by copy, whichever is more efficient:

1. A survey of existing runoff characteristics in small as well as large storms, including the impact of soils, slopes, vegetation and existing development;
2. A survey of existing significant obstructions and their capacities that significantly affect stormwater management and flooding within the watershed(s);
3. An assessment of projected and alternative land development patterns in the watershed(s), and the potential impact of runoff quantity, velocity and quality;
4. An analysis of present and projected development in the flood hazard areas, and its sensitivity to damages from future flooding or increased runoff;
5. A survey of existing drainage problems and proposed solutions;
6. A review of existing and proposed stormwater collection systems and their impacts on flooding or stormwater runoff;
7. An assessment of alternative runoff control techniques and their efficiencies in each watershed identified;

8. An identification of existing and proposed State, Federal and local flood control projects located in the watersheds and their design capacities;
9. A designation of those areas to be served by stormwater collection and control facilities within a ten-year period, an estimate of the design capacity and costs of such facilities, a schedule and proposed methods of financing the development, construction, and operation of such facilities, and an identification of the existing or proposed institutional arrangements to implement and operate the facilities;
10. An identification of flood plains and flood hazard areas within the watersheds;
11. Criteria and standards for the control of stormwater runoff from existing and new development which are necessary to minimize dangers to property and life and carry out the purposes of the Act;
12. Priorities for implementation of action within each watershed identified;
13. Provisions for periodically reviewing, revising and updating the PLAN;
14. Provisions as are reasonably necessary to manage stormwater such that development or activities in each municipality within the watersheds do not adversely affect health, safety, and property in other municipalities within each watershed identified and in basins to which the watersheds are tributary; and
15. Consider and be consistent with other existing municipal, county, regional and State environmental and land use plans.

In addition, the PLAN will identify:

1. Impaired stream segments within the County's watersheds;
2. The type and nature of impairment;
3. Strategies for eliminating or mitigating the impairment to satisfy state water quality requirements pursuant to 25 Pa. Code Chapter 93 regulations and TMDL requirements, if established.
4. An analysis of what problems will, and what problems will not, be solved by implementation of the PLAN;

C.2. Recommended Outline

The recommended outline for the PLAN is as follows:

VOLUME I: Executive Summary of the PLAN

VOLUME II: THE PLAN

Section I - Introduction

Section II - Act 167 Watershed Level Stormwater Management Planning and Implementation

Section III - Watershed Characteristics

1. Present Land Use
2. Projected Land Developments
3. Significant Obstructions
4. Stormwater and Flood Management Systems
5. Stormwater Problems

Section IV - Technical Analysis (Narrative)

1. Quality and Quantity of Present and Future Storm Runoff

Section V - Results of Analysis

1. Interpretation and Evaluation of Analysis
2. Technical Standards and Criteria for Control of Stormwater Runoff

Section VI - Runoff Control Strategies

Section VII - Analysis of Existing Municipal Ordinances

Section VIII - Model Stormwater Ordinances

Section IX - Action Items and Follow-Up

1. Action Items and Priorities for Implementation of the PLAN
2. An analysis of what problems will, and what problems will not, be solved by implementation of this PLAN;

Section X - Provisions for Review, Revision, and Updating the PLAN

Plates/Figures:

1. A base map showing the watershed delineation and political subdivisions, roadway network and the location as referenced to the county.
2. Existing land use.
3. Future land use.
4. Hydrologic soil groups.
5. Development and flood plains.
6. Watershed subareas used for hydrologic analysis including information on applicable management facilities.
7. Stream obstructions, flooding and drainage problem areas.
8. Areas where storm sewer networks exist (if available) and location of storm sewer outfalls.
9. Additional information as determined by the County.

Tables:

1. Runoff characteristics of the watershed.
2. Rainfall values for various frequency durations.

3. Subareas and corresponding management strategy information.

VOLUME III, Appendices

The following data will be included in Volume III:

1. Recommended design storms for significant obstructions;
2. A list (or table) of significant stormwater obstructions including their locations, sizes, and any particular information which may seem helpful to the use of the plan;
3. Any special information concerning stormwater control facilities, BMPs, and other issues.
4. Model Stormwater Management Ordinance
5. Background hydrologic data;

Anticipated Product

The final product will be the adopted and approved COUNTY Stormwater Management PLAN. The final PLAN will consist of three parts: Volumes I through III. The report and all supporting data will be submitted to DEP by the COUNTY in hard copy and in digital format.

C.3 Plan Adoption and Submission to DEP

Prior to the COUNTY's public hearing, the COUNTY will provide a copy of the PLAN to each member of the WPAC, plus two hardcopies for DEP. The COUNTY also will provide DEP with one electronic copy. The involved municipalities, WPAC members and Department will review the PLAN and provide comments to the COUNTY. The COUNTY will allow a maximum of 90 days for return of comments. The COUNTY will tabulate and respond to all comments received. After consideration of the comments and responses, the COUNTY will revise the PLAN accordingly.

Prior to the COUNTY's public hearing on the PLAN, the COUNTY will hold a WPAC meeting to present the final version of the PLAN.

The COUNTY will hold a public hearing for the PLAN. A notice for the public hearing will be published at least two weeks before the hearing date. The notice will contain a brief summary of the principal provisions of the PLAN and a reference to the places within each affected municipality 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 to the PLAN will be made.

The COUNTY Board of Commissioners, or Council, will vote on the PLAN as a resolution, for the purpose of adoption. The resolution needs to be carried by an affirmative vote of at least a majority of the members of the governing body, and must refer expressly to

the maps, charts, textual matter and other materials that constitute the Plan. This action will be recorded on the adopted PLAN.

After adoption, the COUNTY will submit to DEP a letter of transmittal, two paper copies, and one electronic media copy of the adopted PLAN, the comments received from the official planning agency and governing body of each municipality, comments from the County Planning Commission, comments from regional planning agencies (Section 6(c) of Act 167), the responses-to-comments document prepared by the COUNTY, the public hearing notice and minutes of the public hearing (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 requirements of Act 167 and it will request official approval of the adopted PLAN. Subsequent to DEP's approval of the PLAN, 10 final hard-copies of the PLAN will be printed by the COUNTY. Two printed copies and one electronic copy of the final PLAN will be provided to DEP. The final electronic copy will include all supporting data in native digital format and the final PLAN also will be provided in electronic pdf format.

Hard copies of all backup material including technical analyses and models of watersheds or sub-watersheds will be retained at the COUNTY's offices.

Anticipated Product

The product of this task will include the official documentation regarding PLAN adoption and implementation process, including the necessary documentation from the COUNTY certifying the adoption of the PLAN, and the actual adopted PLAN.

Task D - Plan Advisory Committee, Public Participation, and Implementation Workshops

The following paragraphs describe the various activities that will be conducted by the COUNTY to facilitate public participation in the preparation and implementation of the PLAN. These activities include meetings of the WPAC, the public hearing conducted by the COUNTY, the municipal workshops, the public workshop(s) and a public information pamphlet. The relative timing and purpose of these activities are summarized in Table 1.

Discussions, presentations, and handouts on implementation of the PLAN, including various stormwater BMPs, will be an agenda item, from time to time, for regularly scheduled advisory committee meetings.

D.1. Watershed Plan Advisory Committee

A WPAC will be established to provide an opportunity for dialogue with, and participation of, each municipal government, the County Conservation District, other interest groups such as watershed associations, and the public.

The COUNTY will conduct WPAC meetings to provide information on the planning process and to gather data and advice from the members of the WPAC to ensure that

the plan is consistent with the PURPOSE of the PLAN and the needs of the municipalities and the COUNTY.

D.2. Pamphlet

A pamphlet tailored to the PLAN will be prepared to provide guidance to municipal officials and to the public regarding implementation of the PLAN.

D.3. Municipal Implementation Workshops

The COUNTY will conduct municipal workshops to provide information to municipalities regarding their obligation to implement the PLAN. The workshops will cover procedures to adapt, enact, administer, and enforce the stormwater management ordinance as well as municipal obligations to implement other action items in the PLAN. The workshops will address availability of resources to implement the PLAN, establishment of fees for stormwater management, and other issues related sources of funding. Alternatives for pooling resources including municipal authorities and intergovernmental cooperative agreements will be presented and discussed.

The municipal implementation workshops will be conducted within three months following DEP's approval of the PLAN.

D.4. Public Implementation Workshops

The COUNTY will provide implementation workshops to the public regarding implementation of the PLAN within 6 months following DEP's approval of the PLAN

The workshops will cover goals and benefits of the plan and responsibilities and methods for residents to meet the PLAN's requirements.

Table 1: Meetings, Purpose, and Schedule

WPAC Meeting	Purpose of Meeting	Meeting Schedule
1.	Phase II Start-up Meeting - introduce the Phase II Planning process. Emphasize the importance of full municipal involvement. Present summary of the data collection questionnaire from Phase I.	Beginning of the Project
2.	Review the project status, maps, institutional data (ordinances, etc), solicit input from municipalities, provide summary of stormwater problems. Identify areas that require detailed hydrologic modeling.	Subsequent to Task A
3.	General review of draft PLAN: Gather general comments and feedback prior to finalization of the PLAN.	
4.	Pre-hearing meeting: Review comments and responses to comments. Summarize implementation.	Upon completion of the final draft PLAN
Public Hearing	Conduct the hearing as required by Act 167 to present the PLAN to the public.	
5.	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

Anticipated Product

The product will include the presentation materials prepared for the committee meetings, correspondence, notes and summaries from all committee meetings and workshops.

APPENDIX D

PHASE 2 COST ESTIMATE

Note: Since 2009, three have been no appropriations for Act 167 grants; therefore, a cost estimate is not necessary and none are included in this document.

APPENDIX E
PROPOSED PHASE 2 SCHEDULE

Proposed Phase 2 Schedule

Milestone	Estimated Completion Date
Execute PADEP/Beaver County Phase 2 Agreement	Unknown Start Date
WPAC Meeting	Year 1 Kick-off, As needed
Problem Areas Field Visits	Year 1
Analysis and Evaluation of Problem Areas	On-going
WPAC Meeting	Year 2, as needed
Draft Phase 2 Plan	Year 3
Draft Model Ordinance	Year 3
WPAC Meeting	Year 3, as needed
Finalize Phase 2 Report, Model Ordinance, and Exhibits	Year 4
WPAC Meeting, WPAC Legal Meeting, and BMP Workshop	Year 3 and 4 as needed
Public Hearing	Year 4
County Commissioner Approval of Phase 2 Plan	Year 4
Phase 2 Report Submission to PADEP	Year 4
After DEP Plan Approval - Municipal Implementation and Public Information Workshops; Assist municipalities with Ordinance Adoption Process	Year 4
PADEP/Beaver County Agreement Deadline	Year 4

Beaver County
Act 167 SWM Plan
Phase 1 Scope of Study

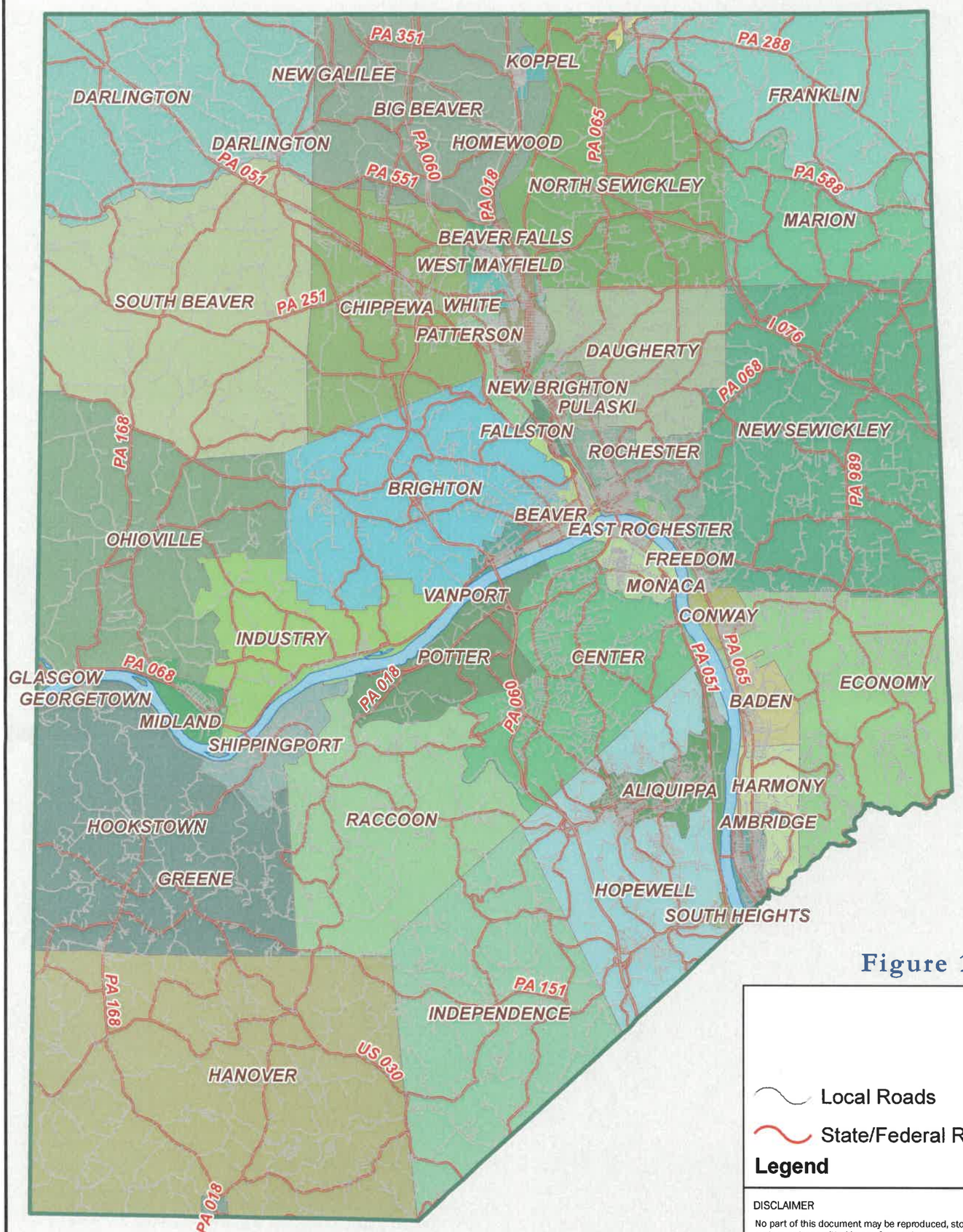
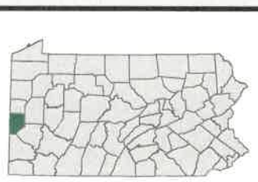


Figure 1

Local Roads

State/Federal Roads

Legend



Location of Beaver County within the state of Pennsylvania.

0 5,000 10,000 20,000 30,000 Feet

L.R. Kimball

ARCHITECTURE · ENGINEERING · COMMUNICATIONS TECHNOLOGY

415 Moon Clinton Road Coraopolis, PA 15108-3886

Prepared by: TCD	**Date: 03/07/10**
Project Number:	**09-1300-0240**

File Location: G:\2009\Beaver_County\Arc\Projects\Figure_1_BaseMap.mxd

Beaver County
Act 167 SWM Plan
Phase 1 Scope of Study

Figure 2

Legend

- Watersheds
- Wetlands
- Ch. 93 CWF
- Ch. 93 HQ-CWF
- Ch. 93 TSF
- Ch. 93 WWF

SWM Problem Types

- Accelerated Erosion
- Flooding
- Habitat Loss or Damage
- Inadequate Infrastructure
- Other
- Sedimentation
- Water Pollution

0 5,000 10,000 20,000 30,000 Feet

Location of Beaver County within the state of Pennsylvania.

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Prepared by: TCD	**Date: 03/07/10**
Project Number:	**09-1300-0240**

File Location: G:\2009\Beaver_County\Arc\Projects\Figure_2_SWMProblem_Areas.mxd

Beaver County
Act 167 SWM Plan
Phase 1 Scope of Study

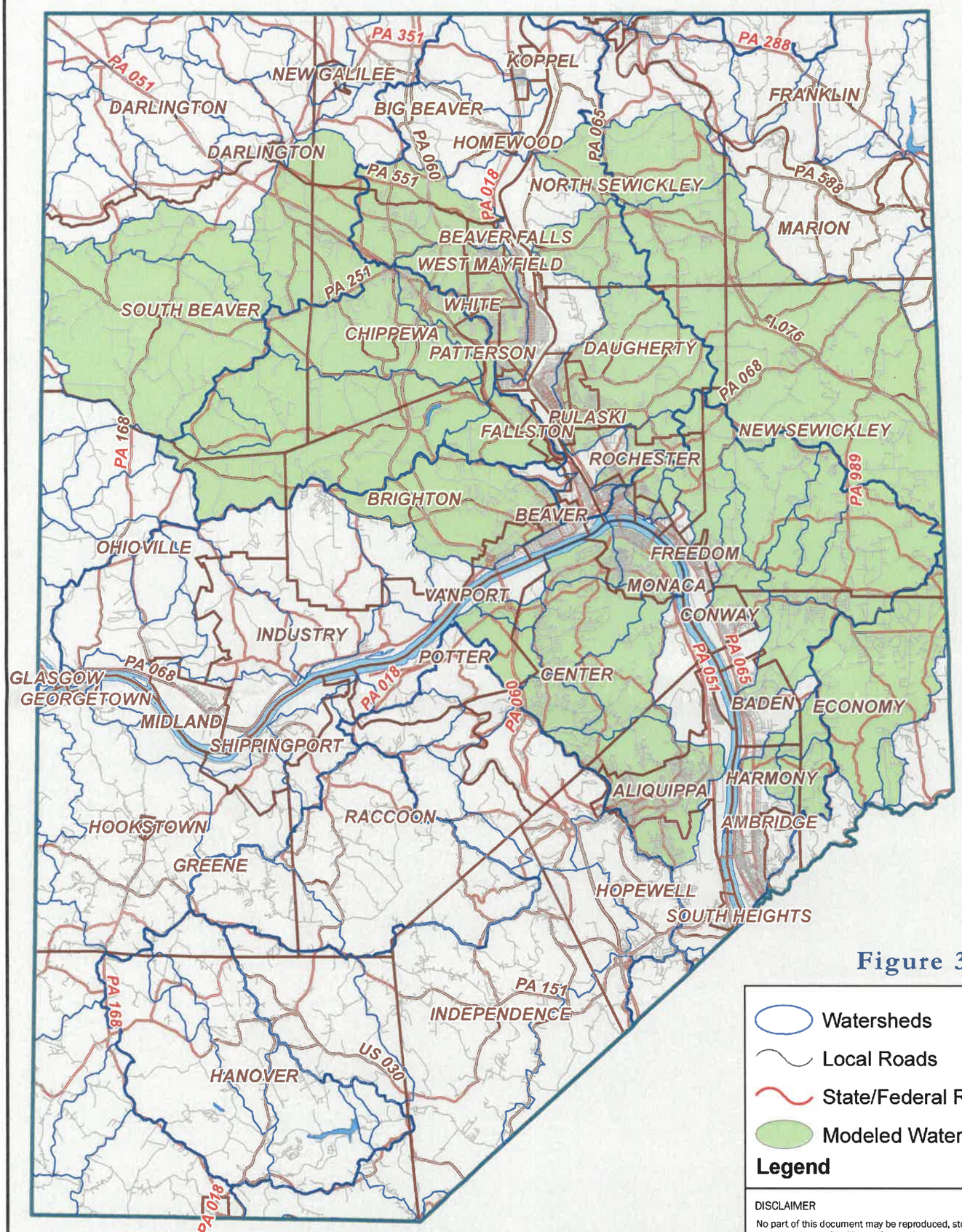
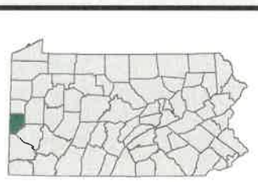


Figure 3

- Watersheds
- Local Roads
- State/Federal Roads
- Modeled Watersheds

Legend



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Prepared by: TCD	**Date: 06/04/10**
Project Number:	**09-1300-0240**

File Location: G:\2009\Beaver_County\ArcProjects\Figure_3_ModeledSheds.mxd