

TOBYHANNA CREEK WATERSHED

**ACT 167 STORMWATER MANAGEMENT
PLAN RENEWAL**

MONROE COUNTY, PENNSYLVANIA

FINAL PLAN - TBD

PREPARED FOR
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Stroudsburg, PA 18360

CARBON COUNTY COMMISSIONERS
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WAYNE COUNTY COMMISSIONERS
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PREPARED BY:
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MONROE COUNTY PLANNING COMMISSION
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MONROE COUNTY BOARD OF COMMISSIONERS

RESOLUTION

ACT 167 STORMWATER MANAGEMENT PLAN RENEWALS
BRODHEAD CREEK AND MCMICHAEL CREEK WATERSHED,
AND THE TOBYHANNA CREEK WATERSHED

WHEREAS, the Storm Water Management Act 167 of 1978 provides for the regulation of land and water use for flood control and storm water management, requires the Department to designate watersheds, and that each county will prepare and adopt a watershed storm water management plan and renew or update said plan every five (5) years for each designated watershed; and

WHEREAS, the Brodhead and McMichaels, and the Tobyhanna Creek Watershed Storm Water Management Plans were previously adopted resolution of the County Commissioners and approved by DEP in 1978, 1988, 1997, respectively, and Brodhead McMichaels Updated in 2006; and.

WHEREAS, the purpose of the Brodhead and McMichaels, and the Tobyhanna Creek Watershed Storm Water Management Plans are to protect public health and safety and to prevent or mitigate the adverse impacts related to the conveyance of excessive rates and volume of storm water runoff by providing for the management of storm water runoff, control of erosion and sediment pollution and control of non-point source pollution; and


WHEREAS, design criteria and standards of storm water management systems and facilities within the Brodhead and McMichaels, and Tobyhanna Watershed shall utilize the criteria and standards as found in the watershed storm water management plans; and

NOW, THEREFORE, BE IT RESOLVED that the Monroe County Board of Commissioners hereby adopt the Brodhead and McMichaels, and the Tobyhanna Creek Watershed, Act 167 Storm Water Management Plans, including all appendices and prior modeling, and forward the Plan to the Pennsylvania Department of Environmental Protection and Department of Community and Economic Development for approval.

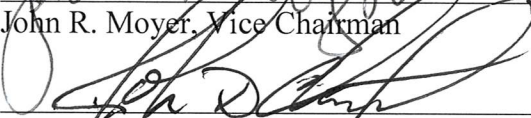
MONROE COUNTY BOARD OF COMMISSIONERS



Sharon S. Laverdure, Chairman

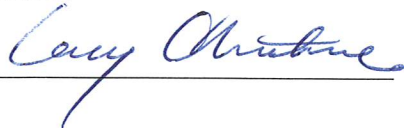


John R. Moyer, Vice Chairman



John D. Christy, Commissioner

ATTEST:



Cary Christine

RESOLUTION

ACT 167 STORMWATER MANAGEMENT PLAN RENEWALS FOR BRODHEAD CREEK AND MCMICHAEL CREEK WATERSHED, AND THE TOBYHANNA CREEK WATERSHED

CARBON COUNTY BOARD OF COMMISSIONERS

WHEREAS, the Storm Water Management Act 167 of 1978 provides for the regulation of land and water use for flood control and storm water management, requires the Department to designate watersheds, and that each county will prepare and adopt a watershed stormwater management plan and renew or update said plan every five (5) years for each designated watershed; and

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WHEREAS, design criteria and standards of storm water management systems and facilities within the Brodhead and McMichaels, AND Tobyhanna Watershed shall utilize the criteria and standards as found in the watershed stormwater management plans;

NOW, THEREFORE, BE IT RESOLVED that the Carbon County Board of Commissioners hereby adopt the Brodhead and McMichaels, AND the Tobyhanna Creek Watershed, Act 167 Storm Water Management Plans, including all appendices and prior modeling, and forward the Plan to the Pennsylvania Department of Environmental Protection and Department of Community and Economic Development for approval.


Adopted by the Carbon County Board of Commissioners at the regular meeting on May 5th, 2022.

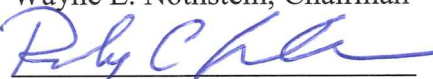
ATTEST:

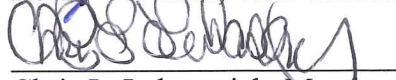


Eloise Ahner
County Administrator/Chief Clerk

CARBON COUNTY BOARD OF COMMISSIONERS

BY: 
Wayne E. Nothstein, Chairman

BY: 
Rocky C. Ahner, Vice-Chairman

BY: 
Chris L. Lukasevich, Member



COMMISSIONERS OF WAYNE COUNTY

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JOSEPH W. ADAMS
Salem Township, PA

JOCELYN CRAMER
Damascus Township, PA



ANDREW M. SEDER
Chief Clerk

WENDELL R. KAY
Solicitor

RESOLUTION No. 21-04-2022
ACT 167 STORMWATER MANAGEMENT PLAN RENEWAL
TOBYHANNA CREEK WATERSHED – Lehigh Township, Wayne Co.

WHEREAS, the Storm Water Management Act 167 of 1978 provides for the regulation of land and water use for flood control and storm water management, requires the Department to designate watersheds, and that each county will prepare and adopt a watershed stormwater management plan; and

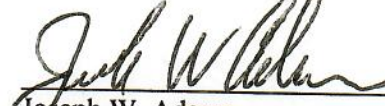
WHEREAS, the Tobyhanna Creek Watershed Storm Water Management Plan was previously adopted resolution of the County Commissioners and approved by DEP in 1997, respectively.

WHEREAS, the purpose of the Tobyhanna Creek Watershed Storm Water Management Plan is to protect public health and safety and to prevent or mitigate the adverse impacts related to the conveyance of excessive rates and volume of storm water runoff by providing for the management of storm water runoff, control of erosion and sediment pollution, and control of non-point source pollution; and

WHEREAS, design criteria and standards of storm water management systems and facilities within the Tobyhanna Creek Watershed shall utilize the criteria and standards as found in the watershed stormwater management plan;

NOW, THEREFORE, BE IT RESOLVED that the Wayne County Board of Commissioners hereby adopt the Tobyhanna Creek Watershed, Act 167 Storm Water Management Plan, including all appendices and prior modeling, and forward the Plan to the Pennsylvania Department of Environmental Protection and Department of Community and Economic Development for approval.


Brian W. Smith, Chairman


Joseph W. Adams


Jocelyn Cramer

ATTEST


Andrew M. Seder, Chief Clerk

4/21/22
Date

Monroe County Commissioners

Sharon S. Laverdure	<i>Chairman</i>
John R. Moyer	<i>Vice Chairman</i>
John D. Christy	<i>Commissioner</i>

Carbon County Commissioners

Wayne E. Nothstein	<i>Chairman</i>
Rocky Ahner	<i>Commissioner</i>
Chris Lukasevich	<i>Commissioner</i>

Wayne County Commissioners

Brian W. Smith	<i>Chairman</i>
Joseph W. Adams	<i>Commissioner</i>
Jocelyn Cramer	<i>Commissioner</i>

Monroe County Planning Commission

Christine Meinhart-Fritz	<i>Director</i>
Eric Koopman	<i>Lead Senior Planner</i>

Monroe County Conservation District

Kristina Heaney	<i>District Manager</i>
Lori Kerrigan	<i>Head Resource Conservationist</i>
Drew Wagner	<i>Hydraulic Engineer</i>
Michael Wilk	<i>Hydraulic Engineer</i>
David Hooker	<i>Resource Conservation Specialist</i>

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Eric Koopman	<i>Monroe County Planning Commission</i>
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Lori Kerrigan	<i>Monroe County Conservation District</i>
Drew Wagner	<i>Monroe County Conservation District</i>
Michael Wilk	<i>Monroe County Conservation District</i>
David Hooker	<i>Monroe County Conservation District</i>
Maryellen J. Keegan	<i>Monroe County Safety Center</i>
Michael Mrozinski	<i>Pike County Planning Commission</i>
Michelle Long	<i>Pike County Conservation District</i>
Ellen Enslin	<i>Pike County Conservation District</i>
Craig Rickard	<i>Wayne County Planning Commission</i>
Jamie Knecht	<i>Wayne County Conservation District</i>
David Bodnar	<i>Carbon County Planning Commission</i>
Chris Storm	<i>Carbon County Conservation District</i>
Shane Kleiner	<i>PA Department of Environmental Protection</i>
Robert Jevin	<i>PA Department of Environmental Protection</i>
Ted Ritsick	<i>PA Department of Community & Economic Development</i>
John Bohman	<i>PA Department of Transportation</i>
David Padfield	<i>PA Emergency Management Agency</i>
Steve Tambini	<i>Delaware River Basin Commission</i>
David Horton	<i>Brodhead Creek Regional Authority</i>
Pamela Gardsy	<i>Barrett Township (Monroe)</i>
Cathy Martinelli, David Albright	<i>Chestnuthill Township (Monroe)</i>
Meredith Thompson, Erin Masker	<i>Coolbaugh Township (Monroe)</i>
Shaina Serrano, Larry Freshcorn	<i>Delaware Water Gap Borough (Monroe)</i>
Becky Smith	<i>East Stroudsburg Borough (Monroe)</i>
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Jacqueline Elliott	<i>Jackson Township (Monroe)</i>
Michele Clewell	<i>Middle Smithfield Township (Monroe)</i>
Joshua Walker, Michael Penn	<i>Mt. Pocono Borough (Monroe)</i>
Reda Briglia	<i>Paradise Township (Monroe)</i>
Beverly Christman, Tracy Herman	<i>Polk Township (Monroe)</i>
Richard Wielebinski	<i>Pocono Township (Monroe)</i>
Samantha Borushak	<i>Price Township (Monroe)</i>

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Brian Barrett, Julia Heilakka	<i>Smithfield Township (Monroe)</i>
Donna Alker, Jennifer Shukaitis	<i>Stroud Township (Monroe)</i>
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Robert McHale, Autumn Canfield	<i>Tobyhanna Township (Monroe)</i>
Tina Kernan	<i>Tunkhannock Township (Monroe)</i>
Linda Kramer	<i>Greene Township (Pike)</i>
Alice Rehrig	<i>Lehigh Township (Wayne)</i>
Suzanne Brooks	<i>Kidder Township (Carbon)</i>
Robert Dobosh	<i>Kidder Township (Carbon)</i>
Alexander Jackson	<i>Brodhead Watershed Association</i>
Craig Todd	<i>Brodhead Watershed Association</i>
Andrea Higgins	<i>Brodhead Watershed Association</i>
James Vogt	<i>Aquashicola Pohopoco Watershed Conservancy</i>
Geoff Rogalsky	<i>Tobyhanna Tunkhannock Creek Watershed Association</i>
Bonnie Smith	<i>North Pocono CARE</i>
Abby Jones	<i>Our Pocono Waters - Penn Future</i>
Eric Baird	<i>Brodhead Chapter of Trout Unlimited</i>
Louise Troutman	<i>Pohoqualine Fish Association</i>

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SECTION I INTRODUCTION

A. The Tobyhanna Creek Watershed

The Tobyhanna Creek Watershed is located in the Pocono Plateau, an area in the northwest and central portions of Monroe County, and portions of eastern Carbon County and southern Wayne County. Tobyhanna Creek discharges to the Lehigh River.

Large portions of this watershed are undeveloped with the potential for growth. The effects of this potential growth and development on drainage, flooding, and erosion problems is a major concern for county and township officials and affected property owners. Extensive commercial growth along the Route 80 interchanges, and Routes 115 and 940 can result in accelerated storm water runoff, which has the potential of causing flooding and erosion problems for property owners along the Tobyhanna Creek and its tributaries. Stream water quality can also become degraded as impervious areas grow throughout the watershed.

B. Storm Water Management

Storm water management entails bringing surface runoff caused by precipitation events under control. In the past, storm water control was viewed only on a site-specific basis. Over time, local perspectives and policies have changed, with the realization that proper storm water management can only be accomplished by evaluating the comprehensive picture (i.e. by analyzing what adverse impacts a development located in a watershed's headwaters may have on flooding downstream). Proper storm water management reduces flooding, soil and stream bank erosion and sedimentation and improves the overall quality of the receiving streams.

Storm water management requires cooperation between the state, county and local officials and involves proper planning, engineering, construction, operation and maintenance. This entails educating the public and local officials and requires program development, financing, revising policy, development of workable criteria and adoption of Ordinances. The Tobyhanna Creek Watershed Storm Water Management Plan, under the Pennsylvania Storm Water Management Act, will enable continued development to occur within the Tobyhanna Creek Watershed, utilizing both structural and nonstructural measures to properly manage storm water runoff in the watershed.

SECTION II ACT 167

A. Storm Water Management Act

The Pennsylvania General Assembly, recognizing the adverse effects of inadequate management of excessive rates and volumes of storm water runoff resulting from development, approved the Storm Water Management Act, P.L. 864, No. 167, October 4, 1978. Act 167 provides for the regulation of land and water use for flood control and storm water management purposes. It imposes duties and confers powers to the Department of Environmental Protection, Municipalities and Counties, and provides for enforcement and making appropriations. The Act requires the Department to designate watersheds and develop guidelines for storm water management and model storm water Ordinances (the designated watersheds were approved by the Environmental Quality Board July 15, 1980, and the guidelines and model ordinances were approved by the Legislature May 14, 1985). The Act provides for grants to be appropriated by the General Assembly and administered by the Department for 75% of the allowable costs for preparation of official storm water management plans and administrative, enforcement and implementation costs incurred by any municipality or county in accordance with Chapter III - Storm Water Management Grants and Reimbursement Regulations (adopted by the Environmental Quality Board August 27, 1985).

Each County must prepare and adopt a watershed storm water management plan for each of its designated watersheds in consultation with the Municipalities, and will periodically review and revise such plans at least every five years when funding is available. Within six months following adoption and approval of a watershed storm water plan, each municipality is required to adopt or amend, and implement Ordinances and regulations as are necessary to regulate development within the Municipality in a manner consistent with the applicable watershed stormwater plan and the provisions of the Act.

Developers are required to manage the quantity, velocity, quality and direction of resulting storm water runoff in a manner which adequately protects health and property from possible injury, and must implement control measures that are consistent with the provisions of the watershed plan and the Act. The Act also provides for civil remedies for those aggrieved by inadequate management of accelerated storm water runoff.

B. Purpose of the Study

Development in the Tobyhanna Creek Watershed causes an increase in storm water runoff and a reduction in groundwater recharge. Uncontrolled storm water runoff not only increases the risk of flooding downstream, but also causes erosion and sedimentation problems, reduces stream quality, raises the temperature of the streams, impairs the aquatic food chain, and reduces the baseflow of streams, which is imperative for aquatic life during the drier summer months. Erosion of the stream banks caused by accelerated stream velocities due to increased runoff is already evident in the lower reaches of Tobyhanna Creek.

There is an increased state-wide as well as local recognition that a sound and effective storm water management plan requires a diversified multiple purpose plan. The plan should address the full range of hydrologic consequences resulting from development instead of simply focusing on controlling site-specific peak flow without consideration including tributary timing of flow volume reduction, base flow augmentation, water quality control and ecological protection.

Managing storm water runoff on a site-specific basis does not meet the requirements of watershed based planning. The timing of flood peaks for each subbasin within a watershed contributes greatly to the flooding potential of a particular storm. Each storm water control site within a subbasin should be managed by evaluating the comprehensive picture.

The Tobyhanna Creek Watershed Storm Water Management Plan provides reasonable regulation of development activities to control accelerated runoff and protect the health, safety and welfare of the public. The Plan includes recognition of the various rules, regulations and laws at the federal, state, county and municipal level. Once implemented, the Plan will aid in reducing costly flood damages by reducing the source and cause of local uncontrolled runoff. The Plan will make municipalities and developers more aware of comprehensive planning in storm water control and will also help maintain the quality of Tobyhanna Creek and its tributaries and to sustain their designation as high quality waters.

C. Plan Format

The 2022 Tobyhanna Creek Storm Water Management Plan is a renewal of the 1997 Plans Volume I and II. Any references to the Technical Appendices are referring to the modeling data of the original plan. The Technical Appendices can be obtained upon request from the Monroe County Conservation District.

The 1997 plan Volume I provides an overview of Storm Water Management and specifies the calculation methodology and peak flows.

The original plan Volume II provides the purpose of the study, data collection, identification of existing problems, present conditions, projected and alternative land development patterns and the model Ordinance. Volume II also assesses the impact of managing storm water by utilizing the criteria and standards set forth in this plan.

The Technical Appendices of the above referenced plans provide all of the supporting data, procedures, parameters and watershed modeling.

SECTION III
TOBYHANNA CREEK WATERSHED CHARACTERISTICS

The Tobyhanna Creek is located in the northwest portion of Monroe County and portions of eastern Carbon County and southern Wayne County as illustrated in Figure III-I and is contained within four Municipalities in Monroe County, one Municipality in Carbon County and one Municipality in Wayne County as listed below:

Tobyhanna Creek Watershed - Municipalities

MONROE COUNTY	CARBON COUNTY
Coolbaugh Township	Kidder Township
Mount Pocono Borough	
Tobyhanna Township	WAYNE COUNTY
Tunkhannock Township	Lehigh Township

A. Drainage Area

Tobyhanna Creek drains a total surface area of approximately 127 square miles. The Tobyhanna Creek begins at Pepridge Swamp in Lehigh Township and flows southwest through Pocono Pines. It then flows westward and combines with Tunkhannock Creek near Blakeslee, then joins the Lehigh River.

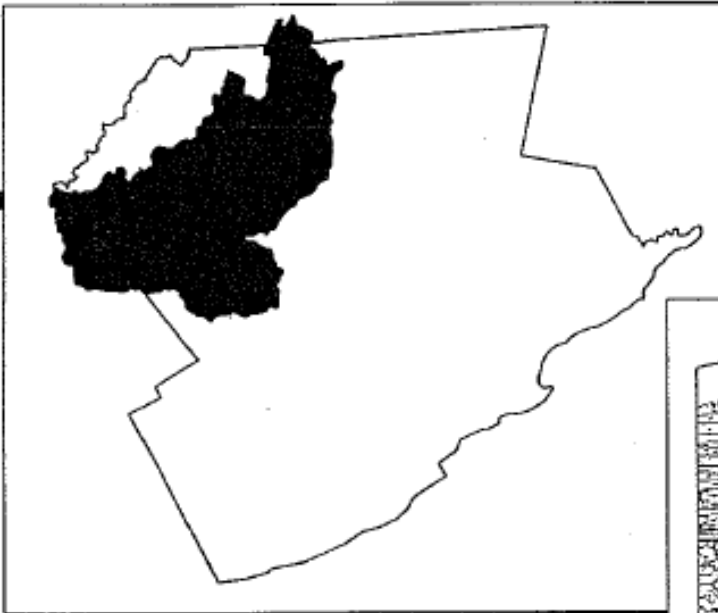
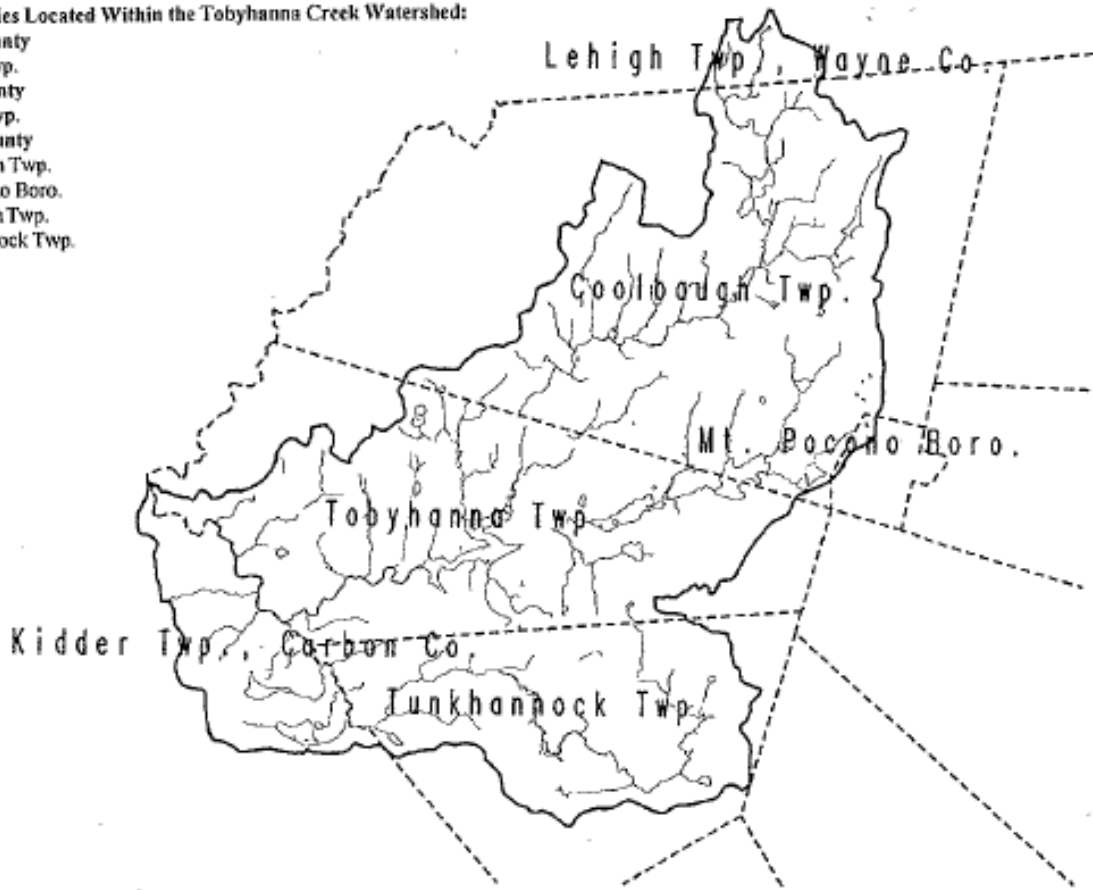
The major tributaries to the Tobyhanna Creek are:

East Branch Dresser Run	Tunkhannock Creek
Upper Tunkhannock Creek	Two Mile Run
Wagner Run	Davey Run

Tunkhannock Creek, the largest tributary to Tobyhanna Creek, flows in a west/northwestern direction to Blakeslee and its confluence with Tobyhanna Creek

Municipalities Located Within the Tobyhanna Creek Watershed:

- Carbon County**
- 1. Kidder Twp.
- Wayne County**
- 1. Lehigh Twp.
- Monroe County**
- 1. Coolbaugh Twp.
- 2. Mt. Pocono Boro.
- 3. Tobyhanna Twp.
- 4. Tunkhannock Twp.



DRAINAGE AREA:
127.12 SQUARE MILES

Figure III-1 Tobyhanna Creek Watershed

B. Land Use

The major land use categories within the Tobyhanna Creek Watershed include residential, commercial, industrial, and forest land. The percentage of land use by category within the watershed for the most part, is indicative of the remainder of the Counties. For instance, only 14.5 percent of the Tobyhanna Creek Watershed is classified as developed, 1 % is farmland (cropland and pasture land), and 69% is forested. Although the land use in the Tobyhanna Creek Watershed is diversified, large portions of the land are undeveloped with the potential for significant future development.

The central and northeast portions of the watershed and the southern portion of Kidder Township area in Carbon County are the most developed. A majority of the commercial, industrial, and high density residential activity is located within these areas. The remainder of the watershed, including Coolbaugh, Tobyhanna and Tunkhannock Townships, is predominantly undeveloped forest or agricultural land. Commercial and industrial activity within this portion of the watershed is limited, with residential activity confined mostly surrounding the lake regions. Residential development has progressed rapidly over the years necessitating proper storm water management.

Route 940 which traverses the entire central portion of the watershed is the major transportation artery within the watershed.

Table III-I shows the overall land use by category within the Tobyhanna Creek Watershed.

Land Use	Area (acres)	Percent
Agriculture	236.1154	0.2902
Commercial	318.9387	0.3920
Forest	63209.1000	77.6928
Graded	283.4354	0.3484
Industrial	97.2214	0.1195
Meadow	1631.9252	2.0059
Open Space	1062.9756	1.3065
Orchard	18.2458	0.0224
Pasture	418.9765	0.5150
Paved	1554.0507	1.9101
R-1	1220.3757	1.5000
R-2	1402.8921	1.7243
R-3	5358.2721	6.5861
R-4	1226.6497	1.5077
R-5	519.3610	0.6384
R-6	91.1872	0.1121
R-7	311.8736	0.3833
Water	2396.1489	2.9452

C. Topography and Streambed Profile

The topography of the watershed is characterized by rolling, gentle to steep hills of moderate relief. The highest point in the watershed is Kistler Ledge in Coolbaugh Township which divides the Tobyhanna Creek and Wallenpaupack Creek Watersheds with an elevation of 2215 feet above sea level U.S.G.S. datum. The lowest point occurs at the Tobyhanna Creek/Lehigh River confluence with an approximate elevation of 1420 feet. There are major impoundments in the watershed including Tobyhanna Lake, Lake Naomi and Pocono Lake.

The streams generally have shallow beds with gravel obstructions which cause bottom land flooding during prolonged rains, typically in the spring of the year. Currently, most of the bottom land is in forest. The average stream bed slope of the Tobyhanna Creek is approximately 0.4 percent.

D. Soils

Soils derived from the underlying bedrock (residual soils) have various drainage properties depending upon the type of bedrock from which they evolved. Soils derived from shales and siltstones may be fairly well-drained. The Natural Resources Conservation Service (N.R.C.S.) has nationally classified soils into four hydrologic soil groups, "A" through "D". Hydrologic soil group "A" is the most pervious with the least amount of natural runoff while soils in hydrologic group "D" are tight, low permeable soils with high runoff rates. The majority of the soils in the Tobyhanna Creek Watershed are of the "C" hydrologic soil group whereas the B, C and D soils are equally distributed in the Tunkhannock Creek Watershed. Figure III-2 of Appendix D shows the locations of the four hydrologic soil groups for the Tobyhanna Creek Watershed. Soils and Hydrologic Soils Group designations for locations within the watershed may be obtained through the USDA Web Soil Survey at the following link: <https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

The watershed is comprised of dominantly deep soils formed in glacial till mainly in the Appalachian Plateau Province and of the following associations.

Wurtsboro-Swartswood-Volusia: Nearly level and gently sloping, deep, well drained to somewhat poorly drained soils underlain by gray to yellowish brown glacial till.

Chippewa-Norwich-Mucky peat: Nearly level, deep, poorly drained and very poorly drained soils underlain by pinkish gray and gray glacial till and organic material.

Wellsboro-Morris-Lackawanna: Nearly level and gently sloping, deep, well drained to somewhat poorly drained soils underlain by reddish glacial till.

Empeyville-Worth: Nearly level and gently sloping, deep, well drained to somewhat poorly drained soils underlain by brownish glacial till.

The Tunkhannock Creek Watershed is comprised mostly of:

Clymer-Buchanan: Nearly level and gently sloping, deep, well drained to somewhat poorly drained soils underlain by brownish glacial till and colluvium.

E. Climate

Monroe County is generally cool and humid with one-third of the precipitation falling in the

form of snow during the winter months. Spring snowmelt causes streams to rise. The average annual precipitation is 45 inches with the heaviest rainfall distribution in the months of June, July and August.

Within a period of years, there is a great fluctuation of precipitation. In summer and in the early part of autumn, a dry condition often exists in most of the soils. Summer rains are of short duration and are usually in the form of thundershowers.

F. Description of Data Collection

1. Topography: The base map was developed utilizing U.S.G.S. topographic quadrangles at one inch equals 2,000 feet (1:24,000 scale). Municipal boundaries, land slopes and drainage courses could all be determined from the base map. Subwatersheds or subareas used in the watershed modeling process were then overlaid onto this base map.
2. Geology: Although geology does not play a direct role in surface runoff in the Tobyhanna Creek due to the absence of limestone sinkholes or deep mine areas; geology does play a major role in soil types through parent material breakdown.
3. Soils: Soils were identified from the Monroe, Carbon and Wayne County Soil Surveys of the U.S. Department of Agriculture's Natural Resources Conservation Service (N.R.C.S.). The Carbon and Wayne County Soils were digitized and then matched with the Monroe County Soils which were digitally recorded by NRCS.
4. Land Cover/Land Use: Existing land use was determined from several sources. Open space, commercial, industrial land uses, etc. were analyzed using infrared aerial photographs of the watershed, U.S.G.S. topographic maps, soil surveys and field verification where necessary. Each land use was then digitized onto a land use and stored in the computer. Composite runoff curve numbers could then be automatically generated by overlaying with the hydrologic soil group for input into the computer models. The existing conditions land use maps for the Tobyhanna Creek Watershed may be found in Figure III-3 of Appendix D.

G. Existing Significant Obstructions

Information on obstructions and their capacities were obtained by the Monroe County Conservation District, Planning Commission and Consultant. Capacities were obtained using hydraulic methods and design charts obtained from the Federal Highway Administration. The reported design parameters and flow capacities for each obstruction and the hydraulic charts/relationships used to determine the capacities can be found in the Technical Appendix of the original plan. The obstruction capacities were then compared to the peak flow at that point derived through the modeling process for each design storm duration and frequency. Flood frequency relationships were then developed from each obstruction and were recorded in tabular form in the Technical Appendix. From these flood-frequency relationships, those obstructions found to be significant were determined. A significant obstruction is defined as "any structure or assembly of materials which would impede, retard, cause ponding or diversion of storm water runoff or erosion of surrounding land or stream banks". Significant obstructions were classified into seven (7) categories as follows:

1. Those obstructions which are able to pass the 100-year, 24-hour storm and greater without obstructing the flow.

2. Those obstructions which are not able to pass the 100-year, 24-hour storm and greater without obstructing the flow.
3. Those obstructions which are not able to pass the 50-year, 24-hour storm and greater without obstructing the flow.
4. Those obstructions which are not able to pass the 25-year, 24-hour storm and greater without obstructing the flow.
5. Those obstructions which are not able to pass the 10-year, 24-hour storm and greater without obstructing the flow.
6. Those obstructions which are not able to pass the 5-year, 24-hour storm and greater without obstructing the flow.
7. Those obstructions which are not able to pass the 2.33-year, 24-hour storm and greater without obstructing the flow.

The locations of all obstructions including those which fall into the seven categories above can be found in Figure III-4 of Appendix D.

H. Projected and Alternative Land Development Patterns in the Watershed

1. Projected Land Development Patterns

All of the townships within the watershed are predominately semi-rural in nature and largely undeveloped. Conversely, a majority of suitable land in the Boroughs of Mount Pocono has already been developed. Overall, potential development pressures will be minimal. Yet development pressures in a few select areas will be great.

Future development within the Tobyhanna Creek Watershed will most likely occur where public facilities are available. Commercial and industrial development will most likely be confined to industrial parks or areas where public water and sewers exist or will soon be available. These areas include the Blakeslee portion of Tobyhanna Township. Residential and commercial areas will continue to arise surrounding the major transportation routes of Interstate 80, Routes 115, 940, 380 and 611. Single lot residential development will continue to occur sporadically throughout the watershed.

Table III-2 provides an overview of the types of development that will occur when existing patterns are considered for each municipality within the watershed.

Table III-2
Development Potential by Municipality
Based Upon Existing Patterns in the Tobyhanna Creek Watershed

Municipality	R-7	R-6	R-5	R-4	R-3	R-2	R-1	I	C	OS
Kidder Township	-	-	-	-	-	-	-	-	-	-
Lehigh Township	-	-	-	-	-	-	-	-	-	-
Coolbaugh Township	-	-	-	-	-	O*	-	O	O	-
Mt. Pocono Borough	-	-	-	-	-	-	-	-	X	-
Tobyhanna Township	-	-	-	O	-	X	-	-	O	-
Tunkhannock Township	-	-	-	-	-	O	-	-	O	-

- | | |
|--|----------------------------|
| R-7 Residential Lots (1/8 ac. or less) | OS Open Space |
| R-6 Residential Lots (1/8 ac. - 1/4 ac.) | X Major Development Impact |
| R-5 Residential Lots (1/4 ac. - 1/3 ac.) | O Minor Development Impact |
| R-4 Residential Lots (1/3 ac. - 1/2 ac.) | ---- No Impact |
| R-3 Residential Lots (1/2 ac. - 1 ac.) | I Industrial |
| R-2 Residential Lots (1 ac. - 2 ac.) | C Commercial |
| R-1 Residential Lots (2 ac. - 4 ac.) | |

* - major impact for immediate Tobyhanna area

2. Impact of Runoff From Future Development

A Future Land Use Map was developed using existing growth patterns in conjunction with physical limitations (wetlands, floodplain, topography) as can be seen in Figure III-5 of Appendix D. The potential impact of additional runoff was then evaluated by placing the future land-use conditions into the computer model and re-running the model. A comparison of the predicted future conditions flows versus the existing conditions flows for the 100-year, 24-hour storm can be found in Table III-3. Other storm frequencies can be found in the Technical Appendix of the original plan. Increased development in a watershed increases runoff peaks and volumes and velocities which decrease the time to peak, increasing the frequency of flooding.

I. Present and Projected Development in the Flood Hazard Areas

1. Present Conditions

The Federal Emergency Management Agency (FEMA) and its predecessor, The U.S. Department of Housing and Urban Development, Federal Insurance Administration has prepared a flood insurance study for several municipalities in the Tobyhanna Creek Watershed. The areas studied by detailed methods were known flood hazard areas and areas of projected development. Those areas studied by approximate methods were those areas having low development potential or minimal flood hazards. The data was submitted to the Pennsylvania Department of Community and Economic Development (PA-CED) for review to insure the accuracy of the data.

Table III-4 summarizes the status of available flood data for the various township and streams at the time of the original study. Municipalities and FEMA should be contacted for the latest FIS study before use.

Detailed methods included hydrologic computations and detailed HEC-2 backwater computations. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction. Approximate analyses were used to study those areas having low development potential or minimal flood hazards.

At present, the 100-year floodplain within the Tobyhanna Creek Watershed is primarily forest and meadow lands. However, several residential and commercial areas along the Tobyhanna Creek and its tributaries lie within the floodplain.

Figure III-6 of Appendix D shows the 100-year floodplain for the Tobyhanna Creek Watershed. Infringements of residential and commercial areas are clearly shown by overlaying the cross-hatched areas on the floodplain. Table III-5 outlines the type of development and land use which infringe upon the floodplain by township, general location and creek or tributary.

TABLE III-3
PRESENT VERSUS FUTURE COMBINED PEAK FLOWS
100-YEAR 24-HOUR STORM

Subarea No.	Existing Pk Q cfs	Future Pk Q cfs	Subarea No.	Existing Pk Q cfs	Future Pk Q cfs
1	2387	2387	40	1656.5	1741
2	1778.4	1778.1	41	15752.3	15974.3
3	3869.1	3868.8	42	16084	16302.5
4	2581.3	2581	43	2048.2	2328.5
5	1335.6	1337.9	44	16356.2	16570.1
6	2042	2044	45	630.3	708.5
7	105	105	46	817	862.5
8	1142.8	1142.5	47	812.7	838.6
9	2279.7	2279.6	48	306.3	324.6
10	2828.8	2828.7	49	948.5	971.3
11	4691.5	4693.2	50	979.8	1027.6
12	5930.7	5950.5	51	668.7	660.6
13	6084.4	6098.1	52	576.6	613.3
14	746.6	746.6	53	736	747.1
15	7738.9	7738.9	54	1006.4	1029.1
16	9308.2	9316.9	55	1087.1	1142.9
17	10340	10868.5	56	446.6	484.3
18	1464.8	1469.4	57	1358.1	1459.1
19	11612.4	12142.8	58	21.4	21.4
20	13758.5	14290.9	59	1488.7	1610.7
21	1769.8	1769.9	60	300.2	300.2
22	951.9	985.2	61	357.6	357.6
23	3690	4234.8	62	1811.9	1915.6
24	686.5	744.6	63	2054.6	2315.1
25	4431	4837.6	64	87.3	87.3
26	1096.7	1092.9	65	160.3	160.3
27	2019.4	2045.6	66	2147.3	2406.8
28	1719.9	1941.8	67	2244.6	2513.4
29	1316.3	1653.6	68	18531.4	18772.9
30	1821.5	1845.8	69	18560.7	18804.3
31	3177.4	3390.5	70	2001.1	2001.1
32	443.7	447.5	71	18761.3	19004.9
33	5136.1	5386.4	72	19020	19269.1
34	1186.9	1186.7	73	3739.8	3789.4
35	3832.5	3966.7	74	99.6	99.6
36	4931	5064.5	75	3512	3612.7
37	4631.4	4679.5	76	19588.4	19838
38	5116.1	5203.8	77	20054	20307.5
39	15042.5	15262.7			

**TABLE III-4
AVAILABLE FLOOD DATA**

<u>MUNICIPALITY</u>	<u>STREAM</u>	<u>DATE OF STUDY</u>	<u>AGENCY</u>	<u>TYPE OF STUDY</u>
Coolbaugh Township (Monroe County)	Hummler Run	10/16/91	FEMA	Approximate
	Pole Bridge Run	10/16/91	FEMA	Approximate
	Tobyhanna Creek	10/16/91	FEMA	Detailed/Approximate
	Frame Cabin Run	10/16/91	FEMA	Approximate
	East Branch			
	Dresser Run	10/16/91	FEMA	Approximate
	Singer Run	10/16/91	FEMA	Approximate
	Jim Smith Run	10/16/91	FEMA	Approximate
	Kistler Run	10/16/91	FEMA	Approximate
	Duckpuddle Run	10/16/91	FEMA	Approximate
	Clear Run	10/16/91	FEMA	Approximate
	Hawley Run	10/16/91	FEMA	Approximate
	Red Run	10/16/91	FEMA	Approximate
	Dotters Run	10/16/91	FEMA	Approximate
Pollys Run	10/16/91	FEMA	Approximate	
Kidder Township (Carbon County)	Tobyhanna Creek	02/02/89	FEMA	Approximate
	Tunkhannock Creek	02/02/89	FEMA	Approximate
Lehigh Township (Wayne County)	N/A	03/04/88	FEMA	Approximate
Mt. Pocono Borough (Monroe County)	N/A	05/28/82	FEMA	Approximate
Tobyhanna Township (Monroe County)	Wagner Run	12/16/88	FEMA	Approximate
	Tobyhanna Creek	12/16/88	FEMA	Detailed/Approximate
	Upper Tunkhannock Cr.	12/16/88	FEMA	Detailed/Approximate
	Davey Run	12/16/88	FEMA	Approximate
	Red Run	12/16/88	FEMA	Approximate
Tunkhannock Twp. (Monroe County)	Tunkhannock Creek	09/04/85	FEMA	Approximate

N/A = Not applicable

**TABLE III-5
TOBYHANNA CREEK
PRESENT RESIDENTIAL AND COMMERCIAL AREAS
WITHIN 100-YEAR FLOODPLAIN**

Municipality	Waterbody/Stream	Land Use Which Infringes on Flood Boundary	General Location
Kidder Township	-	-	-
Lehigh Township	-	-	-
Coolbaugh Twp.	Dresser Run	R3	surrounding Dresser Lake
	Unnamed	RS, R3	west of Sterling Road
	Singer Run	R3	east of Tobyhanna State Park Road
	Unnamed Stream	R3	west of Dresser Lake
	Unnamed	R3	east of Echo Lake
	Unnamed	R3	east of Sterling Road
	Trib. of Dresser Run	R3	east of Dresser Run
	Unnamed Stream	R3	east of Tobyhanna State Park Road
	Mill Pond #1	R3,R4	east of Lakeside Drive
	Hummler Run	R3	north of Belmont Avenue
	Duckpuddle Run	R2	southwest of Belmont Avenue
	Clear Run	R1, R4, R3	north of Belmont Avenue
	Unnamed	R3	north of Locust Lake
	Stillwater Lake	R4, R7, R2	north of SR940
	Unnamed	R7,R4	between Stillwater or Pocono Summit Lake
	Pocono Summit Lake	R7	Pocono Summit Lake
	Hawley Run	R4, R7	east and west of Interstate 380
	Red Run	R7, R1, Commercial	east of Interstate 380
Tobyhanna Twp.	Unnamed	R1, R2, R3, R4	south of Stillwater Lake
	Stillwater Lake	R2, R3	Stillwater Lake
	Unnamed	R3, R4, RS	north of 940 between Lake Naomi and Stillwater Lake
	Lake Naomi	R2, R3, RS	Surrounding Lake Naomi
	Upper Tunkhannock	R2, R3, R4	north of 940
	Pocono Lake	R1, R2	surrounding Pocono Lake
	Davey Run	R1, R3	south of SR 940
	Red Run	R1, R3	north and south of SR 940
	Tobyhanna Creek	R4, R2	north and south of SR 940
Tunkhannock Twp.	Tunkhannock Creek	R3	north of SR 903
Mt. Pocono Boro	-	-	-

2. Future Conditions

As can be seen from the projected Future Land Use Map, Figure III-5, the potential for development in the floodplains is great. The 100-year flood elevation was determined on the land use characteristics at the time of the FIS study and does not account for increased runoff due to developmental pressures. Therefore, the potential for future flooding would increase as development continues if this Watershed Storm Water Management Plan were not adopted.

The trend would be that flood elevations would not rise significantly on broad, level floodplains but the floodplains would expand considerably in width, whereas in streams with steep embankments, the flood elevation would most likely increase significantly with little increase in the floodplain width. Increased flows from developing watershed conditions would also expand the current floodway widths in many instances, thus allowing the potential for existing development to infringe on the floodway. Allowing development in the flood plains is discouraged.

There are several large subdivisions with many vacant lots where they are not just yet sold, or were bought with a future building date in mind. An analysis was performed to see what impact a total build out of these lots would have on stormwater runoff. It was found that by building on the vacant lots in recorded subdivisions that flows could increase upwards to 134 cubic feet per second for particular sub watersheds. It is therefore advantages, however, not mandatory, to control the runoff from undeveloped individual lots. A procedure for municipalities to adopt to control this runoff is attached as Appendix E of the Model Ordinance.

J. Survey of Existing Drainage Problems and Proposed Solutions

Table III-6 summarizes the major problems for individual municipalities obtained from the municipal questionnaires and demonstrates the types of stormwater runoff and water quality problems in the watershed as well as where they occur in the watershed. Figure III-7 of Appendix D is a map of the stormwater problem areas in Monroe County and the Tobyhanna Creek Watershed. See Appendix A for a sample of the questionnaire used to identify these problem areas, and a summary of the responses received with references to the locations identified in Figure III-7.

TABLE III-6
TOBYHANNA CREEK WATERSHED PROBLEM AREAS

<u>Township</u>	<u>Problem Areas</u>
Coolbaugh Township	Sewer / Roadway Flooding
Kidder Township	No reported problem areas
Lehigh Township	No reported problem areas
Mt. Pocono Borough	No reported problem areas
Tobyhanna Township	Sewer/Roadway Flooding
Tunkhannock Township	No reported problem areas

Erosion and Sedimentation (E & S)

The Monroe County Conservation District is responsible for administering Title 25, Chapter 102 (Erosion Control Regulations). These regulations address accelerated erosion and the resulting sedimentation from earthmoving activities. Permanent stabilization of exposed areas and proper stabilization of channels of conveyance will reduce these problems.

Culverts and Outlets

The problems identified in Table III-6 are the result of inadequately sized culverts and/or unstable outlets which traverse state roads, township roads or private access roads. The typical solution involves performing a hydrologic study to determine pipe size and replacing the pipe with a properly sized unit. Costs are typically borne by the owner of the road.

Bridges

Many bridges reach capacity on an annual basis. The proposed solutions all involve performing hydrologic studies and increasing the hydraulic capacity underneath the roadway. Because of the high bed loads of streams within the watershed, gravel deposits threaten capacity in addition to bridge design.

As discussed in the Erosion and Sedimentation portion of this subtask, numerous streambank erosion problems exist. It should be noted that many of these areas are typical of stream characteristics within the watershed. While some pose a threat to personal property, most actually contribute to the unique habitats that make the streams in the watershed outstanding fisheries.

Flooding

Flooding in the watershed can be classified into two categories: 1) local flooding caused by inadequately sized culverts or conveyance systems; and 2) location of structures within the floodplain of the major tributaries. Of the sites identified in Table III-6, most of these are caused by inadequate conveyance systems in developed areas.

K. Existing and Proposed Storm Water Collection Systems

A technical review of available data concerning existing storm water collection systems was performed. There are a number of large developments, including but not limited to the Tobyhanna Army Depot, Pocono Mountain Industrial Center, Arcadia North, New Ventures Park, etc. that contain storm sewers. There are also a number of smaller commercial developments like Dollar General, Moose Crossings, Dunkin Donuts etc. that contain smaller scale storm sewers. The storm sewers were installed in accordance with Act 167 and the Municipal Ordinances in place at the time of approval. The projected life span is good with

general maintenance required for removal of debris at inlets and pipe and manhole cleaning.

A review of the storm drainage problem area inventory in relation to the storm sewer locations indicates that there are many isolated areas where proper storm water management through sewer extensions could alleviate the problem. The majority of the problems were due to surface runoff or clogged inlets. The data indicates that the storm water collection systems are sometimes inadequate for minimizing the local storm water runoff impact from development.

L. Existing and Proposed State, Federal and Local Flood Control Projects

Francis E. Walter Dam

An existing flood control dam located on the Lehigh River just downstream of the confluence of the Lehigh and Tobyhanna Creek which reduces flooding impacts of the Lehigh River in Allentown, Bethlehem and Easton. A comprehensive study was compiled in June of 1986 to raise the embankment and corresponding flood pool to provide even more protection. The existing flood pool creates a backwater on the lower reaches of the Tobyhanna Creek but does not inundate structures as designed.

M. Storm Water Collection and Control Facilities

Due to the rural nature of the watershed and the fact that the largest projects are constructed by the private sector, there are no municipal storm water collection and control facilities proposed for the next ten years other than those mentioned in Section L above. The cost, design capacity, construction and operation of these private facilities cannot be projected at this time since they occur on a case by case basis as a developer buys land, submits plans, and develops the tract. Typically, the cost of such facilities is paid through the developer's financing with costs transferred to the buyer.

N. Wetlands

Wetlands play an important role in the hydrologic process by providing digital baseflow attenuating flood flows and filtering pollutants. Wetland files were obtained from the US Fish and Wildlife Services and imported into the Tobyhanna Creek Watershed GIS to create Figure III-8 of Appendix D.

SECTION IV WATERSHED TECHNICAL ANALYSIS

A. Watershed Modeling

An initial step in the preparation of this storm water management plan was the identification of the storm water runoff simulation model to be utilized. A number of widely accepted computer models are available each of which has its own forte; however, for this study, it was necessary to select a model which:

- Modeled design storms of various durations and frequencies to produce routable hydrographs which could be combined.
- Was adaptable to the size of subwatersheds in this study.
- Could evaluate specific physical characteristics of the rainfall-runoff process.
- Did not require an excessive amount of input data yet yielded reliable results.

The model comparison yielded the decision that the Penn State Runoff Model (PSRM) would be utilized for the following reasons:

- It had been developed at the Penn State University specifically for the analysis of the timing of surface flow contributions to peak rates at various locations in a watershed.
- Although originally developed as an urban runoff simulation model, data requirements make it easily adaptable to a rural situation.
- Input parameters provide a flexible calibration process.
- It has the ability to analyze reservoir or detention basin routing effects and locations in the watershed.
- It is accepted by the Pennsylvania Department of Environmental Protection.

Although other models such as TR-20 may provide essentially the same results as the Penn State Runoff Model, PSRM's ability to compare subwatershed contributions in a Peak Flow Presentation table make it specifically attractive for this study. The Penn State Runoff Model generates runoff flow information for selected subareas along the drainage course and compares individual subarea contributions to the total runoff process. The model generates runoff quantities for a specified design storm based upon the physical characteristics of the subarea, and routes the runoff flow through the drainage system in relation to the hydraulic characteristics of the stream.

The amount of runoff generated from each subarea is a function of its slope, soil type or permeability, percent of the subwatershed that is developed, (i.e. percent of impervious cover) and its vegetative cover.

B. Calibration Process

In order to model a watershed with confidence and reliability, the chosen model should be calibrated against actual field data or actual storm events. Limited stream flow records were available for this study from two USGS gauges located on the main branch of the Tobyhanna Creek near Blakeslee and another on the Tunkhannock Creek near Long Pond. These locations correspond to Subarea 71 and Subarea 54, respectively, in the watershed plan. The Blakeslee stream gauge is still an active gauge with records beginning in October 1961. The Tunkhannock Creek gauge is also currently in operation and has been recording flows since March 1965. Records for both gauges were analyzed and information on annual peak discharges was obtained from USGS.

In addition to the storm events data obtained from USGS, several statistical regression methods were researched to develop flood peaks for various design storms. Calibration of the model was then performed utilizing peak flow data generated from both the USGS stream gauges and the adopted values from the statistical regression methods. Two actual storm events were chosen for calibration along with the 5-year and 100 year design storm flow.

C. Verification

To verify the calibrated model, the model was run for the 2.33-year and 50-year storms and compared to the respective adopted values. Table IV-1 represents the results of the calibrated model.

TABLE IV-1
Comparison of Flow for the
Tobyhanna Creek PSRM Model

Return Period (yrs)	Tobyhanna Creek at Blakeslee Gauge (118 sq. mi.)		Tunkhannock Creek at Long Pond (21 sq. mi.)	
	Adopted Value (cfs)	Modeled Value (cfs)	Adopted Value (cfs)	Modeled Value (cfs)
100	19,150	18,761	977	1,006
50	14,500	14,423	877	699
10	7,250	7,519	650	418
2.33	3,400	2,052	408	172

D. Design Storm Rainfall

A comparison of design rainfall totals was performed to best determine the rainfall amounts to be used for the initial analysis. A wide range of rainfall amounts were found for design storms based upon which method or source was utilized. The Tobyhanna Creek Watershed is located in PA Rainfall Region V. Region V values as specified by PADEP are displayed in Table IV-2 and represent a median value of those rainfall amounts analyzed.

Table IV-2
Design Storm Rainfall Amount (in)

Return Period	1	6	12	24
2.33	1.40	2.40	3.00	3.48
5	1.62	2.76	3.36	4.20
10	1.85	3.30	4.08	5.28
25	2.20	3.90	4.80	6.00
50	2.60	4.62	5.76	7.20
100	2.95	5.46	6.22	8.40

Source: "Field Manual of Pennsylvania Department of Transportation Storm Intensity -Duration-Frequency Charts", May 1986.

E. Modeling Process

The Tobyhanna Creek watershed was divided into subwatersheds for modeling purposes. Considerations in the subdivision process were location of obstructions, known flooding, drainage or erosion problems, impoundments which may influence the hydrology and tributary confluences. The most downstream point of each of these areas is considered a "point of interest" in which increased runoff must be analyzed for its potential impact.

The ultimate goal for selecting the key points of interest is to provide overall watershed storm water runoff control through effective control of individual subarea storm runoff. Thus, comprehensive control of storm water runoff for the entire watershed can be achieved through storm water management in each subbasin.

The watershed was then modeled to determine the hydrologic response for the 2.33, 5, 10, 25, 50, and 100-year storm events for the 1, 6, 12 and 24-hour storms.

The modeling process addressed:

- peak discharge values at various locations along the stream and its tributaries;
- time to peak for the above discharges;
- runoff contributions of individual subareas at selected downstream locations;
- flow values contained in the channel and overflow values; and overall watershed timing.

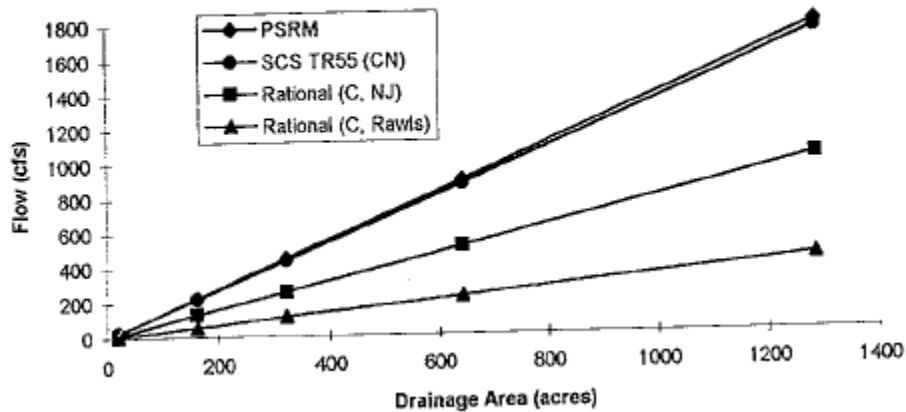
Additional model runs were made for the purpose of assessing alternative storm water management approaches. This involves an evaluation of individual development detention versus a "regional" facility, the results of which are discussed in Section V. The release rate (Management Districts) was also evaluated in addition to the possibility of waiving Management Districts in favor of a downstream facility controlling multiple subbasins, the results of which are also discussed in Section V.

An engineering evaluation of the applicability of various calculation methodologies was conducted as part of the plan preparation and was supported by previous research. Typical subwatersheds varying in size were selected to evaluate desktop methods for determining on-site

runoff. The results were compared with the calibrated PSRM results. Figure IV-I shows a comparison of three calculation methodologies for one-acre lots. The conclusions drawn from the analysis are that, utilizing the S.C.S. curve numbers and rational 'C' values specified in Ordinance Appendix B, either the curve number method or rational method can be used to determine pre- and post-development runoff peak rates.

The rational method only determines peak rates, however. The design of any detention facility would have to include a routing of the calculated runoff through the basin. Routing refers to the calculation process of taking the post-development runoff and determining if the detention facility's stage/storage/discharge characteristics are adequate.

**FIGURE IV-1
Calculation Methodologies Comparison**



F. Water Quality

The streams in the Tobyhanna and Tunkhannock Creek watersheds currently have good water quality. The Tunkhannock Creek Watershed is unique in that it contains 35, rare and endangered species and is included in the Nature Conservancy's global list of "Last Great Places" of ecosystems of the highest biodiversity significance.

Water quality sampling was therefore performed to determine the impact of development on the water resources. The task included the monitoring of water quality at two locations through a series of field samplings which will include seven major parameters of concern, namely:

- Total Suspended Solids (TSS)
- Total Phosphorous (TP)
- Ammonia Nitrogen (NH₃-N)
- pH
- Dissolved Oxygen
- Temperature
- Nitrate-Nitrogen (NO₃-N)

These sampling points were strategically located in the watershed at the stormwater collection points of a commercial and a forested land use. Through sampling taken at these locations, data was analyzed concerning impacts of urban runoff on the quality of the water in the streams being studied. The primary goal of this monitoring program is to create a database of pollutant concentrations sampled at these locations for a number of storm events. Each storm event was closely monitored to arrive at a description of the variation of pollutant concentrations over time. This objective required several samples to be taken during a single storm event.

The ultimate goal of nonpoint source pollution (NPS) assessment is the identification of critical loadings so that best management practices can be incorporated into the stormwater management plan to minimize NPS loads occurring from new land developments. Loadings are calculated as an average annual unit area (lbs./acre/year) to compare against other subareas and EPA or state standards.

Accepted published loadings rates were also applied to the land use map already digitized in the GIS to obtain a unit areal loading for each subarea in the watershed. The land use map is extremely complex with many land use polygons in each of the subareas. The attribute table option in the GIS allowed a loading calculation in a fraction of the time that could be performed manually. This gave loading rates at the points of interest, the outlet of each subarea. As shown in Figures IV-2 through IV-5 of Appendix D. Figure IV-2 shows the annual pollutant loads (pounds/acre/year) for total nitrogen and total phosphorous while Figure IV-3 shows the annual pollutant loads for BOD and Suspended Solids under existing land use conditions. Figures IV-4 and IV-5 show the same respective pollutant loadings under the Future Land Use scenario.

These loading rates were then compared to the water quality data collected on the Tobyhanna Creek and its tributaries as part of the ongoing Monroe County Planning Commission Water Quality Study and was also be compared with EPA's, DRBC's and DEP's stream water quality criteria. Critical subareas were identified by comparing and ranking unit areal loadings and further evaluated as to why these subareas were critical. The appropriate BMPs were then recommended for those subareas and included in the Act 167 Model Ordinance.

G. Opportunities and Constraints

In order to evaluate the land areas in the Tobyhanna Creek Watershed which warrant special considerations (development structures, preservation, etc.) an Opportunities and Constraints Map was developed (Figure IV-6 of Appendix D). Utilizing GIS, certain soil feature constraints (erodible soils, steep slopes, flooding hazard, hydric soils) were overlaid with material feature opportunities. The remaining areas are the lands generally most suitable for development. Figure IV-6 was developed from the Soil Survey and such boundaries shown are approximate and should only be used as a general guide. Detailed field investigations and mapping would be required to verify such factors as septic system and fielding lot suitability.

Another source for planning and identification of opportunities is the "Plan for Clean Water, A Tool for Municipal Officials and Open Space Planners to Help Determine Lands Most Important to Protecting Water Quality".

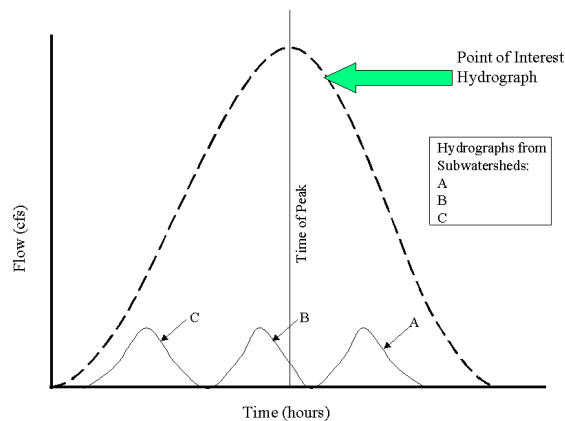
SECTION V STANDARDS AND CRITERIA FOR THE CONTROL OF STORM WATER

A. Description of Management Districts

The timing of runoff from a development site in a particular subarea in relation to the time and peak site of flows at the points of interest (POI) (subarea outlets) dictate how the runoff in a particular subarea should be managed.

Figure V-1 shows a simplified version of how various subarea hydrographs would contribute to the peak flow at a particular point of interest. As can be seen from Figure V-1, hydrograph “A” peaks after the point of interest hydrograph. In this case standard detention or reducing post development flows to predevelopment rates would attenuate the flows past A’s peak, which would not influence the peak of the POI. A development site in subarea B would contribute flow at a time between the start and end of that subareas hydrograph, and standard detention would attenuate flow to a point where it is increasing flow at the POI (Hydrograph B1) therefore, storm water management controls would need to reduce the outflow to a higher frequency (smaller) storm. Flows in subarea A enter and exit the stream system before the peak flow occurred at the POI, therefore it would be advantages to not detain, if possible. Subareas A, B, and C on the sample would fall into 3 districts A, B, and C as shown on Figure V-2 of Appendix D. The watershed management district map is also available online on the Monroe County Conservation District’s website. Development of the design storm criteria was based upon downstream obstruction capacities and problem areas identified in the study.

Figure V-1
Relative Timing of Sub-Watershed Hydrographs



In performing the tasks for the Tobyhanna Creek Watershed Plan under Act 167, a major goal was to determine where in the watershed storm water detention was appropriate for new development and, just as importantly, where detention was not appropriate. It was also important to determine to what extent storm water detention would be required in individual subareas as described above.

Individual subareas would fall into one of three districts:

Table V-1: Peak Runoff Rate Requirements

<u>District</u>	<u>Subareas</u>	<u>Post-Development</u>	<u>Pre-Development</u>
A	1-4, 7, 8	2-year	2-year
	21-40, 43	10-year	10-year
	45-67, 73	50-year	50-year
B	5, 6,	10-year	2 year
	9-20,	50-year	10-year
C	Development sites which can discharge directly to a stream or watercourse main may do so without control of post-development peak rate of runoff. If the post development runoff is intended to be conveyed to a stream or watercourse, assurance must be provided that such system has adequate capacity to convey the increased peak flows. When adequate capacity of downstream system does not exist and will not be provided through improvements, the post-development peak rate of runoff must be controlled to the predevelopment peak rate as required in District "A" provisions (post-development flows to pre-development flows for the 2, 10 and 50 year storms). The subwatershed areas which are included in this district are: 41, 42, 44, 68-72, 74-77.		

The stormwater modeling completed for the plan was conducted utilizing a 2.33 year storm. The release rate requirements are based on the 2 year storm for the sake of simplicity in modeling and to be consistent with PaDEP requirements and accepted industry practices.

For these subareas in District "C", it was determined that it would be advantageous to not detain the runoff volume for the larger storms but to allow it to exit the watershed before the peak reaches that particular subarea. It has been found that these areas still require control of the water quality storms to maintain stream water quality. For water quality, the objective is to detain the 2-year flow and release it at the 1-year predevelopment rate. At the same time the objective is to not attenuate the larger storms. This can be accomplished by configuration of the outlet structure to not control the larger storms, or by a bypass or channel to divert only the 2-year flood into the basin or divert flows in excess of the 2-year storm away from the basin.

Development in those subareas designated on Table V-1 as District "C" must convey the generated storm water runoff to a stream or watercourse in a safe manner. The conveyance must manage the quantity, velocity and direction of resulting storm water runoff in a manner which otherwise adequately protects health and property from possible injury pursuant to Act 167, does not overtax existing drainage facilities, and does not cause erosion or sedimentation. Anyone who proposes no detention must comply with Section 305. G, and H of the Model Ordinance. Acceptable velocities shall be based upon criteria contained in the DEP "Erosion and Sediment Pollution Control Program Manual". Post-

development flows which are greater than the pre-development flows can only be released if the discharge does not exacerbate a significant obstruction or existing problem area, or would overload existing storm sewer networks. If it would, proper storm water management, obstruction replacement or standard detention would be required.

Additionally, any flow from the 50-year storm not able to be conveyed by downstream drainage facilities must be addressed and where necessary, additional controls installed to assure collection of this water by control facilities where required by the storm water design.

Proper analysis of channel capacity downstream of a development site for the purpose of discharging at a rate greater than predevelopment peak flow rates is essential for insuring that the goal of not creating any new problem areas or aggravating existing drainage problem areas is achieved. The analysis must include the assumption of complete build-out of the tributary areas to the channel based upon the Future Land Use Map (Figure III-5) or the latest zoning revision after plan adoption. Also, storm water control measures consistent with the Plan must be assumed in analyzing projected development tributary to the point of evaluation.

Culverts, bridges, stream enclosures or any other facilities proposed within District "C" must pass flows for the 50-year design storm without causing a backwater, or meet more stringent DEP criteria. Such facilities shall allow an unimpeded flow to be conveyed without creating a backwater condition.

Stream channels, water courses or other conveyance facilities may be improved to meet the above requirements and alleviate existing capacity deficiencies as long as local, state, and federal requirements are met and permits obtained.

Any facilities that are subject to PaDEP Chapter 105 criteria must be designed to be consistent with Chapter 105.

B. Standards and Criteria

The required standards and criteria developed are summarized in Table V-2 while recommended standards and criteria can be found in Table V-3.

**TABLE V-2
REQUIRED CRITERIA & STANDARDS**

REQUIRED STANDARD	BENEFIT
<u>Storm Water Management</u> A, B, and C Management Districts	No increase in runoff on a watershed wide basis, storm water detention and attenuation
<u>Calculations Methodology</u> Parameters must be obtained from the Model Ordinance	Calculations for consistent storm water management.
<u>Existing Storm Sewers Or Culverts</u> Discharge into existing sewer networks or culverts will be based on system capacity or design storm(s), whichever is more restrictive. Note: The design storm detention shall not necessarily be applied to the sewers and/or culverts.	Preserve sewer/culvert capacity thereby reducing O & M and replacement costs.
<u>Discharge of Accelerated Runoff</u> Accelerated storm water runoff shall be safely discharged into existing drainage patterns and storm sewers without adversely affecting properties or channel scouring and erosion.	Safe conveyance, continued surface and groundwater quality, flow attenuation.
<u>Inappropriate Outlets</u> If outlet from storm water conveyance systems from a development site to a stream, tributary, stabilized channel, or storm sewer is not possible, runoff shall be collected in a detention/retention facility and discharge at a non-erosive rate. Outlets discharging onto adjacent property owner's properties must have adjacent property owner's written permission.	Safe conveyance, continued surface and ground water quality, storm water detention, flow attenuation.
<u>Wetlands</u> Coordinate regulatory agencies involvement within wetland areas.	Infiltration, surface and groundwater recharge, stream baseflow, water quality, flow attenuation, detention.
<u>Erosion and Sediment Pollution Control</u> Coordinate with Administrative and Regulatory agencies involvement with earth disturbance activities.	Infiltration, structure integrity, surface water quality, safe conveyance, stream, culvert, and channel capacity.

**TABLE V-3
RECOMMENDED CRITERIA & STANDARDS**

RECOMMENDED STANDARD	BENEFIT
<p><u>Floodplains</u> Those floodplains in which the floodplain retains water and acts as a detention basin shall not be filled so as to reduce the storage capacity.</p>	<p>Natural storm water detention/flood control downstream.</p>
<p><u>Hydrologic Soils Groups A & B</u> All development proposed in hydrologic soil groups A and B should investigate the implementation of infiltration or retention structures for the Storm Water Control measures as opposed to surface detention. This also pertains to the portions of the watershed that have storm sewers. Recharge structures installed prior to connecting into the storm sewers are recommended where soils and physical conditions permit.</p>	<p>Groundwater/stream baseflow recharge, flow attenuation.</p>
<p><u>Roof Drains, Residential/Commercial Disconnection</u> - Prevent all roof drains from discharging into storm sewers, roadside ditches or channels. Discharge to lawns, recharge basin or storage facilities.</p>	<p>Promotes infiltration, flow attenuation and increases runoff time of concentration, flow attenuation.</p>
<p><u>Pervious Surfaces</u> The use of pervious materials will be encouraged for parking surfaces and sidewalks.</p>	<p>Infiltration, groundwater recharge.</p>
<p><u>Structures</u> Concentrate on locating facilities within areas conducive to recharge and design, accommodate recharge to meet release rate requirements.</p>	<p>Infiltration, groundwater recharge, stream baseflow.</p>
<p><u>Steep Slopes</u> Regulate activities in critical slope areas where management of storm water by structure is inappropriate.</p>	<p>Stream base flow, flow attenuation conveyance integrity, surface water quality.</p>

C. Sub-Regional (Combined Site) Storage

Traditionally, the approach to storm water management has been to control the runoff on an individual site basis. However, there is a growing commitment to finding cost-effective comprehensive control techniques which both preserve and protect the natural drainage system. In other words, two developers developing sites adjacent to each other could pool their capital resources to provide for a community storm water storage facility in the most hydrologically advantageous location. The goal should be the development and use of the most cost-effective and environmentally-sensitive storm water runoff controls, which significantly improve the capability and flexibility of land developers and communities to control runoff consistent with the Tobyhanna Creek Storm Water Management Plan and the release rates set forth.

An advantage to combining efforts is to increase the opportunity to utilize storm water control facilities to meet other community needs. For example, certain storm water control facilities could be designed so that recreational facilities such as ball fields, open space, volleyball, etc. could be incorporated. Natural or artificial ponds and lakes could serve both recreational and storm water management objectives.

To take this concept a step further, there is also the possibility that the storm water could be managed "off-site"; that is, in a location off the property(s) in question. There could be publicly owned detention, retention, lake, pond or other physical facilities to serve multiple developments. The design and release rate would need to be consistent with the Plan.

D. "No Harm Option"

"No Harm" Option - For any proposed development site not located in District "C", the developer has the option of using a less restrictive runoff control (including no detention) if the developer can prove that "no harm" would be caused by discharging at a higher runoff rate than that specified by the Plan. The "no harm" Option is used when a developer can prove that the post-development hydrographs can match pre-development hydrographs, or if it can be proved that the post-development conditions will not cause increases in peaks at all points downstream. Proof of "no harm" would have to be shown based upon the following "Downstream Impact Evaluation" which shall include a "Downstream Hydraulic Capacity Analysis" in accordance with Section 305H of the Model Ordinance to determine if adequate hydraulic capacity exists. The land developer shall submit to the Municipality this evaluation of the impacts due to increased downstream stormwater flows in the watershed.

1. The "Downstream Impact Evaluation" shall include hydrologic and hydraulic calculations necessary to determine the impact of hydrograph timing modifications due to the proposed development upon a dam, highway, structure, natural point of restricted streamflow or any stream channel section, established with the concurrence of the Municipality.
2. The evaluation shall continue downstream until the increase in flow diminishes due to additional flow from tributaries and/or stream attenuation.
3. The peak flow values to be used for downstream areas for the design return period storms (2-, 10-, 50- and 100-year) shall be the values from the calibrated Penn State Runoff Model for the Tobyhanna Creek Watershed. These flow values would be supplied to the developer by the Conservation District upon request.

4. Developer-proposed runoff controls which would generate increased peak flow rates at storm drainage problem areas would, by definition, be precluded from successful attempts to prove "no-harm."

Capacity improvements may be provided as necessary to implement the "no harm" option which proposes specific capacity improvements to provide that a less stringent discharge control and would not create any harm downstream.

Any "no harm" justifications shall be submitted by the developer as part of the Drainage Plan submission per Article IV of the Model Ordinance.

Attempts to prove "no harm" based upon downstream peak flow versus capacity analysis shall be governed by the following provisions:

- a) The peak flow values to be used for downstream areas for the design return period storms shall be the values from the calibrated Penn State Runoff Model for the Tobyhanna Creek watershed. These flow values would be supplied to the developer by the Conservation District upon request.
- b) Any available capacity in the downstream conveyance system as documented by a developer may be used by the developer only in proportion to his development site acreage relative to the total upstream undeveloped acreage from the identified capacity (i.e. if his site is 10% of the upstream undeveloped acreage, he may use up to 10% of the documented downstream available capacity).
- c) Developer-proposed runoff controls which would generate increased peak flow rates at documented storm drainage problem areas would, by definition, be precluded from successful attempts to prove "no harm."

Any "no harm" justifications shall be submitted by the developer as part of the Drainage Plan submission per Article IV of the Model Ordinance.

E. "Hardship Option"

The development of the plan and its standards and criteria was designed to maintain existing peak flows throughout the Tobyhanna Creek Watershed as the watershed becomes developed. There may be certain instances, however, where the standards and criteria established are too restrictive for a particular landowner or developer. The existing drainage network in some areas may be capable of safely transporting slight increases in flows without causing a problem or increasing flows elsewhere. If a developer or homeowner can prove that: 1) the developer/homeowner cannot reasonable comply with the ordinance requirements due to lot conditions; and 2) the developer/homeowner can demonstrate "no harm" if the hardship waiver is granted, the hardship option may be applied. The landowner would have to plead their case to the Municipal Officials with the final determination made by the Municipality. Any landowners pleading the "hardship option" will assume all liabilities that may arise due to exercising this option. Financial obligations are not considered a hardship.

The Municipality (Governing Body) may hear requests for waivers where it is alleged that the provisions of this (Act I67) Ordinance inflict unnecessary hardship upon the Applicant.

The waiver request shall be in writing on an application form promulgated by the Municipality

and accompanied by the requisite fee based upon a fee schedule adopted by the Municipality. A copy of the completed application form shall be provided to each of the following: Municipality, Municipal Engineer, Municipal Solicitor and Planning Commission. The application shall fully document the nature of the alleged hardship.

The Municipality may grant a waiver provided that all of the following findings are made in a given case:

1. That there are unique physical circumstances or conditions, including irregularity of lot size, shape, or exceptional topographical or other physical conditions peculiar to the particular property, and that the unnecessary hardship is due to such conditions, and not the circumstances or conditions generally created by the provisions of this Ordinance in the Storm Water Management District in which the property is located;
2. That because of such physical circumstances or conditions, there is no possibility that the property can be developed in strict conformity with the provisions of this Ordinance, including the "no harm" provision, and that the authorization of a waiver is therefore necessary to enable the reasonable use of the property;
3. That such unnecessary hardship has not been created by the Applicant; and
4. That the waiver, if authorized, will represent the minimum waiver that will afford relief and will represent the least modification possible of the regulation in issue.

In granting any waiver, the Municipality (governing body) may attach such reasonable conditions and safeguards as it may deem necessary to implement the purposes of Act 167 and this Ordinance.

A Financial Distress shall not be considered under the hardship option.

**SECTION VI
ALTERNATE RUNOFF CONTROL TECHNIQUES
AND THEIR EFFICIENCY IN THE WATERSHED**

A. Regional Detention Facilities

One option in watershed-wide storm management is to control runoff using regional facilities. Developers could pool their capital to build a regional detention basin at a strategic location in place of installing a basin on each individual site.

The potential for locating regional facilities within the Tobyhanna Creek Watershed was evaluated. The six parameters used for locating such a facility were:

1. Site location's influence on the total watershed hydrology
2. Available undeveloped land
3. Ownership of the land
4. Topography
5. Environmental sensitivity of the locations
6. Total area and percent of the total contributing area to the basin location

TABLE VI-1
Regional Detention Facilities

Regional Detention Subarea	Tributary/Location	Available Storage Capacity (Ac. Ft.)	Contributing Drainage Area (Sq. Mi.)
4	Tobyhanna Lake	1037	8.4
16	Tobyhanna Creek	19287	31.9
46	Tunkhannock Creek	417	8.4

Subarea 4 - The Tobyhanna Lake has the potential to act as a regional detention facility to detain/attenuate flows with minor modifications to the embankment and spillway.

Subarea 16 - Located directly on the Tobyhanna Creek, this facility would benefit primarily the main stem of the Tobyhanna Creek to its confluence with the Lehigh River.

Subarea 46 - Located on the headwaters to the Tunkhannock Creek, this facility would benefit the main stem of the Tunkhannock Creek to its confluence with the Tobyhanna Creek.

Most ideal locations for regional detention would have large tributary areas, which naturally puts the locations on the main stem tributaries to the Tobyhanna Creek. The presence of major arterial roads traversing parallel to these tributaries precludes the construction of regional detention basins in most locations.

B. On-Site Storm Water Controls

As indicated in Volume 1, each developer must not allow the runoff from their site to exceed the applicable release rate applied to the subwatershed in which the site is located. This runoff control can be obtained in a number of different ways. Table VI-2 indicates a general overview of measures that can be applied to reduce or delay storm water runoff while Table VI-3 shows the advantages and disadvantages for several types of runoff control measures. It will be up to the developer to select the technique that is most appropriate to the type of project and physical characteristics of the site. Effective measures for reducing peak rates of runoff are not limited to those in Table VI-2. Additional BMPs are described in the PaDEP Stormwater BMP Manual as updated and revised.

In determining what measures or combination of measures to install, the following parameters should be considered:

1. Soil Characteristics (hydrologic soil group, [i.e. permeability, erodibility, etc.]
2. Subsurface conditions (depth to seasonal high water table, bedrock, etc.)
3. Topography (steepness of slope, earthwork requirements)
4. Existing drainage patterns (nearby streams, swales and flooding potential)
5. Economics
6. Advantages and disadvantages of each technique.

Infiltration structures are encouraged for soils with an “A” or “B” hydrologic rating (see Figure III-2). Innovative approaches are encouraged to aid in meeting the applicable release rate criteria. The general suitability of individual runoff control measures in the Tobyhanna Creek watershed are listed in Table VI-4.

**TABLE VI-2
VARIOUS ON-SITE STORM WATER CONTROL METHODS**

AREA	REDUCING RUNOFF	DELAYING RUNOFF
Large Flat Roof	<ol style="list-style-type: none"> 1. Cistern storage 2. Rooftop gardens 3. Pool storage or fountain storage 	<ol style="list-style-type: none"> 1. Ponding on roof by constricted downspouts 2. Increasing roof roughness <ol style="list-style-type: none"> a. Rippled roof b. Graveled roof
Parking Lots	<ol style="list-style-type: none"> 1. Porous pavement <ol style="list-style-type: none"> a. Gravel parking lots b. Porous or punctured asphalt 2. Concrete vaults and cisterns beneath parking lots in high value areas 3. Vegetated ponding areas around parking lots 4. Gravel trenches 	<ol style="list-style-type: none"> 1. Grassy strips on parking lots 2. Grassed waterways draining parking lot 3. Ponding and detention measures for impervious areas <ol style="list-style-type: none"> a. Rippled pavement b. Depressions c. Basins
Residential	<ol style="list-style-type: none"> 1. Cisterns for individual homes or groups of homes 2. Gravel driveways (porous) 3. Contoured landscape 4. Ground-water recharge <ol style="list-style-type: none"> a. Perforated pipe b. Gravel (sand) c. Trench d. Porous pipe e. Dry wells 5. Vegetated depressions 	<ol style="list-style-type: none"> 1. Reservoir of detention basin 2. Planting a high delaying grass (high roughness) 3. Gravel driveways 4. Grassy gutters or channels 5. Increased length of travel of runoff by means of gutters, diversions, etc.
General	<ol style="list-style-type: none"> 1. Gravel alleys 2. Porous sidewalks 3. Mulched planters 	<ol style="list-style-type: none"> 1. Gravel alleys

Source: Urban Hydrology for Small Watershed. Technical Release No. 55.

**TABLE VI-3
ADVANTAGES AND DISADVANTAGES OF
VARIOUS ON-SITE STORM WATER CONTROL METHODS**

MEASURE	ADVANTAGES	DISADVANTAGES
A. Cisterns and Covered Ponds	<ol style="list-style-type: none"> 1. Water may be used for: <ol style="list-style-type: none"> a. Fire Protection b. Watering lawns c. Industrial processes d. Cooling purposes 2. Reduce runoff while only occupying small area 3. Land and space above cistern may be used for other purposes. 	<ol style="list-style-type: none"> 1. Expensive to install 2. Cost required may be restrictive if the cistern must accept water from large drainage areas 3. Requires slight maintenance 4. Restricted access 5. Reduces available space in basements for other uses
B. Rooftop Gardens	<ol style="list-style-type: none"> 1. Esthetically pleasing 2. Runoff reduction 3. Reduce noise levels 4. Wildlife enhancement 	<ol style="list-style-type: none"> 1. Higher structural loadings on roof and building 2. Expensive to install and maintain
C. Surface Pond Storage (usually residential areas)	<ol style="list-style-type: none"> 1. Controls large drainage areas with low release 2. Esthetically pleasing 3. Possible recreation benefits <ol style="list-style-type: none"> a. Boating b. Ice skating c. Fishing d. Swimming 4. Aquatic life habitat 5. Increases land value of adjoining property 	<ol style="list-style-type: none"> 1. Requires large areas 2. Possible pollution from storm water and siltation 3. Possible mosquito breeding areas 4. May have adverse algal blooms as a result of eutrophication 5. Possible drowning 6. Maintenance problems

TABLE VI-3 (CONTINUED)

<p>D. Ponding on Roof by Constricted Downspouts</p>	<ol style="list-style-type: none"> 1. Runoff delay 2. Cooling effect for building <ol style="list-style-type: none"> a. Water on roof b. circulation through 3. Roof ponding provides fire protection for building (roof water may be trapped in case of fire) 	<ol style="list-style-type: none"> 1. Higher structural loadings 2. Clogging of constricted inlet requiring maintenance 3. Freezing during winter (expansion) 4. Waves and wave loading 5. Leakage of roof water into building (water damage)
<p>E. Increased Roof Roughness a. Rippled roof b. Gravel on roof</p>	<ol style="list-style-type: none"> 1. Runoff delay and some reduction (detention in ripples or gravel) 	<ol style="list-style-type: none"> 1. Somewhat higher structural loadings
<p>F. Porous pavement (parking lots and alleys) a. Gravel parking lot b. Holes in impervious pavements (1/4 in. diam.)filled with sand</p>	<ol style="list-style-type: none"> 1. Runoff reduction (a and b) 2. Potential groundwater recharge (a and b) 3. Gravel pavements may be cheaper than asphalt or concrete (a) 	<ol style="list-style-type: none"> 1. Clogging of holes or gravel (a and b) 2. Compaction of earth below pavement or gravel decreases permeability of soil (a and b) 3. Ground-water pollution from salt in winter (a and b) 4. Frost heaving for impervious pavement with holes (b) 5. Difficult to maintain 6. Grass or weeds could grow in porous pavement (a and b)
<p>G. Grassed channels and vegetated strips</p>	<ol style="list-style-type: none"> 1. Runoff delay 2. Some runoff reduction (infiltration recharge) 3. Esthetically pleasing <ol style="list-style-type: none"> a. Flowers b. Trees 	<ol style="list-style-type: none"> 1. Sacrifice some land area for vegetated strips 2. Grassed areas must be mowed or cut periodically (maintenance costs)

TABLE VI-3 (CONTINUED)

<p>H. Ponding and detention measures on impervious pavement</p> <ul style="list-style-type: none"> a. Rippled pavement b. Basins c. Constructed inlets 	<ul style="list-style-type: none"> 1. Runoff delay (a,b, and c) 2. Runoff reduction (a and b) 	<ul style="list-style-type: none"> 1. Somewhat restricted movement of vehicle (a) 2. Interferes with normal use (a and c) 3. Damage to rippled pavement during snow removal (a) 4. Depressions collect dirt and debris (a,b, and c)
<p>I. Reservoir or detention basin</p>	<ul style="list-style-type: none"> 1. Runoff delay 2. Recreation benefits <ul style="list-style-type: none"> a. Ice skating b. Baseball, football, etc. if land is provided 3. Esthetically pleasing 4. Could control large drainage areas with low release 	<ul style="list-style-type: none"> 1. Considerable amount of land is necessary 2. Maintenance costs <ul style="list-style-type: none"> a. Mowing grass b. Herbicides c. Cleaning periodically (silt removal) 3. Mosquito breeding area 4. Siltation in basin
<p>J. Converted septic tank for storage and ground-water recharge</p>	<ul style="list-style-type: none"> 1. Low installation costs 2. Runoff reduction (infiltration and storage) 3. Water may be used for: <ul style="list-style-type: none"> a. Fire protection b. Watering lawns and gardens c. Ground-water recharge 	<ul style="list-style-type: none"> 1. Requires periodic maintenance (silt removal) 2. Possible health hazard 3. Sometimes requires a pump for emptying after storm
<p>K. Ground-water recharge</p> <ul style="list-style-type: none"> a. Perforated pipe or hose b. French drain c. Dry well 	<ul style="list-style-type: none"> 1. Runoff reduction (infiltration) 2. Ground-water recharge 3. May supply water to garden or dry areas 4. Little evaporation loss 	<ul style="list-style-type: none"> 1. Clogging or pores or perforated pipe 2. Initial expense of installation (materials)
<p>L. High delay grass (high roughness)</p>	<ul style="list-style-type: none"> 1. Runoff delay 2. Increased infiltration 	<ul style="list-style-type: none"> 1. Possible erosion or scour 2. Standing water on lawn in depressions

TABLE VI-4
SUITABILITY OF RUNOFF CONTROL
MEASURES IN THE TOBYHANNA CREEK WATERSHED

1. Cisterns and Covered Ponds
Recommended in industrial parks where water could be utilized for fire protection; expensive to install with limited benefit. Low maintenance costs (usually requires periodic sediment removal); good for receiving water quality since no outflow.
2. Rooftop Gardens
Recommended for Industrial and commercial development
3. Surface Pond Storage
Recommended where pond sites exist or on more porous soils (A and B) for groundwater recharge. Relatively inexpensive to install and maintain. Helps entrap sediment to improve water quality of receiving stream.
4. Ponding on Roof, Constricted Downspouts
Possible on large buildings. Required structure modifications usually expensive. Low maintenance costs unless leaks occur. Typically "warms" water which could affect receiving water.
5. Increased Roof Roughness
Possible for industrial, commercial and public buildings. Relative effectiveness minimal on a watershed-wide basis. Moderate installation costs; little maintenance costs. "Warms" runoff.
6. Porous Pavement
Highly recommended where possible, especially in A and B soils and large parking facilities. Promotes groundwater recharge. Moderate in expense compared to typical paving, however, less land intensive if surface detention would be required. Low maintenance costs.
7. Grassed Channels and Vegetated Strips
Recommended wherever possible throughout the watershed to slow velocity and reduce erosion. Minimal slopes (greater than 0.5%) recommended; could entrap sediment to improve water quality. Low installation and maintenance costs. Promotes infiltration.
8. Ponding and Detention on Pavement
Recommended in entire watershed except in "no detention" areas. Tends to warm water which could affect receiving water. Very inexpensive with low maintenance costs. Freezing should be considered. Entraps some pollutants.
9. Reservoir or Detention Basin
Recommended in entire watershed except in "no detention" areas. Relatively easy to implement. Moderate installation and maintenance costs. Aids in entrapping some sediment which improves water quality.
10. Groundwater Recharge
Recommended in A and B soils and in broad flat valleys where minor elevation drop precludes typical detention basin outlets.

11. High Delay Grass and Routing Flow Over Lawns
Recommended in the entire watershed. Delays runoff, entraps sediment, reduces velocities, reduces erosion potential and improves water quality of receiving watercourse. Relatively inexpensive installation and maintenance costs.

C. Best Management Practices

Water quality problems resulting from storm water runoff have necessitated the development of innovative pollution and runoff control practices termed best management practices (BMP's). Current literature offers many examples of such practices that have been proposed to solve specific storm water quality problems. Below is a summary of recommended practices based upon three separate categories. For additional BMPs, please refer to the PaDEP Stormwater BMP manual.

- 1.0 Pollution Source Control consists of practices that are intended to improve water quality by reducing the generation and accumulation of potential runoff at or near their sources. These would include:
 - 1.1 Street Sweeping - Sweeping, vacuuming, and controlled flushing or otherwise cleaning streets, parking lots and other paved vehicular traffic areas. This removes dry-weather accumulations of pollutants before they are washed into streams.
 - 1.2 Solid Waste Collection and Disposal - Municipal collections of refuse such as leaves which would otherwise be dumped in a place which would wash into the stream. Public education is important.
 - 1.3 Fertilizer Application Control - Preventing fertilization near streams, waterways, lakes and ponds, and insuring that lawns are not over fertilized keeps nutrients from entering the streams. Public education, the need for soil testing to determine fertilizer needs, and application timing are important factors in reducing nutrient loads to surface waters.
 - 1.4 Pesticide Use Control - Again, public education on proper use, application rates, equipment cleaning, disposal of unused chemicals and containers, storage and alternate pest control methodologies is crucial to reducing pesticide contamination in receiving waters.
 - 1.5 Highway Deicing Compound Control - Highway deicing compounds in storage and application sites run off the land and pollute streams. Proper storage and application of deicing compounds is recommended with limitations placed on their use.
 - 1.6 Nonpoint Source Pollution Control on Construction Sites - Proper erosion and sediment pollution control on construction sites is important in reducing solids and phosphorus transported to receiving waters. Such concepts may include sedimentation basins, storm sewer inlet protection, proper refuse disposal, dust control, designated equipment cleaning areas, etc.
- 2.0 Runoff Control are practices aimed primarily at runoff rate and volume control. They also provide some degree of storm water treatment. Many typical runoff control measures can be easily modified to provide a higher degree of pollution control. Described below are the quality control aspects of various runoff control measures.

- 2.1 Dry Detention Basin - A typical detention basin remains dry between periods of rain events. Its primary purpose is to reduce the peak rate of runoff to that which occurred prior to development. The ponding time during a storm event allows a portion of the pollutants to settle out.
- 2.2 Extended Detention Basin - Extended detention basins are designed to allow an extended ponding time, thus allowing a larger volume of pollutants to settle out. These basins are typically designed to reduce peak rates of runoff for a much greater frequency storm, i.e., the two-year storm.
- 2.3 Wet Detention Basin - A wet detention basin is essentially a wet pond which has a permanent pool of water. The pool allows an extended detention time allowing pollutants to settle. Aquatic plants and organisms utilize the nutrients in the water, preventing escape of those pollutants.
- 2.4 Infiltration Basins - An infiltration basin is an excavated impoundment with a relatively permeable bottom soil. The purpose is to temporarily store the surface runoff for a selected design storm and then allow the stored water to infiltrate into the groundwater. This method prevents surface water pollution but care to prevent groundwater pollution should be exercised.
- 2.5 Infiltration Trenches - Trenches excavated in porous soils and filled with aggregate allow runoff from small drainage areas to infiltrate into the ground.
- 2.6 Dry Wells - Pits excavated in porous soils and filled with aggregate. These are typically used to control roof runoff.
- 2.7 Filter Strips - Grass filter strips accept runoff from roofs or parking areas and filter pollutants before the runoff can enter the receiving water.
- 2.8 Grassed Waterways and Seepage Areas - Grassed waterways and seepage areas reduce runoff velocities, enhance infiltration and filter runoff pollutants, thus improving runoff quality.
- 2.9 Concrete Grid and Modular Pavement - Concrete grid and modular pavement promotes infiltration and delays runoff, thereby improving runoff quality. These are typically promoted in overflow parking areas.
- 2.10 Porous Asphalt Pavement - Special asphaltic paving material allows storm water to infiltrate through the pavement through an aggregate base and into the soil, thus reducing runoff and in turn pollutant runoff to streams. Runoff temperatures are also reduced from conventional pavement since the initial rainfall (which typically generates the warmest runoff) infiltrates as opposed to running off into receiving waters.
- 2.11 Constructed Wetlands - Excavated basins into which wetland vegetation is planted to enhance pollutant removal. Similar to wet detention basins, they are typically much shallower, thus allowing rooted vegetation to grow. Larger surface areas are therefore required to store the required volume of storm water runoff.
- 3.0 Collection and Treatment Systems deals with collecting and treating urban

storm water runoff. It typically applies to more heavily developed areas with defined collection systems.

- 3.1 New Sewer System Control - Involves the planning of proposed storm sewer systems to incorporate storm water treatment of some sort before runoff is discharged into the receiving waters.
- 3.2 Storm Sewer System Storage - Incorporates storage capabilities (detention) in storm sewers for pollutant deposition and "clean" water discharge.
- 3.3 Flow Regulators - Involves installing mechanized devices in storm water conveyance and storage facilities to control runoff volumes, velocities and directions of flows.
- 3.4 Treatment - Involves considering methods of treatment for storm water runoff to remove solids and contaminants. Such processes may be filtration, settling, screening, or disinfection.
- 3.5 Water Quality Inlets (Oil and Grease Separators) - Designed to remove sediment and hydrocarbons from parking lot runoff before they are conveyed to the storm sewer or infiltration structure. They are typically multi-chambered and are limited to small drainage areas due to their small storage volume.

D. Nonstructural Storm Water Management Measures Conservation Easement

A conservation easement is a legal agreement between a qualified conservation organization, government agency or other parties and a land owner that permanently limits certain specified uses on all or a portion of a property for conservation purposes, while leaving the property in the landowners' ownership. Conservation easements can be tailored to the conservation requirements of a particular property and to the desires of the landowner and the conservation organization alike. An easement might state, for example, that no building or road may be placed and no logging may occur within 200 feet of a stream passing through a property, but allow for a house to be built or for logging to occur on another portion of the same property.

Property owners have the right to use their property for many different purposes, subject to local zoning and public health and safety requirements. A property owner can plant trees or cut them down, build buildings or demolish them, grow crops or dig holes, allow public access or prohibit it, etc. To understand the easement concept, it is helpful to think of these rights as a bundle or rights. A landowner may sell or give away the whole bundle, or just one or two of the rights. These may include the rights to develop or subdivide the land, to restrict access, or to harvest timber. A conservation easement may involve selling or giving away some or all of these rights to a qualified conservation organization – such as a public agency, a land trust or an historic preservation organization. The instrument transferring these rights usually conveys to the organization the right to enforce the easement.

Impervious Surface Reduction

Asphalt and concrete are the most common types of driving surfaces, but are highly impervious (hard and water resistant). Alternative surfaces are more pervious than asphalt or concrete.

Some allow a little rain to seep (infiltrate) into the ground, while others allow 100 percent of the

rain to infiltrate. The more rain that infiltrates, the less runoff that is created. The less runoff, the fewer pipes and storage systems are needed to build in order to prevent flooding.

Stream Buffer

A buffer network acts as the "right-of-way" for a stream and functions as an integral part of the stream ecosystem. Stream buffers add to the quality of the stream and the community in many diverse ways as summarized in Table VI-5. Much of the pollutant removal observed in rural and agricultural buffers appears to be due to relatively slow transport of pollutants across the buffer in sheet flow or under it in shallow groundwater. In both cases, this relatively slow movement promotes greater removal by soils, roots and microbes.

**TABLE VI-5
TWENTY BENEFITS OF URBAN STREAM BUFFERS**

1. Reduces overall watershed impervious cover.
2. Improves separation areas of impervious cover from the stream.
3. Reduces small drainage problems and complaints.
4. Stream "right-of-way" allows for lateral movement.
5. Effective flood control.
6. Protection from streambank erosion.
7. Increases property values.
8. Increased pollutant removal.
9. Foundation for present or future greenways.
10. Provides food and habitat for wildlife.
11. Mitigates stream warming.
12. Provides protection of associated wetlands.
13. Prevents disturbance to steep slopes.
14. Preserves important terrestrial habitat.
15. Provides corridors for conversation.
16. Essential habitat for amphibians.
17. Fewer barriers to fish migration.
18. Discourages excessive storm drain enclosures/channel hardening.
19. Provides space for stormwater ponds.
20. Allowance for future restoration.

Open Space Requirements

Permanent Open Space consists of developed lands (parks, recreation facilities, historic resources) and undeveloped lands (open space comprised of streams, floodplains, wetlands, slope banks, natural features, scenic resources, agricultural and timber resources) owned and managed by all levels of government, public school districts, and non-profit conservation organizations.

These lands should be permanently protected with their primary purpose being to function as a recreation resource and/or preserve and enhance the natural open space resources.

Permanent Open Space areas provide:

- recreation opportunities that accommodate physical and psychological human needs;
- ecological benefits through the protection of natural resources (air, water, soil, plants, animals);
- direct and indirect economic development (tourism; positive real estate values; attraction

- of business and industry, recreation related business);
- buffers between incompatible land uses;
- habitat for wildlife;
- Contribution to the character and individuality of the community;
- the preservation of community identity by preventing communities from merging;
- attractive settings for public holdings, historic resources;
- aesthetic value and scenic beauty;
- Educational resources.

Subdivision and land development regulations may provide for the preservation of lands by developers for recreation/open space purposes provided they are suitable in size and location for their designated use. The Municipalities Planning Code gives Municipalities the authority to require a developer to dedicate land to the public that is suitable for park and recreation purposes. The Municipality may accept the construction of recreational facilities by the developer, the payment of fees-in-lieu-of-dedication, or the private reservation of land. Fees-in-lieu-of-dedication should be utilized if a suitable recreation site cannot be properly located in the development (due to size, shape, access, topography, drainage, etc.), where the application of the area standards would result in an open space or recreation site too small to be usable, or if the recreation plan calls for the recreation site to be located elsewhere. In order to require such mandatory dedication or fees, the Municipality must meet the items listed in the Municipalities Planning Code.

Floodplain Regulation

Floodplain regulation is a Zoning measure whereby areas adjacent to water bodies and subject to frequent flooding are zoned to restrict their use. Normally public and private recreational uses and activities such as parks, day camps, picnic grounds, golf courses, hiking and horseback riding trails, wildlife and nature preserves, game farms, fish hatcheries, hunting and fishing areas are permitted uses in floodplain districts, provided that they do not require substantial structures, fill or storage of materials and equipment. Water related uses and activities such as docks, boat rentals and launching, and swimming areas are usually permitted by special exceptions.

Trail Preservation

Trail preservation provisions could designate existing regional trail corridors on the zoning map and establish provisions to restrict development within a certain distance of the trail (setbacks).

Historic Preservation

Provisions for historic preservation could be contained in the Zoning Ordinance to encourage the retention and restoration of historic resources, facilitate their appropriate reuse and promote preservation of a community's historic values. However, such provisions are not recommended unless the Municipality has a significant amount of concentrated historic resources, such as a historic district. Restoration of historic structures to serve as community centers should be promoted in areas where suitable need for such facilities exists. Historic structures can provide a focal point around which community parks can be developed. Priority should be given to structure/areas that are listed on the National Register of Historic Places. Historic resources should be identified and delineated on a map, which would be used as a historic district overlay for the various Zoning Districts. Provisions could be developed for the historic resources regarding demolition, additional use opportunities, design standards, modification to area and bulk regulations, signs, landscaping, etc. Constraints on future

modifications of use of a structure or area, which are associated with preservation mechanisms, should be realized and evaluated in relation to growth and development expectations.

Planned Residential Developments

Planned Residential Development (PRD) is a mechanism for flexibility in land use controls, authorized by the Municipalities Planning Code to provide greater opportunities for better housing and recreation. By allowing flexibility and innovation in residential development, the PRD provisions provide for a greater percentage of a site to be maintained as common open space and recreation. This measure is similar to cluster zoning, only on a larger scale, and non-residential uses may be permitted. The developer is given more freedom in arranging buildings on the site, in exchange for a greater amount of land being dedicated for open space and recreation uses. This is a valuable way of meeting open space and recreation needs for communities. It ensures that the developer provides the recreation service rather than burdening the community with the responsibility.

Cluster Development

Cluster development with substantial open space requirements can promote imaginative, well designed subdivisions that preserve open space and respect the physical and environmental qualities of the land. Clustering allows greater flexibility in the location of lots on the tract, which results in the ability to concentrate and group buildings on the least sensitive portion of the site. This allows for the preservation of the most critical natural features (i.e. steep slopes, the ridgeline, scenic vistas, prime timber stands) of the tract. The open space provisions associated with cluster regulations, which require a certain percentage of the total tract be permanently preserved, should be mandatory and can range from 15-50% of the gross area of the tract. This common open space should be permanently set aside for the purposes of recreation (active or passive) and/or the conservation of natural features. All land that is preserved as open space should be:

- owned jointly or in common by the owners of the building lots, or
- owned by the municipality, subject to acceptance, or
- donated to a local non-profit conservation agency, subject to acceptance, or
- retained by the original property owner.

For land that is not dedicated to the municipality, satisfactorily written agreements acceptable to the municipality, should be made for its perpetual preservation and maintenance.

Environmentally Sensitive Areas

Lands in this category consist of prominent forested areas (large contiguous tracts of woodland associated with or adjacent to the other open space) and steep slopes greater than 20%. Areas are inappropriate for infrastructure investment due to environmental and economic reasons. Development should be strongly discouraged from these areas due to potential environmental impacts, such as soil instability, erosion and sedimentation and associated restrictive environmental capacities. However, where development does occur, it should be strictly regulated to ensure that proper precautions have been taken to guard against potential hazards. Innovative development patterns and design techniques should be devised to maximize conservation of these areas.

Slope Density Provisions

Slope-density provisions decrease allowable development densities as slope increases. The rationale justifying slope-density provisions is that as slope increases so does the potential for environmental degradation. Limiting development according to slope shifts development into areas with the least potential for environmental damage. Aesthetic values are maintained, development is directed to gently sloping areas while keeping steeply sloped landscapes and ridgelines in their natural state. An important feature of slope-density provisions is the flexibility in setting the standards. These standards are easily tailored to reflect local concerns. Each municipality utilizes the same basic concept, but each can adjust the provision to meet their own specific concerns and needs.

Along with regulating lot sizes according to slope, Municipalities must include coverage requirements. Coverage maximums specify the amount of land that may be covered by impervious surfaces (buildings, driveways, parking lots, etc.). In designing slope-lot size relationships liberal coverage allowances in steep-slope areas can negate the effectiveness of the provisions. Coverage maximums are a function of lot size; the smaller the lot, the higher the allowable coverage; the larger the lot, the lower the allowable coverage.

A simpler version of this concept is to establish provisions requiring a larger lot size (such as 1.5 acres) if any areas of 15 percent to 25 percent slope are to be developed. On slopes of 25 percent or greater, an even larger minimum lot size (such as 3 acres) could be required. The Zoning Officer would maintain a map or overlay depicting the areas of steep slope. The larger lot sizes would take effect any time development would be proposed within the mapped areas.

Transferable Development Rights

Each parcel of land within a jurisdiction would be assigned a certain number of development rights, generally in proportion to its current market value. The land would then be regulated, with some owners allowed to develop and others restricted. Under TDRs, those who were granted development permission would be required to buy a certain number of rights from those in the restricted class. A market in such rights would quickly arise and transaction costs would be low. There is much interest in this idea, which seems particularly effective in preserving historic buildings in urban areas, or in developing large tracts of open land with fragmented ownership. As yet, actual experimentation is rare, but it is an idea that local governments may wish to explore.

SECTION VII
THE DEVELOPMENT OF THE MODEL ORDINANCE

The implementation of the runoff control strategy for new development will be through Municipal adoption of the appropriate Ordinance provisions. As part of the preparation of the Tobyhanna Creek Watershed Storm Water Management Plan, a model Municipal Ordinance has been prepared which would implement the Plan provisions presented as a single purpose Ordinance. This could be adopted essentially "as is" by the Municipalities. Provisions would also be required in the Subdivision and Land Development Ordinance to ensure that activities regulated by the Ordinance were appropriately referenced. The "Tobyhanna Creek Watershed Act 167 Storm Water Management Ordinance" will not completely replace the existing storm drainage Ordinance provisions currently in effect in the Municipalities. The reasons for this are as follows:

Not all of the Municipalities in the Tobyhanna Creek Basin are completely within the watershed. For those portions of the Municipality outside the Tobyhanna Creek watershed, the existing Ordinance provisions would still apply.

Permanent and temporary storm water control facilities are regulated by the Act 167 Ordinance. Storm water management and erosion and sedimentation control during construction would continue to be regulated under the existing Ordinances and Chapter 102 Erosion and Sediment and Pollution Controls, Title 25 of PaDEP Regulations.

The Act 167 Ordinance contains only those minimum storm water runoff control criteria and standards which are necessary or desirable from a total watershed perspective. Additional storm water management design criteria (i.e. inlet spacing, inlet type, collection system details, etc.) which should be based on sound engineering practice should be regulated under current Ordinance provisions or as part of the general responsibilities of the Municipal Engineer.

The Act 167 Ordinance contains only those storm water runoff controls required from new development which are the minimum criteria from a watershed perspective.

The text of the Ordinance is organized into nine articles as follows:

- I. General Provisions
- II. Definitions
- III. Drainage Plan Requirements
- IV. Drainage Plan Submittal and Review Procedures
- V. Permit Requirements and Procedures
- VI. Inspections
- VII. Fees and Expenses
- VIII. Financial Guarantees and Maintenance
- IX. Enforcement and Penalties

Although the actual storm water control provisions, may change significantly from an existing Municipal Ordinance, the structure of the Ordinance itself is very similar to many existing Ordinances.

Within six months following adoption and approval of the watershed storm water Plan, each Municipality shall adopt or amend, and shall implement such Ordinances and regulations, including zoning, subdivision and development, building code, and erosion and

sedimentation Ordinances, as are necessary to regulate development within the Municipality in a manner consistent with the applicable watershed storm water Plan and the provisions of this act.

The following amendment is required for the Municipalities that issue an Occupancy Permit: An Occupancy Permit shall not be secured or issued unless the project complies with the Storm Water Management Ordinance. Occupancy Permit shall be required for each lot owner and/or developer of all major and minor subdivisions and land development in the Municipality.

For Municipalities without an Occupancy Permit, they may want to adopt the above draft and also include other regulatory items in the Occupancy Permit requirement for their own purpose and use.

**MODEL ACT 167 STORMWATER MANAGEMENT
ORDINANCE**

**FINAL
INSERT
DATE**

**PLEASE HAVE YOUR SOLICITOR REVIEW THE ENCLOSED
ORDINANCE AND CHECK THE APPLICABILITY OF ALL
SECTIONS TO YOUR MUNICIPALITY**

STORMWATER MANAGEMENT ORDINANCE

ORDINANCE NO. **INSERT #**

[Municipal Name] , **[County Name]**

COUNTY, PENNSYLVANIA

Adopted at a Public Meeting Held on

Date _____, 20**add** _____

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ARTICLE I- GENERAL PROVISIONS

Section 101. Statement of Findings

The Governing Body of **[Insert Municipality]** finds that:

- A. Inadequate management of accelerated stormwater runoff resulting from development throughout a watershed increases flood flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of existing streams and storm sewers, greatly increases the cost of public facilities to convey and manage stormwater, undermines floodplain management and flood reduction efforts in upstream and downstream communities, reduces groundwater recharge, and threatens public health and safety.
- B. A comprehensive program of stormwater management, including reasonable regulation of development and activities causing accelerated erosion, is fundamental to the public health, safety, welfare, and the protection of the people of **[Insert Municipality]** and all the people of the Commonwealth, their resources, and the environment.
- C. Inadequate management of accelerated stormwater runoff resulting from development throughout a watershed poses a threat to surface and groundwater quality.
- D. Through project design, impacts from stormwater runoff can be minimized to maintain the natural hydrologic regime, and sustain high water quality, groundwater recharge, stream baseflow and aquatic ecosystems. The most cost effective and environmentally advantageous way to manage storm water runoff is through nonstructural project design, minimizing impervious surfaces and sprawl, avoiding sensitive areas (i.e. buffers, floodplains, steep slopes), and designing to topography and soils to maintain the natural hydrologic regime.
- E. To effectively monitor the maintenance of base flow within the watershed, a tracking of consumptive use including storm water discharges and groundwater withdrawals is critical to complying with anti-degradation, the Act's goals and policy, and the regulatory requirement to maintain base flow and stream health.

Section 102. Purpose

The purpose of this Ordinance is to promote the public health, safety, and welfare within the Tobyhanna Creek watershed by maintaining the natural hydrologic regime and minimizing the impacts described in Section 101 of this Ordinance through provisions designed to:

- A. Promote alternative project designs and layout that minimizes impacts to surface and ground water.
- B. Promote nonstructural BMP's.
- C. Minimize increases in stormwater volume.
- D. Minimize impervious surfaces.
- E. Manage accelerated runoff and erosion and sedimentation problems at their source by regulating activities that cause these problems during construction.
- F. Utilize and preserve the existing natural drainage systems.

- G. Encourage recharge of groundwater where appropriate and prevent degradation of groundwater quality.
- H. Address the quality and quantity of stormwater discharges from the development site.
- I. Maintain existing baseflow and quality of streams and watercourses in the Municipality and the Commonwealth
- J. Preserve and restore the flood carrying capacity of streams.
- K. Provide proper maintenance of all permanent stormwater management facilities that are constructed in the Municipality.
- L. Provide performance standards and design criteria for watershed-wide stormwater management and planning.

Section 103. Statutory Authority

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

Section 104. Applicability/Regulated Activities

This Ordinance shall apply to those areas of the Municipality that are located within the Tobyhanna Creek Watershed, as delineated on the mapping in Appendix D which is hereby adopted as part of this Ordinance.

This Ordinance shall only apply to permanent nonstructural and structural stormwater management Best Management Practices (BMP's) constructed as part of any of the "Regulated Activities" listed in this Section.

This Ordinance contains only the stormwater management performance standards and design criteria that are necessary or desirable from a watershed-wide perspective. Local stormwater management design criteria (e.g., inlet spacing, inlet type, collection system design and details, outlet structure design, etc.) shall continue to be regulated by the applicable Municipal Ordinances and applicable State Regulations.

The Municipality may, after consultation with DEP, approve alternative methods for meeting the State Water Quality Requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, State law including but not limited to the Clean Streams Law and the Pennsylvania Stormwater BMP Manual as revised.

The following activities are defined as "Regulated Activities" and shall be regulated by this Ordinance:

- A. Land development.
- B. Subdivisions.
- C. Alteration of the natural hydrologic regime.
- D. Construction of/or additional impervious or semi-pervious surfaces (driveways, parking lots, roads).
- E. Construction of new buildings or additions to existing buildings.

- F. Redevelopment of a site which will increase runoff or change a discharge point. Any redevelopment that does not increase the runoff must still comply with Sections 303 (Water Quality and Streambank Erosion Requirements) and 304 (Ground Water Recharge).
- G. Diversion piping or encroachments in any natural or man-made channel.
- H. Nonstructural and structural storm water management BMP's or appurtenances thereto.
- I. Stream enhancement or restoration projects.

Section 105. Repealer

Any ordinance or ordinance provision of the Municipality inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

Section 106. Severability

Should any section or provision of this Ordinance be declared invalid by a court of competent jurisdiction, such decision shall not affect the validity of any of the remaining provisions of this Ordinance.

Section 107. Compatibility with Other Ordinance Requirements

Approvals issued pursuant to this Ordinance do not relieve the Applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act, or ordinance.

ARTICLE II-DEFINITIONS

Section 201. Interpretation.

For the purposes of this Ordinance, certain terms and words used herein shall be interpreted as follows:

- A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.
- B. The word "includes" or "including" shall not limit the term to the specific example, but is intended to extend its meaning to all other instances of like kind and character.
- C. The word "person" includes an individual, firm, association, organization, partnership, trust, company, corporation, unit of government, or any other similar entity.
- D. The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.
- E. The words "used or occupied" include the words "intended, designed, maintained, or arranged to be used, occupied or maintained."

Section 202 - Definitions

Accelerated Erosion - The removal of the surface of the land through the combined action of man's activity and the natural processes of a rate greater than would occur because of the natural process alone.

Agricultural Activities - The work of producing crops and raising livestock including tillage, plowing, disking, harrowing, pasturing and installation of conservation measures. For purposes of regulation by this Ordinance construction of new buildings or impervious area is not considered an agricultural activity.

Alteration - As applied to land, a change in topography as a result of the moving of soil and rock from one location or position to another; also the changing of surface conditions by causing the surface to be more or less impervious; land disturbance.

Applicant - A person who has filed an application for approval to engage in any "Regulated Activities" as defined in Section 104 of this Ordinance.

Bankfull – The channel at the top-of-bank or point where water begins to overflow onto a floodplain.

Base Flow – The portion of stream flow that is sustained by ground water discharge.

Bioretention – A storm water retention area which utilizes woody and herbaceous plants and soils to remove pollutants before infiltration occurs.

Best Management Practice (BMP) - Stormwater structures, facilities and techniques to control, maintain or improve the quantity and quality of surface runoff and groundwater recharge.

BMP Manual - Pennsylvania Stormwater Best Management Practices Manual (Stormwater BMP Manual), Commonwealth of Pennsylvania, Department of Environmental Protection, No 363-0300-002 (December 2006), as amended and updated.

Buffer – The area of land immediately adjacent to any wetland, lake, pond, vernal pond, or stream, measured perpendicular to and horizontally from the delineated edge of the wetland, lake, pond, or vernal pond, or the top-of-bank on both sides of a stream.

Channel Erosion - The widening, deepening, and headward cutting of small channels and waterways, caused by stormwater runoff or bankfull flows.

Cistern - An underground reservoir or tank for storing rainwater.

Conservation District - The Monroe or Pike County Conservation District.

Consumptive Water Use – That part of water removed from the immediate water environment not available for other purposes such as water supply, maintenance of stream flows, water quality, fisheries and recreation, as opposed to water that is used non-consumptively, which is returned to a surface water, where practicable, and/or to groundwater.

Culvert - A structure with appurtenant works, which carries water under or through an embankment or fill.

Dam - An artificial barrier, together with its appurtenant works, constructed for the purpose of impounding or storing water or another fluid or semifluid, or a refuse bank, fill or structure for highway, railroad or other purposes which does or may impound water or another fluid or semifluid.

Department – The Pennsylvania Department of Environmental Protection.

Designee - The agent of the Monroe or Pike County Planning Commission, Monroe or Pike County Conservation District and/or agent of the Governing Body involved with the administration, review or enforcement of any provisions of this Ordinance by contract or memorandum of understanding.

Design Professional (Qualified) – A Pennsylvania Registered Professional Engineer, Registered Landscape Architect or a Registered Professional Land Surveyor trained to develop stormwater management plans.

Design Storm - The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g., a 5-year storm) and duration (e.g., 24-hours), used in the design and evaluation of stormwater management systems.

Detention Basin - An impoundment structure designed to manage stormwater runoff by temporarily storing the runoff and releasing it at a predetermined rate.

Development Site - The specific tract of land for which a Regulated Activity is proposed.

Diffused Drainage Discharge – Drainage discharge not confined to a single point location or channel, such as sheet flow or shallow concentrated flow.

Disturbed Areas – Land area where an earth disturbance activity is occurring or has occurred.

Downslope Property Line - That portion of the property line of the lot, tract, or parcels of land being developed located such that overland or pipe flow from the site would be directed towards it.

Drainage Conveyance Facility - A Stormwater Management facility designed to transmit stormwater runoff and shall include channels, swales, pipes, conduits, culverts, storm sewers, etc.

Drainage Easement - A right granted by a Grantor to a Grantee, allowing the use of private land for stormwater management purposes.

Drainage Permit - A permit issued by the Municipal Governing Body after the drainage plan has been approved.

Drainage Plan - The documentation of the stormwater management system, if any, to be used for a given development site, the contents of which are established in Section 403.

Earth Disturbance – A construction or other human activity which disturbs the surface of land, including, but not limited to, clearing and grubbing, grading, excavations, embankments, agricultural plowing or tilling, timber harvesting activities, road maintenance activities, mineral extraction, and the moving, depositing, stockpiling, or storing of soil, rock or earth materials.

Emergency Spillway – A conveyance area that is used to pass peak discharge greater than the maximum design storm controlled by the storm water facility.

Encroachment – A structure or activity that changes, expands or diminishes the course, current or cross section of a watercourse, floodway or body of water.

Erosion - The movement of soil particles by the action of water, wind, ice, or other natural forces.

Erosion and Sediment Control Plan - A site specific plan that is designed to minimize accelerated erosion and sedimentation during construction.

Exceptional Value Waters – Surface waters of high quality which satisfy Pennsylvania Code Title 25 Environmental Protection, Chapter 93, Water Quality Standards, § 93.4b(b) (relating to anti- degradation).

Existing Conditions - The initial condition of a project site prior to the proposed alteration. If the initial condition of the site is undeveloped land, the land use shall be considered as "meadow" unless the natural land cover is proven to generate lower Curve Numbers (CN) or Rational "C" value.

FEMA-The Federal Emergency Management Agency

Flood - A temporary condition of partial or complete inundation of land areas from the overflow of streams, rivers, and other waters of this Commonwealth.

Floodplain – The lands adjoining a river or stream that have been or may be expected to be inundated by flood waters in a 100-year frequency flood.

Floodway - The channel of the watercourse and those portions of the adjoining floodplains, which are reasonably required to carry and discharge the 100-year frequency flood. Unless otherwise specified, the boundary of the floodway is as indicated on maps and flood insurance studies provided by FEMA. In an area where no FEMA maps or studies have defined the boundary of the 100-year frequency floodway, it is assumed - absent evidence to the contrary - that the floodway extends from the stream to 50 feet from the top of the bank of the stream.

Forest Management/Timber Operations - Planning and activities necessary for the management of forest land with no change of land use proposed. These include timber inventory and preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting and reforestation.

Freeboard - A vertical distance between the elevation of the design high-water and the top of a dam, levee, tank, basin, swale, or diversion berm. The space is required as a safety margin in a pond or basin.

Grade - A slope, usually of a road, channel or natural ground specified in percent and shown on plans as specified herein. (To) Grade - to finish the surface of a roadbed, top of embankment or bottom of excavation.

Grassed Waterway - A natural or constructed waterway, usually broad and shallow, covered with erosion-resistant grasses, used to convey surface water.

Groundwater Recharge - Replenishment of existing natural underground water supplies without degrading groundwater quality.

HEC-HMS - The U.S. Army Corps of Engineers, Hydrologic Engineering Center (HEC) - Hydrologic Modeling System (HMS) computer program.

High Quality Waters – Surface waters having quality which exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water by satisfying Pennsylvania Code Title 25 Environmental Protection, Chapter 93 Water Quality Standards, § 93.4b(a).

High Tunnel – A structure which meets the following:

- (i) Is used for the production, processing, keeping, storing, sale or shelter of an agricultural commodity as defined in Section 2 of the Act of December 19, 1974 (P.L. 973, No. 319), known as the “Pennsylvania Farmland and Forest Land Assessment Act of 1974” or for the storage of agricultural equipment and supplies.
- (ii) Is constructed consistent with all of the following:
 - a. Has a metal, wood or plastic frame.
 - b. When covered, has a plastic, woven textile, or other flexible covering.
 - c. Has a floor made of soil, crushed stone, matting, pavers or a floating concrete slab.

Hydrologic Regime (natural) – The hydrologic cycle or balance that sustains quality and quantity of storm water, baseflow, storage, and groundwater supplies under natural conditions.

Hydrologic Soil Group - A classification of soils by the Natural Resources Conservation Service, formerly the Soil Conservation Service, into four runoff potential groups. The groups range from A soils, which are very permeable and produce little runoff, to D soils, which are not very permeable and produce much more runoff.

Impervious Surface - A surface that prevents the percolation of water into the ground such as rooftops, pavement, sidewalks, driveways, gravel drives, roads and parking, and compacted fill, earth or turf to be used as such.

Impoundment - A retention or detention basin designed to retain stormwater runoff and release it at a controlled rate.

Infill – Development that occurs on smaller parcels that remain undeveloped but are within or very close proximity to urban areas. The development relies on existing infrastructure and does not require an extension of water, sewer or other public utilities.

Infiltration – For stormwater to pass through the soil from the surface.

Infiltration Structures - A structure designed to direct runoff into the underground water (e.g., French drains, seepage pits, seepage trench, etc.).

Inlet - The upstream end of any structure through which water may flow.

Land Development - (i) the improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving (a) a group of two or more residential or nonresidential buildings, whether proposed initially or cumulatively, or a single nonresidential building on a lot or lots regardless of the number of occupants or tenure or (b) the division or allocation of land or space, whether initially or cumulatively, between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups, or other features; (ii) A subdivision of land; (iii) development in accordance with Section 503(1.1) of the PA Municipalities Planning Code.

Limiting zone - A soil horizon or condition in the soil profile or underlying strata which includes one of the following:

- (i) A seasonal high water table, whether perched or regional, determined by direct observation of the water table or indicated by soil mottling.
- (ii) A rock with open joints, fracture or solution channels, or masses of loose rock fragments, including gravel, with insufficient fine soil to fill the voids between the fragments.
- (iii) A rock formation, other stratum or soil condition which is so slowly permeable that it effectively limits downward passage of water.

Lot - A part of a subdivision or a parcel of land used as a building site or intended to be used for building purposes, whether immediate or future, which would not be further subdivided. Whenever a lot is used for a multiple family dwelling or for commercial, institutional or industrial purposes, the lot shall be deemed to have been subdivided into an equivalent number of single family residential lots as determined by estimated sewage flows.

Main Stem (Main Channel) - Any stream segment or other runoff conveyance facility used as a reach in the Tobyhanna hydrologic model.

Management District - Those subareas in which some type of detention is required to meet the plan requirements and the goals of Act 167.

Manning Equation (Manning formula) - A method for calculation of the velocity of flow (e.g., feet per second) and flow rate (e.g., cubic feet per second) in open channels based upon channel shape, roughness, depth of flow and slope. "Open channels" may include closed conduits so long as the flow is not under pressure.

Municipality – **[Municipal Name]**, **[Monroe or Pike]** County, Pennsylvania.

Natural Hydrologic Regime - see Hydrologic Regime (natural)

Non-point Source Pollution - Pollution that enters a water body from diffuse origins in the watershed and does not result from discernible, confined, or discrete conveyances.

Nonstructural BMPs – Methods of controlling stormwater runoff quantity and quality, such as innovative site planning, impervious area and grading reduction, protection of natural depression areas, temporary ponding on site and other techniques

NRCS - Natural Resource Conservation Service (previously SCS).

Open Channel - A drainage element in which stormwater flows within an open surface. Open channels include, but shall not be limited to, natural and man-made drainage ways, swales, streams, ditches, canals, and pipes flowing partly full.

Outfall - Point where water flows from a conduit, stream, or drain.

Outlet - Points of water disposal from a stream, river, lake, tidewater or artificial drain.

Parent Tract – The parcel of land from which a land development or subdivision originates, existing as of the date of municipal adoption of the original Tobyhanna Creek Ordinance.

Parking Lot Storage - The use of parking areas as temporary impoundments with controlled release rates during rainstorms.

Peak Discharge - The maximum rate of stormwater runoff from a specific storm event.

Penn State Runoff Model (calibrated) - The computer-based hydrologic modeling technique adapted to the Tobyhanna watershed for the Act 167 Plan. The model has been "calibrated" to reflect actual recorded flow values by adjoining key model input parameters.

Pipe - A culvert, closed conduit, or similar structure (including appurtenances) that conveys stormwater.

Planning Commission - The Planning Commission of **[Municipal Name]**.

PMF - Probable Maximum Flood - The flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in any area. The PMF is derived from the probable maximum precipitation (PMP) as determined based on data obtained from the National Oceanographic and Atmospheric Administration (NOAA).

Practicable Alternative – An alternative that is available and capable of being implemented after taking into consideration cost, existing technology and logistics in light of overall project purposes.

Predevelopment – Undeveloped/Natural Condition. See Existing Conditions.

Pretreatment – Techniques employed in structural and nonstructural stormwater BMPs to provide storage or filtering to help trap coarse materials and other pollutants before they enter the system, but not necessarily meet the water quality volume requirements of Section 303.

Rational Formula - A rainfall-runoff relation used to estimate peak flow.

Recharge Area – Undisturbed surface area or depression where stormwater collects, and a portion of which infiltrates and replenishes the underground and groundwater.

Record Drawings - Original documents revised to suit the as-built conditions and subsequently provided by the Design Professional (Qualified) to the Applicant. The Design Professional takes the Contractor's as-builts, reviews them in detail with his/her own records for completeness, then either turns these over to the Applicant or transfers the information to a set of reproducibles, in both cases for the Applicant's permanent records."

Redevelopment – Any construction, alteration, or improvement exceeding 5,000 square feet of impervious surface on sites where existing land use is commercial, industrial, institutional, or multifamily residential.

Regulated Activities - Actions or proposed actions that have an impact on stormwater runoff quality and quantity and that are specified in Section 104 of this Ordinance.

Release Rate - The reduction of post development peak rates of runoff from a site or subarea to

existing conditions peak rates of runoff to protect downstream areas.

Retention Basin - A structure in which stormwater is stored and not released during the storm event. Retention basins do not have an outlet other than recharge and must infiltrate stored water in no more than 4 days.

Return Period - The average interval, in years, within which a storm event of a given magnitude can be expected to recur.

Riser - A vertical pipe extending from the bottom of a pond that is used to control the discharge rate from the pond for a specified design storm.

Rooftop Detention - Temporary ponding and gradual release of stormwater falling directly onto flat roof surfaces by incorporating controlled-flow roof drains into building designs.

Runoff - Any part of precipitation that flows over the land surface.

SALDO – Subdivision and Land Development Ordinance.

Sediment Basin - A barrier, dam, retention or detention basin located and designed to retain rock, sand, gravel, silt, or other material transported by water during construction.

Sediment Pollution - The placement, discharge or any other introduction of sediment into the waters of the Commonwealth.

Sedimentation - The process by which mineral or organic matter is accumulated or deposited by the movement of water or air.

Seepage Pit/Seepage Trench - An area of excavated earth filled with loose stone or similar coarse material, into which surface water is directed for infiltration into the underground and groundwater.

Sheet Flow - Runoff that flows over the ground surface as a thin, even layer.

Soil-Cover Complex Method - A method of runoff computation developed by the NRCS that is based on relating soil type and land use/cover to a runoff parameter called Curve Number (CN).

Source Water Protection Areas (SWPA) – The zone through which contaminants, if present, are likely to migrate and reach a drinking water well or surface water intake.

Special Protection Watersheds - Watersheds for which the receiving waters are exceptional value (EV) or high quality (HQ) waters.

Spillway – A conveyance that is used to pass the peak discharge of the maximum design storm controlled by the stormwater facility.

Storage Indication Method - A reservoir routing procedure based on solution of the continuity equation (inflow minus outflow equals the change in storage) with outflow defined as a function of storage volume and depth.

Storm Frequency - The number of times that a given storm "event" occurs or is exceeded on the average in a stated period of years. See "Return Period".

Storm Sewer - A system of pipes and/or open channels that convey intercepted runoff and stormwater from other sources, but excludes domestic sewage and industrial wastes.

Stormwater - The surface runoff generated by precipitation reaching the ground surface.

Stormwater Management Facility - Any structure, natural or man-made, that, due to its condition, design, or construction, conveys, stores, or otherwise affects stormwater runoff quality and quantity. Typical stormwater management facilities include, but are not limited to, detention and retention basins, open channels, storm sewers, pipes, and infiltration structures.

Stormwater Management Plan - The plan for managing those land use activities that will influence stormwater runoff quality and quantity and that would impact the Tobyhanna Watershed adopted by Monroe County and Pike County as required by the Act of October 4, 1978, P.L. 864, (Act 167), and known as the "Tobyhanna Watershed Act 167 Stormwater Management Plan".

Stormwater Management Site Plan - The plan prepared by the Applicant or his representative indicating how stormwater runoff will be managed at the particular site of interest according to this Ordinance.

Stream - A watercourse.

Stream Enclosure - A bridge, culvert or other structure in excess of 100 feet in length upstream to downstream which encloses a regulated water of this Commonwealth.

Subarea (Subwatershed) - The smallest drainage unit of a watershed for which stormwater management criteria have been established in the Stormwater Management Plan.

Subdivision - The division or re-division of a lot, tract, or parcel of land by any means into two or more lots, tracts, parcels or other divisions of land including changes in existing lot lines for the purpose, whether immediate or future, of lease, partition by the court for distribution to heirs or devisees, transfer of ownership, or building or lot development: Provided, however, that the subdivision by lease of land for agricultural purposes into parcels of more than ten acres, not involving any new street or easement of access or any residential dwelling, shall be exempted.

Swale - A low lying stretch of land which gathers or carries surface water runoff.

Timber Operations - See Forest Management.

Time-of-Concentration (Tc) - The time for surface runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. This time is the combined total of overland flow time and flow time in pipes or channels, if any.

Watercourse - A channel or conveyance of surface water having defined bed and banks, whether natural or artificial, with perennial or intermittent flow.

Waters of the Commonwealth - Rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

Wellhead - The point at which a groundwater well bore hole meets the surface of the ground.

Wellhead Protection Area - The surface and subsurface area surrounding a water supply well, well field, spring or infiltration gallery supplying a public water system, through which contaminants are reasonably likely to move toward and reach the water source

Wetland - Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.

ARTICLE III-STORMWATER MANAGEMENT

Section 301. General Requirements

- A. Applicants proposing Regulated Activities in the Tobyhanna Creek Watershed which do not fall under the exemption criteria shown in Section 402 shall submit a drainage plan consistent with the Tobyhanna Creek Watershed Stormwater Management Plan to the Municipality for review. These criteria shall apply to the total proposed development even if development is to take place in stages
- B. The Applicant is required to perform an alternatives analysis to find practicable alternatives to the surface discharge of stormwater, the creation of impervious surfaces and the degradation of waters of the Commonwealth, and must maintain as much as possible the natural hydrologic regime
- C. The Drainage Plan must be designed through an alternatives analysis consistent with the sequencing provisions of Section 302 to ensure maintenance of the natural hydrologic regime and to promote groundwater recharge and protect groundwater and surface water quality and quantity. The Drainage Plan designer must proceed sequentially in accordance with Article III of this Ordinance.
- D. Stormwater drainage systems shall be provided in order to permit unimpeded flow along natural watercourses, except as modified by stormwater management facilities or open channels consistent with this Ordinance.
- E. The existing points of concentrated drainage that discharge onto adjacent property shall not be altered in any manner which could cause property damage without permission of the affected property owner(s) and shall be subject to any applicable discharge criteria specified in this Ordinance.
- F. Areas of existing diffused drainage discharge shall be subject to any applicable discharge criteria in the general direction of existing discharge, whether proposed to be concentrated or maintained as diffused drainage areas, except as otherwise provided by this Ordinance. If diffused drainage discharge is proposed to be concentrated and discharged onto adjacent property, the Applicant must document that adequate downstream conveyance facilities exist to safely transport the concentrated discharge, or otherwise prove that no erosion, sedimentation, flooding or other impacts will result from the concentrated discharge.
- G. Where a development site is traversed by existing watercourses, drainage easements shall be provided conforming to the line of such watercourses. The terms of the easement shall conform to the stream buffer requirements contained in Section 303.K.7 of this Ordinance.
- H. Any stormwater management facilities regulated by this Ordinance that would be located in or adjacent to waters of the Commonwealth or wetlands shall be subject to approval by PaDEP through the Joint Permit Application process, or, where deemed appropriate by PaDEP, the General Permit process. When there is a question whether wetlands may be involved, it is the responsibility of the Applicant or his agent to show that the land in question cannot be classified as wetlands, otherwise approval to work in the area must be obtained from PaDEP.
- I. Any stormwater management facilities regulated by this Ordinance that would be located on State highway rights-of-way shall be subject to approval by the Pennsylvania Department of Transportation (PennDOT).

- J. Infiltration of runoff through seepage beds, infiltration trenches, etc., where soil conditions permit, and the minimization of impervious surfaces to the extent permitted by the Municipality's Zoning Ordinance, are encouraged to reduce the size or eliminate the need for detention facilities or other structural BMPs.
- K. Roof drains shall not be connected to streets, sanitary or storm sewers, or roadside ditches in order to promote overland flow and infiltration/percolation of stormwater where advantageous to do so. Considering potential pollutant loading, roof drain runoff in most cases will not require pretreatment.
- L. All stormwater runoff, other than roof top runoff discussed in Section K. above, shall be treated for water quality prior to discharge to surface or groundwater.

Section 302. Non-Structural Project Design (Sequencing to Minimize Stormwater Impacts)

- A. The design of all Regulated Activities shall include the following steps in sequence to minimize stormwater impacts.
 - 1. The Applicant is required to find practicable alternatives to the surface discharge of stormwater, the creation of impervious surfaces and the degradation of waters of the Commonwealth, and must maintain as much as possible the natural hydrologic regime of the site.
 - 2. An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology and logistics in light of overall project purposes.
 - 3. All practicable alternatives to the discharge of stormwater are presumed to have less adverse impact on quantity and quality of waters of the Commonwealth unless otherwise demonstrated.
- B. The Applicant shall demonstrate that they designed the Regulated Activities in the following sequence to minimize the increases in stormwater runoff and impacts to water quality:
 - 1. Prepare an Existing Resource and Site Analysis Map (ERSAM), showing environmentally sensitive areas including, but not limited to, steep slopes, ponds, lakes, streams, wetlands, hydric soils, vernal ponds, flood plains, buffer areas, hydrologic soil groups A and B (areas conducive to infiltration), any existing recharge areas and any other requirements outlined in the municipal Subdivision and Land Development Ordinance.
 - 2. Establish buffers in accordance with Section 303.K
 - 3. Prepare a draft project layout avoiding earth disturbance in sensitive areas identified in Section 302.B.1 and minimizing total site earth disturbance as much as possible. The ratio of the disturbed area to the entire site area and measures taken to minimize earth disturbance shall be included on the ERSAM.
 - 4. Identify site specific predevelopment drainage areas, discharge points, recharge areas to be preserved and hydrologic soil groups A and B to be utilized for recharge.

5. Evaluate Nonstructural Stormwater Management Alternatives
 - a. Minimize earth disturbance
 - b. Minimize impervious surfaces
 - c. Break up large impervious surfaces.
6. Satisfy the Water Quality and Streambank Erosion Requirements outlined in Section 303.
7. Satisfy Groundwater Recharge (infiltration) requirements of Section 304 and provide for stormwater treatment prior to infiltration.
8. Determine the Management District where the site is located (Appendix D) and conduct a predevelopment runoff analysis.
9. Prepare final project design to maintain predevelopment drainage areas and discharge points, to minimize earth disturbance and impervious surfaces, and to reduce runoff to the maximum extent possible.
10. Conduct a post development runoff analysis based on the final design and meet the release rate, the overbank flow and extreme event requirements of Section 305.
11. Manage any remaining runoff through treatment prior to discharge, as part of detention, bioretention, direct discharge or other structural control

After completion of Section 302, proceed to Section 303

Section 303. Water Quality and Streambank Erosion Requirements

In addition to the performance standards and design criteria requirements of this Ordinance, the Applicant SHALL comply with the following water quality requirements of this Article.

- A. For water quality and streambank erosion, the objective is to design a water quality BMP to detain the proposed conditions 2-year, 24-hour design storm to the existing conditions 1-year flow using the SCS Type II distribution. Additionally, provisions shall be made (such as adding a small orifice at the bottom of the outlet structure) so that the proposed conditions 1- year storm takes a minimum of 24 hours to drain from the facility from a point where the maximum volume of water from the 1-year storm is captured. (i.e., the maximum water surface elevation achieved in the facility.) At the same time, the objective is not to attenuate the larger storms in “no detention” areas (District C). This can be accomplished by configuration of the outlet structure not to control the larger storms, or by a bypass or channel to divert only the 2-year design storm into the basin or divert flows in excess of the 2-year storm away from the basin.

Where practicable, wet basins shall be utilized for water quality control and shall meet the requirements found in the PA Stormwater BMP manual as revised.

Release of water can begin at the start of the storm (i.e., the invert of the water quality orifice is at the invert of the facility). The design of the facility shall consider and minimize the chances of clogging and sedimentation. Orifices smaller than 3 inches diameter are not recommended. However, if the Design Professional can provide proof that the smaller orifices are protected from clogging by use of trash racks, etc., smaller orifices may be permitted.

- B. Where an NPDES permit for stormwater discharges associated with construction activities is required, the water quality requirements of that permit should be used. However the buffer provisions listed below should be applied to all applications.
- C. MS4 requirements for water quality shall be used where applicable in addition to the water quality requirements in this Section.
- D. In selecting the appropriate BMPs or combinations thereof, the Applicant SHALL consider the following:
1. Total contributing area.
 2. Permeability and infiltration rate of the site soils.
 3. Slope and depth to bedrock.
 4. Depth to seasonal high water table.
 5. Proximity to building foundations and well heads.
 6. Erodibility of soils.
 7. Land availability and configuration of the topography
 8. Peak discharge and required volume control.
 9. Stream bank erosion.
 10. Efficiency of the BMPs to mitigate potential water quality problems.
 11. The volume of runoff that will be effectively treated.
 12. The nature of the pollutant being removed.
 13. Maintenance requirements.
 14. Creation/protection of aquatic and wildlife habitat.
 15. Recreational value.
- E. The temperature and quality of water and streams shall be maintained through the use of temperature sensitive BMPs and stormwater conveyance systems.
- F. The Applicant shall consider the guidelines found in the PaDEP BMP Manual (latest edition) for constructed wetlands, where proposed.
- G. Pretreatment in accordance with Sections 301.K and 301.L shall be provided prior to infiltration.
- H. Streambank restoration projects shall include the following:
1. No restoration or stabilization projects may be undertaken without examining the fluvial geomorphology of stable reaches above and below the unstable reach.
 2. Restoration project design must consider maintenance of stability in the adjacent stable reaches of the stream channel.
 3. An Erosion and Sediment Control Plan approved by the Conservation District must be provided by the Applicant.
 4. All applicable State and Federal permits must be obtained.
- I. Biology shall be incorporated into the design of all wet basins in accordance with the West Nile Virus Guidance found in Appendix E of the 2003 plan update.
- J. To accomplish the above, the Applicant SHALL submit original and innovative designs

to the Municipal Engineer for review and approval. Such designs may achieve the water quality objectives through a combination of BMPs (Best Management Practices).

K. Buffers

1. In addition to the other requirements of Section 303, buffers shall be provided in accordance with this Section.
2. Where resource buffers overlap, the more restrictive requirements shall apply.
3. Pre-existing Lots or Parcels/Development in Outer Buffers - In the case of legally pre-existing lots or parcels (approved prior to the effective date of this Ordinance) where the useable area of a lot or parcel lies within an outer buffer area, rendering the lot or parcel unable to be developed in accordance with the allowable use per Municipal Zoning, the development may only be permitted by variance as provided in Section **[INSERT]** of the Municipality's **[INSERT]** Ordinance.
4. Improvements to Existing Structures in Outer Buffers - The provisions of this Section 303.K do not require any changes or improvements to be made to lawfully existing structures in buffers. However, when any substantial improvement to a structure is proposed which results in a horizontal expansion of that structure, the improvement may only be permitted by variance as provided in Section **[INSERT]** of the Municipality's **[INSERT]** Ordinance.
5. Wetlands and Vernal Ponds
 - a. Wetland Identification – wetlands shall be identified in accord with the most current U.S. Army Corps of Engineers Manual for Identifying and Delineating Wetlands, properly flagged and surveyed on site to ensure they are protected.

Wetlands in an artificial watercourse – wetlands contained within the banks of an artificial watercourse shall not be considered for buffer delineation purposes.

 - Wetlands in a natural watercourse – where wetlands are contained within the banks of a natural watercourse, only the stream buffer shall apply.
 - b. Wetland and Vernal Pond Buffer Delineation – A **[50]** foot inner buffer and **[100]** foot outer buffer, measured perpendicular to and horizontally from the edge of the delineated wetland or vernal pond for a total distance of **[150]** feet, shall be maintained for all wetlands and vernal ponds.
 - i. Inner Buffer – Measured perpendicular to and horizontally from the edge of the delineated wetland or vernal pond, for a distance of **[50]** feet.
 - Stormwater conveyance required by the **[insert Municipality]**, buffer maintenance and restoration, the correction of hazardous conditions, stream crossings permitted by DEP and passive unpaved stable trails shall be permitted.

No other earth disturbance, grading, filling, buildings, structures, new construction, or development shall be permitted.

- The area of the inner buffer altered by activities permitted in accord with Section 303.K.5.b.i shall be minimized to the greatest extent practicable

ii. Outer Buffer – Measured perpendicular to and horizontal from the outer edge of the inner buffer for a distance of **[100]** feet, resulting in a total buffer of **[150]**.feet.

- Stormwater conveyance required by the Township/Borough, buffer maintenance and restoration, the correction of hazardous conditions, stream crossings permitted by DEP, roads constructed to existing grade, unpaved trails, and limited forestry activities that do not clear cut the buffer (e.g. selective regeneration harvest) in accord with a forestry management plan shall be permitted provided no buildings are involved, and those activities permitted under Sections 303.K.3 and 303.K.4.
- No more than twenty **[20]** percent of the cumulative outer buffer on the subject parcel shall be altered by the activities permitted in accordance with Section 303.K.5.b.ii.

6. Lakes and Ponds

- a. There is no outer buffer around lakes and ponds
- b. Lake and Pond Buffer Delineation – A **[150]** foot buffer measured perpendicular to and horizontally from the edge of any water body, shall be maintained around any water body.
- c. Permitted Activities/Development - Stormwater conveyance required by the Township/Borough, buffer maintenance and restoration, the correction of hazardous conditions, lake front views, boat docks and unpaved trails shall be permitted provided no buildings are involved.
- d. The area of the buffer impacted by activities permitted in Section 303.K.6.c. shall not exceed thirty-five **[35]** percent of the buffer on the subject parcel.

7. Streams

- a. Stream Buffer Delineation – A **[50]** foot inner buffer and **[100]** foot outer buffer, measured perpendicular to and horizontally from the top-of-bank on both sides of any stream, for a total distance of **[150]** feet, shall be maintained on both sides of any stream. See Figure 303.1.
 - i. Inner Buffer – Measured perpendicular to and horizontally from the top-of- bank of the stream for a distance of **[50]** feet.

- Stormwater conveyance required by the Township/Borough, buffer maintenance and restoration, the correction of hazardous conditions, stream crossings permitted by DEP, fish hatcheries, wildlife sanctuaries and boat launch sites constructed so as not to alter the flood plain cross section, and unpaved trails shall be permitted providing no buildings are involved. No other earth disturbance, grading, filling, buildings, structures, new construction, or development shall be permitted
 - The area of the inner buffer altered by activities permitted in accord with Section 303.K.7.a.i shall be minimized to the greatest extent practicable.
- ii. Outer Buffer – Measured perpendicular to and horizontally from the outer edge of the inner buffer for a distance of **[100]** feet resulting in a total buffer of **[150]** feet.
- Stormwater conveyance required by the **[Insert Municipality]**, buffer maintenance and restoration, the correction of hazardous conditions, agricultural activities, plant nurseries, parking lots constructed to existing grade, temporary fairs and carnivals, accessory uses for residential purposes, private sportsmen’s club activities, athletic facilities, orchards, wildlife sanctuaries, boat launch sites, roads constructed to existing grade, stream crossings permitted by DEP and unpaved trails and limited forestry activities that do not clear cut the buffer (e.g. selective regeneration harvest) in accord with a forestry management plan shall be permitted provided no buildings are involved.
 - In areas of the outer buffer which are not wetlands, vernal ponds or slopes of more than **[15]** percent, stormwater management facilities which improve water quality of stormwater discharge shall be permitted unless prohibited by other Township/Borough or state requirements. No other earth disturbance, grading, filling buildings, structures, new construction, or development shall be permitted
 - No more than **[twenty (20)]** percent of the cumulative outer buffer on the subject parcel shall be altered by the activities permitted in accordance with Section 303.K.7.ii.

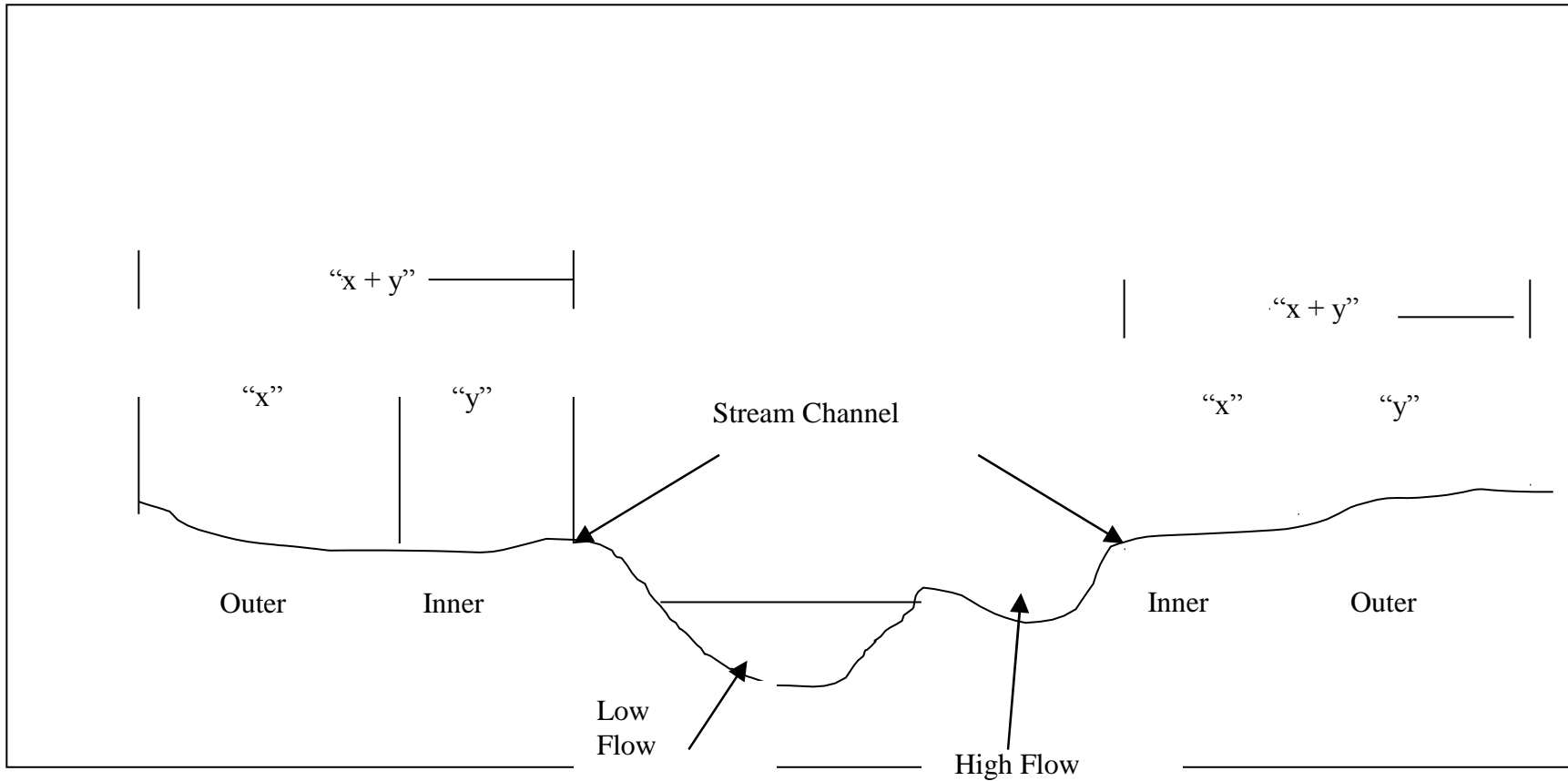


Figure 303.1 Stream Buffer

Section 304 Groundwater Recharge (Infiltration/Recharge/Bioretention)

Maximizing the ground water recharge capacity of the area being developed is required. Design of the infiltration/recharge stormwater management facilities shall give consideration to providing ground water recharge to compensate for the reduction in the percolation that occurs when the ground surface is disturbed or impervious surface is created. It is recommended that roof runoff be directed to infiltration BMPs which may be designed to compensate for the runoff from parking areas. These measures are required to be consistent with Section 102, and take advantage of utilizing any existing recharge areas.

A. Infiltration BMPs shall meet the following minimum requirements:

1. Where a NPDES permit for stormwater discharges associated with construction activities is required, the volume control requirement of that permit should be met unless the volume control requirement in this plan is greater.
2. Maximum Infiltration Requirements:
 - a. Regulated activities will be required to recharge (infiltrate), where practicable, a portion of the runoff created by the development as part of an overall stormwater management plan designed for the site. The volume of runoff to be recharged shall be determined from Sections 304.4.a. or 304.4.b, depending upon demonstrated site conditions.
3. Infiltration BMPs intended to receive runoff from developed areas shall be selected based on suitability of soils and site conditions and shall be constructed on soils that have the following characteristics:
 - a. A minimum depth of 24 inches between the bottom of the BMP and the limiting zone.
 - b. An infiltration and/or percolation rate sufficient to accept the additional stormwater load and drain completely as determined by field tests conducted by the Applicant's design professional.
 - c. The recharge facility shall be capable of completely infiltrating the recharge volume within 4 days.
 - d. Pretreatment in accordance with Sections 301.K and 301.L shall be provided prior to infiltration.
4. The size of the recharge facility shall be based upon the following volume criteria:
 - a. NRCS Curve Number equation.

The NRCS runoff shall be utilized to calculate infiltration requirements (P) in inches. For zero runoff:

$$P = I (\text{Infiltration}) (\text{in.}) = (200 / \text{CN}) - 2 \quad \text{Equation: 304.1}$$

Where: CN=SCS (NRCS) curve number of existing conditions contributing to the recharge facility.

This equation is displayed graphically in, and the infiltration requirement can be determined from, Figure 304.1.

The recharge volume required would therefore be computed as:

$$Re_v(c.f.) = [I \text{ (in)} * \text{impervious area (s.f.)}] / 12 \quad \text{Equation: 304.2}$$

Where: I= infiltration requirements (in.)

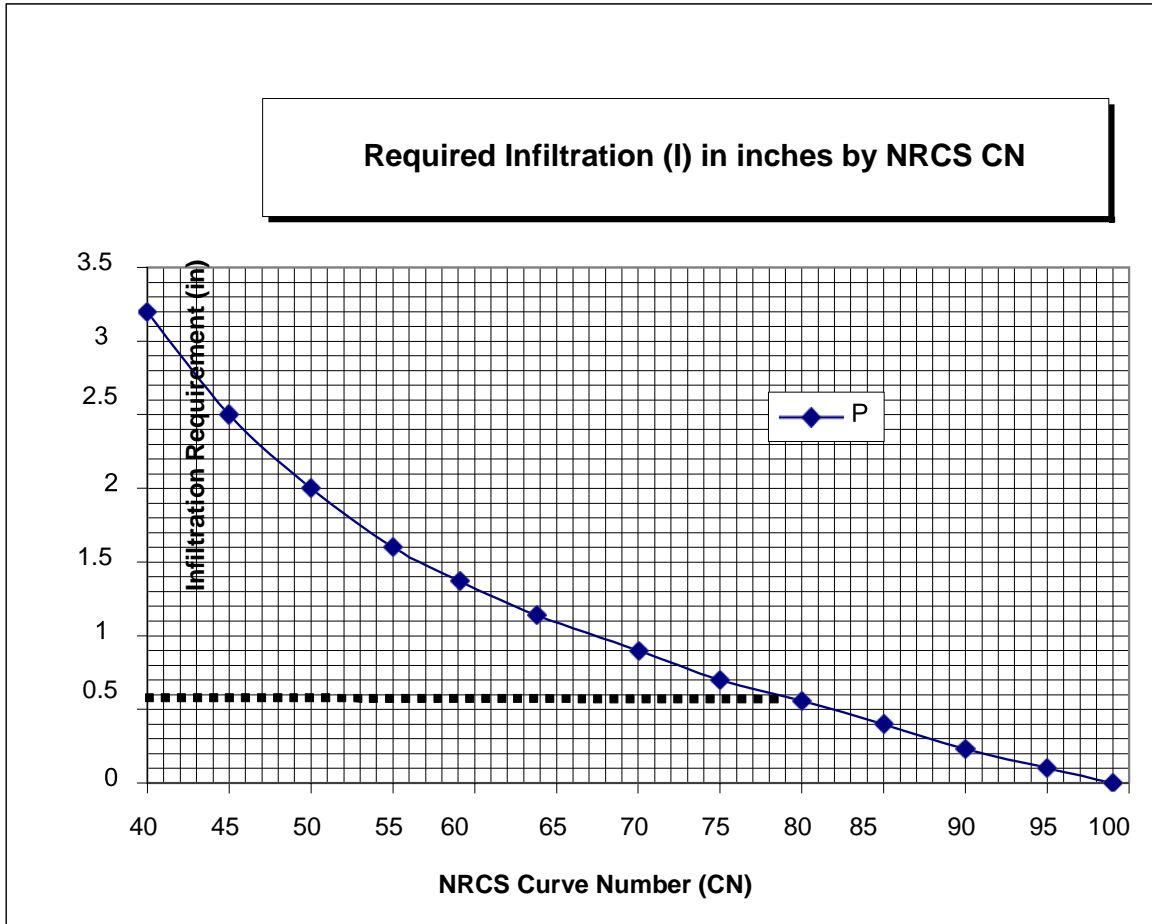


Figure 304.1. Infiltration requirement based upon NRCS Curve Number.

b. Annual Recharge – Water Budget Approach

It has been determined that infiltrating 0.6 inches of runoff from the post development impervious areas will aid in maintaining the hydrologic regime of the watershed. A minimum of 0.6 inches of rainfall shall be infiltrated from all impervious areas, up to an existing site condition curve number of 77. Above a curve number of 77, Equation 304.1 or the curve in Figure 304.1 shall be used to determine the Infiltration requirement and Equation 304.2 shall be used to determine the recharge volume.

The recharge volume (Re_v) required would therefore be computed as:
 $Re_v = [(0.6 \text{ or } I, \text{ whichever is less}) * \text{impervious area}] / 12$

- B. Soils - A detailed soils evaluation of the project site shall be required where practicable to determine the suitability of recharge facilities. The evaluation shall be performed by a qualified design professional, and at a minimum, address soil permeability, depth to bedrock and subgrade stability. The general process for designing the infiltration BMP shall be:
1. Analyze hydrologic soil groups as well as natural and man-made features within the watershed to determine general areas of suitability for infiltration practices.
 2. Provide site-specific infiltration test results (at the level of the proposed infiltration surface) in accord with ASTM Guide No. D5126 to determine the appropriate hydraulic conductivity rate.
 3. Design the infiltration structure for the required storm volume based on field determined capacity at the level of the proposed infiltration surface.
 4. If on-lot infiltration structures are proposed by the Applicant's design professional, it must be demonstrated to the Municipality that the soils are conducive to infiltrate on the lots identified.
- C. Stormwater Hotspots – A stormwater hotspot is defined as a land use activity that generates higher concentrations of hydrocarbons, trace metals or toxicants than are found in typical stormwater runoff, based on monitoring studies. Table 304.1 provides samples of designated hotspots. If a site is designated as a hotspot, it has important implications for how stormwater is managed. First and foremost, untreated stormwater runoff from hotspots cannot be allowed to infiltrate into groundwater where it may contaminate water supplies. Therefore, the Re_v requirement is NOT applied to development sites that fit into the hotspot category, but the requirements of Section 304.A should be met. Second, a greater level of stormwater treatment may be needed at hotspot sites to prevent pollutant discharge after construction. EPA's NPDES stormwater program requires some industrial sites to prepare and implement a stormwater pollution prevention plan.

Table 304.1 – Classification of Stormwater Hotspots

The following land uses and activities are samples of stormwater hotspots:
<ul style="list-style-type: none"> • Vehicle salvage yards and recycling facilities
<ul style="list-style-type: none"> • Fleet storage areas (bus, truck, etc.)
<ul style="list-style-type: none"> • Public works storage areas
<ul style="list-style-type: none"> • Facilities that generate or store hazardous materials

Extreme caution shall be exercised where salt or chloride would be a pollutant since soils do little to filter this pollutant and it may contaminate the groundwater. The qualified design professional shall evaluate the possibility of groundwater contamination from the proposed infiltration/recharge facility and perform a hydrogeologic justification study if necessary. The infiltration requirement in High Quality/Exceptional Value waters shall be subject to the Department's Chapter 93 Antidegradation Regulations. The municipality may require the installation of an impermeable liner in detention basins where the possibility of groundwater contamination exists. A detailed hydrogeologic investigation may be required by the Municipality.

The Municipality shall require the Applicant to provide safeguards against groundwater contamination for uses which may cause groundwater contamination, should there be a mishap or spill.

- D. Extreme caution shall be exercised where infiltration is proposed in Source Water Protection Areas or that may affect a wellhead or surface water intake.
- E. Recharge/infiltration facilities shall be used in conjunction with other innovative or traditional BMPs, stormwater control facilities, and nonstructural stormwater management alternatives.

Upon completion of Section 304, proceed to Sections 305, 306 and 307

Section 305. Stormwater Management Districts

- A. The Tobyhanna Creek Watershed has been divided into stormwater management districts as shown on the Watershed Map in Appendix D. The Management District Map is also available on the Monroe County Conservation District's website.

Standards for managing runoff from each subarea in the Tobyhanna Creek Watershed for the various design storms are shown in Table 305.1. Development sites located in each of the A, B, or C Districts must control proposed conditions peak runoff rates to existing conditions peak runoff rates for the design storms in accord with Table 305.1.

In addition to the requirements specified in Table 305.1 below, the Water Quality and Streambank Erosion Requirements (Section 303), Groundwater Recharge (Section 304), and Erosion and Sediment Control Requirements (Section 308) shall be implemented.

TABLE 305.1 –Peak Runoff Rate Requirements

<u>District</u>	<u>Subareas</u>	<u>Post-Development</u>	<u>Pre-Development</u>
A	1-4, 7, 8	2-year	2-year
	21-40, 43	10-year	10-year
	45-67, 73	50-year	50-year
B	5, 6,	10-year	2 year
	9-20,	50-year	10-year
C	Development sites which can discharge directly to a stream or watercourse main may do so without control of post-development peak rate of runoff. If the post development runoff is intended to be conveyed to a stream or watercourse, assurance must be provided that such system has adequate capacity to convey the increased peak flows. When adequate capacity of downstream system does not exist and will not be provided through improvements, the post-development peak rate of runoff must be controlled to the predevelopment peak rate as required in District “A” provisions (post-development flows to pre-development flows for the 2, 10 and 50 year storms). The subwatershed areas which are included in this district are: 41, 42, 44, 68-72, 74-77.		

- B. General - Proposed conditions peak rates of runoff from any Regulated Activity shall not exceed the peak release rates of runoff prior to development for the design storms specified on the Stormwater Management District Watershed Map (Appendix D) and Section 302, of this Ordinance.
- C. District Boundaries - The boundaries of the Stormwater Management Districts are shown on an official map that is available for inspection at the municipal office. A copy of the official map at a reduced scale is included in the Ordinance Appendix D. The exact location of the Stormwater Management District boundaries as they apply to a given development site shall be determined by mapping the boundaries using the two-foot topographic contours (or most accurate data required) provided as part of the Drainage Plan.
- D. Sites Located in More Than One District - For a proposed development site located within two or more stormwater management district category subareas, the peak discharge rate from any subarea shall meet the requirements of Table 305.1 for each discharge point from the site. The calculated peak discharges shall apply regardless of whether the grading plan changes the drainage area by subarea.
- E. Off-Site Areas - Off-site areas that drain through a proposed development site are not subject to release rate criteria when determining allowable peak runoff rates. However, on-site drainage facilities shall be designed to safely convey off-site flows through the development site.

- F. Site Areas - Where the site area to be impacted by a proposed development activity differs significantly from the total site area, only the proposed impact area utilizing stormwater management measures shall be subject to the Management District Criteria. In other words, undisturbed areas bypassing the stormwater management facilities would not be subject to the Management District Criteria.
- G. "No Harm" Option - For any proposed development site not located in a provisional direct discharge district, the Applicant has the option of using a less restrictive runoff control (including no detention) if the Applicant can prove that "no harm" would be caused by discharging at a higher runoff rate than that specified by the Stormwater Management Plan. The "no harm" option is used when an Applicant can prove that the proposed hydrographs can match existing hydrographs, or if it can be proved that the proposed conditions will not cause increases in peaks at all points downstream. Proof of "no harm" must be shown based upon the following "Downstream Impact Evaluation" which shall include a "downstream hydraulic capacity analysis" consistent with Section 305.H to determine if adequate hydraulic capacity exists. The Applicant shall submit to the Municipality this evaluation of the impacts due to increased downstream stormwater flows in the watershed.
1. The Hydrologic Regime of the site must be maintained.
 2. The "Downstream Impact Evaluation" shall include hydrologic and hydraulic calculations necessary to determine the impact of hydrograph timing modifications due to the proposed development upon a dam, highway, structure, natural point of restricted streamflow or any stream channel section, established with the concurrence of the Municipality.
 3. The evaluation shall continue downstream until the increase in flow diminishes due to additional flow from tributaries and/or stream attenuation.
 4. The peak flow values to be used for downstream areas for the design return period storms (2, 5, 10, 25, 50, and 100-year) shall be the values from the calibrated model for the Tobyhanna Creek Watershed. These flow values can be obtained from the original Act 167 watershed storm water management plans.
 5. Applicant-proposed runoff controls which would generate increased peak flow rates at storm drainage problem areas, by definition, are precluded from successful attempts to prove "no-harm", except in conjunction with proposed capacity improvements for the problem areas consistent with Section 305.H.
 6. A financial distress shall not constitute grounds for the Municipality to approve the use of the "no-harm" option.
 7. Downstream capacity improvements may be provided as necessary to achieve the "no harm" option.
 8. Any "no harm" justifications shall be submitted by the Applicant as part of the Drainage Plan Requirements per Article IV of this Ordinance.
- H. "Downstream Hydraulic Capacity Analysis" - Any downstream hydraulic capacity analysis conducted in accordance with this Ordinance shall use the following criteria for determining adequacy for accepting increased peak flow rates:
1. Existing natural or man-made channels or swales must be able to convey the increased runoff associated with a 2-year return period event within their banks at velocities consistent with protection of the channels from erosion. Acceptable

velocities shall be based upon criteria included in the DEP *Erosion and Sediment Pollution Control Program Manual*.

2. Existing natural or man-made channels or swales must be able to convey increased 25- year return period runoff without creating any hazard to persons or property.
 3. Culverts, bridges, storm sewers or any other facilities which must pass or convey flows from the tributary area must be designed in accordance with DEP Chapter 105 regulations (if applicable) and, at minimum, pass the increased 25-year return period runoff.
- I. Hardship Option - The Stormwater Management Plan and its standards and criteria are designed to maintain existing conditions peak flows and volumes throughout the Tobyhanna Creek watershed as the watershed becomes developed. There may be certain instances, however, where the standards and criteria established are too restrictive for a particular Applicant. The existing drainage network in some areas may be capable of safely transporting slight increases in flows without causing a problem or increasing flows elsewhere. If an Applicant cannot meet the stormwater standards due to lot conditions or if conformance would become a hardship to an Applicant, the hardship option may be applied. A financial distress shall not constitute grounds for the Municipality to approve the use of the hardship option. The Applicant would have to plead his/her case to the Governing Body with the final determination made by the Municipality. Any Applicant's pleading the "hardship option" will assume all liabilities that may arise due to exercising this option. A financial distress shall not constitute grounds for the Municipality to approve the use of the "no-harm" option.

Section 306. Calculation Methodology

- A. Stormwater runoff from all development sites with a drainage area of greater than 200 acres shall be calculated using a generally accepted calculation technique that is based on the NRCS soil cover complex method. Table 306-1 summarizes acceptable computation methods and the method selected by the design professional shall be based on the individual limitations and suitability of each method for a particular site. The Municipality may allow the use of the Modified Rational Method to estimate peak discharges from drainage areas that contain less than one (1) acre. The Soil Cover Complex Method shall be used for drainage areas greater than 1 acre.

**TABLE 306-1
Acceptable Computation Methodologies For
Stormwater Management Plans**

METHOD	METHOD DEVELOPED BY	APPLICABILITY
TR-20 (or commercial computer package based on TR-20)	USDA NRCS	Applicable where use of full hydrology computer model is desirable or necessary.
TR-55 (or commercial computer package based on TR-55)	USDA NRCS	Applicable for land development plans within limitations described in TR-55.
HEC-1 / HEC-HMS	US Army Corps of Engineers	Applicable where use of full hydrologic computer model is desirable or necessary.
PSRM	Penn State University	Applicable where use of a hydrologic computer model is desirable or necessary; simpler than TR-20 or HEC-1.
Modified Rational Method commercial computer package based on Rational Method)	Emil Kuichling (1889)	For sites less than 1 acre, or (or as approved by the Municipality and/or Municipal Engineer).
Other Methods	Varies	Other computation methodologies approved by the Municipality and/or Municipal Engineer.

- B. All calculations consistent with this Ordinance using the soil cover complex method shall use the appropriate design rainfall depths for the various return period storms consistent with current NOAA Atlas 14 Point Precipitation Frequency Estimates. If a hydrologic computer model such as PSRM or HEC-1 is used for stormwater runoff calculations, then the duration of rainfall shall be 24 hours. The SCS Type II Rainfall Distribution shall be utilized for the rainfall distribution.
- C. For the purposes of existing conditions flow rate determination, undeveloped land shall be considered as "meadow" in good condition, unless the natural ground cover generates a lower Curve Number (CN) or Rational 'C' value, as listed in Tables B-1 or B-32 in Appendix B of this Ordinance.
- D. All calculations using the Modified Rational Method shall use rainfall intensities consistent with appropriate times-of-concentration for overland flow and return periods from the current NOAA Atlas 14 Point Precipitation Frequency Estimates. Times-of-concentration for overland flow shall be calculated using the methodology presented in Chapter 3 of Urban Hydrology for Small Watersheds, NRCS, TR-55 (as amended or replaced from time to time by NRCS). Times-of- concentration for channel and pipe flow shall be computed using Manning's equation.
- E. Calculations using the Modified Rational Method shall be based on a common time of concentration for all contributing areas to a discharge point in both the predevelopment and post development runoff conditions.
- F. Hydrograph volumes generated by the Modified Rational Method for routing through control (detention and infiltration) facilities should be comparable to hydrograph volumes generated by the TR-55 methodology. The ascending and descending limbs of the hydrograph generated by the Modified Rational method should be adjusted in order to provide a comparable hydrograph volume.

- G. Runoff Curve Numbers (CN) for both existing and proposed conditions to be used in the soil cover complex method shall be obtained from Table B-1 in Appendix B of this Ordinance. Due to limitations of the TR-55 methodology, a minimum weighted Curve Number of 40 shall be utilized for the calculations.
- H. Runoff coefficients (C) for both existing and proposed conditions for use in the Modified Rational method shall be obtained from Table B-2 in Appendix B of this Ordinance.
- I. The designer shall consider that the runoff from proposed sites graded to the subsoil will not have the same runoff conditions as the site under existing conditions, even after placement of topsoil and/or seeding. The designer may increase his proposed condition "CN" or "C" to better reflect proposed soil conditions.
- J. Where uniform flow is anticipated, the Manning equation shall be used for hydraulic computations, and to determine the capacity of open channels, pipes, and storm sewers. Values for Manning's roughness coefficient (n) shall be consistent with Table B-3 in Appendix B of the Ordinance.
- K. Outlet structures for stormwater management facilities shall be designed to meet the performance standards of this Ordinance using any generally accepted hydraulic analysis technique or method.
- L. The design of any stormwater detention facilities intended to meet the performance standards of this Ordinance shall be verified by routing the design storm hydrograph through these facilities using the Storage-Indication Method. The Municipality may approve the use of any generally accepted full hydrograph approximation technique that shall use a total runoff volume that is consistent with the volume from a method that produces a full hydrograph.

Section 307. Other Requirements

- A. Any stormwater facility located on State highway rights-of-way shall be subject to approval by the Pennsylvania Department of Transportation (PennDOT).
- B. Pretreatment in accordance with Sections 301.K and 301.L shall be provided prior to infiltration.
- C. Any stormwater management facility (i.e., BMP, detention basin) designed to store runoff and requiring a berm or earthen embankment required or regulated by this Ordinance shall be designed to provide an emergency spillway to handle the discharge of flows up to and including the inflow to the facility from the 100- year proposed conditions, considering the primary outlet control structure(s) are blocked. The height of embankment must provide a minimum one (1) foot of freeboard above the maximum pool elevation computed when the facility functions for the 100-year proposed conditions inflow. Should any stormwater management facility require a dam safety permit under PaDEP Chapter 105, the facility shall be designed in accordance with Chapter 105 and meet the regulations of Chapter 105 concerning dam safety which may be required to pass storms larger than the 100-year event.
- D. Any facilities that constitute water obstructions (e.g., culverts, bridges, outfalls, or stream enclosures), and any work involving wetlands governed by PaDEP Chapter 105 regulations (as amended or replaced from time to time by PaDEP), shall be designed in accordance with Chapter 105 and will require a permit from PaDEP.
- E. Any other drainage conveyance facility that does not fall under Chapter 105 regulations

must be able to convey, without damage to the drainage structure or roadway, runoff from the 25-year design storm with a minimum 1.0 foot of freeboard measured below the lowest point along the top of the roadway. Any facility that constitutes a dam as defined in PaDEP Chapter 105 regulations may require a permit under dam safety regulations. Any facility located within a PennDOT right-of-way must meet PennDOT minimum design standards and permit submission requirements.

- F. Any drainage conveyance facility and/or channel not governed by Chapter 105 Regulations, must be able to convey, without damage to the drainage structure or roadway, runoff from the 25-year design storm. Conveyance facilities to or exiting from stormwater management facilities (i.e., detention basins) shall be designed to convey the design flow to or from that structure. Roadway crossings located within designated floodplain areas must be able to convey runoff from a 100-year design storm. Any facility located within a PennDOT right-of-way must meet PennDOT minimum design standards and permit submission requirements.
- G. Storm sewers must be able to convey proposed conditions runoff from a [25]-year design storm without surcharging inlets, where appropriate.
- H. Adequate erosion protection shall be provided along all open channels, and at all points of discharge.
- I. The design of all stormwater management facilities shall incorporate sound engineering principles and practices. The Municipality reserves the right to disapprove any design that would result in the construction of or continuation of a stormwater problem area.

Upon completion of Section 307, proceed to Section 308

Section 308. Erosion and Sediment Control Requirements

- A. Any earth disturbance must be conducted in conformance with PA Title 25, Chapter 102, “Erosion and Sediment Control.”
- B. Additional erosion and sediment control design standards and criteria that must be or are recommended to be applied where infiltration BMPs are proposed shall include the following:
 - 1. Areas proposed for infiltration BMPs shall be protected from sedimentation and compaction during the construction phase to maintain maximum infiltration capacity.
 - 2. Infiltration BMPs shall not be constructed nor receive runoff until the entire contributory drainage area to the infiltration BMP has achieved final stabilization.

ARTICLE IV-DRAINAGE PLAN REQUIREMENTS

Section 401. General Requirements

For any of the activities regulated by this Ordinance, the preliminary or final approval of subdivision and/or land development plans, the issuance of any building or occupancy permit, or the commencement of any earth disturbance may not proceed until the Applicant or his/her agent has received written approval of a Drainage Plan from the Municipality and an adequate Erosion and Sediment Control Plan review by the Conservation District.

Section 402. Drainage Plan Submission Exemptions

A. Exemptions

The following land use activities are exempt from the Drainage Plan submission requirements of this Ordinance:

1. Use of land for gardening for home consumption.
2. Agriculture when operated in accordance with a Conservation Plan or Erosion and Sediment Control Plan (E&S) found adequate by the Conservation District.
3. Forest Management operations which are following the Department of Environmental Protection's management practices contained in its publication "Soil Erosion and Sedimentation (E&S) Control Guidelines for Forestry" and are operating under an approved E&S Plan and must comply with stream buffer requirements in Section 303 and flood plain management requirements.
4. Impervious Surface - Any Regulated Activity that has less than 5,000 square foot of impervious surface and/or meets the following exemption criteria is exempt from the plan submittal provisions of this Ordinance. These criteria shall apply to the total development even if development is to take place in phases. The date of the original Tobyhanna Municipal Ordinance adoption shall be the starting point from which to consider tracts as "parent tracts" in which future subdivisions and respective impervious area computations shall be cumulatively considered. Impervious areas existing on the "parent tract" prior to adoption of this Ordinance shall not be considered in cumulative impervious area calculations for exemption purposes.
5. High Tunnels shall be exempt from the provisions of this Ordinance if:
 - a. The High Tunnel or its flooring does not result in an impervious area exceeding 25% of all structures located on the owners total contiguous land area; and
 - b. The High Tunnel meets one of the following:
 - i. The High Tunnel is located at least 100 feet from any perennial stream or watercourse, public road or neighboring property line.
 - ii. The High Tunnel is located at least 35 feet from any perennial stream or watercourse, public road or neighboring property line and located on land with a slope not greater than 7%.

- iii. The High Tunnel is supported with a buffer or diversion system that does not directly drain into a stream or other watercourse managing storm water runoff in a manner consistent with requirements of this Ordinance and the Act of April 18, 2018 P.L. 91, No. 15, and the Act of October 4, 1978 (P.L. 864, No 167).

B. Additional exemption criteria includes:

1. Exemption responsibilities – An exemption shall not relieve the Applicant from implementing such measures as are necessary to protect the public health, safety, and property. An exemption shall not relieve the Applicant from providing adequate stormwater management for Regulated Activities to meet the purpose of this Ordinance; however, drainage plans will not have to be submitted to the Municipality.
2. This exemption shall not relieve the Applicant from meeting the requirements for watersheds draining to Exceptional Value (EV) waters and Source Water Protection Areas (SWPA): requirements for Nonstructural Project Design (Section 302) Water Quality and Streambank Erosion (Section 303), and Groundwater Recharge (Section 304).
3. Drainage Problems - If a drainage problem is documented or known to exist downstream of, or expected from the proposed activity, then the Municipality may require a Drainage Plant Submittal.
4. Parent Tracts – Ordinance criteria shall apply to the total development even if development is to take place in phases. The date of the Municipal Ordinance adoption from the original Tobyhanna Creek Act 167 Plans shall be the starting point from which to consider tracts as “parent tracts” in which future subdivisions and respective impervious area computations shall be cumulatively considered.

Section 403. Drainage Plan Contents

The Drainage Plan shall consist of a general description of the project including sequencing items described in Section 302, calculations, maps, and plans. A note on the maps shall refer to the associated computations and erosion and sediment control plan by title and date. The cover sheet of the computations and erosion and sediment control plan shall refer to the associated maps by title and date. All Drainage Plan materials shall be submitted to the Municipality in a format that is clear, concise, legible, neat, and well organized; otherwise, the Drainage Plan shall not be accepted for review and shall be returned to the Applicant.

The following items shall be included in the Drainage Plan:

A. General

1. General description of the project including those areas described in Section 302.
2. General description of permanent stormwater management techniques, including construction specifications of the materials to be used for stormwater management facilities.
3. Complete hydrologic, hydraulic, and structural computations for all stormwater management facilities.

4. An Erosion and Sediment Control Plan, including all reviews and letters of adequacy obtained by the Conservation District.
5. A general description of nonpoint source pollution controls.

B. Maps

Map(s) of the project area shall be submitted on **[24-inch x 36-inch sheets]** and/or shall be prepared in a form that meets the requirements for recording at the offices of the Recorder of Deeds of Monroe County. If the Subdivision and Land Development Ordinance (SALDO) has more stringent criteria then the more stringent criteria shall apply. The contents of the map(s) shall include, but not be limited to:

1. The location of the project relative to highways, municipalities or other identifiable landmarks.
2. Existing and final contours at intervals of two feet. In areas of steep slopes (greater than 15 percent), five-foot contour intervals may be used.
3. Existing streams, lakes, ponds or other Waters of the Commonwealth within the project area.
4. Other physical features including flood hazard boundaries, buffers, existing drainage courses, areas of natural vegetation to be preserved, and the total extent of the upstream area draining through the site.
5. The locations of all existing and proposed utilities, sanitary sewers, and water lines within fifty (50) feet of property lines.
6. The location(s) of public water supply wells and surface water intakes as well as their source water protection areas.
7. Soil names and boundaries.
8. Limits of earth disturbance, including the type and amount of impervious area that would be added.
9. Proposed structures, roads, paved areas, and buildings.
10. The name of the development, the name and address of the Applicant of the property, and the name of the individual or firm preparing the plan.
11. The date of submission.
12. A graphic and written scale of one (1) inch equals no more than fifty (50) feet; for tracts of twenty (20) acres or more, the scale shall be one (1) inch equals no more than one hundred (100) feet.
13. A north arrow.
14. The total tract boundary and size with distances marked to the nearest foot and bearings to the nearest degree.
15. Existing and proposed land use(s).
16. A key map showing all existing man-made features beyond the property boundary

that would be affected by the project.

17. Location of all open channels.
18. Overland drainage patterns and swales.
19. A fifteen foot wide access easement to and around all stormwater management facilities that would provide ingress to and egress from a public right-of-way.
20. The location of all erosion and sediment control facilities.
21. A note on the plan indicating the location and responsibility for maintenance of stormwater management facilities that would be located off-site. All off-site facilities shall meet the performance standards and design criteria specified in this Ordinance.
22. A statement, signed by the Applicant, acknowledging that any revision to the approved Drainage Plan must be approved by the Municipality and that a revised E&S Plan must be submitted to the Conservation District for a determination of adequacy.
23. The following signature block for the Design Engineer:

I, (Design Engineer), on this date (date of signature), hereby certify that the Drainage Plan meets all design standards and criteria of the Tobyhanna Creek Watershed Act 167 Stormwater Management Ordinance."

C. Supplemental Information

1. A written description of the following information shall be submitted.
 - a. The overall stormwater management concept for the project designed in accordance with Section 302.
 - b. Stormwater runoff computations as specified in this Ordinance.
 - c. Stormwater management techniques to be applied both during and after development.
 - d. Expected project time schedule.
 - e. Development stages (project phases) if so proposed.
 - f. An operation and maintenance plan in accordance with Section 702 of this Ordinance.
2. An erosion and sediment control plan.
3. The effect of the project (in terms of runoff volumes and peak flows) on adjacent properties and on any existing municipal stormwater collection system that may receive runoff from the project site.
4. A Declaration of Adequacy and Highway Occupancy Permit from the PennDOT District Office when utilization of a PennDOT storm drainage system is proposed.

D. Stormwater Management Facilities

1. All stormwater management facilities must be located on a plan and described in detail.
2. When groundwater recharge methods such as seepage pits, beds or trenches are used, the locations of existing and proposed septic tank infiltration areas and wells

must be shown.

3. All calculations, assumptions, and criteria used in the design of the stormwater management facilities must be shown.

Section 404. Plan Submission

The Municipality shall require receipt of a complete plan, as specified in this Ordinance.

For any activities that require an NPDES Permit for Stormwater Discharges from Construction Activities, or a PaDEP Joint Permit Application, or a PennDOT Highway Occupancy Permit, or any other permit under applicable state or federal regulations, or are regulated under Chapter 105 (Dam Safety and Waterway Management) or Chapter 106 (Floodplain Management) of PaDEP's Rules and Regulations, the proof of application for said permit(s) or approvals shall be part of the plan. The plan shall be coordinated with the state and federal permit process and the municipal SALDO review process.

- A. For those Regulated Activities which require SALDO approval, the Drainage Plan and ERSAM shall be submitted by the Applicant as part of the Preliminary Plan submission.
- B. For those Regulated Activities that do not require SALDO approval, See Section 401, General Requirements.
- C. Six (6) copies of the Drainage Plan shall be submitted and distributed as follows:
 1. **[Two (2)]** copies to the Municipality accompanied by the requisite Municipal Review Fee, as specified in this Ordinance.
 2. **[Two (2)]** copies to the Conservation District.
 3. **[One (1)]** copy to the Municipal Engineer.
 4. **[One (1)]** copy to the County Planning Commission.
- D. Any submissions found incomplete shall not be accepted for review and shall be returned to the Applicant with a notification in writing of the specific manner in which the submission is incomplete.

Section 405. Drainage Plan Review

- A. The Municipal Engineer shall review the Drainage Plan for consistency with the adopted Tobyhanna Creek Watershed Act 167 Stormwater Management Plan.
- B. The Municipal Engineer shall review the Drainage Plan for any subdivision or land development against the municipal subdivision and land development ordinance provisions not superseded by this Ordinance.
- C. The E & S Plan shall be reviewed by the County Conservation District and found adequate to meet the requirements of PaDEP's Chapter 102 regulations prior to Municipal approval of the Drainage Plan.
- D. For Regulated Activities specified in Section 104 of this Ordinance, the Municipal Engineer shall notify the Municipality in writing, within **[ninety (90)]** calendar days, whether the Drainage Plan is consistent with the Stormwater Management Plan.

1. Should the Drainage Plan be determined to be consistent with the Stormwater Management Plan, the Municipal Engineer will forward a letter of consistency to the Municipal Secretary, who will then notify the Developer.
 2. Should the Drainage Plan be determined to be inconsistent or noncompliant with the Stormwater Management Plan, the Municipal Engineer shall forward a letter to the Municipal Secretary with a copy to the Applicant citing the reason(s) and specific Ordinance sections for the inconsistency or noncompliance. Inconsistency or noncompliance may be due to inadequate information to make a reasonable judgment as to compliance with the stormwater management plan. Any Drainage Plans that are inconsistent or noncompliant may be revised by the Applicant and resubmitted consistent with this Ordinance. The Municipal Secretary shall then notify the Developer of the Municipal Engineer's findings. Any disapproved Drainage Plans may be revised by the Developer and resubmitted consistent with this Ordinance.
- E. For Regulated Activities specified in Section 104 of this Ordinance, which require a building permit, the Municipal Engineer shall notify the Enforcement Officer in writing, whether the Drainage Plan is consistent with the Stormwater Management Plan and forward a copy of the approval/disapproval letter to the Applicant. Any disapproved drainage plan may be revised by the Applicant and resubmitted consistent with this Ordinance.
- F. For Regulated Activities specified in Section 104 of this Ordinance that require an NPDES Permit Application, PaDEP and the Conservation District may consider the Municipal Engineer's review comments in determining whether to issue a permit.
- G. The Municipality shall not grant approval or grant preliminary approval to any subdivision or land development for Regulated Activities specified in Sections 104 of this Ordinance if the Drainage Plan has been found to be inconsistent with the Stormwater Management Plan, as determined by the Municipal Engineer. All required permits from PaDEP must be obtained prior to approval of any subdivision or land development.
- H. No municipal permits shall be issued for any Regulated Activity specified in Section 104 of this Ordinance if the Drainage Plan has been found to be inconsistent with the Stormwater Management Plan, as determined by the Municipal Engineer, or without considering the comments of the Municipal Engineer shall be issued. All required permits from PaDEP must be obtained prior to issuance of a building permit.
- I. The Applicant shall be responsible for completing Record Drawings of all stormwater management facilities included in the approved Drainage Plan. The Record Drawings and an explanation of any discrepancies with the design plans shall be submitted to the Municipal Engineer for final approval. In no case shall the Municipality approve the Record Drawings until the Municipality receives a copy of an approved or amended Declaration of Adequacy and/or Highway Occupancy Permit from the PennDOT District Office, NPDES Permit, and any applicable permits or approvals, from PaDEP or the Conservation District.
- J. The Municipality's approval of a Drainage Plan shall be valid for a period not to exceed **five (5)** years, commencing on the date that the Municipality signs the approved Drainage Plan. If stormwater management facilities included in the approved Drainage Plan have not been constructed, or if constructed, and record drawings of these facilities

have not been approved within this **[five (5)]** year time period, then the Municipality may consider the Drainage Plan disapproved and may revoke any and all permits. Drainage Plans that are considered disapproved by the Municipality shall be resubmitted in accordance with Section 407 of this Ordinance.

Section 406. Modification of Plans

- A. A modification to a Drainage Plan under review by the Municipality for a development site that involves a change in stormwater management facilities or techniques, or that involves the relocation or re-design of stormwater management facilities, or that is necessary because soil or other conditions are not as stated on the Drainage Plan as determined by the Municipal Engineer, shall require a resubmission of the modified Drainage Plan consistent with Section 404 of this Ordinance and be subject to review as specified in Section 405 of this Ordinance.
- B. A modification to an already approved or disapproved Drainage Plan shall be submitted to the Municipality, accompanied by the applicable Municipal Review and Inspection Fee. A modification to a Drainage Plan for which a formal action has not been taken by the Municipality shall be submitted to the Municipality, accompanied by the applicable Municipal Review and Inspection Fee.

Section 407. Resubmission of Disapproved Drainage Plans

A disapproved Drainage Plan may be resubmitted, with the revisions addressing the Municipal Engineer's concerns documented in writing and addressed to the Municipal Secretary in accordance with Section 404 of this Ordinance and distributed accordingly and be subject to review as specified in Section 405 of this Ordinance. The applicable Municipal Review and Inspection Fee must accompany a resubmission of a disapproved Drainage Plan.

Section 408. Authorization to Construct and Term of Validity

The Municipality's approval of an SWM Site Plan authorizes the regulated activities contained in the SWM Site Plan for a maximum term of validity of 5 years following the date of approval. The Municipality may specify a term of validity shorter than 5 years in the approval for any specific SWM Site Plan. Terms of validity shall commence on the date the Municipality signs the approval for an SWM Site Plan. If an approved SWM Site Plan is not completed according to Section 407 within the term of validity, then the Municipality may consider the SWM Site Plan disapproved and may revoke any and all permits. SWM Site Plans that are considered disapproved by the Municipality shall be resubmitted in accordance with Section 405 of this Ordinance.

ARTICLE V-INSPECTIONS

Section 501. Schedule of Inspections

- A. The Municipal Engineer or his municipal designee shall inspect all phases of the installation of the permanent stormwater management facilities as deemed appropriate by the Municipal Engineer.
- B. During any stage of the work, if the Municipal Engineer or his municipal designee determines that the permanent stormwater management facilities are not being installed in accordance with the approved Stormwater Management Plan, the Municipality shall revoke any existing permits or other approvals and issue a cease and desist order until a revised Drainage Plan is submitted and approved, as specified in this Ordinance.
- C. A final inspection of all stormwater management facilities shall be conducted by the Municipal Engineer or his municipal designee and to confirm compliance with the approved Drainage Plan prior to the issuance of any Occupancy Permit.

ARTICLE VI-FEES AND EXPENSES

Section 601. Municipality Drainage Plan Review and Inspection Fee

Fees shall be established by the Municipality to defray plan review and construction inspection costs incurred by the Municipality. All fees shall be paid by the Applicant at the time of Drainage Plan submission. Review and Inspection Fee Schedule shall be established by resolution of the municipal Governing Body based on the size of the Regulated Activity and based on the Municipality's costs for reviewing Drainage Plans and conducting inspections pursuant to Section 501. The Municipality shall periodically update the Review and Inspection Fee Schedule to ensure that review costs are adequately reimbursed.

Section 602. Expenses Covered by Fees

The fees required by this Ordinance shall at a minimum cover:

- A. Administrative costs.
- B. The review of the Drainage Plan by the Municipality and the Municipal Engineer.
- C. The site inspections.
- D. The inspection of stormwater management facilities and drainage improvements during construction.
- E. The final inspection upon completion of the stormwater management facilities and drainage improvements presented in the Drainage Plan.
- F. Any additional work required to enforce any permit provisions regulated by this Ordinance, correct violations, and assure proper completion of stipulated remedial actions.

ARTICLE VII-CONSTRUCTION AND MAINTENANCE RESPONSIBILITIES

Section 701. Performance Guarantee

- A. For subdivisions and land developments the Applicant shall provide a financial guarantee to the Municipality for the timely installation and proper construction of all stormwater management controls as: 1) Required by the approved Drainage Plan equal to or greater than the full construction cost of the required controls or 2) in the amount and method of payment provided for in the Subdivision and Land Development Ordinance.
- B. For other Regulated Activities, the Municipality may require a financial guarantee from the Applicant.
- C. At the completion of the project, and as a prerequisite for the release of the performance guarantee, the Applicant or his representatives shall:
 - 1. Provide a certification of completion from an engineer, architect, surveyor or other qualified person verifying that all permanent facilities have been constructed according to the plans and specifications and approved revisions thereto.
 - 2. Provide a set of record drawings.
- D. After the Municipality receives the certification, a final inspection shall be conducted by the Municipal Engineer or designee to certify compliance with this Ordinance.

Section 702. Maintenance Responsibilities

- A. The Drainage Plan for the development site shall contain an operation and maintenance plan prepared by the Applicant and approved by the Municipal Engineer. The operation and maintenance plan shall outline required routine maintenance actions and schedules necessary to insure proper operation of the facility(ies).
- B. The Drainage Plan for the development site shall establish responsibilities for the continuing operation and maintenance of all proposed stormwater control facilities, consistent with the following principles:
 - 1. If a development consists of structures or lots which are to be separately owned and in which streets, sewers or other public improvements are to be dedicated to the Municipality, stormwater control facilities may also be dedicated to and maintained by the Municipality (the Municipality is not obligated to accept ownership).
 - 2. If a development site is to be maintained in a single ownership or if streets, sewers or other public improvements are to be privately owned and maintained, then the ownership and maintenance of stormwater control facilities may be the responsibility of the Applicant or private management entity.
- C. The Governing Body, upon recommendation of the Municipal Engineer, shall make the final determination on the continuing maintenance responsibilities prior to approval of the Drainage Plan. The Governing Body reserves the right to accept the ownership and operating responsibility for any or all of the stormwater management controls.

Section 703. Maintenance Agreement for Privately Owned Stormwater Facilities

- A. Prior to approval of the site's Drainage Plan, the Applicant shall sign and record the Maintenance Agreement contained in Appendix A which is attached and made part hereof, covering all stormwater control facilities that are to be privately owned.
- B. Other items may be included in the agreement where determined necessary to guarantee the satisfactory maintenance of all facilities. The Maintenance Agreement shall be subject to the review and approval of the Municipal Solicitor and Governing Body.

Section 704. Municipal Stormwater Maintenance Fund

- A. Persons installing stormwater storage facilities shall be required to pay a specified amount to the Municipal Stormwater Maintenance Fund to help defray costs of periodic inspections and maintenance expenses. The amount of the deposit shall be determined as follows:
 - 1. If the storage facility is to be privately owned and maintained, the deposit shall cover the cost of periodic inspections performed by the Municipality for a period of **[ten (10) years]**, as estimated by the Municipal Engineer. After that period of time, inspections will be performed at the expense of the Municipality.
 - 2. If the storage facility is to be owned and maintained by the Municipality, the deposit shall cover the estimated costs for maintenance and inspections for **[ten (10) years]**. The Municipal Engineer will establish the estimated costs utilizing information submitted by the Applicant.
 - 3. The amount of the deposit to the fund shall be converted to present worth of the annual series values. The Municipal Engineer shall determine the present worth equivalents, which shall be subject to the approval of the Governing Body.
- B. If a storage facility is proposed that also serves as a recreation facility (e.g., ballfield, lake), the Municipality may reduce or waive the amount of the maintenance fund deposit based upon the value of the land for public recreation purpose.
- C. If at some future time a storage facility (whether publicly or privately owned) is eliminated due to the installation of storm sewers or other storage facility, the unused portion of the maintenance fund deposit will be applied to the cost of abandoning the facility and connecting to the storm sewer system or other facility. Any amount of the deposit remaining after the costs of abandonment are paid will be returned to the depositor.
- D. Long-Term Maintenance – The Municipality may require Applicants to pay a fee to the Municipal Stormwater Maintenance Fund to cover long term maintenance of stormwater control and best management practices.
- E. Stormwater Related Problems - The Municipality may require Applicants to pay a fee to the Municipal Stormwater Maintenance Fund to cover stormwater related problems which may arise from the land development and earth disturbance

ARTICLE VIII-ENFORCEMENT AND PENALTIES

Section 801. Right-of-Entry

Upon presentation of proper credentials, duly authorized representatives of the Municipality may enter at reasonable times upon any property within the Municipality to inspect the condition of the stormwater structures and facilities in regard to any aspect regulated by this Ordinance.

Section 802. Notification

In the event that a person fails to comply with the requirements of this Ordinance, or fails to conform to the requirements of any permit issued hereunder, the Municipality shall provide written notification of the violation. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of these violation(s). Failure to comply within the time specified shall subject such person to the penalty provisions of this Ordinance. All such penalties shall be deemed cumulative and shall not prevent the Municipality from pursuing any and all remedies. It shall be the responsibility of the Applicant of the real property on which any Regulated Activity is proposed to occur, is occurring, or has occurred, to comply with the terms and conditions of this Ordinance.

Section 803. Enforcement

The Municipal Governing Body is hereby authorized and directed to enforce all of the provisions of this Ordinance. All inspections regarding compliance with the Drainage Plan shall be the responsibility of the Municipal Engineer or other qualified persons designated by the Municipality.

- A. Design Plans - A set of design plans approved by the Municipality shall be on file at the site throughout the duration of the construction activity. Periodic inspections may be made by the Municipality or designee during construction.
- B. Adherence to Approved Plan - It shall be unlawful for any person, firm or corporation to undertake any Regulated Activity under Section 104 on any property except as provided for in the approved Drainage Plan and pursuant to the requirements of this Ordinance. It shall be unlawful to alter or remove any control structure required by the Drainage Plan pursuant to this Ordinance or to allow the property to remain in a condition which does not conform to the approved Drainage Plan.
- C. Hearing - Prior to revocation or suspension of a permit and at the request of the Applicant, the Governing Body will schedule a hearing to discuss the non-compliance if there is no immediate danger to life, public health or property. The expense of a hearing shall be the Applicant's responsibility.
- D. Suspension and Revocation of Permits
 - 1. Any permit issued by the Municipality may be suspended or revoked for:
 - a. Non-compliance with or failure to implement any provision of the permit.
 - b. A violation of any provision of this Ordinance or any other applicable law, ordinance, rule or regulation relating to the project.
 - c. The creation of any condition or the commission of any act during construction or development which constitutes or creates a hazard or

nuisance, pollution or which endangers the life or property of others.

2. A suspended permit shall be reinstated by the Governing Body when:
 - a. The Municipal Engineer or his Municipal designee has inspected and approved the corrections to the stormwater management and erosion and sediment pollution control measure(s), or the elimination of the hazard or nuisance, and/or;
 - b. The Governing Body is satisfied that the violation of the Ordinance, law, or rule and regulation has been corrected.
3. A permit that has been revoked cannot be reinstated. The Applicant may apply for a new permit under the procedures outlined in this Ordinance.

E. Occupancy Permit

An occupancy permit shall not be issued unless the certification of completion pursuant to Section 701 A has been approved by the Municipality. The occupancy permit shall be required for each lot owner and/or Applicant for all subdivisions and land development in the Municipality.

Section 804. Public Nuisance

- A. The violation of any provision of this Ordinance is hereby deemed a Public Nuisance.
- B. Each day that a violation continues shall constitute a separate violation.

Section 805. Penalties

- A. Anyone violating the provisions of this Ordinance shall be subject to a fine of not more than \$[INSERT] for each violation, recoverable with costs, or imprisonment of not more than [INSERT] days, or both. Each day that the violation continues shall be a separate offense
- B. In addition, the Municipality may institute injunctive, mandamus or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus or other appropriate forms of remedy or relief.

Section 806. Appeals

- A. Any person aggrieved by any action of the Municipality or its designee may appeal to the Municipality's **[Governing Body or Zoning Hearing Board]** (per MPC Section 909.1(a)(8 and 909.1(b)(6))within **[thirty (30)]** days of that action.
- B. Any person aggrieved by any decision of **[the Municipality's Governing Body or Zoning Hearing Board]** may appeal to the County Court of Common Pleas in the County where the activity has taken place within **[thirty (30) days]** of the Municipal decision.

APPENDIX A
STANDARD STORMWATER FACILITIES
MAINTENANCE AND MONITORING AGREEMENT

THIS AGREEMENT, made and entered into this _____ day of _____, 20____, by and between _____, (hereinafter the “Landowner”), and _____ [Municipal Name] _____, [County Name] County; Pennsylvania, (hereinafter “Municipality”);

WITNESSES:

WHEREAS, the Landowner is the owner of certain real property as recorded by deed in the land records of _____ County, Pennsylvania, Deed Book _____ at Page _____, (hereinafter “Property”).

WHEREAS, the Landowner is proceeding to build and develop the Property; and

WHEREAS, the _____ Subdivision/Land Management Plan (hereinafter “Plan”) for the _____ Subdivision which is expressly made a part hereof, as approved or to be approved by the Municipality, provides for detention or retention of stormwater within the confines of the Property; and

WHEREAS, the Municipality and the Landowner, his successors and assigns agree that the health, safety, and welfare of the residents of the Municipality require that on-site stormwater management facilities be constructed and maintained on the Property; and

WHEREAS, the Municipality requires, through the implementation of the _____ Watershed Stormwater Management Plan, that stormwater management facilities as shown on the Plan be constructed and adequately maintained by the Landowner, his successors and assigns.

NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The on-site stormwater management facilities shall be constructed by the Landowner, his successors and assigns, in accordance with the terms, conditions and specifications identified in the Plan.
2. The Landowner, his successors and assigns, shall maintain the stormwater management facilities in good working condition, acceptable to the Municipality so that they are performing their design functions
3. The Landowner, his successors and assigns, hereby grants permission to the Municipality, his authorized agents and employees, upon presentation of proper identification, to enter upon the Property at reasonable times, and to inspect the stormwater management facilities whenever the Municipality deems necessary. The purpose of the inspection is to assure safe and proper functioning of the facilities. The inspection shall cover the entire facilities, berms, outlet structures, pond areas, access roads, etc. When inspections are conducted, the Municipality shall give the Landowner, his successors and assigns, copies of the inspection report with findings and evaluations.

At a minimum, maintenance inspections shall be performed in accordance with the following schedule:

- Annually for the first 5 years after the construction of the stormwater facilities,
 - Once every 2 years thereafter, or
 - During or immediately upon the cessation of a 100 year or greater precipitation event.
4. All reasonable costs for said inspections shall be borne by the Landowner and payable to the Municipality.
 5. The owner shall convey to the municipality easements and/or rights-of-way to assure access for periodic inspections by the Municipality and maintenance, if required.
 6. In the event the Landowner, his successors and assigns, fails to maintain the stormwater management facilities in good working condition acceptable to the Municipality, the Municipality may enter upon the Property and take such necessary and prudent action to maintain said stormwater management facilities and to charge the costs of the maintenance and/or repairs to the Landowner, his successors and assigns. This provision shall not be construed as to allow the Municipality to erect any structure of a permanent nature on the land of the Landowner, outside of any easement belonging to the Municipality. It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.
 7. The Landowner, his successors and assigns, will perform maintenance in accordance with the maintenance schedule for the stormwater management facilities including sediment removal as outlined on the approved schedule and/or Subdivision/Land Development Plan.
 8. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like on account of the Landowner's or his successors' and assigns' failure to perform such work, the Landowner, his successors and assigns, shall reimburse the Municipality upon demand, within 30 days of receipt of invoice thereof, for all costs incurred by the Municipality hereunder. If not paid within said 30-day period, the Municipality may enter a lien against the property in the amount of such costs, or may proceed to recover his costs through proceedings in equity or at law as authorized under the provisions of the _____ Code.
 9. The Landowner, his successors and assigns, shall indemnify the Municipality and his agents and employees against any and all damages, accidents, casualties, occurrences or claims which might arise or be asserted against the Municipality for the construction, presence, existence or maintenance of the stormwater management facilities by the Landowner, his successors and assigns.
 10. In the event a claim is asserted against the Municipality, his agents or employees, the Municipality shall promptly notify the Landowner, his successors and assigns, and they shall defend, at their own expense, any suit based on such claim. If any judgment or claims against the Municipality, his agents or employees shall be allowed, the Landowner, his successors and assigns shall pay all costs and expenses in connection

therewith.

- 11. In the advent of an emergency or the occurrence of special or unusual circumstances or situations, the Municipality may enter the Property, if the Landowner is not immediately available, without notification or identification, to inspect and perform necessary maintenance and repairs, if needed, when the health, safety or welfare of the citizens is at jeopardy. However, the Municipality shall notify the landowner of any inspection, maintenance, or repair undertaken within 5 days of the activity. The Landowner shall reimburse the Municipality for his costs.

This Agreement shall be recorded among the land records of

_____ [County Name] County, Pennsylvania and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

(SEAL)

For the Landowner:

ATTEST:

_____ (City, Borough, Township) County of _____ [County Name] _____
 _____, Pennsylvania

I, _____, a Notary Public in and for the County and State aforesaid, whose commission expires on the _____ day of _____, 20__, do hereby certify that _____ whose name(s) is/are signed to the foregoing Agreement bearing date of the _____ day of _____, 20__, has acknowledged the same before me in my said County and State.

GIVEN UNDER MY HAND THIS _____ day of _____, 20__.

NOTARY PUBLIC

(SEAL)

APPENDIX B
STORMWATER MANAGEMENT DESIGN CRITERIA

**Table B-1
Runoff Curve Numbers Based on Land Use and HSG**

Cover Type and Hydrologic Condition	CNs for hydrologic soil group			
	A	B	C	D
Open Space (lawns, parks, golf courses, cemeteries, landscaping, etc.)				
Poor condition (grass cover on <50% of the area)	68	79	86	89
Fair condition (grass cover on 50% to 75% of the area)	49	69	79	84
Good condition (grass cover on >75% of the area)	39	61	74	80
Impervious Areas:				
Open water bodies: lakes, wetlands, ponds, etc.	100	100	100	100
Paved parking lots, roofs, driveways, etc. or other similar impervious surfaces	98	98	98	98
Porous Pavement and Pavers:				
Porous Pavement / Concrete on minimum 12" Clean Aggregate Base	40	40	66	70
Porous Pavers/ Pavement/Concrete Walks with min. 6" Clean Aggregate Base	40	52	75	80
Non-Impervious Driving Surfaces:				
Gravel	94	97	97	97
Dirt	88	93	94	94
Cultivated Agricultural Lands				
Row Crops (good), e.g., corn, sugar beets, soy beans	64	75	82	85
Small grain (good), e.g., wheat, barley, flax	60	72	80	84
Meadow (continuous grass, protected from grazing, and generally mowed for hay):	30	58	71	78
Brush (brush-weed-grass mixture, with brush the major element):				
Poor (<50% ground cover)	48	67	77	83
Fair (50% to 75% ground cover)	35	56	70	77
Good (>75% ground cover)	30	48	65	73
Woods:				
Poor (forest litter, small trees, and brush are destroyed by heavy grazing or regular burning)	45	66	77	83
Fair (woods are grazed but not burned, and some forest litter covers the soil)	36	60	73	79
Good (woods are protected from grazing, and litter and brush adequately cover the soil)	30	55	70	77

[1] Composite CNs for Residential , Commercial and Industrial Uses shall be computed based on the applicable values provided in this Table

[2] If Weighted CN is less than 40, use CN=40 for runoff computations.

[3] Designer shall submit justification for the use of CN values not specified in the above Table

Table B-2
Runoff Coefficients for the Rational Formula
By Land Use, Hydrologic Soil Group and Overland Slope (%)

Hydrologic Soil Group (HSG) Slope	A			B			C			D		
	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
Cultivated Land	0.08 (a)	0.13	0.16	0.11	0.15	0.21	0.01	0.19	0.28	0.18	0.23	0.31
	0.14 (b)	0.18	0.22	0.16	0.21	0.28	0.20	0.25	0.34	0.24	0.29	0.41
Pasture	0.12	0.20	0.30	0.18	0.28	0.37	0.24	0.34	0.44	0.30	0.40	0.50
	0.15	0.25	0.37	0.23	0.34	0.45	0.30	0.42	0.52	0.37	0.50	0.62
Open Space/Lawn	0.10	0.16	0.25	0.14	0.22	0.30	0.20	0.28	0.36	0.24	0.30	0.40
	0.14	0.22	0.30	0.20	0.28	0.37	0.26	0.35	0.44	0.30	0.40	0.50
Forest	0.05	0.08	0.11	0.08	0.11	0.14	0.10	0.13	0.16	0.12	0.16	0.20
	0.08	0.11	0.14	0.10	0.14	0.18	0.12	0.16	0.20	0.15	0.20	0.25
Meadow	0.05	0.10	0.14	0.05	0.13	0.19	0.12	0.17	0.24	0.16	0.21	0.28
	0.11	0.16	0.20	0.14	0.19	0.26	0.18	0.23	0.32	0.22	0.27	0.39
Impervious Surfaces (including dirt, gravel)	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87
	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97

(a) Runoff coefficients for storm recurrence intervals less than 25 years.

(b) Runoff coefficients for storm recurrence intervals of 25 years or more

Source: "Recommended Hydrologic Procedures for Computing Urban Runoff from Small Watersheds in Pennsylvania"
 Pennsylvania DER #609-12/90

TABLE B-3

Roughness Coefficients (Manning's "n") For Overland Flow (U.S. Army Corps Of Engineers, HEC-1 Users Manual)

<u>Surface Description</u>	n		
		-	
Dense Growth	0.4	-	0.5
Pasture	0.3	-	0.4
Lawns	0.2	-	0.3
Bluegrass Sod	0.2	-	0.5
Short Grass Prairie	0.1	-	0.2
Sparse Vegetation	0.05	-	0.13
Bare Clay-Loam Soil (eroded)	0.01	-	0.03
Concrete/Asphalt - very shallow depths (less than 1/4 inch)	0.10	-	0.15
- small depths (1/4 inch to several inches)	0.05	-	0.10

Roughness Coefficients (Manning's "n") For Channel Flow

<u>Reach Description</u>	n
Natural stream, clean, straight, no rifts or pools	0.03
Natural stream, clean, winding, some pools or shoals	0.04
Natural stream, winding, pools, shoals, stony with some weeds	0.05
Natural stream, sluggish deep pools and weeds	0.07
Natural stream or swale, very weedy or with timber underbrush	0.10
Concrete pipe, culvert or channel	0.012
Corrugated metal pipe	0.012-0.027 ⁽¹⁾
High Density Polyethylene (HDPE) Pipe	
Corrugated	0.021-0.029 ⁽²⁾
Smooth Lined	0.012-0.020 ⁽²⁾

(1) Depending upon type, coating and diameter

(2) Values recommended by the American Concrete Pipe Association, check Manufacturer's recommended value.

APPENDIX C
SAMPLE DRAINAGE PLAN APPLICATION AND FEE SCHEDULE

(To be attached to the "land subdivision plan or development plan review application or "minor land subdivision plan review application")

Application is hereby made for review of the Stormwater Management and Erosion and Sedimentation Control Plan and related data as submitted herewith in accordance with the _____ Township Stormwater Management and Earth Disturbance Ordinance.

_____ Final Plan _____ Preliminary Plan _____ Sketch

Plan Date of Submission _____ Submission No. _____

1. Name of subdivision or development _____
2. Name of Applicant _____ Telephone No. _____ (if corporation, list the corporation's name and the names of two officers of the corporation)
 _____ Officer 1
 _____ Officer 2

Address _____

Zip _____

Applicants interested in subdivision or development
 (if other than property owner give owners name and address)

3. Name of property owner _____ Telephone No. _____
 Address _____
 Zip _____
4. Name of engineer or surveyor _____ Telephone No. _____
 Address _____
 Zip _____

5. Type of subdivision or development proposed:

- | | | |
|---------------------------|-------------------------|------------------------------|
| _____ Single-Family Lots | _____ Townhouses | _____ Commercial(Multi-Lot) |
| _____ Two Family Lots | _____ Garden Apartments | _____ Commercial (One-Lot) |
| _____ Multi-Family Lots | _____ Mobile-Home Park | _____ Industrial (Multi-Lot) |
| _____ Cluster Type Lots | _____ Campground | _____ Industrial (One-Lot) |
| _____ Planned Residential | _____ Other | _____ Development |

6. Linear feet of new road proposed _____ L.F.
7. Area of proposed and existing conditions impervious area on entire tract.
- a. Existing (to remain) _____ S.F. _____ % of Property
- b. Proposed _____ S.F. _____ % of Property
8. Stormwater
- a. Does the peak rate of runoff from proposed conditions exceed that flow which occurred for existing conditions for the designated design storm? _____
- b. Design storm utilized (on-site conveyance systems) (24 hr.) _____ No. of Subarea _____
 Watershed Name _____
 Explain: _____

- c. Does the submission and/or district meet the release rate criteria for the applicable subarea? _____
- d. Number of subarea(s) from Ordinance Appendix D of the Tobyhanna Watershed Stormwater Management Plan. _____
- e. Type of proposed runoff control _____
- f. Does the proposed stormwater control criteria meet the requirement/guidelines of the Stormwater Ordinances? _____
 If not, what variances/waivers are requested? _____ Reasons Why:

- g. Does the plan meet the requirements of Article iii of the Stormwater Ordinances? _____
 If not, what variances/waivers are requested? _____ Reasons Why:

- h. Was TR-55, June 1986 utilized in determining the time of concentration?

- i. What hydrologic method was used in the stormwater computations?

- j. Is a hydraulic routing through the stormwater control structure submitted?

 - k. Is a construction schedule or staging attached? _____
 - l. Is a recommended maintenance program attached? _____
9. Erosion and Sediment Pollution Control (E&S):
- a. Has the stormwater management and E&S plan, supporting documentation and narrative been submitted to the _____ County Conservation District? _____
 - b. Total area of earth disturbance _____ S.F.
10. Wetlands
- a. Have the wetlands been delineated by someone trained in wetland delineation? _____
 - b. Have the wetland lines been verified by a state or federal permitting authority? _____
 - c. Have the wetland lines been surveyed? _____
 - d. Total acreage of wetland within the property _____
 - e. Total acreage of wetland disturbed _____
 - f. Supporting documentation _____
11. Filing
- a. Has the required fee been submitted? _____ Amount: _____
 - b. Has the proposed schedule of construction inspection to be performed by the Applicant's engineer been submitted? _____
 - c. Name of individual who will be making the inspections _____
 - d. General comments about stormwater management at the development:

Drainage Plan Proposed Schedule of Fees

Subdivision name _____ Submittal No. _____

Owner _____ Date _____

Engineer _____

1. Filing fee	\$ _____
2. Land use	
2a. Subdivision, campgrounds, mobile home parks, and multi-family dwelling where the units are located in the same local watershed.	\$ _____
2b. Multi-family dwelling where the designated open space is located in a different local watershed from the proposed units.	\$ _____
2c. Commercial/industrial.	\$ _____
3. Relative amount of earth disturbance	
3a. Residential road <500 l.f.	\$ _____
road 500-2,640 l.f.	\$ _____
road >2,640 l.f.	\$ _____
3b. Commercial/industrial and other impervious area <3,500 s.f.	\$ _____
impervious area 3,500-43,460 s.f.	\$ _____
impervious area >43,560 s.f.	\$ _____
4. Relative size of project	
4a. Total tract area <1 ac	\$ _____
1-5 ac	\$ _____
5-25 ac	\$ _____
25-100 ac	\$ _____
100-200 ac	\$ _____
>200 ac	\$ _____
5. Stormwater control measures	
5a. Detention basins & other controls which require a review of hydraulic routings (\$ per control).	\$ _____
5b. Other control facilities which require storage volume calculations but no hydraulic routings. (\$ per control)	\$ _____
6. Site inspection (\$ per inspection)	\$ _____
Total	\$ _____

All subsequent reviews shall be 1/4 the amount of the initial review fee unless a new application is required as per Section 406 of the stormwater Ordinance. A new fee shall be submitted with each revision in accordance with this schedule.

APPENDIX D
STORMWATER MANAGEMENT DISTRICT WATERSHED MAP

Management District Map Fly Page

APPENDIX E
EXISTING VACANT LOTS IN RECORDED SUBDIVISIONS
METHOD OF STORAGE COMPUTATION AND EXAMPLE LOT LAYOUTS

STEP 1.

Determine Impervious Surfaces

House Roof 1	12 X 48 =	576
House Roof 2	12 X 48 =	576
Deck***	12 X 18 =	216
Deck	4 X 24 =	96
Drive	12 X 50 =	600
Garage	12 X 12 =	144

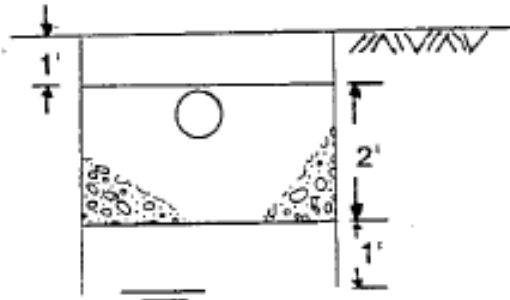
2,208 S.F.

STEP 2.

Required storage volume from Figure 1 = 505 cubic feet

STEP 3.

Refer to soil log for septic system. Indicates mottling at 48 inches. The percolation rate is 96 minutes/inches. Therefore, from Figure 2, choose seepage trenches for each rain gutter outlet.



STEP 4.

Determine length of trench required - use 6-inch perforated pipe.

<u>GUTTER OUTLET</u>	<u>REQ'D VOL.(C.F.) FROM FIGURE 1</u>	<u>DEPTH OF AGGREGATE FT.</u>	<u>TRENCH WIDTH FT.</u>		
1	118	2	3		
2	118	2	3		
3	30	2	3		
<u>GUTTER OUTLET</u>	<u>VOLUME OF STORAGE* PER FT. OF TRENCH</u>	<u>VOLUME OF STORAGE** PER FT. OF PIPE</u>	<u>TOTAL</u>	<u>TOTAL LENGTH OF TRENCH REQ'D (FT.)</u>	
1	2.1	0.2	2.3	118/2.3 = 51	
2	2.1	0.2	2.3	118/2.3 = 51	
3	2.1	0.2	2.3	30/2.3 = 13	

* From Table 5

** From Table 6

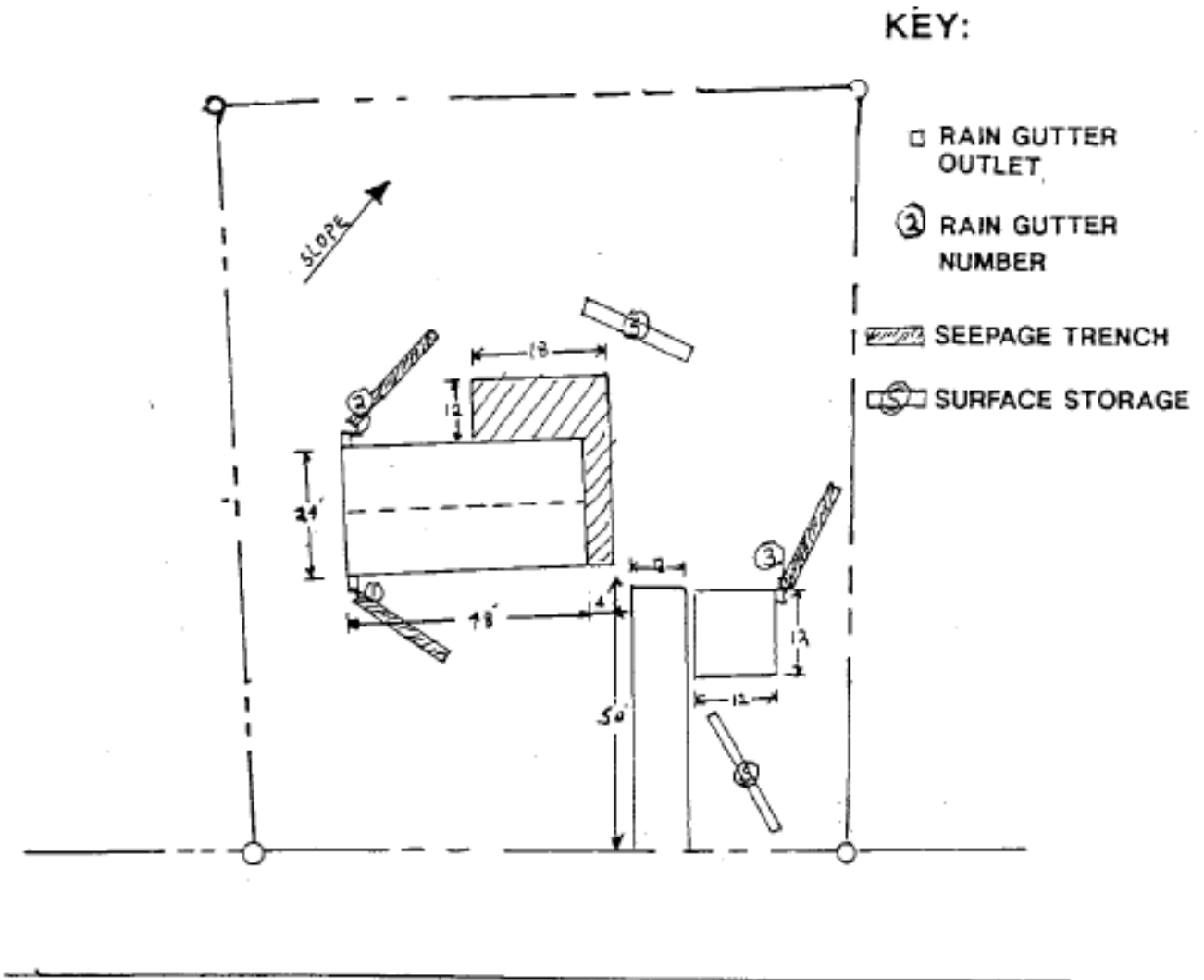
*** Wood decks with spacing between boards are exempt from the calculations.

STEP 5.

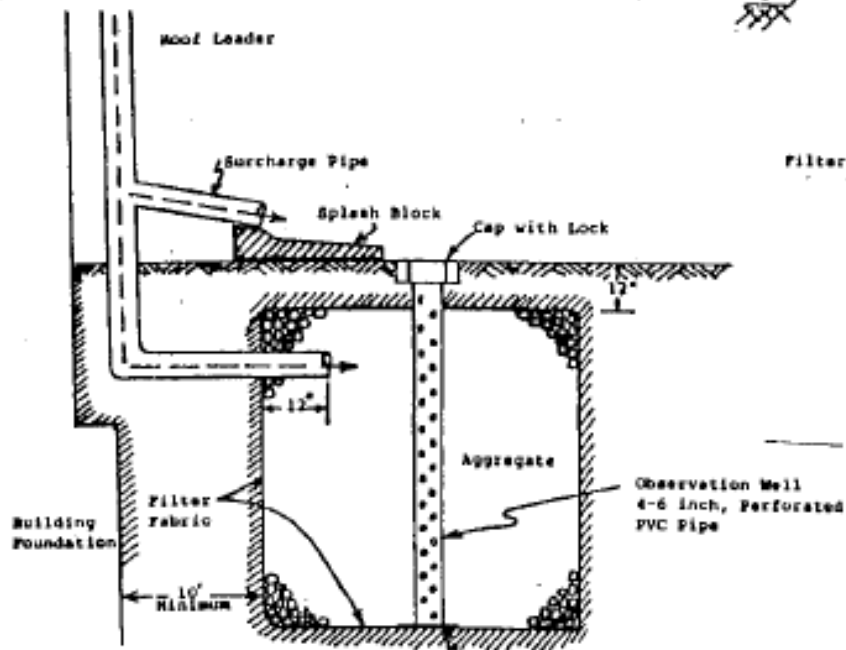
Determine remainder of impervious surfaces which requires detention and required storage volume from Figure 2.

Deck 312 S.F. 912 S.F. = 185 C.F. of Storage
Drive $\frac{600 \text{ S.F.}}{912 \text{ S.F.}}$

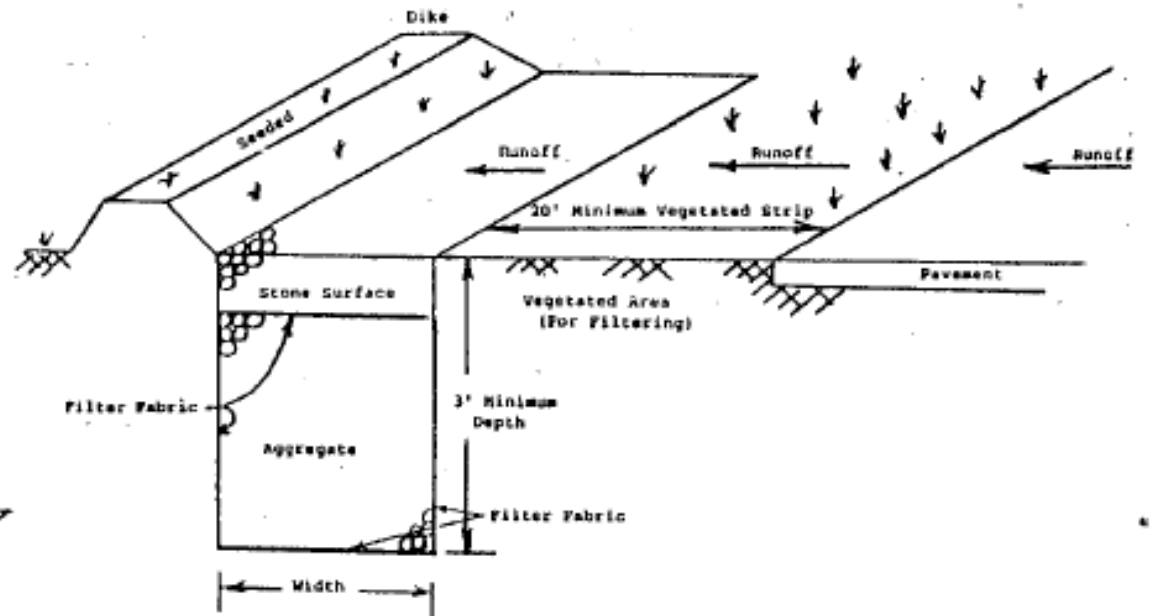
Use trench 6' wide by 1' deep x 31 feet long or 2 - 6' x 1' x 16' trenches in locations shown on plan.



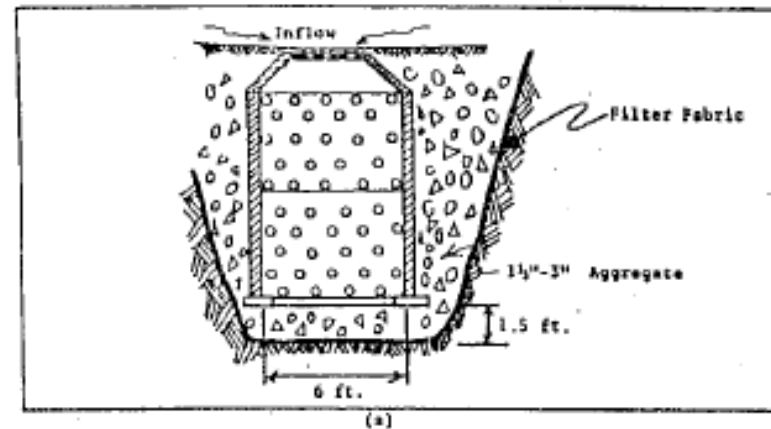
TYPICAL LOT LAYOUT



Typical Dry Well Cross Section

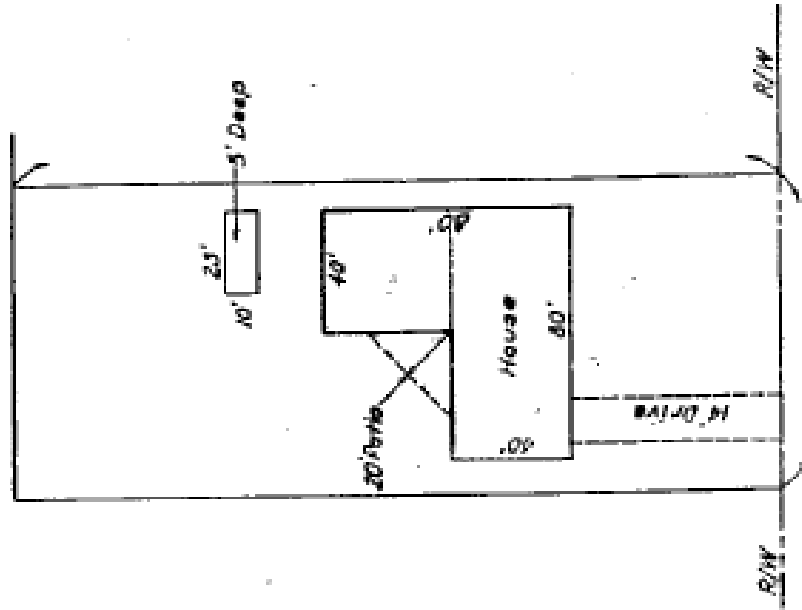


Typical Section of Infiltration Trenches
Modified after Frederick Co., MD. (1979)

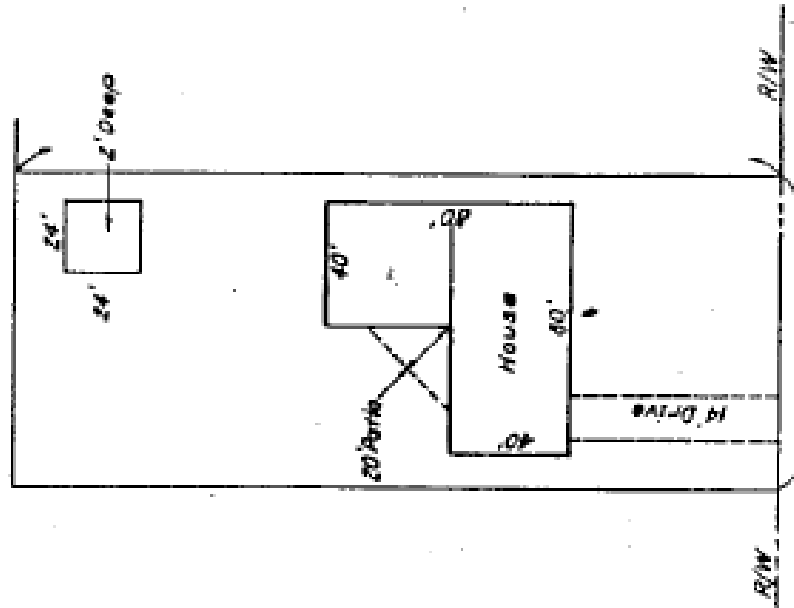


Source: Modified from Sullivan (1981)

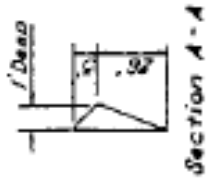
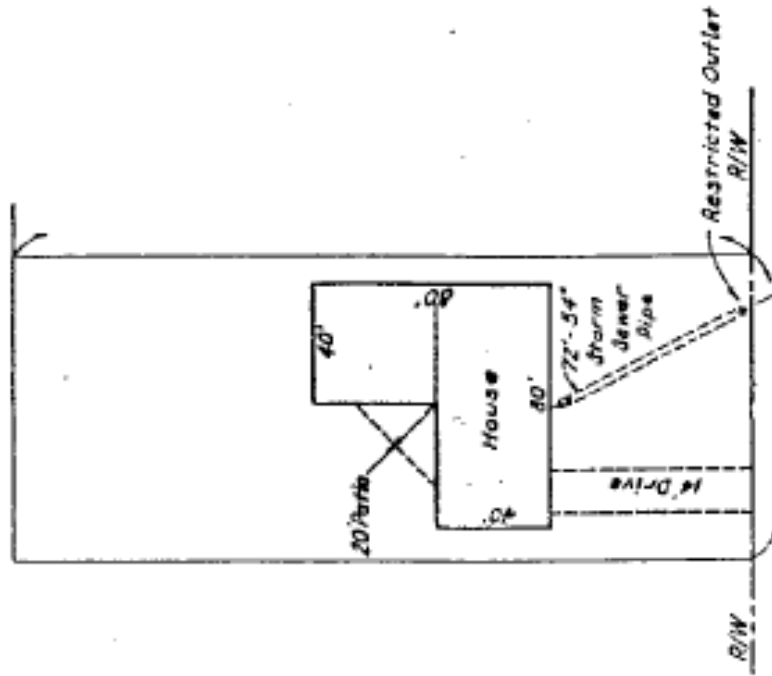
ON-SITE STORM WATER MANAGEMENT
 ALTERNATE NO. 4
 UNDERGROUND TANK STORAGE



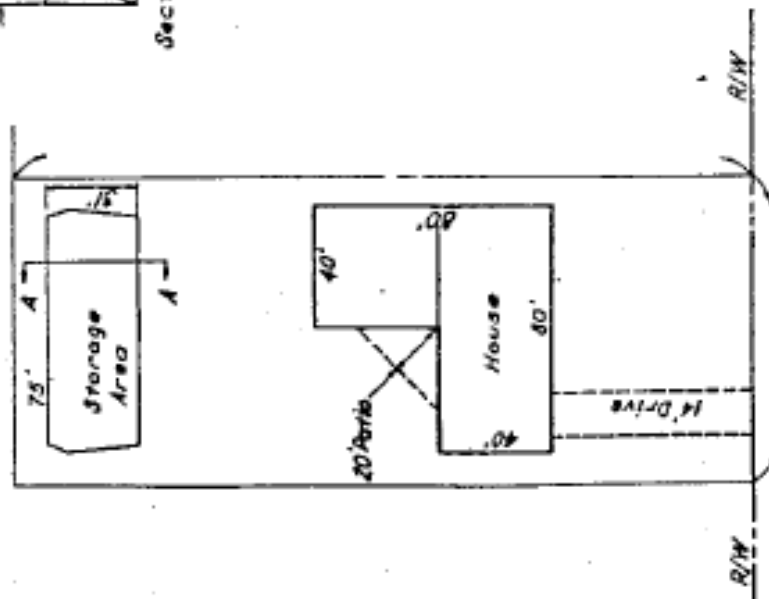
ON-SITE STORM WATER MANAGEMENT
 ALTERNATE NO. 3
 POND STORAGE



ON-SITE STORM WATER MANAGEMENT
 ALTERNATE NO. 2
 OVERSIZED STORM SEWER PIPE



ON-SITE STORM WATER MANAGEMENT
 ALTERNATE NO. 1
 SURFACE STORAGE



SECTION IX
THE DEVELOPMENT OF PRIORITIES
FOR IMPLEMENTATION OF ACTION WITHIN THE PLAN

The Tobyhanna Creek Watershed Storm Water Management Plan preparation process is complete with Monroe, Carbon and Wayne Counties' adoption of the draft Plan and submission of the Final Plan to PaDEP for approval. Procedures for the review and adoption of the Plan are included in Section X. Subsequent activities to carry out the provisions of the Plan are considered by PaDEP to be part of the implementation of the Plan. DEP approval sets in motion the mandatory schedule of adoption of Municipal Ordinance provisions to implement the storm water management criteria. Tobyhanna Creek Watershed Municipalities will have six months from PaDEP approval in which to adopt the necessary Ordinance provisions.

A. DEP Approval of the Plan

Upon adoption of the watershed plan by Monroe, Carbon and Wayne Counties, the Plan is submitted to PaDEP for approval. A draft of the Storm Water Management Plan and Draft Model Ordinance will be sent to PaDEP prior to adoption of the watershed plan. The PaDEP review process involves determination that all of the activities are completed in the Plan. The Department will only approve the Plan if it determines the following:

1. That the Plan is consistent with Municipal floodplain management plans, State programs which regulate dams, encroachments and other water obstructions, and State and Federal flood control programs; and
2. That the Plan is compatible with other watershed storm water plans in which the watershed is located and is consistent with the policies and purposes of Act 167.

DEP action to either approve or disapprove the Plan must take place within ninety (90) days of receipt of the Plan by the Department. Otherwise, the Plan would be approved by default.

B. Publishing the Final Plan

Consistent with the Tobyhanna Creek Scope of Study, the Monroe County Planning Commission will publish copies of the Watershed Plan after DEP approval. A link to the Plans will be provided to each Municipality via email and made available at the County website. Additionally, the Tobyhanna Creek Watershed Act 167 Storm Water Management Ordinance will be published for use by the Municipalities.

C. Municipal Adoption of Ordinance Provisions to Implement the Plan

The key ingredient for implementation of the Storm Water Management Plan is the adoption of the necessary Ordinance provisions by the Tobyhanna Creek Watershed Municipalities. Provided as part of the Plan is the Tobyhanna Creek Watershed Act 167 Storm Water Management Ordinance which is a single purpose storm water Ordinance that could be adopted by each Municipality essentially "as is" to implement the Plan. The single purpose Ordinance was chosen for ease of incorporation into the existing structure of Municipal Ordinances. All that would be required of any Municipality would be to adopt the Ordinance itself and adopt the necessary provisions into the existing Subdivision and Land Development Ordinance and Zoning Ordinance. The provisions would simply refer any applicable regulated activities within the Tobyhanna Creek Watershed from the other Ordinances to the single purpose Ordinance. It is recommended that the delineation of the watershed subareas and the Management Districts

assigned to each subarea be enacted as part of each Municipality's Zoning or Subdivision Ordinance so that the requirements for management of storm water will be applicable to all changes in land use and not limited only to activities which are subject to subdivision and land development regulations.

The proposed model Ordinance provisions include the technical standards of the Tobyhanna Creek Watershed Storm Water Management Plan as well as recommended procedures for review and approval of development applications and for the financing and maintenance of storm water control facilities constructed in conjunction with development and land alteration activities. These technical, procedural and administrative provisions are summarized in this Section and Section V, Criteria and Standards.

D. Level of Government Involvement in Storm Water Management

The existing institutional arrangements for the management of storm water include federal, state, and county governments, as well as every Municipality within the watershed. Table IX-1 indicates the major areas of involvement of each of these agencies - prior to the adoption of the Watershed Storm Water Management Plan

In the absence of a single entity with responsibility for all aspects of storm water management within a watershed, it is clear that the "management" which occurs is primarily a function of a multiple permitting process in which a developer attempts to satisfy the requirements of all of the permitting agencies. Each public agency has established its own regulations based on its own objectives and legislative mandates as well as its own technical standards, applicable to its particular storm water concerns.

The minimum objectives of this plan and the minimum mandates of ACT 167 can be accomplished without significant modification of existing institutional arrangements - by actions taken at the Municipal and County level (in combination with continuing voluntary coordination at the watershed level), participation by the Municipality in the technical review of storm water management plans, maintenance and operation of the computer model (as necessary) and compilation of data required for periodically updating the plan. In addition, upon adoption and approval of the watershed plan, all future public facilities, facilities for the provision of public utility services, and all facilities owned or financed by state funds will have to be consistent with the watershed plan, even though they might not otherwise be subject to Municipal regulation.

1. Municipal/Watershed Level Activities

Adoption or amendment of development regulations by each Municipality to incorporate watershed storm water management standards. ACT 167 requires that this be accomplished within six months of the plan's adoption and approval. Model Ordinance provisions have been distributed to all of the watershed Municipalities. The Monroe, Carbon and Wayne Counties' Planning Commissions and Conservation Districts will be available upon request to assist Municipalities in the adoption of the model Ordinance provisions to fit particular Municipal Ordinance structures.

TABLE IX-1
Public Involvement in Storm Water Management

Government Level and Agency	Area of Involvement
<u>Federal</u>	
Environmental Protection Agency	Clean Water Act - concerned with water quality including runoff quality and wetlands.
NRCS	Erosion and sediment pollution control - agriculture.
Corps of Engineers	Floodplain management, navigation and flood control, wetlands.
U.S. Fish & Wildlife Service	Wetlands, land use.
<u>State</u>	
Department of Environmental Protection	Clean Streams Law - concerned with runoff quality, specifically erosion and sedimentation.
	Dam Safety and Encroachments Act - regulates dams, obstructions and encroachments streams, flood plains, and wetlands.
	Storm Water Management Act - administers law; approves watershed management plans.
DCED	Administers Flood Plain Management Act; with DEP, reviews watershed plans.
<u>County</u>	
Conservation District	Approves erosion and sediment pollution control plans under agreement with DEP.
Planning Commission	Reviews Municipal subdivision regulations.
Municipalities	Enact and administer Zoning, Subdivision and Land Development, building code, site alteration regulations. In addition, the state, county and Municipalities all construct and maintain a variety of public facilities - such as roads, bridges, culverts, storm sewers and other storm control facilities, which affect and are affected by storm water flows.

The Municipalities should also consider issues of the repair, maintenance and improvement of existing Municipal storm water facilities in order to ensure the proper functioning of the total system and to address the correction of existing problems.

2. County Level Activities

a. Establishment of review procedures

The model Ordinance calls for review of storm water management plans for development sites by the Monroe, Carbon and Wayne County Planning Commissions, and Erosion and Sediment Pollution Control Plans by the same respective County Conservation Districts. Evidence that the appropriate state and federal agencies responsible for administering wetland regulatory programs have been contacted for land development sites containing regulated wetlands is also required. The purpose is to ensure that plan standards have been applied appropriately and that downstream impacts have been adequately addressed. Procedures and capabilities for performing the review function exist within the governmental agencies.

b. Maintenance of data for performance of review and of no-harm evaluation

The materials initially prepared by the consultants during the plan preparation process which are needed or which may be needed in the development of site specific storm water management plans, including data needed to perform the no-harm evaluation as detailed in the Model Ordinance, must be maintained in a place and form which is accessible to users. This material includes the computer model tabular printouts and the PSRM input files on disc.

E. County Wide Coordination

1. Regional Storm Water Management Board

There are possible situations of storm water management functions and concerns which may not be adequately addressed within the structure of the existing institutional arrangements or by the adoption and enforcement of new regulations at the Municipal level, as outlined above.

For example, the construction of regional storage facilities may offer a very economic and technically sound alternative to the construction of individual, on-site detention basins. There is, however, no organization at the present time which is capable of implementing such a concept. To do so would require a multi-Municipal entity capable of planning, financing, constructing, operating and maintaining the shared storage facilities in a manner similar to the management required for the collection, treatment and disposal of sanitary waste.

The Tobyhanna Creek Watershed is a drainage system. All of its parts are interrelated. What happens upstream affects what happens downstream, and what happens downstream places limitations on what happens upstream. If runoff is not controlled in upstream communities, downstream communities will flood. But, if in a downstream community, the capacity of a drainage channel can be safely increased, more upstream runoff may be released, thus reducing to some degree the cost of required upstream control facilities.

The standards proposed in this plan are the primary standards for managing storm water

on a watershed basis and is a very simple concept which can be implemented on a property-by-property basis. It is equitable and can be used to achieve the law's "no-harm" mandate. But the same technical tool which allowed the modeling of rainfall routing throughout the watershed and the development of a usable standard for property-level control is capable of testing numerous, technically feasible solutions which would work for combinations of properties and for combinations of subareas. Some of these potential solutions may be preferable to those which would result from the application of release rates to individual properties.

There are, of course, ways to work out agreements on a case-by-case basis to permit the accomplishment of almost any objective, whether a public or a private undertaking. As the number of storm water detention and control facilities increases during future years, continuing maintenance to ensure the integrity of structures and their performance will become very important. A proliferation of "special agreements" to handle special situations may make future accountability very difficult.

An ideal structure for the management of storm water on a watershed basis would be an entity capable of dealing with all of the interrelated elements of the system in order to achieve the following:

- o the best possible technical solutions in the most effective manner;
- o the efficient and competent review of storm water management components of development plans;
- o the continued maintenance and proper functioning of all elements of the system;
- o the repair and replacement of system components as necessary;
- o continuing monitoring and evaluation of the performance of the drainage system;
- o updating and revision of system requirements and standards as necessary;
- o coordination of storm water management in the watershed with other actors and concerns such as water quality and supply, recreation, conservation and environmental objectives; and
- o responsible financial management including an equitable apportionment of operating and capital costs among the system's users and beneficiaries.

It is clear that not all of these objectives can be achieved on a watershed basis through Municipal implementation of the storm water plan, but that the existence of an inter-municipal entity capable of continuous action at the system or watershed level is required.

An optimum management system would be an entity capable of performing similar functions for multiple watersheds - a County-level storm water management institution. There are a variety of models for such an entity, ranging from assigning new responsibilities to a coordinated team of existing county departments to the creation of a regional storm water management board to include storm water functions. Further,

under any management system, some of the elements in the process could be contracted out to a private vendor.

2. Financing

The essential concept is that storm water can be managed like a public utility and that the costs for planning, construction, operation and maintenance, monitoring and evaluation can be equitably shared by all of the system's users.

A basic assumption underlying the concept of user financing of storm water management is that damage caused by existing and potential storm water runoff without controls is intolerable. Therefore, it is in the public interest to undertake storm water management immediately, and such management should not be delayed until federal and state funding is available.

Based on storm water management experience elsewhere, users (defined to include beneficiaries also) can finance the full cost of storm water management inexpensively and equitably. The cost to each user is calculated on the basis of the user's property characteristics. Because this method is based on a formula, it has the advantage of being objective in its application.

3. Recommendations for Institutional Arrangements

In order that the technical standards for control of storm water in the Tobyhanna Creek Watershed can be implemented within the time period specified by the law (six months after approval of the adopted plan by PaDEP), it is recommended that the Model Ordinance be adopted in its entirety.

F. Development of a Systematic Approach for Correction of Existing Storm Drainage

Correction of the existing storm drainage problem areas in the watershed is not specifically part of the ACT 167 planning process. However, the development of the watershed plan has provided a framework for their correction for the following reasons: (1) existing storm drainage problems have been documented through interaction with the Watershed Plan Advisory Committee (WPAC); (2) implementation of the runoff control criteria specified in the Plan will prevent the existing drainage problems from becoming worse (and prevent the creation of new drainage problem areas); and (3) the hydrologic model developed to formulate the runoff control criteria could be used as an analytical tool for designing engineering solutions to existing drainage problems.

With the above in mind, each Municipality within the Tobyhanna Creek Basin should take the following steps to implement solutions to the existing storm drainage problem areas:

1. Prioritize the list of storm drainage problems within the Municipality based on frequency of occurrence, potential for injury to persons or property, damage history, public perception of the problems, and other appropriate criteria.
2. For the top priority drainage problems in the Municipality, conduct detailed engineering evaluations to determine the exact nature of the problems (if not known), determine alternative solutions, provide cost estimates for the alternative solutions, and recommend a course of Municipal action. The number of drainage problems to be evaluated by a Municipality as a first cut from the priority list should be based on a

schedule commensurate with completing engineering studies on all problem areas within approximately five years.

3. On a priority and cost basis, incorporate the implementation of recommended solutions to the drainage problems in the annual Municipal capital budget or the Municipal maintenance budget as funds are available. The number of drainage problems corrected in a given year should be based on a maximum ten-year schedule of resolving all existing documented drainage problems in the Municipality for which cost-effective solutions exist.

The above-stated procedure for dealing with existing storm drainage problem areas is not a mandatory action placed on Municipalities with the adoption of the watershed plan. Rather, it represents one systematic method to approach the problems uniformly throughout the watershed and attempt to improve the current runoff situation in the basin. The key elements involved in the success of the remedial strategy will be the dedication of the Municipalities to construct the corrective measures and the consistent and proper application of the runoff control criteria specified in the Plan. The latter element is essential to ensure that remedial measures do not become obsolete (under-designed) by increasing peak flows with new development.

G. Culvert Replacement

The General Procedures for Municipalities to determine the size of replacement culverts using Act 167 data is as follows:

1. Determine the location and Municipality of obstruction on the Obstruction Map and obtain the obstruction number.
2. From Section 105.161 of DEP's Chapter 105, determine the design storm frequency.
3. Locate the flow value (cfs) for the design storm frequency determined from #1 and #2 above.
4. Have the culvert sized for this design flow and obtain any necessary approvals/permits.

Note: Any culverts/stream crossings not identified on the Obstruction Map would need to have storm flows computed for sizing purposes.

H. PENNVEST Funding

One way in which the completion and implementation of this plan can be of assistance in addressing storm drainage problems is by opening the avenue of funding assistance through the PENNVEST program. The PENNVEST Act of 1988, as amended, provides low interest loans to governmental entities for the construction, improvement or rehabilitation of stormwater projects including the transports, storage and infiltration of stormwater and best management practices to address non-point source pollution associated with stormwater.

In order to qualify for a loan under PENNVEST, the Municipality or county:

1. Must be located in a watershed for which there is an existing county adopted and DEP approved stormwater plan with enacted stormwater Ordinances consistent with the plan, or
2. Must have enacted a stormwater control Ordinance consistent with the Stormwater Management Act.

More information on the PENNVEST loan application procedure can be found online at <https://www.pennvest.pa.gov/Services/Pages/Apply-Online.aspx>.

There may be alternate sources of funding through grants or other government programs to address the storm drainage problems in the watershed. These programs will vary over time and available funding.

I. Landowner's/Developer's Responsibilities

Any landowner and any person engaged in the alteration or development of land that may affect stormwater runoff characteristics shall implement such measures consistent with the provisions of the applicable watershed stormwater plan as are reasonably necessary to prevent injury to health, safety or other property. Such measures shall include such actions as are required:

1. to assure the maximum rate of stormwater runoff is no greater after development than' prior to development activities; or
2. to manage the quantity, velocity and direction of resulting stormwater runoff in a manner which otherwise adequately protects health and property from possible injury.

Many developers throughout the state, after realizing the national resource, public safety and potential economic advantages of proper storm water management, are constructing new development consistent with natural resources protection.

SECTION X
PLAN REVIEW ADOPTION AND UPDATING PROCEDURES

A. County Adoption

Plan review by the Municipal planning agency and the Governing Body of each involved municipality, the respective County Planning Commissions and the Watershed Plan Advisory Committee (WPAC) was conducted as a part of the municipal and public participation required in the Stormwater management Act. This review included an evaluation of the plan's consistency with other plans, programs and current regulations affecting the watershed. Reviews and comments should be submitted to the County by official correspondence. The county will receive, tabulate and respond to the comments and will revise the Plan as appropriate.

Monroe County is required to hold a public hearing as a part of the process. A notice for the hearing shall be published two weeks prior to the hearing date. The meeting notice is to contain a summary of the principal provisions of the Plan and indicate where copies of the Plan may be examined or obtained within each Municipality. The comments received at the public hearing are to be reviewed by the County and appropriate modifications to the Plan made.

The original Plan was passed as a resolution by the County Commissioners of Monroe, Carbon and Wayne Counties for the purpose of adoption. The same process will be followed for this plan renewal. The County resolution will be recorded in the minutes of a regular meeting of the Monroe, Carbon and Wayne Counties Commissioners, respectively.

Monroe County will submit to the Department of Environmental Protection a letter of transmittal and copies of the adopted plan, the review by each affected Municipal Planning agency and local governing body and the County Planning Commission, public hearing notice and minutes, and the resolution of adoption of the Plan by the County. The letter of transmittal will state that Monroe County has complied with all procedures outlined in Act 167 and will request that the Department of Environmental Protection approve the adopted plan.

B. Provisions for Plan Revision

Section 5 of the Storm Water Management Act requires that the storm water management plan be updated at least every five years.

This requirement considers the changes in land use, obstructions, flood control projects, floodplain identification, and management objectives or policy that may take place within the watershed.

It will be necessary to collect and manage the required data in a consistent manner and preferably store it in a central location not only to prepare an updated plan, but also, if required, to make interim changes on the runoff simulation model to analyze the impact of a proposed major development or a proposed major storm water management facility.

The following recommendations detail the minimum requirements that will have to be undertaken to maintain an effective technical position for periodically reviewing, revising and updating the Plan:

1. It is recommended that the Monroe County Board of Commissioners authorize the County Planning Commission to undertake the task of collecting and organizing storm water management plans and supporting documentation and data submitted for review.
2. It is recommended that the Monroe County Planning Commission prepare a workable program for the identification, collection and management of the required data. The program should not be limited to the cooperative efforts of the constituent member Municipalities within the Tobyhanna Creek watershed, but should also include both state and county agencies concerned with storm water management.
3. It is recommended that The Watershed Plan Advisory Committee convene bi-annually or as needed to review the Storm Water Management Plan and determine if the Plan is adequate for minimizing the runoff impacts of new development. At minimum, the information (to be reviewed by the Committee) will be as follows:
 - a. Development activity data as monitored by the Monroe, Carbon and Wayne County Planning Commissions.
 - b. Information regarding additional storm drainage problem areas as provided by the municipal representatives to the Advisory Committee.
 - c. Zoning and Subdivision amendments within the watershed.
 - d. Impacts associated with any regional or sub-regional detention alternatives implemented within the watershed.
 - e. Adequacy of the administrative aspects of regulated activity review.
 - f. Additional hydrologic data available through preparation of the Storm Water Management Plan for the Tobyhanna Creek Watershed.

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

**SECTION XI
FORMATION OF THE TOBYHANNA CREEK
WATERSHED PLAN ADVISORY COMMITTEE**

WATERSHED PLAN ADVISORY COMMITTEE (WPAC)

The current plan effort involves the updating and renewal of the Act 167 Plan to meet current standards. For the current effort, the Watershed Plan Advisory Committee (WPAC) for the Tobyhanna Creek watershed was reorganized with representatives from each municipality within the watershed.

A Technical Subcommittee was formed to review and revise the Plan and present the final document for review by the WPAC. Meetings were held throughout the planning process to develop an understanding of the updated criteria and to solicit input as to how these criteria can be best implemented within the watersheds. Input was obtained from the WPAC members as to how the existing ordinances were being implemented and the effectiveness of their implementation.

An Educational Subcommittee was formed to provide community education on the Act 167 planning and adoption process through a series of webinars, workshops and presentations. Subcommittee members attended and presented at the Monroe County Council of Governments (COG) meeting in July 2021.

A summary of the WPAC meetings, and their purpose, is included on the following page.

Table XI-1: Formation of the Tobyhanna Creek Watershed Plan Advisory Committee

WPAC Planning Meetings

- Committee Formation Meetings: **6/25/20, 7/24/20, 10/14/20, 11/9/20, 11/18/20, 1/29/21, 2/3/21, 2/18/21**
- WPAC Meeting dates: **2/24/21, 5/27/21, 12/9/21**
- Form WPAC and subcommittees - **3/5/21**
- Subcommittees Meeting dates: **3/18/21, 4/15/21, 5/13/21, 6/17/21, 7/15/21, 8/12/21, 9/30/21, 10/27/21**

Technical Tract

- Review/Audit of existing plans
- Draft Update Reviewed by DEP and WPAC – ***Provided to DEP and WPAC 1/28/22; Comments submitted by 3/1/22***
- Monroe County Public Hearing – ***Notice sent out 3/2/22; Public hearing held 3/16/22***
- Monroe County Commissioners Resolution to renew adoption – ***4/20/22***
- Wayne County Public Hearing – ***Notice sent out; Public hearing held 4/21/22***
- Wayne County Commissioners Resolution to renew adoption – ***4/21/22***
- Carbon County Public Hearing – ***Notice sent out 4/26/22; Public hearing held 5/5/22***
- Carbon County Commissioners Resolution to renew adoption – ***5/5/22***
- *90 Days* DEP and DCED Review
- DEP Approved plan or Revisions
- Municipalities have *six months* to adopt or amend ordinances

Municipal and Public - Educational Tract

- Monroe County Stormwater Planning Survey- ***11/23/20; sent to 1420 recipients, 85 people responded.***
- Survey 123 - Municipal hot spots -***7/28/2021; sent to 73 recipients, 27 people responded.***
- Webinar Educational Series:
 - Public on Facebook - "Stormwater Takeover" Webinar Shorts – ***7/26/21 – 8/2/21; 1939 people reached***
 - Municipal (Zoning and Supervisors) - Email Webinar series – ***7/26/21 – 8/3/21; 7 townships participated***
- Monroe County Council of Governments Meeting Presentation and Q/A – ***7/26/21 @10am***
- Rain Barrel Workshop – ***6/30/21 with the Brodhead Watershed Association***
- Riparian Buffer Planting / Workshop – ***4/2/22 with U.S. Fish & Wildlife Service – Cherry Valley National Wildlife Refuge, Penn State Extension Master Watershed Steward Program, and The Friends of Cherry Valley***
- Municipal Stormwater BMP tour and Ordinance adoption Updates – ***Fall 2022***

Appendix A
Stormwater Problem Area Survey
Sample and Results

```
<iframe src="https://www.googletagmanager.com/ns.html?id=GTM-NGMP3BG" height="0" width="0" style="display:none;visibility:hidden"></iframe>
```

Storm Water Problem Areas

1. Please fill out your contact information:

Name	<input type="text"/>
Municipality	<input type="text"/>
Address	<input type="text"/>
City/Town	<input type="text"/>
State/Province	<input type="text"/>
ZIP/Postal Code	<input type="text"/>
Email Address	<input type="text"/>
Phone Number	<input type="text"/>

2. Do you have any issues with overbank (stream) flooding?

- Yes
- No

3. Do you have any issues with storm sewer/roadway flooding?

Yes

No

4. Do you have any issues with localized flooding/standing water?

Yes

No

5. Do you have any issues with stream bank erosion?

Yes

No

6. Do you have any issues with stream sedimentation?

Yes

No

7. Do you have any issues with sediment runoff?

Yes

No

8. Do you have any issues with urban runoff?

Yes

No

9. If you chose "yes" to any of the above questions please reference the question numbers, and describe the suspected causes for each of the issues:

Example Answer: #4 - Roadway flooding caused by under-maintained storm drains.

10. Please describe any proposed solutions either formally proposed or suggested to any of the above issues:

Next

Powered by



See how easy it is to [create a survey](#).

[Privacy & Cookie Policy](#)

2021 Stormwater Hotspot Survey Results

Map ID (Figure III-7)	Stormwater Problem Description	Type	Latitude	Longitude
0	Flooding of the low area during periods of heavy rain due to inability of conveyance pipes to handle the flow.	Localized Flooding	40.999213	-75.199135
1	Flooding along channel of tributary stream probably due to inadequate storm sewer size downstream of pipe that crosses North 5th Street.	Sewer / Roadway Flooding	41.008871	-75.206493
2	box culvert washed out.	Sewer / Roadway Flooding	41.078866	-75.582569
3	Runoff during large storm events overwhelms the unnamed tributary along Neola Road. Additionally stormwater from Theresa Lane combines and the PennDOT owned pipe beneath Rt. 209 is insufficient.	Stream Flooding	40.935420	-75.314134
4	Storm water came up and over my driveway causing a tremendous loss of dirt, trees and gravel, in danger of losing part of paved driveway	Localized Flooding	41.069782	-75.132910
5	Stormwater coming onto property. Storm pipes get clogged water flows down hill beside the road.	Localized Flooding	40.950186	-75.354621
6	Street flooding; minor flooding in parking lots and basements.	Sewer / Roadway Flooding	40.983968	-75.200166
7	Collection points need to be cleaned out	Sewer / Roadway Flooding	41.152006	-75.367940
8	Glenbrook East Apartments (82 Waverly drive) is often flooded by the Pocono Creek. It flooded in 2020 and on August 22nd/23rd, 2021. The 2021 flood was worse than 2020. Residents had to be evacuated both times.	Stream Flooding	40.982001	-75.200316
9	Numerous yards and basements flooded. Retention Pond not large enough and pump and conveyance system not large enough to handle the large amount of rainfall.	Localized Flooding	41.008449	-75.174612
10	Conveyance system not large enough to handle large rainfalls	Sewer / Roadway Flooding	41.008220	-75.183514
11	Road flooding due to the Brodhead creek being higher than the outfall.	Sewer / Roadway Flooding	40.990157	-75.181517
12	Roadway fully engulfed in water	Sewer / Roadway Flooding	40.977626	-75.426491

Map ID (Figure III-7)	Stormwater Problem Description	Type	Latitude	Longitude
13	The north bound lane of road floods along Independence dr SR447 during storm events. Ponding creates hazardous driving (i.e., deep water impedes braking and splashing blinds driver)	Sewer / Roadway Flooding	41.003155	-75.154650
14	During large storms the streams will rise above the banks and flood Warner Rd all the way out to Rt 611 even sometimes flooding learn Rd.	Stream Flooding	41.030796	-75.303563
15	Flooding on Rt 447 and on private properties due to historical rerouting of flow and inadequate capacity of watercourse	Stream Flooding	41.026729	-75.197173
16	This is one of the most flooded areas in Pocono. Water runoff from the fill and properties on Archer Lane. Learn Roads generally will completely flood 2-3 times a year, causing it to close down. Much of the aggregate and debris from the hill will fill	Sewer / Roadway Flooding	41.037078	-75.302618
17	This is a stormwater runoff issue for years. Floods the road, shoulders and is very dangerous in the winter as it floods the road and causes it to be flooded and freezes	Sewer / Roadway Flooding	41.020400	-75.282797
18	During hard rainstorms, the river will flood outside of the banks and wing walls. Causes the road to shut down many times. Along with dangerous debris that will jam up the bridge.	Stream Flooding	41.023575	-75.303404
19	Stormwater runoff off of the hill and overload the drainbox. causing flooding on both entrances to Beehler & Serfass Rd, sometimes flooding both lanes of 611	Sewer / Roadway Flooding	41.021439	-75.297073
20	Water runoff from the hill, will flood the roads and intersection. And riddles the roads with debris. Causing 3 roads to be closed during flooding.	Sewer / Roadway Flooding	41.008721	-75.281360
21	Lower Sierra View	Sewer / Roadway Flooding	40.990576	-75.447598
22	The Highlands	Sewer / Roadway Flooding	40.966250	-75.460463

Map ID (Figure III-7)	Stormwater Problem Description	Type	Latitude	Longitude
23	Woods Crossing/Country Terrace	Localized Flooding	40.974602	-75.406587
24	547 White Birch Drive	Sewer / Roadway Flooding	40.976468	-75.391378
25	343 Kennel Road	Sewer / Roadway Flooding	40.938892	-75.381501
26	1324 Route 115 (Hugharts)	Sewer / Roadway Flooding	40.917433	-75.353445
27	814 Frable Road	Sediment Runoff	40.921686	-75.375176
28	Bush Lane	Localized Flooding	40.921624	-75.411519
29	When there are heavy rains, the three areas listed above, the creeks go over the roads and cause flooding.	Localized Flooding	41.174622	-75.274545
30	When it rains heavy Route 115 is flooded out and the shoulder is washed out. PennDOT and the contractor that widened Rt 115 have fixed the shoulders several times when they wash out.	Sewer / Roadway Flooding	41.053862	-75.533376
31	Roadway flooding after heavy rain	Sewer / Roadway Flooding	41.028568	-75.334753
32	Roadway flooding after heavy rain	Sewer / Roadway Flooding	40.984821	-75.315322
33	over tops pipe in heavier rain events	Sewer / Roadway Flooding	41.108819	-75.156261
34	pipe over tops in heavy storm events	Sewer / Roadway Flooding	41.079078	-75.176267
35	two 18 inch pipes receive over flow from a tributary that feed east stroudsburg reservoir	Localized Flooding	41.076587	-75.174464
36	water over tops bridge in storm events on primrose dr	Sewer / Roadway Flooding	41.056419	-75.103185

Appendix B

Public and Watershed Plan Advisory Committee

Participation and Comments

Lori Kerrigan

From: Monroe County Conservation District <monroecd+ptd.net@ccsend.com>
Sent: Thursday, January 28, 2021 3:52 PM
To: lkmccd@ptd.net
Subject: You're Invited: Act 167 Stormwater WPAC Meeting



Monroe County, Pennsylvania ACT 167 Stormwater Planning Meeting



The Monroe County Conservation District and Monroe County Planning Commission would like to invite you to participate in the Act 167 Watershed Plan Advisory Committee (WPAC) kickoff meeting to discuss stormwater management in your watershed on **Wednesday, February 24, 2021 at 10am.**

WPAC is an important advisory committee to the Act 167 Watershed update required per Section 5(a) of Act 167. Each watershed plan is required to be reviewed and any additional revisions be made at least every 5 years after its initial adoption. Plan updates are needed to maintain effective management of stormwater and protect water quality throughout the watershed.

Please register [here](#) by February 11, 2021 to reserve your spot!



**MONROE COUNTY
CONSERVATION DISTRICT**



**MONROE COUNTY
PLANNING COMMISSION**

ACT 167 Stormwater COG Meeting

Agenda

Monday, July 26, 2021 at 10am

1. Short Overview of Storm Water and Watershed Management
2. Intro to Act 167 requirements and obligations under the act
3. Where are we today and what needs updating
4. Watershed Plan Advisory Committee
 - a. Role
 - b. Participants
 - c. Subcommittees
5. Timeline
6. Next Steps

Lori Kerrigan

From: Monroe County Conservation District <bbmccd+ptd.net@ccsend.com>
Sent: Thursday, July 15, 2021 10:45 AM
To: lkmccd@ptd.net
Subject: ACT 167 Municipal Stormwater_Zoning Officer Training Opportunity



ACT 167 Municipal Stormwater Training for Zoning Officers and Inspectors

The Monroe County Conservation District and Monroe County Planning Commission would like to invite Zoning Officers and Inspectors to participate in the Act 167 Watershed Educational stormwater management Series Starting July 26 – August 3rd

Act 167 Watershed Planning maintains effective management of stormwater and protect water quality throughout the watershed.

Please register by July 15, 2021 for this week-long series!
<https://www.mcconservation.org/721act167stormwater821.html>

Municipal “Short” Webinar Series for Zoning and Inspectors

- How Does Permeable Pavement Work?
- Why Do Engineers Invent Floods
- Green Infrastructure- Inspiration from other cities
- Long Term Nitrate Removal Riparian Buffers
- Large Woody Debris for Stream Restoration
- Stormwater Basin Retrofitting
- Post Construction Stormwater Management Inspections

For more information, or if you have questions, please contact Lori Kerrigan, Head Resource Conservationist, at M CCD @ lkmccd@ptd.net or call 570-629-3060.

Lori Kerrigan

Subject: FW: Public, FB, Stormwater Takeover_Shots_Series
Attachments: public stormwater takeover links.docx

Water, water everywhere, and not a drop to drink !

Stormwater Shorts FACE BOOK Webinar Series

The Monroe County Conservation District and Monroe County Planning Commission would like to invite you to participate in the Act 167 Watershed Educational Stormwater Series

Act 167 Watershed Planning maintains effective management of stormwater and protect water quality throughout the watershed.

This week-long series is FREE to the Public on Face Book!

July 26 August 2nd

Stormwater Short Webinar Series

- **Stormwater-basics**
- **Why-should-I care-about-stormwater**
- **How-can-I control-stormwater-on-my-property**
- **Why-does-my-community-flood-more-than-it-used-to**
- **What-are-stormwater-pollutants**
- **How-can-I-be-a-good-stormwater-neighbor**
- **Where does the Stormwater Go**

For more information, or if you have questions, please contact Lori Kerrigan, Head Resource Conservationist, at MCCD @ lmccd@ptd.net or call 570-629-3060.

Lori Kerrigan

From: Lori Kerrigan <lkmccd@ptd.net>
Sent: Friday, January 28, 2022 8:59 AM
To: 'a.velopolcek@eldredtwp.org'; 'acanfield@tobyhannatwppa.gov'; 'ammccd@ptd.net'; 'apwc.nepa@gmail.com'; 'arehrig@leightownship.com'; 'becky.smith@eaststroudsburgboro.org'; 'bill@angrymechanics.com'; 'brian@smithfieldtownship.com'; 'carbmgr@ptd.net'; 'cmartinelli@chestnuthilltwppa.gov'; 'cmeinhardt@monroecountypa.gov'; 'crickard@waynecountypa.gov'; 'ctmccd@gmail.com'; 'dalbright@chestnuthilltwppa.gov'; 'davidbodnar@carboncounty.net'; 'dhorton@bcrawater.com'; 'dwgboro@ptd.net'; 'dwilliams@waynecountypa.gov'; 'dwmccd@ptd.net'; 'EMasker@coolbaughtwp.org'; 'eratbaird@frontiernet.net'; 'executive@brodheadwatershed.org'; 'gchristine@monroecountypa.gov'; 'grogalsky@verizon.net'; 'hamtwp@ptd.net'; 'info@jacksontwp-pa.gov'; 'info@kiddertownship.org'; 'jav45@psu.edu'; 'jbohman@pa.gov'; 'jknecht@waynecountypa.gov'; 'jones@pennfuture.org'; 'julia@smithfieldtownship.com'; 'kdixon@mstownship.com'; 'khmccd@ptd.net'; 'kidder.admin@pa.metrocast.net'; 'L.freshcorn@dwgpa.gov'; 'ltroutman@phlt.org'; 'mayor@mountpocono-pa.gov'; 'mclewell@mstownship.com'; 'MKeegan@monroecountypa.gov'; 'mlong@pikepa.org'; 'mmrozinski@pikepa.org'; 'mquinn@stroudsburgboro.com'; 'Mthompson@coolbaughtwp.org'; 'mwmccd@ptd.net'; 'Pam@barrettownship.com'; 'planning@pikepa.org'; 'polktwp@ptd.net'; 'pricetownship@verizon.net'; 'reda@paradisetownship.com'; 'rhill@monroecountypa.gov'; 'rojevin@pa.gov'; 'rosstwp@ptd.net'; 'rtroscianecki@gmail.com'; 'rwielebinski@poconopa.gov'; 'shkleiner@pa.gov'; 'slavardure@monroecountypa.gov'; 'smith.b.l@att.net'; 'steve.tambini@drbc.gov'; 'stroud17@ptd.net'; 'stroudjs@ptd.net'; 'stroudpa@ptd.net'; 'tctcwa@hotmail.com'; 'thritsick@pa.gov'; 'tunksec@longpondpa.com'; 'ZONING@POLKTWP.ORG'; 'dobie@ptd.net'; 'jacob@smithfieldtownship.com'; 'smcglynn@sfcconsultingllc.org'; 'money@mstownship.com'; 'vjc1@psu.edu'; 'carbtech@ptd.net'; 'rpt5342@psu.edu'; David Hooker
Subject: Action Item: Internal WPAC_DEP comment_ Act 167 Renewal
Attachments: Tobyhanna Act 167 Draft Plan 1.2022.pdf; Brodhead McMichaels Act 167 Draft.1.2022.pdf
Importance: High
Follow Up Flag: Follow up
Due By: Wednesday, February 23, 2022 4:00 PM
Flag Status: Flagged

Good Morning WPAC members !

Thanks to all the hard work and outreach of our WPAC technical and educational subcommittees we have compiled the Final Draft for Renewal of both the Tobyhanna and Brodhead McMichaels Stormwater Management Plans. These plans were previously adopted resolution of the County Commissioners and Approved by DEP in 1997 and 2006, respectively.

Our next step for compliance with the Stormwater Management Act, 1978 – No. 167 prior to adoption and public hearing is for the WPAC, which is comprised of the official planning agencies, governing body of each municipality , the County Planning Commission and regional planning agencies (an then some) to **review for consistency with other plans and programs affecting the watershed**. Per the Act, all such reviews shall be submitted to the department (DEP and

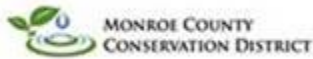
DRBC) with the proposed plan. MCCD will act as the clearing house for these comments and will provide them to DEP when the plan is submitted.

Please provide all comments as official correspondence to lkccd@ptd.net by **March 1, 2022**.

We sincerely appreciate all the efforts of the WPAC group for sticking with us through this long awaited renewal.

All the Best,
Lori

Lori A. Kerrigan, CPESC
Technical Section Supervisor,
Head Resource Conservationist
Monroe County Conservation District
8050 Running Valley Road
Stroudsburg, PA 18360
<http://www.mcconservation.org>
570-629-3060
570-629-3063 fax



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act 167

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Notice Publish Date:

Wednesday, March 02, 2022

Notice Content

PUBLIC NOTICE The Monroe County Board of Commissioners and Watershed Plan Advisory Committee (WPAC) will hold a public hearing on the Act 167 Storm Water Management Brodhead Creek, McMichaels Creek, 2006 and Tobyhanna Creek, 1997 Plan Renewal, on Wednesday March 16, 2002 at 9:00 a.m. at the Monroe County Commissioners Office, Public Meeting Room 203, Monroe County Administrative Center, One Quaker Plaza, Stroudsburg, PA 18360 Under the Storm water Management Act of 1978 update of the plans is required per Section 5(a) Act 167. Each watershed plan is required to be reviewed at least every five (5) years after its initial adoption. Plan reviews are needed to maintain effective management of storm water and water quality throughout the county, identify new storm water issues in the community, provide protection of infrastructure and assets, maintain consistency with the County Hazard Mitigation Plan and increase eligibility for emergency funding from FEMA and PEMA. The WPAC, with representatives from each municipality, along with our state and local partners, has worked this past year to update the Plans to account for high tunnel farming practices, updated and new technology BMPs, consistency with 25 Pa. Code Chapter 102. Erosion and Sediment Control, and to provide updated release rate district mapping. Municipalities required to adopt Draft Plan renewals in the Brodhead Creek and McMichaels Creek Watershed are contained within seventeen (17) municipalities in Monroe County and one municipality in Pike County as follows: Barrett, Paradise, Chestnuthill, Coolbaugh, East Stroudsburg, Greene (Pike County) Smithfield, Hamilton, Jackson, Middle Smithfield, Mt. Pocono, Pocono, Price, Ross, Stroud, Stroudsburg, Tobyhanna, and Tunkhannock. The Tobyhanna Creek, encompasses the northwest portion of Monroe County and portions of eastern Carbon County and southern Wayne County is contained within four Municipalities in Monroe County, one Municipality in Carbon County and one Municipality in Wayne County: Coolbaugh, Mount Pocono, Tobyhanna, Tunkhannock, Kidder (Carbon County), Lehigh (Wayne County). If you require special accommodations to attend this meeting, please contact the Chief Clerk at 570-517-3102. Greg F. Christine, Chief Clerk/Administrator
PUBLISH: 03/02/2022

[Back](#)

**PUBLIC HEARING
MONROE COUNTY BOARD OF COMMISSIONERS
AND
WATERSHED PLAN ADVISORY COMMITTEE
MARCH 16, 2022**

The Monroe County Board of Commissioners and Watershed Plan Advisory Committee held a public hearing on the Act 167 Storm Water Management Brodhead Creek, McMichaels Creek, 2006 and Tobyhanna Creek 1997 Plan Renewal, on Wednesday March 16, 2022 at 9:00 a.m. at the Monroe County Commissioners Office, Public Meeting Room 203, Monroe County Administrative Center, One Quaker Plaza, Stroudsburg, PA 18360. Members present were: Sharon S. Laverdure, Commissioner, W. Michael Johnson, Brodhead Watershed Association (BWA), Craig Todd, BWA, Drew Wagner, Monroe County Conservation District (MCCD), David Hooker, MCCD, Kristina Heaney, District Manager of MCCD, Lori Kerrigan, MCCD, and John Christy, Commissioner.

Commissioner Laverdure called the meeting to order at 9:05 a.m. Commissioner Laverdure asked if there was any public comments or questions. Commissioner Christy asked how the new Act 167 plan relates to the current storm water management plan. Lori Kerrigan, MCCD, replied Act 167 plan address storm water management within Monroe County. The MS4 permit is included in the plan. Kristina Haney, MCCD, stated as part of the process and according to the Act there is a Watershed Planning Advisory Committee includes all the municipalities and representatives and have been meeting since 2021.

Craig Todd, BWA, and Michael Johnson BWA testified that they support the current Act 167 plan/ordinance recognizing that there is still a process involving other agencies. The ordinance contains all the primary provisions that were very successful. He reviewed some of provisions in the ordinance.

Kristina Haney, explained that the Commissioners will have to adopt a resolution renewing the Act 167 Plan, then it has to be approved by Department of Environmental Protection and Department of Community and Economic Development. Then the plan has to be approved by the municipalities.

There was no public comment. Commissioner Laverdure closed the hearing at 9:24 a.m.


Sharon Laverdure, Commissioner

701 Main Street, Suite 405
Stroudsburg, PA 18360



Phone: 570-517-3100
Fax: 570-517-3858
mcp@monroecountypa.gov
www.monroecountypa.gov

MONROE COUNTY PLANNING COMMISSION

May 5, 2022

Lori A. Kerrigan, Technical Section Supervisor
Monroe County Conservation District
8050 Running Valley Road
Stroudsburg, Pa 18360

Re: Tobyhanna Creek Watershed Act 167 Stormwater
Management Plan Update
Brodhead McMichaels Creek Watershed Act 167
Stormwater Management Plan Update
MCPC Review #84-22

Dear Ms. Kerrigan:

The Monroe County Planning Commission has reviewed the above noted plan updates. This office has worked closely with the Monroe County Conservation District throughout the development process of this plan update and we appreciate being given the opportunity to provide input on the plans and look forward to facilitating its implementation and adoption.

The proposed Act 167 Plan Updates are generally consistent with the Monroe 2030 Comprehensive Plan, December 2014, with respect to supporting its goal and policies regarding stormwater issues and water quality throughout the watershed areas within the county.

If you have any questions or if we can be of further service to you, please feel free to contact me.

Sincerely yours,

A handwritten signature in blue ink that reads "Christine Meinhart-Fritz". The signature is written in a cursive, flowing style.

Christine Meinhart-Fritz
Director

CMF/ebk

MONROE COUNTY BOARD OF COMMISSIONERS

RESOLUTION

ACT 167 STORMWATER MANAGEMENT PLAN RENEWALS
BRODHEAD CREEK AND MCMICHAEL CREEK WATERSHED,
AND THE TOBYHANNA CREEK WATERSHED

WHEREAS, the Storm Water Management Act 167 of 1978 provides for the regulation of land and water use for flood control and storm water management, requires the Department to designate watersheds, and that each county will prepare and adopt a watershed storm water management plan and renew or update said plan every five (5) years for each designated watershed; and

WHEREAS, the Brodhead and McMichaels, and the Tobyhanna Creek Watershed Storm Water Management Plans were previously adopted resolution of the County Commissioners and approved by DEP in 1978, 1988, 1997, respectively, and Brodhead McMichaels Updated in 2006; and.

WHEREAS, the purpose of the Brodhead and McMichaels, and the Tobyhanna Creek Watershed Storm Water Management Plans are to protect public health and safety and to prevent or mitigate the adverse impacts related to the conveyance of excessive rates and volume of storm water runoff by providing for the management of storm water runoff, control of erosion and sediment pollution and control of non-point source pollution; and


WHEREAS, design criteria and standards of storm water management systems and facilities within the Brodhead and McMichaels, and Tobyhanna Watershed shall utilize the criteria and standards as found in the watershed storm water management plans; and

NOW, THEREFORE, BE IT RESOLVED that the Monroe County Board of Commissioners hereby adopt the Brodhead and McMichaels, and the Tobyhanna Creek Watershed, Act 167 Storm Water Management Plans, including all appendices and prior modeling, and forward the Plan to the Pennsylvania Department of Environmental Protection and Department of Community and Economic Development for approval.

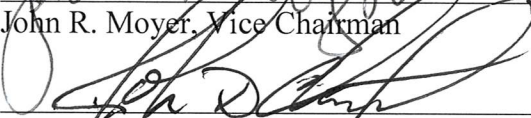
MONROE COUNTY BOARD OF COMMISSIONERS



Sharon S. Laverdure, Chairman

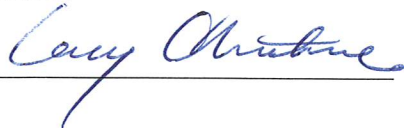


John R. Moyer, Vice Chairman



John D. Christy, Commissioner

ATTEST:



Legal Notices

PUBLIC HEARING

Wayne County Commissioners will hold an Act 167 Stormwater Plan Renewal Public Hearing for Tobyhanna Creek on Thursday, April 21, 2022 at 10:00 a.m. at the Commissioners' Office, Third Floor of the Courthouse Annex, 925 Court St., Honesdale, Pa. 18431. Commissioners intend to take action on a formal resolution on this matter at their weekly business meeting held at 10:30 a.m. on April 21, 2022 in the same location. Under the Stormwater Management Act of 1978 update of the plans is required per Section 5(a) Act 167. Each watershed plan is required to be reviewed at least every 5 years after its initial adoption. Plan reviews are needed to maintain effective management of stormwater and water quality throughout the county, identify new stormwater issues in the community, provide protection of infrastructure and assets, maintain consistency with the County Hazard Mitigation Plan and increase eligibility for emergency funding from FEMA and PEMA.

The Tobyhanna Creek, encompasses the northwest portion of Monroe County and portions of eastern Carbon County and southern Wayne County is contained within four Municipalities in Monroe County, one Municipality in Carbon County and one Municipality in Wayne County: Coolbaugh, Mount Pocono, Tobyhanna and Tunkhannock (Monroe County), Kidder (Carbon County), and Lehigh (Wayne County). The Plan Renewal can be found for review online at <https://www.mcconservation.org/act-167-plans-and-maps.html> A hard copy can be viewed upon request.

Andrew M. Seder, Wayne
County Chief Clerk

From: Andrew Seder [<mailto:aseder@waynecountypa.gov>]
Sent: Friday, April 22, 2022 3:31 PM
To: Jamie Knecht; Craig Rickard; khmccd@ptd.net
Subject: Tobyhanna Creek Hearing and Resolution

All,

Please see attached. Nobody attended public hearing and there was no public comment. Resolution passed 3-0.

Andrew

Andrew M. Seder
Chief Clerk of Wayne County/Open Records Officer
925 Court St.
Honesdale, PA 18431
570-253-5970, ext. 1301
www.waynecountypa.gov

COMMISSIONERS OF WAYNE COUNTY

BRIAN W. SMITH, CHAIRMAN
Damascus Township, PA

JOSEPH W. ADAMS
Salem Township, PA

JOCELYN CRAMER
Damascus Township, PA



ANDREW M. SEDER
Chief Clerk

WENDELL R. KAY
Solicitor

RESOLUTION No. 21-04-2022
ACT 167 STORMWATER MANAGEMENT PLAN RENEWAL
TOBYHANNA CREEK WATERSHED – Lehigh Township, Wayne Co.

WHEREAS, the Storm Water Management Act 167 of 1978 provides for the regulation of land and water use for flood control and storm water management, requires the Department to designate watersheds, and that each county will prepare and adopt a watershed stormwater management plan; and

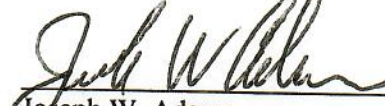
WHEREAS, the Tobyhanna Creek Watershed Storm Water Management Plan was previously adopted resolution of the County Commissioners and approved by DEP in 1997, respectively.

WHEREAS, the purpose of the Tobyhanna Creek Watershed Storm Water Management Plan is to protect public health and safety and to prevent or mitigate the adverse impacts related to the conveyance of excessive rates and volume of storm water runoff by providing for the management of storm water runoff, control of erosion and sediment pollution, and control of non-point source pollution; and

WHEREAS, design criteria and standards of storm water management systems and facilities within the Tobyhanna Creek Watershed shall utilize the criteria and standards as found in the watershed stormwater management plan;

NOW, THEREFORE, BE IT RESOLVED that the Wayne County Board of Commissioners hereby adopt the Tobyhanna Creek Watershed, Act 167 Storm Water Management Plan, including all appendices and prior modeling, and forward the Plan to the Pennsylvania Department of Environmental Protection and Department of Community and Economic Development for approval.


Brian W. Smith, Chairman


Joseph W. Adams


Jocelyn Cramer

ATTEST


Andrew M. Seder, Chief Clerk

4/21/22
Date

From: [Eloise Ahner](#)
To: [David Bodnar](#)
Cc: [Wayne E Nothstein](#); [Chris Lukasevich](#); [Rocky Ahner](#); ["Robert Frycklund"](#); khmccd@ptd.net
Subject: RE: Act 167 Stormwater Plan Update: Public Hearing Necessary
Date: Tuesday, April 26, 2022 11:31:58 AM
Attachments: [image003.jpg](#)
[image004.jpg](#)
[image005.jpg](#)

Good morning David,

Please post the notice in Kidder Township and forward the corrected Resolution for the May 5th Commissioners Meeting. The public hearing is on the Commissioners schedule for May 5th at 9:45 AM.

Thank you,
Ellie

Eloise K. Ahner

Chief Clerk/County Administrator
Carbon County Commissioners
PO Box 129
Jim Thorpe, PA 18229
EloiseAhner@carboncounty.net
Telephone 570-325-3611



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RESOLUTION

ACT 167 STORMWATER MANAGEMENT PLAN RENEWALS FOR BRODHEAD CREEK AND MCMICHAEL CREEK WATERSHED, AND THE TOBYHANNA CREEK WATERSHED

CARBON COUNTY BOARD OF COMMISSIONERS

WHEREAS, the Storm Water Management Act 167 of 1978 provides for the regulation of land and water use for flood control and storm water management, requires the Department to designate watersheds, and that each county will prepare and adopt a watershed stormwater management plan and renew or update said plan every five (5) years for each designated watershed; and

WHEREAS, the Brodhead and McMichaels, AND the Tobyhanna Creek Watershed Storm Water Management Plans were previously adopted resolution of the County Commissioners and approved by DEP in 1978, 1988, 1997, respectively, and Brodhead McMichaels Updated in 2006.

WHEREAS, the purpose of the Brodhead and McMichaels, AND the Tobyhanna Creek Watershed Storm Water Management Plans are to protect public health and safety and to prevent or mitigate the adverse impacts related to the conveyance of excessive rates and volume of storm water runoff by providing for the management of storm water runoff, control of erosion and sediment pollution, and control of non-point source pollution; and

WHEREAS, design criteria and standards of storm water management systems and facilities within the Brodhead and McMichaels, AND Tobyhanna Watershed shall utilize the criteria and standards as found in the watershed stormwater management plans;

NOW, THEREFORE, BE IT RESOLVED that the Carbon County Board of Commissioners hereby adopt the Brodhead and McMichaels, AND the Tobyhanna Creek Watershed, Act 167 Storm Water Management Plans, including all appendices and prior modeling, and forward the Plan to the Pennsylvania Department of Environmental Protection and Department of Community and Economic Development for approval.

Adopted by the Carbon County Board of Commissioners at the regular meeting on May 5th, 2022.

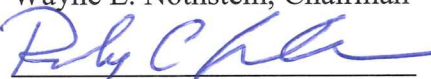
ATTEST:

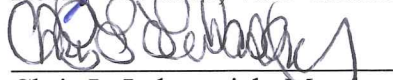


Eloise Ahner
County Administrator/Chief Clerk

CARBON COUNTY BOARD OF COMMISSIONERS

BY: 
Wayne E. Nothstein, Chairman

BY: 
Rocky C. Ahner, Vice-Chairman

BY: 
Chris L. Lukasevich, Member



From: Kovach, David [DRBC] <David.Kovach@drbc.gov>
Sent: Tuesday, April 19, 2022 4:03 PM
To: Drew Wagner
Subject: RE: [EXTERNAL] Brodhead and McMichales Creek Act 167 Plan

Drew,

I did review the plan. It appears that projects completed in accordance with the Brodhead and McMichael Creek Act 167 Plan and associated Ordinance, BMP's, and references therein would continue to meet DRBC's Special Protection Waters (SPW) requirement for a Non-point Source Pollution Control Plan (NPSPCP) for all projects requiring DRBC Compact Section 3.8 Approval that are located in the drainage area to SPW. I do note that the DRBC's requirement for a NPSPCP has no exemptions from a Drainage Plan as detailed in Section 402; although, it is unlikely that such projects would require an approval from the DRBC and thereby would be rare. In such cases, DRBC would still require a NPSPCP as part of its own review.

David Kovach P.G.
Project Review Manager
Delaware River Basin Commission
25 Cosey Road
West Trenton, NJ 08628-0360
609-477-7264

Lori Kerrigan

From: Bohman, John D <jbohman@pa.gov>
Sent: Tuesday, March 1, 2022 11:28 AM
To: Lori Kerrigan
Subject: RE: [External] RE: Action Item: Internal WPAC_DEP comment_ Act 167 Renewal

Lori, thank you for including me. I just completed my review and I didn't have any comments/changes.

Take care,

John Bohman | Senior Civil Engineer Supervisor – Permit Coordinator
PA Department of Transportation | Engineering District 5-0
1002 Hamilton Street | Allentown, PA 18101
Phone: 610.871.4578 | Fax: 610.871.4122
www.pa.gov

PRIVILEGED AND CONFIDENTIAL COMMUNICATION

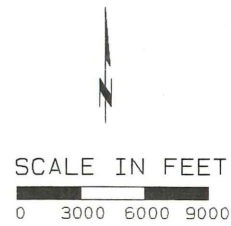
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Appendix C
Municipal Ordinance Matrix
(Reserved for Future Updates Upon Plan Adoption)

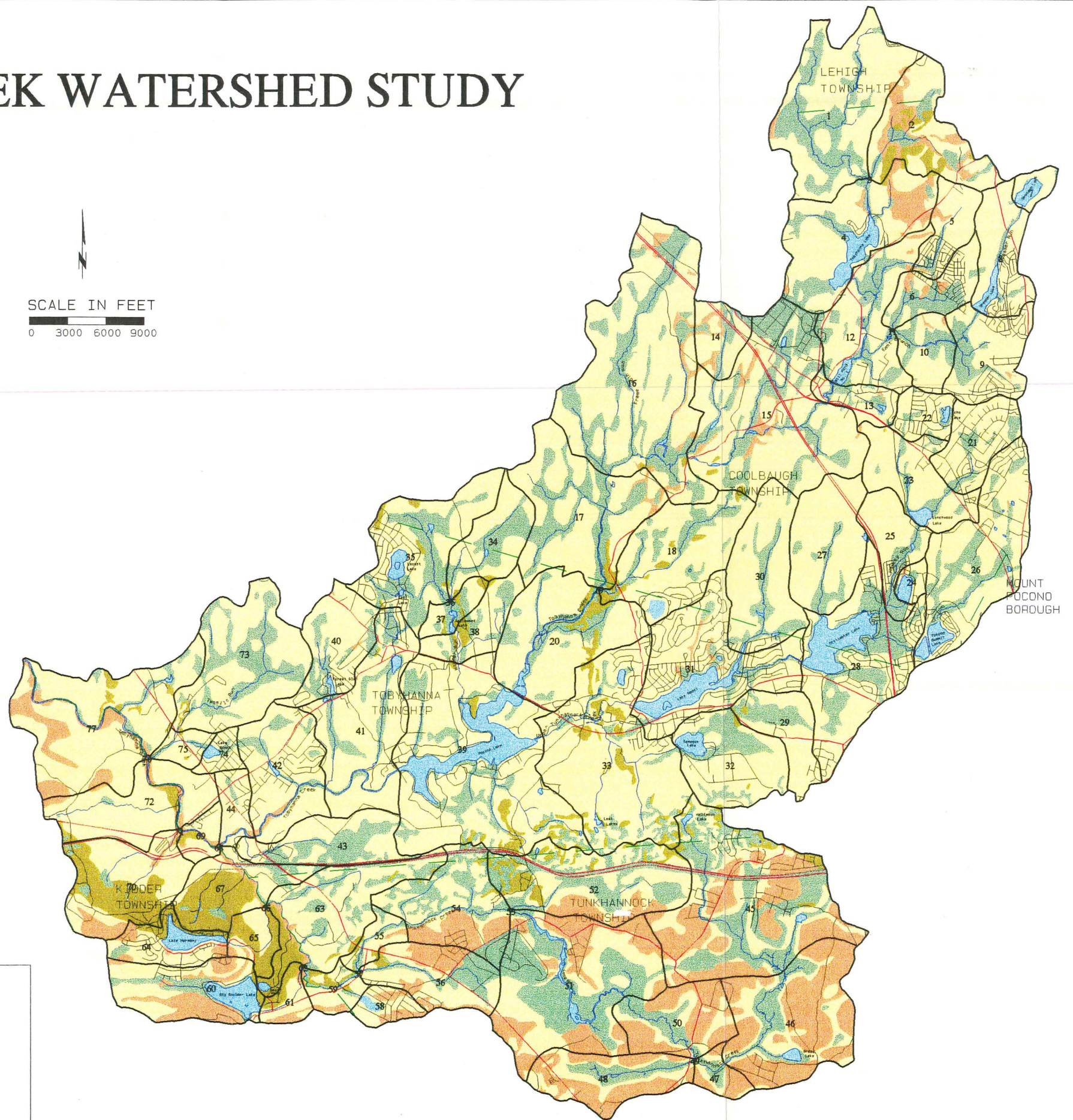
Appendix D

Maps

TOBYHANNA CREEK WATERSHED STUDY



- A: Low Runoff Potential, High Infiltration Rates.
- B: Moderate Infiltration Rates.
- C: Slow Infiltration Rates.
- D: High Runoff Potential, Very Slow Infiltration Rates.
- Lakes
- Subwatershed Boundaries
- Municipal Boundary
- Streams
- Major Roads
- Minor Roads



TOBYHANNA CREEK WATERSHED
HYDROLOGIC SOIL GROUP MAP



Paul A. DeBarry, Project Manager
M.L.M., Map Designer

05/30/97: wshd_hsg

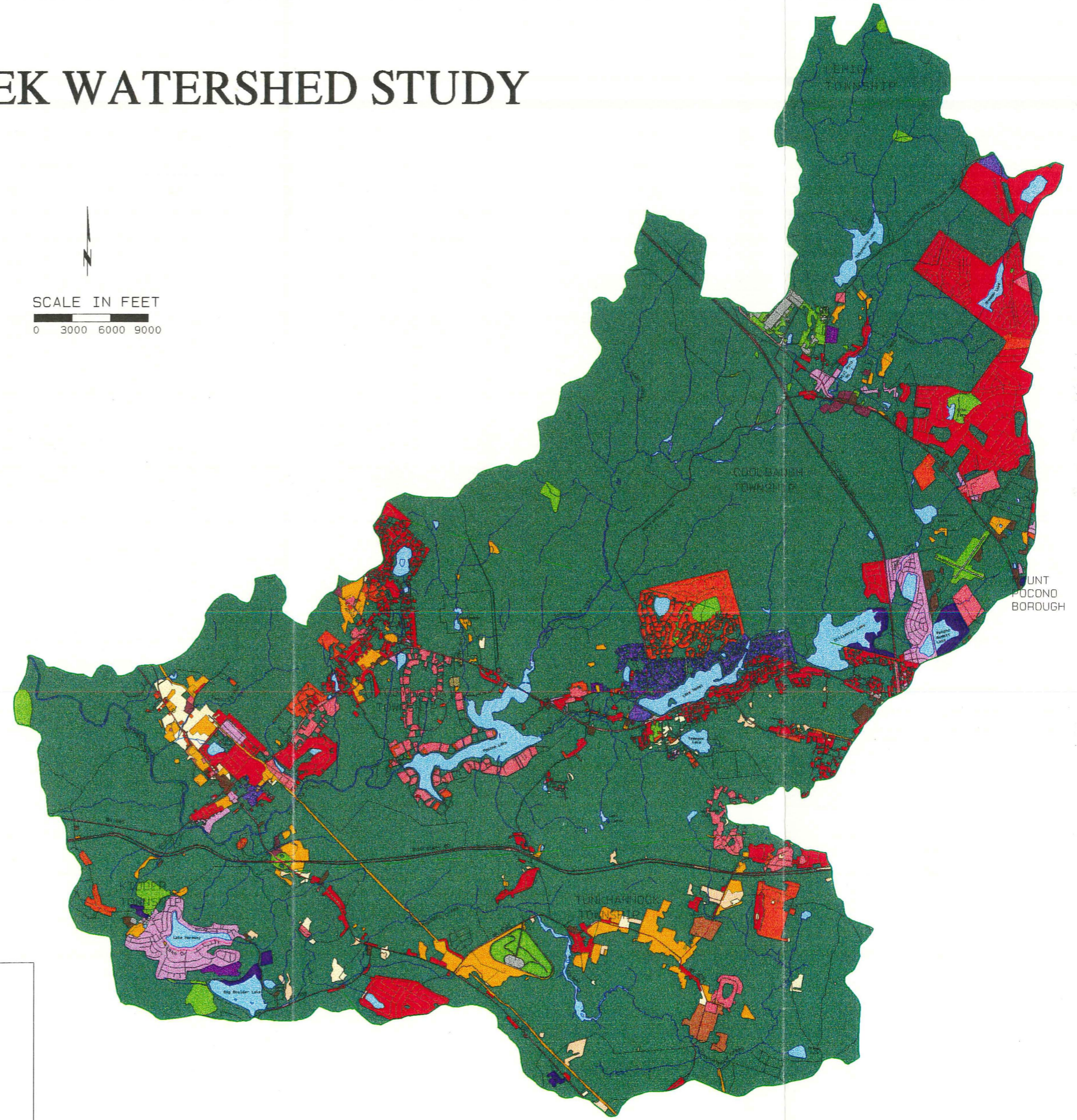
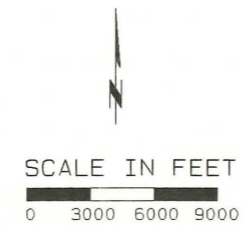
FIGURE III-2

TOBYHANNA CREEK WATERSHED STUDY

LEGEND :

-  OPEN SPACE
-  PASTURE
-  ORCHARD
-  AGRICULTURE
-  COMMERCIAL
-  INDUSTRIAL
-  R7 (1/8 ac. or less)
-  R6 (1/8 ac. - 1/4 ac.)
-  R5 (1/4 ac. - 1/3 ac.)
-  R4 (1/3 ac. - 1/2 ac.)
-  R3 (1/2 ac. - 1 ac.)
-  R2 (1 ac. - 2 ac.)
-  R1 (2 ac. - 4 ac.)
-  PAVED
-  WATER
-  FOREST
-  MEADOW
-  GRADED

-  Watershed Boundary
-  Municipal Boundary
-  Streams
-  Major Roads
-  Minor Roads



TOBYHANNA CREEK WATERSHED

WATERSHED EXISTING LAND USE MAP









R. K. R. HESS ASSOCIATES
 112 N. Courtland St., P.O. Box 268,
 East Stroudsburg, PA. (717) 421-1550.
 81995 WEB SITE: www.rkhess.com

Paul A. DeBarry, Project Manager
 T.J.O. & M.L.M., Map Designers

05/30/97: watershed13

FIGURE III-3

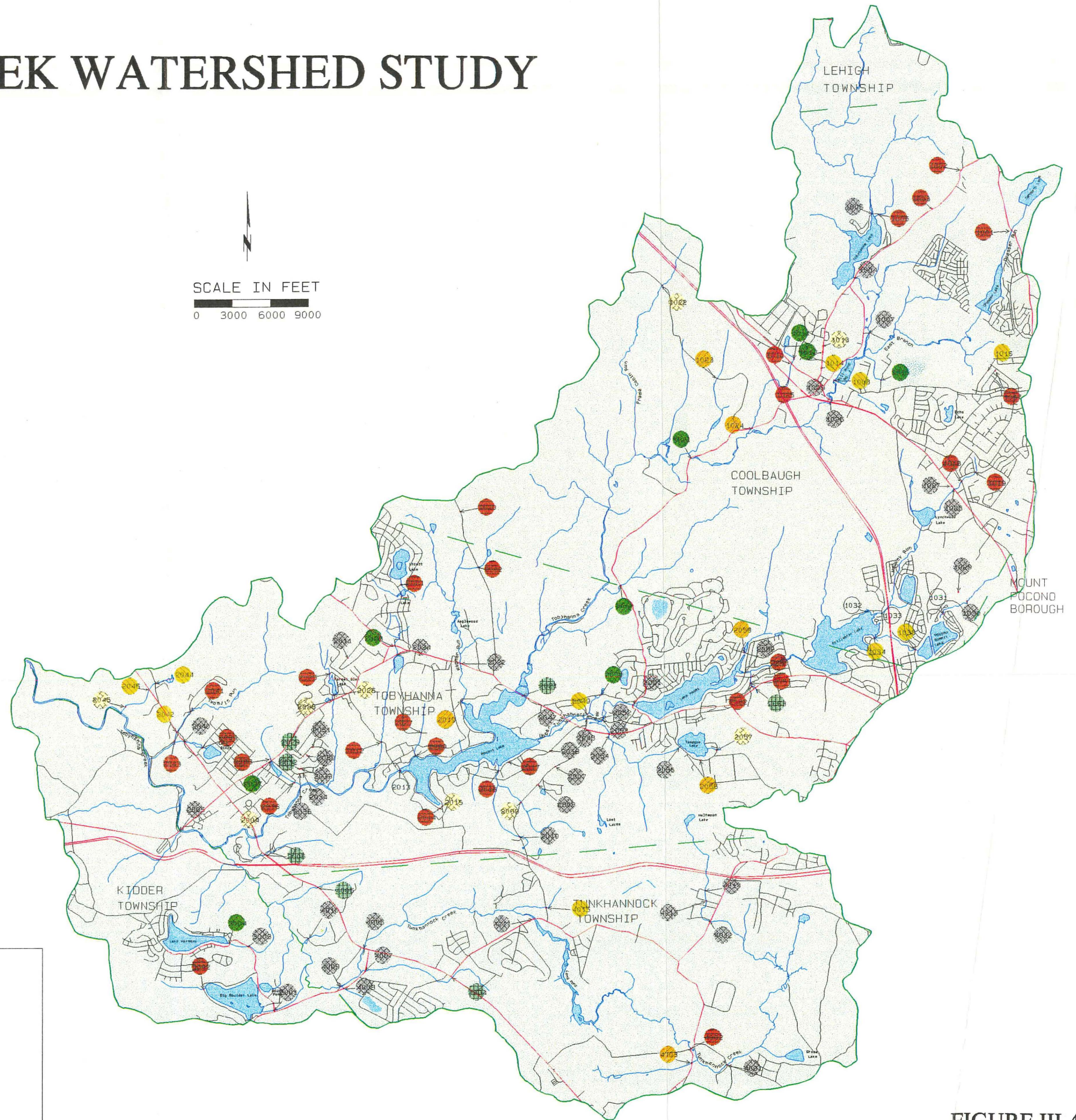
TOBYHANNA CREEK WATERSHED STUDY

-  NOT ABLE TO PASS 2 YEAR FLOW AND GREATER
-  NOT ABLE TO PASS 5 YEAR FLOW AND GREATER
-  NOT ABLE TO PASS 10 YEAR FLOW AND GREATER
-  NOT ABLE TO PASS 25 YEAR FLOW AND GREATER
-  NOT ABLE TO PASS 50 YEAR FLOW AND GREATER
-  NOT ABLE TO PASS 100 YEAR FLOW AND GREATER
-  ABLE TO PASS 100 YEAR FLOW
-  NOT APPLICABLE

(Design Storm Flows Not Determined At These Locations Due To Small Contributing Watershed Area Or Pipe Size)

SCALE IN FEET
0 3000 6000 9000

-  Watershed Boundary
-  Municipal Boundary
-  Streams
-  Major Roads
-  Minor Roads
-  Lakes



TOBYHANNA CREEK WATERSHED OBSTRUCTION MAP

R.K.R. HESS ASSOCIATES
112 N. Courtland St., P.O. Box 268,
East Stroudsburg, PA. (717) 421-1550.
81995 WEB SITE: www.rkrhess.com

Paul A. DeBarry, Project Manager
T.J.O. & M.L.M., Map Designers

05/30/97: wshed_obstret.mxd

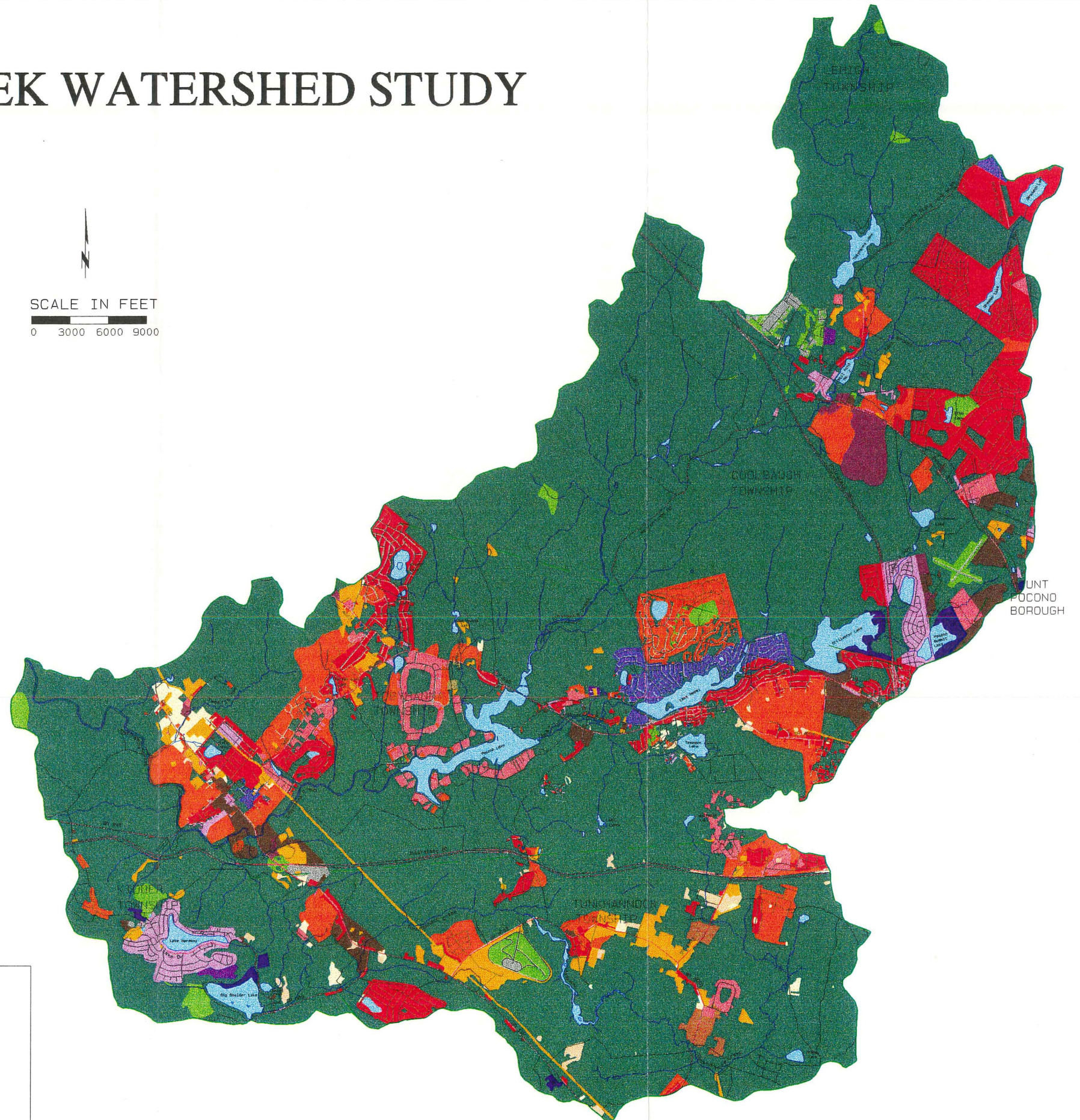
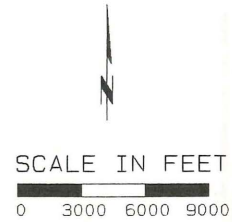
FIGURE III-4

TOBYHANNA CREEK WATERSHED STUDY

LEGEND :

- OPEN SPACE
- PASTURE
- ORCHARD
- AGRICULTURE
- COMMERCIAL
- INDUSTRIAL
- R7 (1/8 ac. or less)
- R6 (1/8 ac. - 1/4 ac.)
- R5 (1/4 ac. - 1/3 ac.)
- R4 (1/3 ac. - 1/2 ac.)
- R3 (1/2 ac. - 1 ac.)
- R2 (1 ac. - 2 ac.)
- R1 (2 ac. - 4 ac.)
- PAVED
- WATER
- FOREST
- MEADOW
- GRADED

- Watershed Boundary
- Municipal Boundary
- Streams
- Major Roads
- Minor Roads



TOBYHANNA CREEK WATERSHED

WATERSHED FUTURE LAND USE MAP

R.K.R. HESS ASSOCIATES
 112 N. Courtland St., P.O. Box 268,
 East Stroudsburg, PA. (717) 421-1550.
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Paul A. DeBarry, Project Manager
 T.J.O. AND M.L.M., Map Designers

05/30/97: flupd8

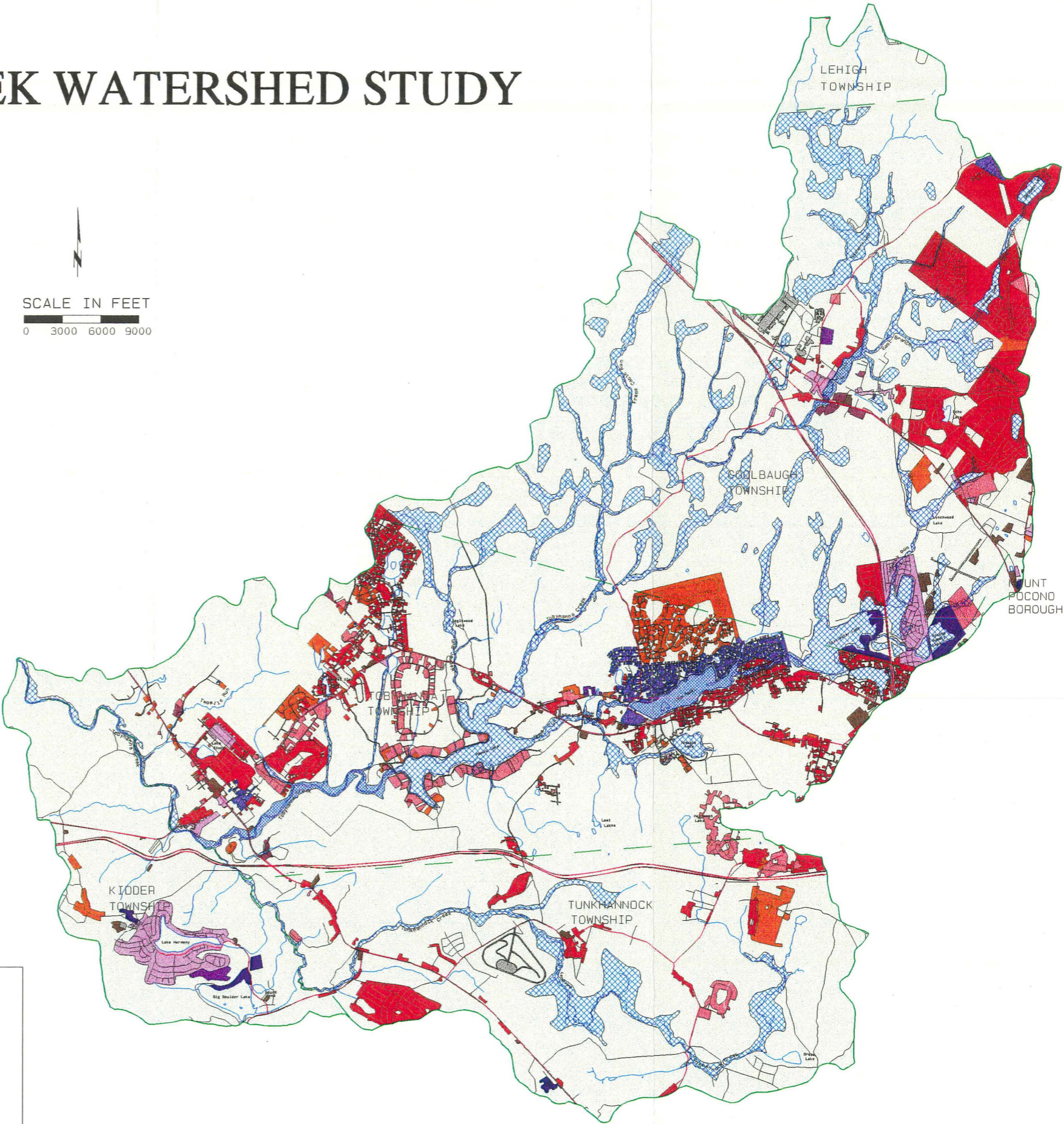
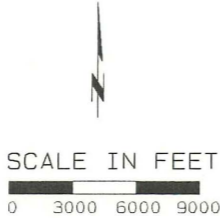
FIGURE III-5

TOBYHANNA CREEK WATERSHED STUDY

LEGEND :

- COMMERCIAL
- INDUSTRIAL
- PAVED
- R7 (1/8 ac. or less)
- R6 (1/8 ac. - 1/4 ac.)
- R5 (1/4 ac. - 1/3 ac.)
- R4 (1/3 ac. - 1/2 ac.)
- R3 (1/2 ac. - 1 ac.)
- R2 (1 ac. - 2 ac.)
- R1 (2 ac. - 4 ac.)
- UNDEVELOPED

- Detailed Flood Area
- Approximate Flood Area
- Watershed Boundary
- Municipal Boundary
- Streams
- Major Roads
- Minor Roads



TOBYHANNA CREEK WATERSHED

WATERSHED FLOODPLAINS & DEVELOPMENT MAP

R. K. R. HESS ASSOCIATES
 112 N. Courtland St., P.O. Box 268,
 East Stroudsburg, PA. (717) 421-1550.
 91995 WEB SITE: www.rkrhess.com

Paul A. DeBarry, Project Manager
 T.J.O. & M.L.M., Map Designers

05/30/97: Floods

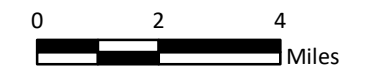
FIGURE III-6

STORMWATER HOT SPOTS

2021 SURVEY RESPONSES
MONROE COUNTY, PENNSYLVANIA

Figure III-7

- Localized Flooding
- Sediment Runoff
- Stream Flooding
- Sewer / Roadway Flooding



1:200,000

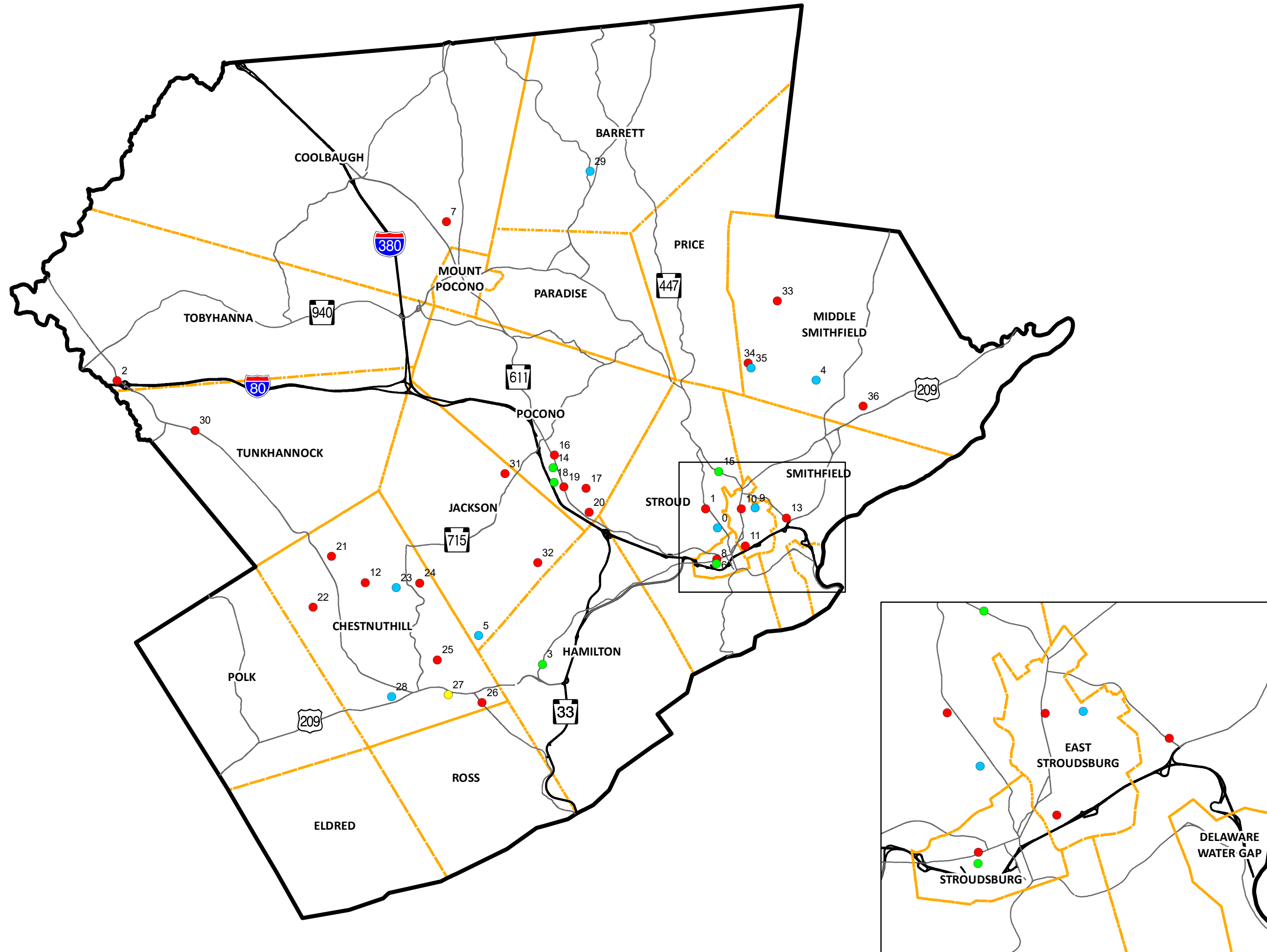


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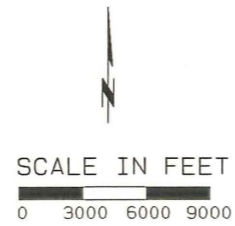


www.monroecountypa.gov

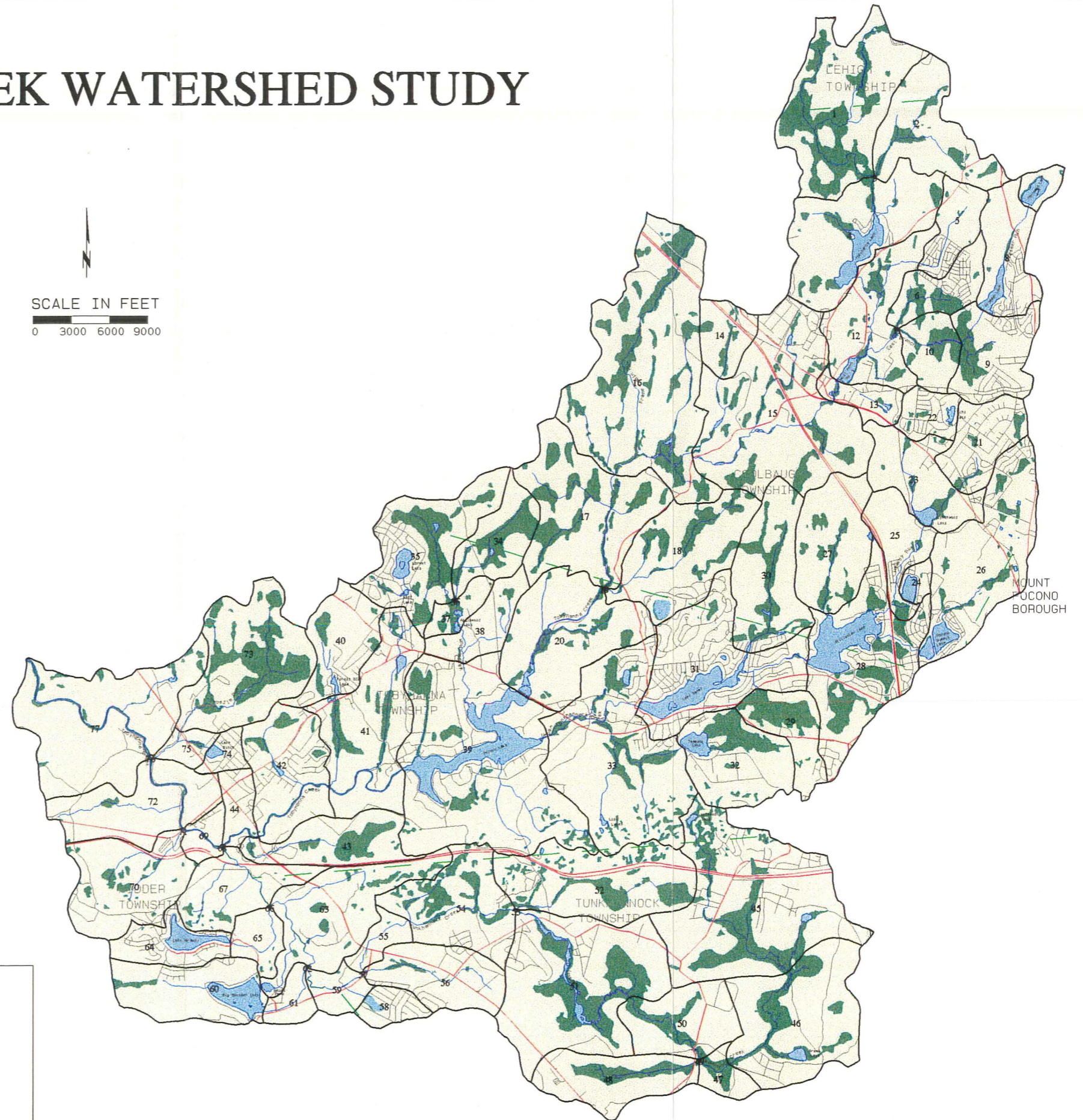
PREPARED BY:
**Monroe County
 Planning Commission**
 701 Main Street, Suite 405
 Stroudsburg, PA 18360
 (570) 517-3100
mcpc@monroecountypa.gov
 January 2022



TOBYHANNA CREEK WATERSHED STUDY



-  NWI Delineated Wetlands
-  Lakes
-  Subwatershed Boundaries
-  Municipal Boundary
-  Streams
-  Major Roads
-  Minor Roads



TOBYHANNA CREEK WATERSHED WATERSHED WETLANDS MAP



Paul A. DeBarry, Project Manager
T.J.O. & M.L.M., Map Designers

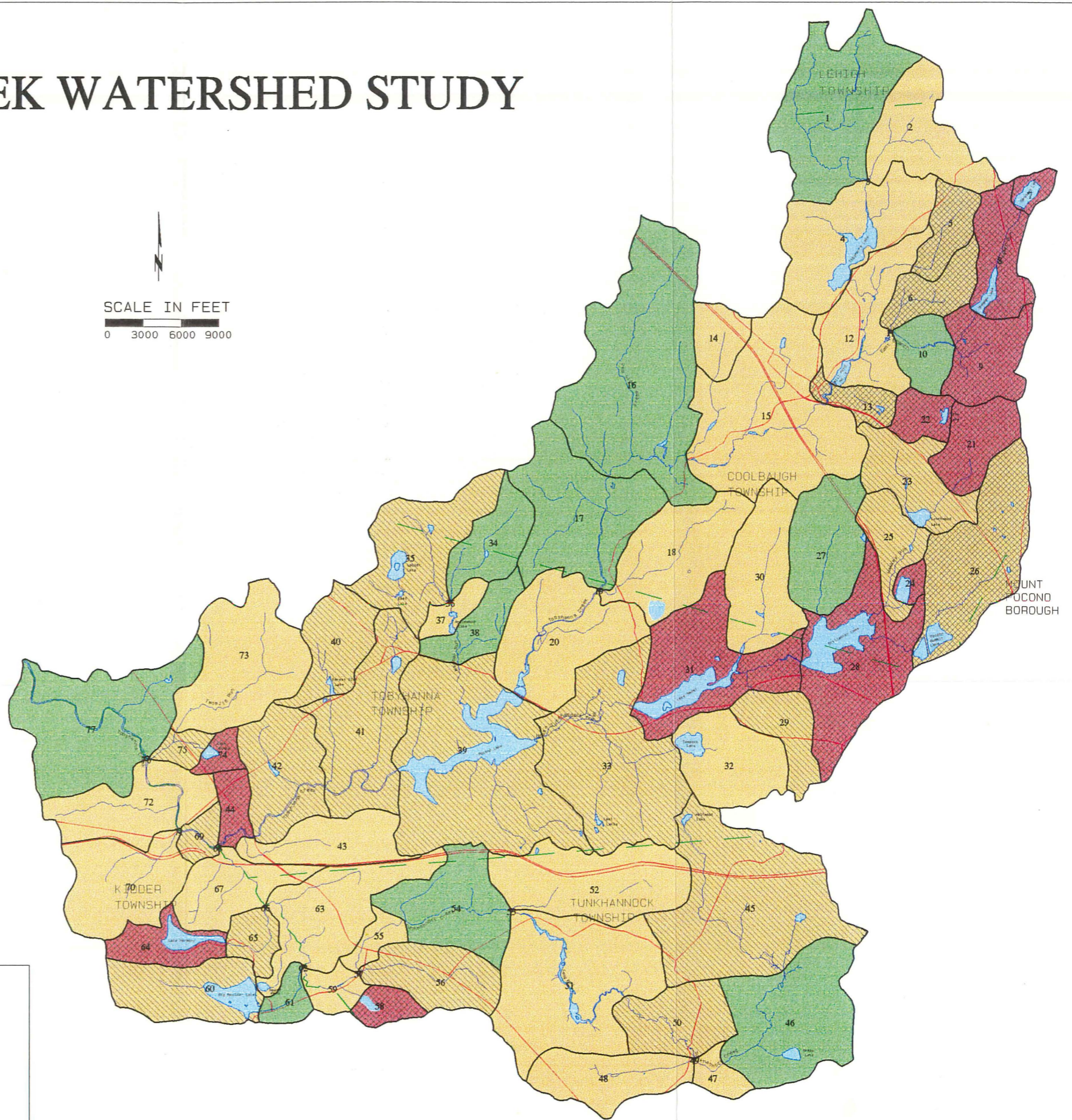
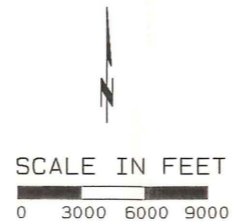
05/30/97: watershed_wetland

FIGURE III-8

TOBYHANNA CREEK WATERSHED STUDY

LEGEND :

- TOTAL NITROGEN < 1.00 LB/AC/YR
- TOTAL NITROGEN 1.00 - 4.00 LB/AC/YR
- TOTAL NITROGEN > 4.00 LB/AC/YR
- TOTAL PHOSPHORUS < 0.20 LB/AC/YR
- TOTAL PHOSPHORUS 0.20 - .40 LB/AC/YR
- TOTAL PHOSPHORUS > .40 LB/AC/YR
- Subwatershed Boundaries
- Municipal Boundary
- Streams
- Major Roads
- Lakes



NONPOINT SOURCE POLLUTANT LOADINGS
CRITICAL SUBWATERSHEDS

TOTAL NITROGEN AND TOTAL PHOSPHORUS
7, 8, 9, 21, 22, 24, 28, 31, 44, 58, 64, 74

EXISTING CONDITIONS

TOBYHANNA CREEK WATERSHED
WATER QUALITY MANAGEMENT PLAN



Paul A. DeBarry, Project Manager
M.L.M., Map Designer

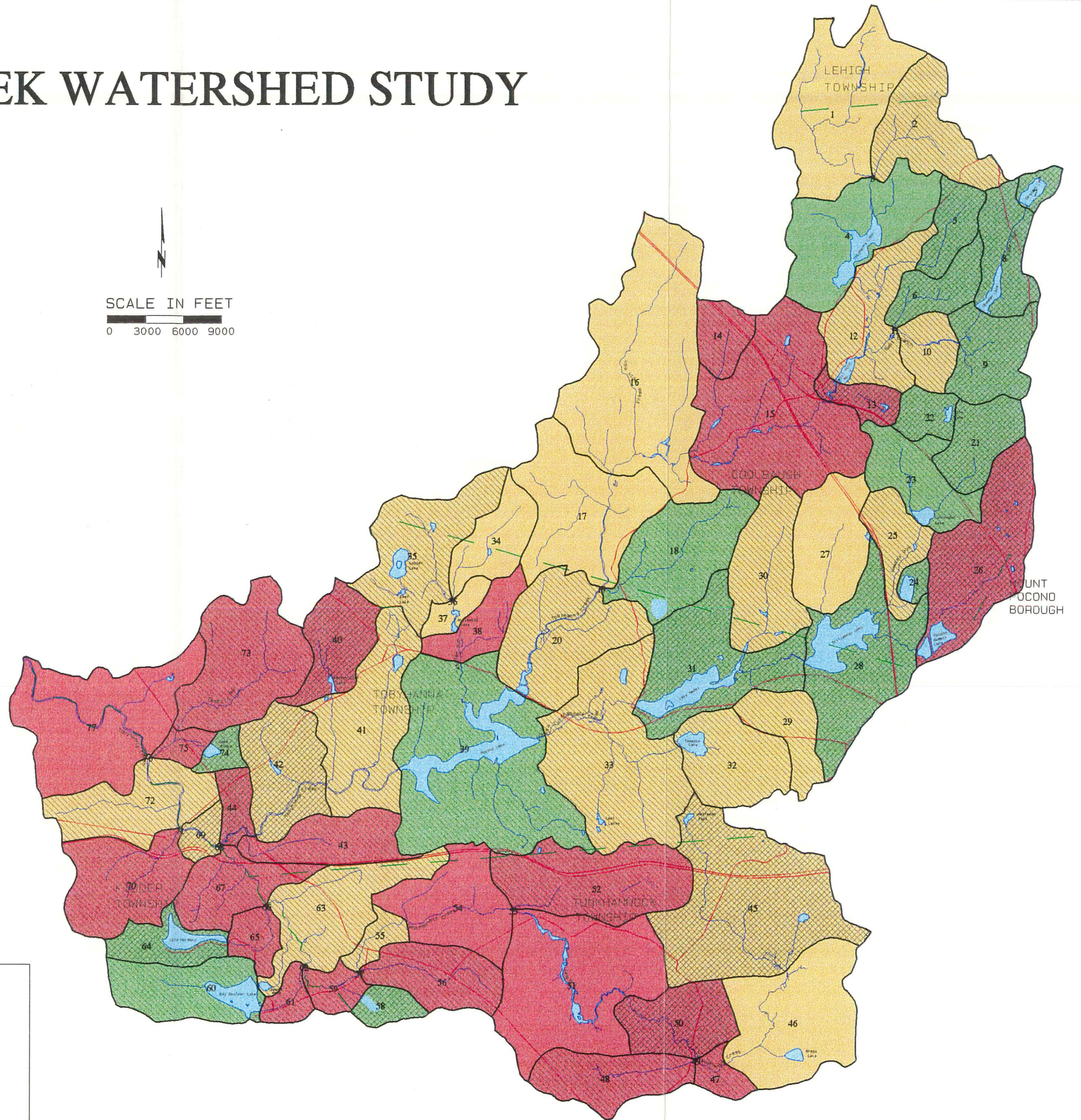
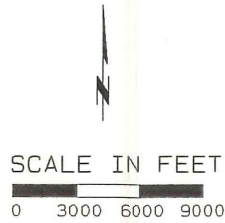
05/30/97: wshed_empt1.mxd wshed_empt

FIGURE IV-2

TOBYHANNA CREEK WATERSHED STUDY

LEGEND :

- B.O.D. < 16.00 LB/AC/YR
- B.O.D. 16.00 - 17.80 LB/AC/YR
- B.O.D. > 17.80 LB/AC/YR
- SUSPENDED SOLIDS < 150 LB/AC/YR
- SUSPENDED SOLIDS 150 - 300 LB/AC/YR
- SUSPENDED SOLIDS > 300 LB/AC/YR
- Subwatershed Boundaries
- Municipal Boundary
- Streams
- Major Roads
- Lakes



NONPOINT SOURCE POLLUTANT LOADINGS
CRITICAL SUBWATERSHEDS

B.O.D. AND SUSPENDED SOLIDS
13, 26, 40, 44, 50

EXISTING CONDITIONS

TOBYHANNA CREEK WATERSHED

WATER QUALITY MANAGEMENT PLAN



Paul A. DeBarry, Project Manager
M.L.M., Map Designer

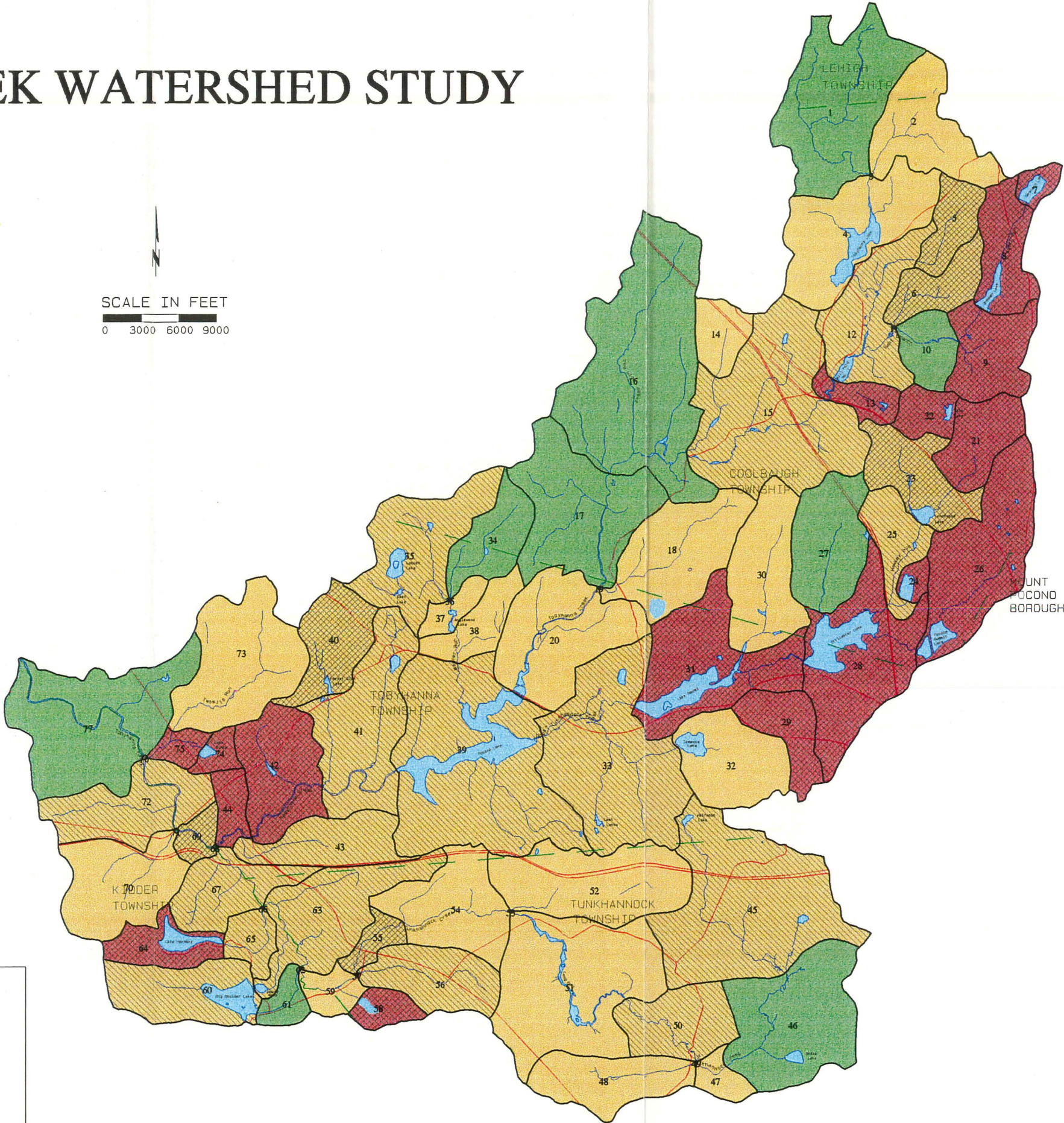
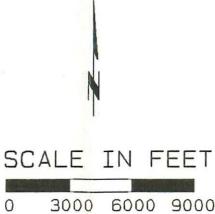
03/30/97: wshad_eng2.unal wshad_eng3

FIGURE IV-3

TOBYHANNA CREEK WATERSHED STUDY

LEGEND :

- TOTAL NITROGEN < 1.00 LB/AC/YR
- TOTAL NITROGEN 1.00 - 4.00 LB/AC/YR
- TOTAL NITROGEN > 4.00 LB/AC/YR
- TOTAL PHOSPHORUS < 0.20 LB/AC/YR
- TOTAL PHOSPHORUS 0.20 - .40 LB/AC/YR
- TOTAL PHOSPHORUS > .40 LB/AC/YR
- Subwatershed Boundaries
- Municipal Boundary
- Streams
- Major Roads
- Lakes



NONPOINT SOURCE POLLUTANT LOADINGS
CRITICAL SUBWATERSHEDS

TOTAL NITROGEN AND TOTAL PHOSPHORUS
7, 8, 9, 13, 21, 22, 24, 26, 28,
29, 31, 42, 44, 58, 64, 74, 75

FUTURE CONDITIONS

TOBYHANNA CREEK WATERSHED
WATER QUALITY MANAGEMENT PLAN



Paul A. DeBarry, Project Manager
M.L.M., Map Designer

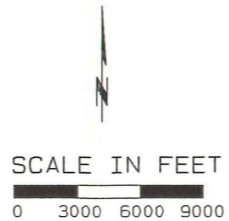
05/30/97: watershed_fps1.mxd watershed_fps

FIGURE IV-4

TOBYHANNA CREEK WATERSHED STUDY

LEGEND :

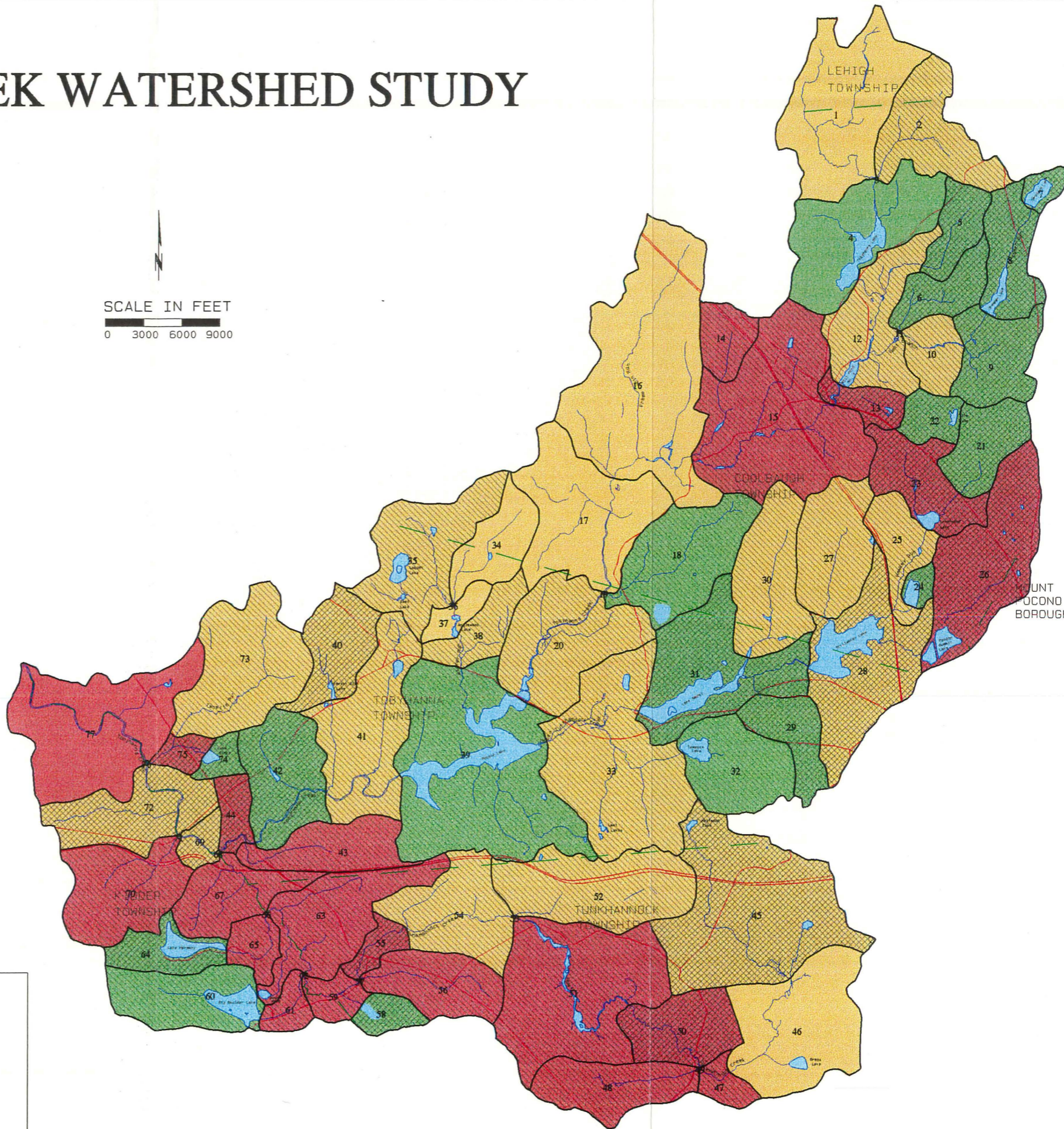
- B.O.D. < 16.00 LB/AC/YR
- B.O.D. 16.00 - 17.80 LB/AC/YR
- B.O.D. > 17.80 LB/AC/YR
- SUSPENDED SOLIDS < 150 LB/AC/YR
- SUSPENDED SOLIDS 150 - 300 LB/AC/YR
- SUSPENDED SOLIDS > 300 LB/AC/YR
- Subwatershed Boundaries
- Municipal Boundary
- Streams
- Major Roads
- Lakes



NONPOINT SOURCE POLLUTANT LOADINGS
CRITICAL SUBWATERSHEDS

B.O.D. AND SUSPENDED SOLIDS
13, 23, 26, 44, 50, 55, 75

FUTURE CONDITIONS



TOBYHANNA CREEK WATERSHED
WATER QUALITY MANAGEMENT PLAN







Paul A. DeBarry, Project Manager
M.L.M., Map Designer

05/30/97: wshed_fmap2.nml wshed_fmap





FIGURE IV-5




TOBYHANNA CREEK WATERSHED STUDY

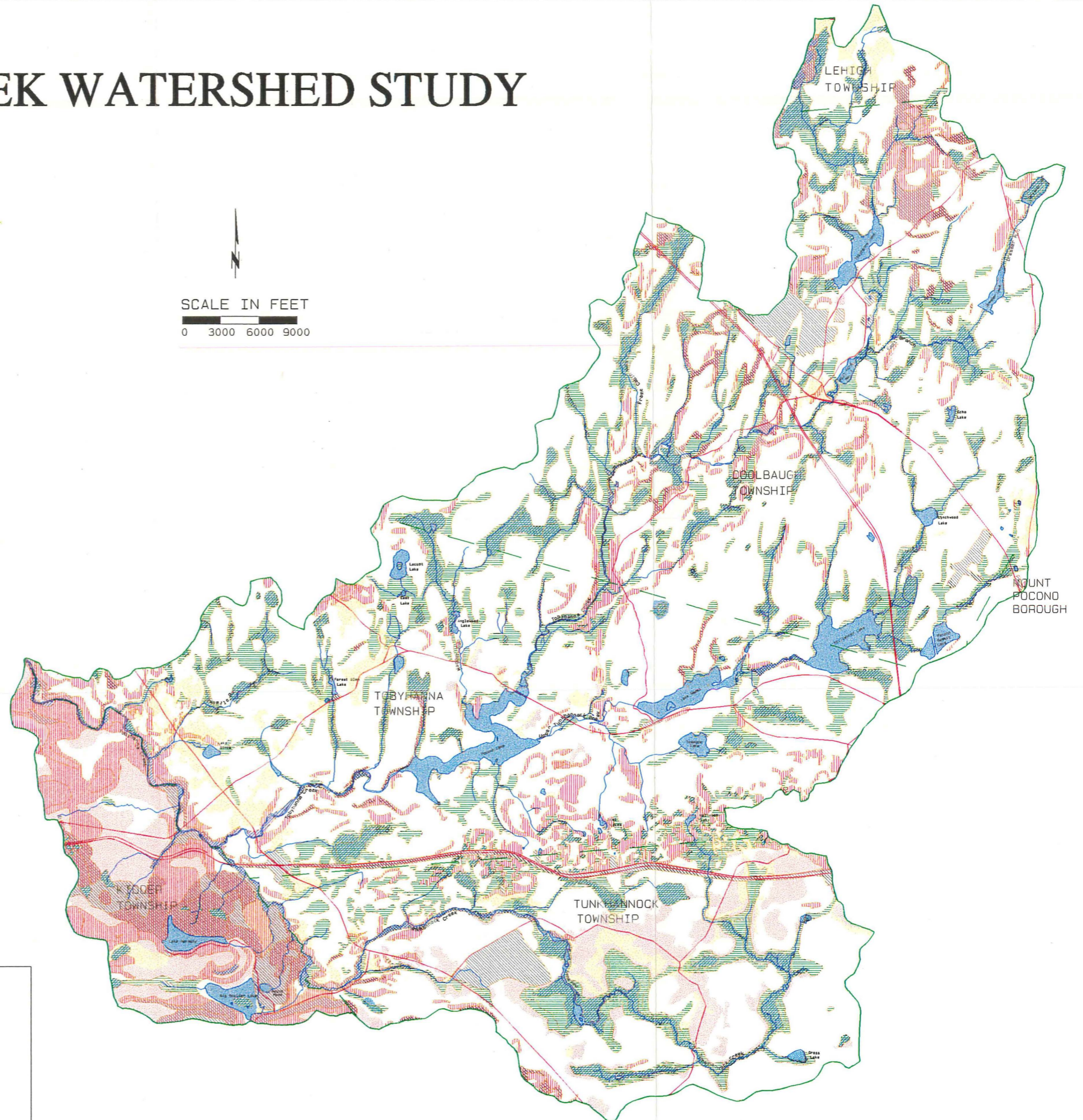
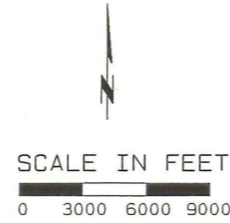
OPPORTUNITIES

-  GOOD OPEN HABITAT FOR WILDLIFE
-  GOOD WOODLAND HABITAT FOR WILDLIFE
-  GOOD WETLAND HABITAT FOR WILDLIFE
-  LAKES

CONSTRAINTS

-  EROSION PROBLEM
-  SLOPE 15% OR GREATER
-  FLOODING HAZARD
-  HYDRIC SOILS

-  Watershed Boundary
-  Municipal Boundary
-  Streams
-  Major Roads



TOBYHANNA CREEK WATERSHED

OPPORTUNITY & CONSTRAINTS MAP

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Paul A. DeBarry, Project Manager
 T.J.O. & M.L.M., Map Designers

05/30/97: TSQIL/TBL

FIGURE IV-6

TOBYHANNA CREEK WATERSHED STUDY







DISTRICT LEGEND:

POST DEV. FLOW TO PRE-DEV. FLOW

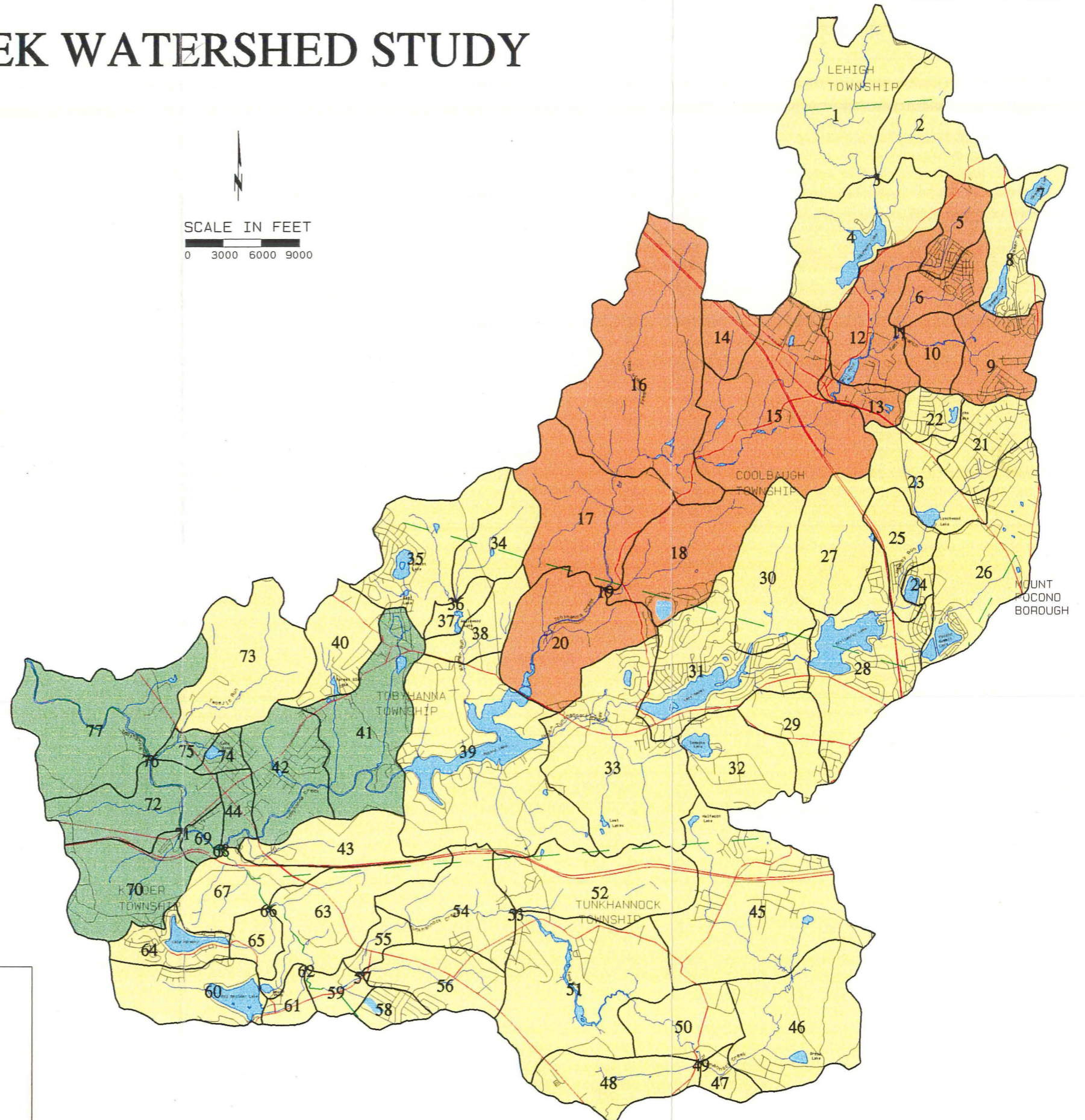
A 2.33 YEAR 2.33 YEAR
10-YEAR 10-YEAR
50-YEAR 50-YEAR

B 10-YEAR 2.33 YEAR
50-YEAR 10-YEAR

C ** DETENTION IS NOT REQUIRED IF THE INCREASE IN STORM WATER RUNOFF CAN BE CONVEYED TO A STREAM OR WATERCOURSE IN A SAFE MANNER (ORDINANCE SECTIONS 305 G, H); OTHERWISE DISTRICT A REQUIREMENTS APPLY.

-  Subwatershed Boundaries
-  Municipal Boundary
-  Streams
-  Major Roads
-  Minor Roads
-  Lakes

SCALE IN FEET
0 3000 6000 9000



STORMWATER RUNOFF PEAK RATE DISTRICTS



Paul A. DeBarry, Project Manager
M.L.M., Map Designer

05/30/97: wabed_subwa6

Figure V-2