

**BRODHEAD CREEK AND
MCMICHAEL CREEK WATERSHED**

**ACT 167 STORMWATER MANAGEMENT
PLAN RENEWAL**

MONROE COUNTY, PENNSYLVANIA

FINAL PLAN – April 19, 2022

PREPARED FOR
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Stroudsburg, PA 18360

PIKE COUNTY COMMISSIONERS
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PREPARED BY:
MONROE COUNTY CONSERVATION DISTRICT
8050 Running Valley Road
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MONROE COUNTY PLANNING COMMISSION
1 Quaker Plaza, Room 106
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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.

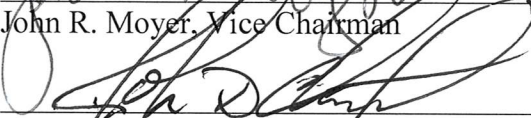
MONROE COUNTY BOARD OF COMMISSIONERS



Sharon S. Laverdure, Chairman

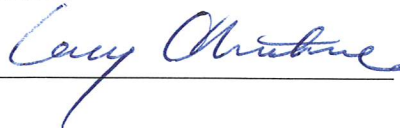


John R. Moyer, Vice Chairman



John D. Christy, Commissioner

ATTEST:



Cary Christine

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COMMISSIONERS



GARY R. ORBEN
CHIEF CLERK

THOMAS F. FARLEY, ESQUIRE
COUNTY SOLICITOR

RESOLUTION NO. 22-22 ACT 167 STORMWATER MANAGEMENT PLAN RENEWAL BRODHEAD AND MCMICHAEL CREEKS 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 stormwater management plan and renew or update said plan every five (5) years for each designated watershed; and

WHEREAS, the purpose of the Brodhead and McMichaels 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 Brodhead and McMichaels Watershed shall utilize the criteria and standards as found in the watershed stormwater management plan;


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


Duly presented and adopted by the Pike County Board of Commissioners, Pike County, Pennsylvania on June 1, 2022.

BOARD OF COMMISSIONERS OF PIKE COUNTY

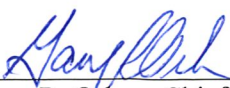



Matthew M. Osterberg, Chairman


Ronald R. Schmalzle, Vice Chairman


R. Anthony Waldron, Commissioner

Attest:


Gary R. Orben, Chief Clerk
June 1, 2022

Monroe County Commissioners

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

Pike County Commissioners

Matthew M. Osterberg	<i>Chairman</i>
Ronald R. Schmalzle	<i>Vice Chairman</i>
Tony Waldron	<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>

Watershed Plan Advisory Committee

<u>Name(s)</u>	<u>Affiliation</u>
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Greg Christine	<i>Monroe County Commissioners</i>
Christine Meinhart-Fritz	<i>Monroe County Planning Commission</i>
Eric Koopman	<i>Monroe County Planning Commission</i>
Kristina Heaney	<i>Monroe County Conservation District</i>
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>
E. Ann Velopolcek	<i>Eldred Township (Monroe)</i>
Terry Keesler, Lawrence Buzzard	<i>Hamilton Township (Monroe)</i>
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>

Watershed Plan Advisory Committee, Continued

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Brian Barrett, Julia Heilakka	<i>Smithfield Township (Monroe)</i>
Donna Alker, Jennifer Shukaitis	<i>Stroud Township (Monroe)</i>
Mary Pat Quinn	<i>Stroudsburg Borough (Monroe)</i>
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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I. INTRODUCTION

Initially, Act 167 Watershed Stormwater Management Plans were developed for the Brodhead Creek (1991) and the McMichaels Creek Watersheds (1988) separately. Since both plans are similar, new stormwater related issues are similar, and since the McMichaels Creek is a tributary to the Brodhead Creek, the plans were combined and updated in 2003. This Plan Renewal (2022) is for the combined Brodhead/McMichaels Creek Watershed.

Section 5(a) of Act 167 requires that each watershed plan be reviewed and any necessary revisions be made at least every 5 years after its initial adoption. An update may occur before the 5-year period has elapsed, should a county determine the need.

Plan updates are important to maintain effective management of stormwater. Other reasons for updating a plan could include changes in zoning, new flooding problems, and new obstructions in a stream or tributary impacting flooding. Implementation issues at the local level and the desire by the county and municipalities to evaluate new watershed issues and management techniques such as groundwater recharge and water quality could also warrant a plan update. A plan's standards may have to be reevaluated to manage the runoff from the additional impervious surfaces.

II. BROADHEAD CREEK AND MCMICHAELS CREEK WATERSHED CHARACTERISTICS

A. Watershed Characteristics

The Brodhead Creek and McMichaels Creek Watershed as illustrated in Figure II-1 of Appendix D are located in south central, central, and northeastern Monroe County and southwestern Pike County.

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 Township	Paradise Township
Chestnuthill Township	Pocono Township
Coolbaugh Township	Price Township
East Stroudsburg Borough	Ross Township
Greene Township (Pike County)	Smithfield Township
Hamilton Township	Stroud Township
Jackson Township	Stroudsburg Borough
Middle Smithfield Township	Tobyhanna Township
Mt. Pocono Borough	Tunkhannock Township

Brodhead Creek drains a watershed area of approximately one hundred seventy-two (172) square miles in central and northeastern Monroe County and a small section of southwestern Pike County. Major tributaries to Brodhead Creek include Buck Hill Creek, Griscom Creek, Leavitt Branch, Marshalls Creek and its tributaries, Michael Creek, Middle Branch, Mill Creek, Paradise Creek and its tributaries, Pine Mountain Run, Poplar Run, Rattlesnake Creek, Sambo Creek, Spruce Cabin Run, and Stony Run.

McMichaels Creek drains a watershed area of approximately one hundred thirteen (113) square miles in south central Monroe County. Major tributaries to McMichaels Creek include Appenzell Creek, Bowers Creek, Fall Creek, Hypsy Creek, Kettle Creek, Lake Creek, Little Pocono Creek, Pocono Creek Sand Spring Run, and Spring Run. The Brodhead Creek and McMichaels Creek Watershed and major tributaries are shown in Figure II-1 of Appendix D.

Large scale mapping of the watershed is available for review at the Monroe County Planning Commission office and available online at the Monroe County Conservation District website.

The major traffic routes in the Brodhead Creek and McMichaels Creek Watershed include Interstate Route 80 as well as PA Routes 611, 940, 209, 33, 191, and 447. Interstate Route 80 runs east-west through the center of the watershed.

Land use in the watershed is primarily residential, especially in Jackson (central), Chestnuthill, and Ross Townships (southwest). There are large undeveloped areas found throughout the watershed. Urbanized areas are found in the Boroughs of Mount Pocono, Tobyhanna and Coolbaugh Townships (northwest), Pocono Township (central), Stroudsburg and East Stroudsburg Boroughs (southeast), and Smithfield and Stroud Townships (southeast). Commercial land uses have been concentrated along major arterial and collector highways such as Pa. State Routes 611, 940, 209, 191, and 447.

B. Topography

The topography of the Brodhead Creek and McMichaels Creek watershed, as shown on the Digital Elevation Model (DEM) in Figure II-2 of Appendix D, varies significantly along its reach. In the upper headwaters of the Brodhead, the terrain is primarily steep with widening valleys. In the middle reaches of the watershed, the terrain is steep to mild in slope with U-shaped valleys. And in the lower reaches, the terrain consists of steep to moderate slopes with wide to narrow valleys. The McMichaels Creek has steep to mildly sloping terrain in its headwaters with a widening valley. The middle reaches have a gently sloping terrain, with knobby hills and a wide valley. The lower reach contains steep to moderately sloping terrain with wide to narrow valleys.

C. Geology

Geology plays a direct role in surface runoff in the Brodhead-McMichaels Watershed because it affects the soil types within the watershed through parent material breakdown. The geology of the southernmost portions of both the Brodhead and McMichaels Creek watersheds consists of formations which include some deposits of limestone, as described below. The geologic map of the watershed can be found in Figure II-3 of Appendix D. Below is a description of geologic formations in the watershed.

1. **Beaverdam Run Member of Catskill Formation** - Alternating olive-gray siltstone and sandstone; marine fossils.
2. **Bloomsburg Formation** - Grayish-red siltstone, shale, and sandstone arranged in fining- upward cycles.
3. **Buttermilk Falls through Esopus Formation Undivided** - In descending order; Buttermilk Falls Limestone - gray fossiliferous limestone and black chert; Palmerton Sandstone – massive white siliceous sandstone; Schoharie Formation - gray calcareous, argillaceous siltstone; Esopus Formation - gray silty shale and sandy siltstone.
4. **Duncannon Member of Catskill Formation** - Grayish-red sandstone, siltstone, and claystone in fining-upward cycles; conglomerate occurs at base of some cycles.
5. **Long Run Member of Catskill Formation** - Gray and grayish-red sandstone and grayish-red siltstone and claystone in fining-upward cycles.
6. **Long Run and Walcksville Member** - Combination of Long Run and Walcksville Member descriptions.
7. **Mahantango Formation** - Gray, brown, and olive shale and siltstone; marine fossils. Includes following members, in descending order: Tully - limestone or calcareous shale; Sherman Ridge, Montebello (sandstone), Fisher Ridge, Dalmatia, and Turkey Ridge. In south central Pennsylvania, includes Clearville, Frame, Chaneyville, and Gander Run Members. Characterized by coarsening-upward cycles.
8. **Marcellus Formation** - Black, carbonaceous shale; sparse marine fauna and siderite concretions. Contains local limestone ("Purcell") member. Tioga bentonite included at base in eastern Pennsylvania.
9. **Packerton Member of Catskill Formation** - Greenish-gray to gray sandstone; some laterally persistent conglomerate beds in lower part.
10. **Poplar Gap Member of Catskill Formation** - Gray and light-olive-gray sandstone conglomerate containing intermittent red beds; laterally equivalent to Clarks Ferry, Sawmill Run, and Berry Run Members.
11. **Poplar Gap and Packerton Member** - Combination of Poplar Gap and Packerton Member descriptions.

12. **Ridgeley Formation-Coeymans Formation Undivided** - In descending order: Ridgeley Formation - white siliceous sandstone; Shriver Chert - gray siltstone and shale and dark- gray chert; Port Ewen Shale - dark-gray calcareous siltstone and shale; Minisink Limestone - dark-gray clayey limestone; New Scotland Formation - dark-gray fossiliferous shale and clayey limestone; Coeymans Formation - gray, clayey to sandy limestone.
13. **Towamensing Member of Catskill Formation** - Dominantly gray sandstone and some siltstone; freshwater fossils.
14. **Trimmers Rock Formation** - Olive-gray siltstone and shale, characterized by graded bedding; marine fossils; some very fine grained sandstone in northeast; black shale of Harrell Formation at base in Susquehanna Valley.
15. **Walcksville Member of Catskill Formation** - Greenish-gray sandstone and red siltstone and claystone in fining-upward cycles.

D. Soils (Hydrologic Soil Groups)

Soil characteristics are critical elements of stormwater runoff management. Each soil type has unique characteristics such as depth to bedrock (i.e., soil depth), texture, and structure, which define the ability to infiltrate stormwater and remove runoff pollutants. The soil characteristic of major importance to stormwater management planning is the Hydrologic Soil Group. Hydrologic Soil Groups account for physical soil characteristics as well as a slope factor to give an indication of runoff potential.

The USDA Natural Resources Conservation Service (NRCS) has established a criterion determining how soils will affect runoff by placing all soils into Hydrologic Soil Groups (HSGs). HSGs are broken down into four groups (A through D) based on infiltration rate and depth.

The A soils have high infiltration rates even when thoroughly wetted and consist mainly of deep, well-drained to excessively drained soils with moderately fine to moderately coarse textures. The A soils have a high rate of water transmission and low runoff potential.

The B soils have moderate infiltration rates when thoroughly wetted and consist mainly of moderately deep or deep, moderately well or well drained soils with moderately fine to moderately coarse textures. The B soils have a moderate rate of water transmission.

The C soils have slow infiltration rates when thoroughly wetted and consist mainly of: (1) soils with a layer that impedes the vertical movement of water, or (2) soils with moderately fine or fine textures and slow infiltration rates. The C soils have a slow rate of water transmission.

The D soils have very slow infiltration rates when thoroughly wetted and consist mainly of: (1) clayey soils with high swelling capacity or potential, (2) soils with a high permanent water table, (3) soils with a claypan or clay layer at or near the surface, and (4) shallow soils over nearly impervious materials. The D soils have a very slow rate of water transmission and a high runoff potential.

Hydrologic Soil Groups were mapped in the original Brodhead and McMichaels Creek Watershed Act 167 Plans. Soils and Hydrologic Soils Group designations for locations within the watershed may be obtained through the online USDA Web Soil Survey.

III. PREVIOUS AND CURRENT PLAN EFFORTS

An Act 167 Plan was developed separately for the Brodhead Creek (1991) and McMichaels Creek (1988) watersheds by the Monroe County Planning Commission and combined as part of the 2003 update. Standards and criteria were developed and incorporated into a model municipal ordinance. The 2022 Plan Renewal is considered a “straight renewal” of the 2003 Plan Update. The limited updates to the 2003 Plan were made 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.

A. POCONO CREEK PILOT PROJECT

Throughout the process of the Brodhead and McMichaels Creek Watershed Act 167 Stormwater Management Plan 2003 update, the Pocono Creek Pilot Project was concurrently being conducted. The Pocono Creek is a tributary of the McMichaels Creek and eventually also the Brodhead Creek. The Pocono Creek Pilot Project entailed developing community-based goals and objectives which yielded the following water resources and community goals:

- Improve water quality
- Preserve stream corridors and floodplains
- Coordinate watershed planning process with other levels of government
- Maintain existing stream flow
- Preserve open space
- Develop using village centers and conservation design
- Establish an environmentally compatible economy.

Four main water resource disciplines were identified to evaluate and determine targets in order to develop a means to achieve these goals. These four water resource related disciplines included:

Water Quality

- Maintain existing water quality where it is better than state standards
- Improve water quality to meet state standards

Stream Channel Stability

- Maintain natural stable streams
- Re-establish stability to unstable streams

Stream Flow

- Provide necessary stream flows to support a natural ecosystem

Aquatic Ecology (Macroinvertebrates)

- Restore or maintain an optimal biological community in each management area

Since the municipalities in the Pocono Creek watershed extend into the Brodhead and McMichaels Creek Watershed, it is safe to assume that the same concerns would be applicable to the Brodhead and McMichaels Creek watersheds. The Pocono Creek Pilot Project did not specifically address “water quantity” or stormwater and floodplain management since the Brodhead/McMichaels Creek Act 167 Plan was addressing that goal. A watershed under natural conditions is in equilibrium, with aquatics, water quantity, stream bank erosion and sedimentation and stream flows typically under “stable” conditions. It is the influence of man, or anthropogenic changes to the land surface including regrading, impervious area, pollutant

accumulation and washoff that alters this equilibrium. Many of the detrimental effects of these disturbances occur during rainstorm events. Therefore, water quantity or stormwater management from new development is a means to achieve many of the goals of the Pocono Creek Pilot Project and maintain the hydrologic regime of the watershed in general. The final report from the project is available online and is titled “Framework for Sustainable Watershed Management – Pocono Creek.”

Water Quantity Management

Manage stormwater to achieve the objectives below:

- Minimize flooding
- Prevent future stormwater flows from being greater than predevelopment flows
- Manage flows to prevent accelerated stream bank erosion
- Treat stormwater to improve the quality of the stormwater runoff
- Recharge the groundwater to replenish groundwater supplies and stream base flow.

As one can see, the objectives above can be achieved through the five-phase approach to stormwater management, which also achieves the four goals of the Pocono Creek Pilot Project. The five-phase approach to stormwater runoff is described in Section IV.

Mapping of the watershed management districts as defined in this study can be found on the Monroe County Conservation District website.

Flood Plain and Riparian Buffer Management

Floodplains and riparian buffer areas store flood waters reducing flooding downstream, allow sediment to settle, provide groundwater recharge, keep stream temperatures cooler, remove nutrients, provide important wildlife habitat, and preserve stream banks. Filling floodplains, on the other hand, in accordance with current flood plain ordinance criteria, not only is a detriment to the natural functions above, but also acts to channel the flood flow volumes and sediment downstream, causing increased flooding and sedimentation problems. In addition, structures and fill in floodplains are prone to damage. Proper stormwater management, should therefore include riparian and floodplain preservation. The Chesapeake Bay Riparian Handbook has identified the following recommended minimum buffer widths to aid in the following functions:

- Stream bank stabilization – 40 feet
- Water temperature moderation – 60 feet
- Nitrogen removal – 140 feet
- Sediment removal – 160 feet
- Flood mitigation – 220 feet
- Wildlife habitat – 275 feet

Source: USDA Forest Service, Chesapeake Bay Riparian Handbook: A Guide for Establishing and maintaining Riparian Forest Buffers, June, 1998

B. 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 Planning Advisory Committee (WPAC) for both watersheds was reorganized with representatives from each municipality within the two watersheds.

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 III-1
Formation of the 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 (*two weeks* public notice) – ***Notice sent out 3/2/22; Public hearing held 3/16/22***
- Monroe County Commissioners Resolution to renew adoption – ***4/20/22***
- Pike County Public Hearing (*two weeks* public notice) – ***Notice sent out 5/17/22; Public hearing held 6/1/22***
- Pike County Commissioners Resolution to renew adoption – ***6/1/22***
- *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***

IV. DRAINAGE PROBLEMS AND PROPOSED SOLUTIONS

A survey questionnaire was incorporated into the 2022 Plan Renewal work plan to obtain municipal input on how well the current Plan is working, how it could be improved, and to determine areas that may necessitate reevaluation. The questionnaire is also designed to solicit input from each municipality relative to specific problems in the watershed, as well as for the need for stormwater management in their particular area. The questionnaire, along with a summary of the purpose of Act 167 (which includes an emphasis on Act 167 goals as they relate to this watershed), was distributed to municipalities, watershed groups and other agencies and interested individuals. These questionnaires included broad questions such as “Do you have any issues with overbank (stream) flooding?,” and specific questions on new problem areas and new needs within the watershed. An example of the questionnaire package is included as Appendix A of this document.

Because the most important part of the Act 167 planning process is the implementation of the Plan, another consideration in utilizing this questionnaire strategy is to develop interest by the responding municipalities for the need and the desire to actively implement stormwater management measures within their community. A summary of the stormwater related problems and the identification of properties affected by flooding incidents in each municipality is an important expected product of this study.

The overall evaluation of the municipal questionnaires which were received shows several occurrences of small stream flooding and stream bank erosion throughout the watershed during major storm events resulting in both private and public property damages.

These problems are more pronounced in the more populated areas most likely due to encroachments onto floodplain areas and undersized culverts or bridges. A large number of these stormwater related problems have been traced back to uncontrolled runoff from local and upstream areas, inadequate culverts or bridges, and obstructions in the system that are blocking the natural flow of stormwater. The DEP sponsored Stroudsburg/East Stroudsburg Levee project aids in flood control in this area as shown in Appendix D. The management district criteria are consistent with maintaining design flows for which the project was designed at this location.

An example of a problem stormwater hotspot area which was fixed is the Flory Pond area. East Stroudsburg Borough has reported flooding in the Flory Pond area. Flory Pond does not have an outlet; therefore, the flooding problem surrounding the pond is related to the increase in volume of runoff from new development as opposed to the increase in peak flow. The recharge requirements of this plan helped this situation, but a structural solution was needed to fix the problem. Pumps were installed to provide a discharge to Flory Pond to alleviate the flooding.

An additional problem of major concern in this watershed relates to water quality. Runoff from parking lots and streets contribute non-point source pollution to the storm sewers and eventually the streams. Due to the residential land use in the watershed, the area experiences contamination caused by residential nutrient runoff as well as soil erosion and stream bank erosion. Bacteria, nutrients, sediments and erosion have been identified as water quality problems in the watershed. Water quality problems have been identified as being a result of developed land non-point source pollution and sediment from stream bank erosion. In addition, habitat loss and eutrophication have also been reported. The following list 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 IV-1 of Appendix D is a map of stormwater problem areas and Table IV-1

summarizes the problems identified in the public questionnaires. See Appendix A for a sample of the questionnaire used to identify these problem areas and a more detailed summary of the responses received with references to the locations identified in Figure IV-1.

Table IV-1: Stormwater Problems by Municipality

<u>Township</u>	<u>Most Severe Problems</u>
Barrett Township	No reported problem areas
Chestnuthill Township	Localized & Sewer/Roadway Flooding
Coolbaugh Township	Sewer / Roadway Flooding
East Stroudsburg Borough	Localized & Sewer/Roadway Flooding
Greene Township (Pike County)	No reported problem areas
Hamilton Township	Roadway Flooding
Jackson Township	Localized Flooding
Middle Smithfield Township	Localized Flooding
Mt. Pocono Borough	No reported problem areas
Paradise Township	Roadway Flooding
Pocono Township	Roadway Flooding, Stream Flooding
Price Township	No reported problem areas
Ross Township	No reported problem areas
Smithfield Township	Roadway Flooding
Stroud Township	Sewer/Roadway Flooding, Localized Flooding, Stream Flooding
Stroudsburg Borough	Localized Flooding, Sewer/Roadway Flooding
Tobyhanna Township	Sewer/Roadway Flooding
Tunkhannock Township	No reported problem areas

Although some of these problems are not directly related to stormwater runoff, this stormwater management plan will coordinate with the programs that address some of these other problems.

Although the land use of the watershed has become more urbanized since the original Plan adoptions, the storm water management ordinance provisions to reduce post-development peak rates to pre-development peak rates of runoff have been implemented where it was found to be necessary. The goal of the original Plan was to maintain the existing conditions peak flows as of the adoption of the Plan. Plan implementation achieves these goals, as verified in the municipal survey. Therefore an extensive re-evaluation of hydrologic modeling and resulting standards was not warranted. In the 2003 plan update, the original percentage discharge requirement was modified to a Management District approach to address the smaller, more frequent storms that create water quality and stream bank erosion problems. It has been determined from WPAC input that under this update, the release rate concept of stormwater management was successfully being implemented and was not creating any problems.

Stormwater management planning is critical in the areas both affected and currently unaffected by stormwater problems in the Brodhead Creek and McMichaels Creek watershed. For areas which are currently being affected, the frequency of flooding is mainly during larger storm events. The Act 167 Plan can significantly address future, more frequent flooding problems in these areas by managing runoff from newly developing areas and by providing rainfall design values which address changing precipitation patterns. For areas currently unaffected by stormwater problems, the Act 167 Plan will provide controls on future development to aid in preventing future stormwater runoff problems. The plan is also being updated to incorporate

updated guidance and design rationale (i.e. NOAA Atlas 14 Point Precipitation Frequency Estimates, revised PaDEP BMP manuals, etc.) to address the effects of climate change producing shorter duration, higher intensity storms.

Any technical evaluations and revisions to standards will be performed with input from the advisory committee, municipal engineers committee and legal advisory committee as in regular plan preparations.

V. COMPREHENSIVE WATERSHED - WIDE WATER RESOURCES MANAGEMENT

A. Impact of Runoff on Watersheds

Stormwater runoff from developed areas has a direct influence on the quality of the Brodhead Creek and McMichaels Creek waters. This influence begins with the effects development have on the natural hydrologic cycle of the watershed. During development, trees, meadow grasses, open fields and agricultural areas which would have naturally intercepted or infiltrated a significant portion of the rainfall are cleared, graded, and compacted. Much of these natural areas are then covered with impervious surfaces, such as buildings or parking lots, which reduces the total amount of rainfall which would have infiltrated to groundwater sources under natural conditions. Rainfall which does not infiltrate into the subsurface is converted directly to surface stormwater runoff and typically conveyed quickly to a receiving body of water, such as a stream or lake. With this large conversion of rainfall to surface runoff, streams are required to convey much larger volumes and higher peak rates of runoff, which the existing drainage systems may not be capable of handling. This may lead to erosion and sedimentation problems which can be evident in downstream areas.

B. Five-Phased Approach

The goal of Act 167 and this Stormwater Management Plan is to encourage planning and management of stormwater runoff that is consistent with sound water and land use practices. In addition, the Act authorizes a comprehensive stormwater management program designated to preserve and restore flood carrying capacities of streams, preserve to the maximum extent practical the natural courses of stormwater runoff, preserve current cross sections of streams, and protect and conserve ground waters and ground-water recharge areas. Maintaining the existing conditions hydrologic regime in the watershed is the best means to accomplish these goals. The technical standards and criteria developed as a part of this task will be watershed-wide in their interpretation and/or application. To strive toward achieving this goal, and to address stream bank erosion, flooding, water quality, groundwater recharge, and stormwater management projects on development sites, the following five (5) objectives should be considered:

1. Maintain groundwater recharge
2. Implement non-point source pollution removal methodologies
3. Reduce channel erosion
4. Manage overbank flood events
5. Manage extreme flood events

These objectives can be accomplished under the following items, and are shown in Figure V-1.

Act 167
 Technical Objectives (Desired)

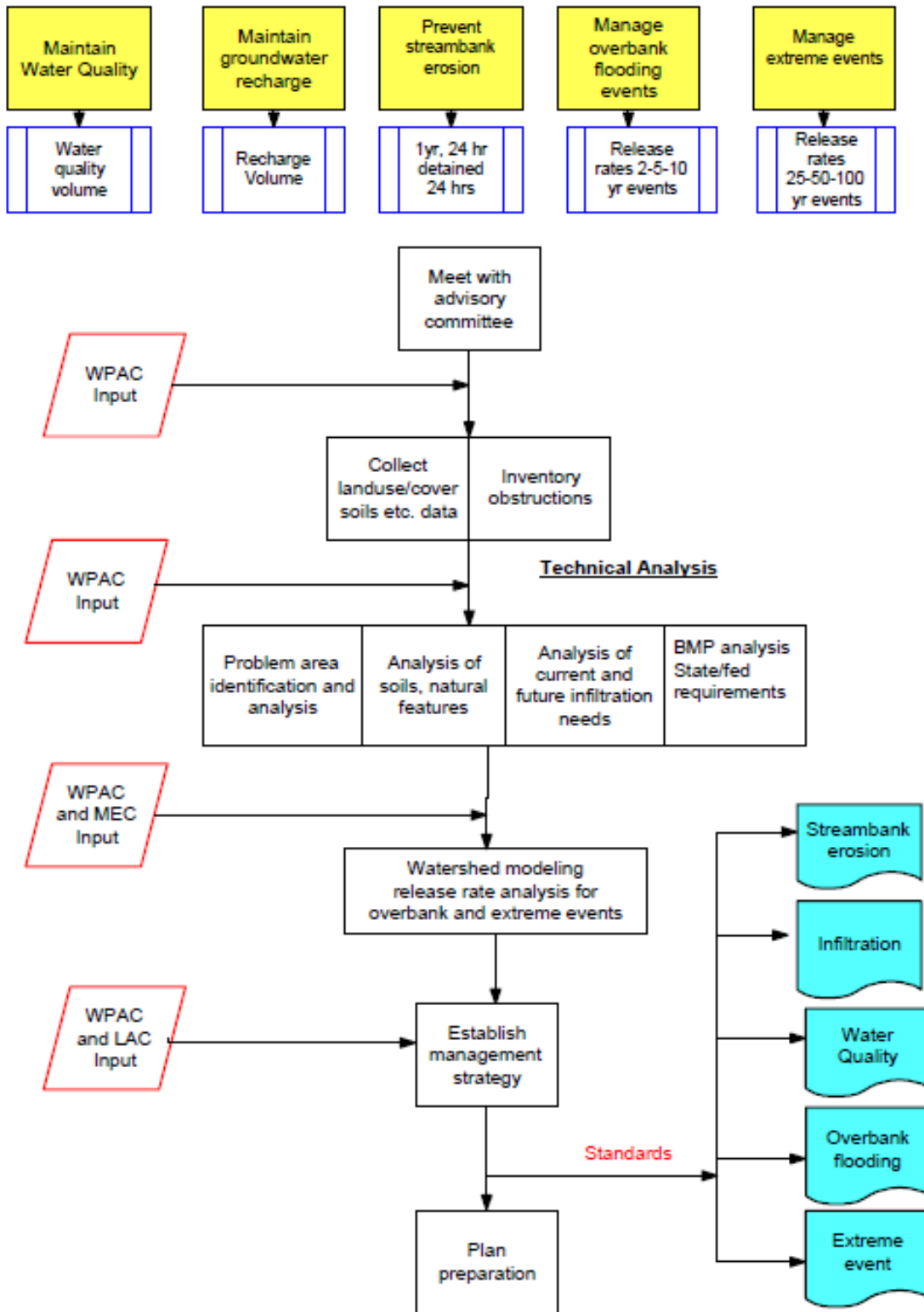


Figure V-1. Process utilized analyzing five comprehensive management objectives.

1. Groundwater Recharge/Infiltration

Recharging rainfall into the ground replenishes the groundwater that provides baseflow to streams, (a process that keeps streams flowing during the drier summer months), and maintains groundwater for drinking water purposes. As development occurs and the impervious area, increases, less rainfall reaches the groundwater systems and lower base flows and smaller groundwater supplies may result. Although detention basins can reduce the after development peak rate of flow to the existing conditions rate, the increased volume of runoff still gets passed downstream unless special provisions are designed into the basin to recharge this increase in runoff volume.

In highly developed watersheds, it is not uncommon to see dry streams during periods of drought, along with severely depleted groundwater drinking supplies. Stormwater management measures such as porous pavement with underground infiltration beds and infiltration/recharge structures, or Best Management Practices (BMPs) can be designed to promote groundwater recharge. These measures are encouraged, and should be utilized wherever feasible.

It is realized, however, that due to certain soils and topographic conditions, recharge may not be feasible on every site. It will be up to the design professional, therefore, to show that groundwater recharge cannot be *physically* accomplished. The infiltration criteria is therefore based upon a hierarchical approach, striving to achieve the maximum infiltration achievable, taking into account site limitations. Where infiltration is not feasible, other volume managing stormwater BMPs should be used such as Managed Release Concept BMPs or other BMPs developed to manage increased volume from development.

The size of the recharge facility shall be based upon the following volume criteria:

a. NRCS Curve Number equation.

The NRCS runoff equation is universally accepted to predict stormwater runoff from precipitation events:

Equation. V-1.
$$Q = \frac{(P-0.2S)^2}{P + 0.8S}$$

where

Equation. V-2.
$$S = 1000/CN - 10$$

Where:
Q = Runoff (inches)
P = Rainfall (inches)
S = Potential maximum retention after runoff begins (inches)
CN = The NRCS Curve Number

Setting Q to zero in the equation above would represent zero runoff from the site. Solving the equation above for P, while holding Q equal to zero, would provide an equation that represents the rainfall volume that would infiltrate from a site with a particular (or composite) CN under existing conditions. This equation would take the form:

For zero runoff: $P = I \text{ (Infiltration) (in)} = (200 / \text{CN}) - 2$ Eqn. V-3

Where: CN = the existing condition curve number of the land area that will be converted to impervious surface. This equation can be displayed graphically as shown in Figure V-2.

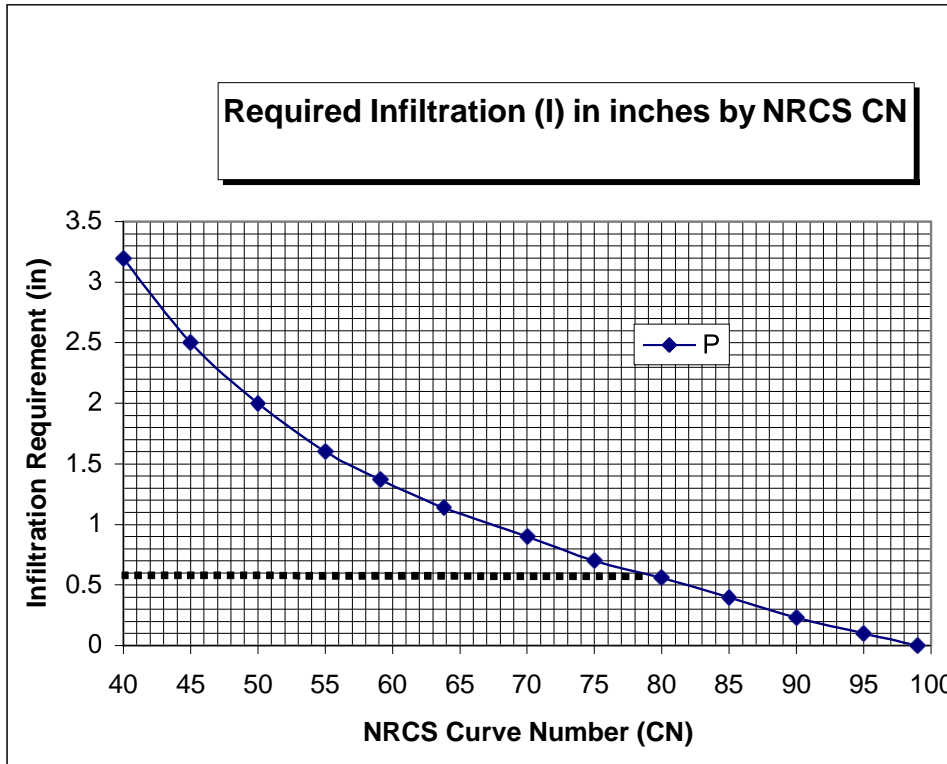


Figure V-2. Infiltration requirement based upon NRCS Curve Number.

To apply the above procedure, the infiltration requirement would be determined by finding where the existing condition CN intersects the curve. The goal then, is to maintain the natural existing hydrologic regime of a site by recharging that portion of rainwater that recharges under existing conditions. Therefore multiplying the infiltration requirement (I) by the site area would be the site's required recharge or runoff capture volume, Re_v .

In most cases, existing sites may have varying land uses and hydrologic soil groups (HSG). Obtaining a composite CN for the existing site conditions, and then obtaining the infiltration requirement, is not the proper way of determining the required recharge. One must determine the infiltration requirement for each unique land use/hydrologic soil group individually and then sum the infiltration values determined to obtain the recharge volume as shown in the example on the following page:

<div style="border: 1px solid black; display: inline-block; padding: 2px;">1</div> Meadow HSG = B CN = 58 2 Ac Impervious area	<div style="border: 1px solid black; display: inline-block; padding: 2px;">2</div> Meadow HSG = C CN = 71 4 Ac Impervious Area
<div style="border: 1px solid black; display: inline-block; padding: 2px;">3</div> Forest HSG = B CN = 60 1 Ac Impervious Area	<div style="border: 1px solid black; display: inline-block; padding: 2px;">4</div> Forest HSG = C CN = 73 2 Ac Impervious Area

Figure V-3. Hypothetical Undeveloped Site:

From Equation V-3, or Figure V-2, the required infiltration (I) can be obtained:

1. $I = 1.44 \text{ in.} \times 2 \text{ Ac.} \times 1 \text{ ft./12in.} = 0.24 \text{ Ac-ft.}$
2. $I = 0.82 \text{ in.} \times 4 \text{ Ac.} \times 1 \text{ ft./12in.} = 0.27 \text{ Ac-ft.}$
3. $I = 1.33 \text{ in.} \times 1 \text{ Ac.} \times 1 \text{ ft./12in.} = 0.11 \text{ Ac-ft.}$
4. $I = 0.74 \text{ in.} \times 2 \text{ Ac.} \times 1 \text{ ft./12in.} = \underline{0.12 \text{ Ac-ft.}}$
 $Re_v = \text{Total required recharge} = 0.74 \text{ Ac-ft.}$

This process also advocates that the more permeable soils (HSG A and B), where the most rainfall would recharge the groundwater, be maintained in their natural condition. It is advantageous to develop on the less permeable soils (C and D) and keep the more permeable soils (A and B) as the recharge areas. If one were to run through the calculations, one would find that developing on or disturbing the permeable soils would require a lot more recharge volume than the other way around. This process therefore promotes the preservation of recharge areas.

b. Inability to Meet NRCS Curve Number Goals. Application of the Water Budget Approach.

It has been determined that infiltrating 0.6 inches of runoff from the impervious areas will aid in maintaining the hydrologic regime of the watershed. If the goals of Section a above cannot be achieved, then 0.6 inches of rainfall shall be infiltrated from all impervious areas, up to an existing conditions site conditions curve number of 77. Above a curve number of 77, Equation V-3 or the curve in Figure V-2 should be used to determine the infiltration requirement.

The requirements for recharge are applied to all disturbed areas, even if they are ultimately to be an undeveloped land use such as grass areas, since studies have found that compaction of the soils during disturbance reduces their infiltrative capacity.

c. Where an 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. Water Quality

Pollutants accumulate on impervious surfaces between rainfall events or during dry weather.

Pollutant concentrations in runoff from developed land therefore, tend to be greatest at the beginning of the storm event, a phenomenon commonly known as the first flush. It has also been found that eighty to ninety percent of rainfall events are one inch of rainfall or less, storms that essentially simulate this “first flush”. The majority of the non-point source pollutants, therefore, are being washed into streams during the smaller storms. Capturing this first flush and/or smaller storms will allow the stormwater to be detained and will allow pollutants to settle, thus allowing a “cleaner” outflow.

- a. **Buffers:** Maintaining or restoring natural buffers has many storm water related benefits including aiding in groundwater recharge, improving water quality of runoff and protecting streambanks from erosion. A listing of 20 benefits of buffers is shown in Table V-1. Buffer requirements are therefore incorporated into the Ordinance.

TABLE V-1 Twenty Benefits of Buffers

1. Reduce watershed impervious area by 5%.
2. Maintain distance from impervious cover.
3. Reduce small drainage problems and complaints.
4. Stream "right-of-way" allows for lateral movement.
5. Effective flood control.
6. Protection from streambank erosion.
7. Increase property values.
8. Increased pollutant removal.
9. Foundation for present or future greenways.
10. Provide food and habitat for wildlife.
11. Mitigate stream warming.
12. Protection of associated wetlands.
13. Prevent disturbance to steep slopes.
14. Preserve important terrestrial habitat.
15. Corridors for conservation.
16. Essential habitat for amphibians.
17. Fewer barriers to fish migration.
18. Discourage excessive storm drain enclosures/channel hardening.
19. Provide space for stormwater ponds.
20. Allowance for future restoration.

- b. **Water Quality Requirements** - The land developer SHALL comply with the following water quality requirements unless otherwise exempted.

For the water quality volume (WQv), the objective is to promote settlement of pollutants through detaining 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 is achieved in the facility). At the same time, the objective is not to attenuate the larger storms. 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 flood into the basin or divert flows in excess of the 2-year storm away

from the basin with the larger flows going to a storm water quantity control facility. 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 potential. Orifices smaller than 3 inches diameter are not recommended. However, if the Design Engineer can provide proof that the smaller orifices are protected from clogging by use of trash racks, etc., smaller orifices may be permitted.

Where an NPDES permit for stormwater discharges associated with construction activities is required, the water quality requirements of that permit should be used.

- c. Innovative Design - To accomplish the water quality objectives, the land developer MAY 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).
- d. BMP Selection - In selecting the appropriate BMPs or combinations thereof, the land developer SHALL consider the following:
 - 1. Total contributing area.
 - 2. Permeability and infiltration rate of the site soils.
 - 3. Renovative capacity of the soils
 - 4. Slope and depth to bedrock.
 - 5. Seasonal high water table.
 - 6. Proximity to building foundations and well heads.
 - 7. Erodibility of soils.
 - 8. Land availability and configuration of the topography.
 - 9. Peak discharge and required volume control.
 - 10. Stream bank erosion.
 - 11. Efficiency of the BMPs to mitigate potential water quality problems.
 - 12. The volume of runoff that will be effectively treated.
 - 13. The nature of the pollutant being removed.
 - 14. Maintenance requirements.
 - 15. Creation/protection of aquatic and wildlife habitat.
 - 16. Recreational value.
 - 17. Enhancement of aesthetic and property value.

3. Stream Bank Erosion

As storm flows increase, the velocities in streams also increase, thus exacerbating stream bank erosion problems. Stream bank full flow has been found to equate to approximately a 1.5- to 2-year storm. Theoretically, stream flows kept to near the one-year storm flow would minimize stream bank erosion. Detaining the smaller, more frequent events, where feasible, would therefore minimize the number of storms causing stream bank erosion.

Applying the water quality criteria above will also help the stream bank erosion problem. Thus, detaining the 2-year proposed conditions storm to the one-year existing conditions storm and detaining the 1-year proposed conditions storm a minimum of 24 hours would minimize the number of storms causing stream bank erosion. This is the same management criterion that has been recognized to also improve the water quality of stormwater runoff.

4. Overbank Events

Flooding and stormwater problems are caused by excess stormwater quantity. Storm events which result in water exceeding the natural bank of a stream are termed as “Overbank” events and are typically defined as an expected frequency of occurrence. Based upon the realization that most bankfull events occur at approximately the 1.5- to 2- year event, events greater than the 2- year storm generally result in overbank flooding. These “overbank” events typically range from the 2- year to 10- year events. Management of these “overbank” events requires a detailed knowledge of the interrelationship between all contributing areas of a watershed. Analysis of peak runoff, timing of runoff, and duration of runoff from the various areas of a watershed is critical for establishing this criteria. The result of this analysis is the Management District Concept, discussed below.

5. Extreme Events

“Extreme” flooding events are separated from “overbank” flooding events by the severity of damage which is incurred. Typically, events such as the 25-, 50- and 100- year events are labeled as “extreme” events.

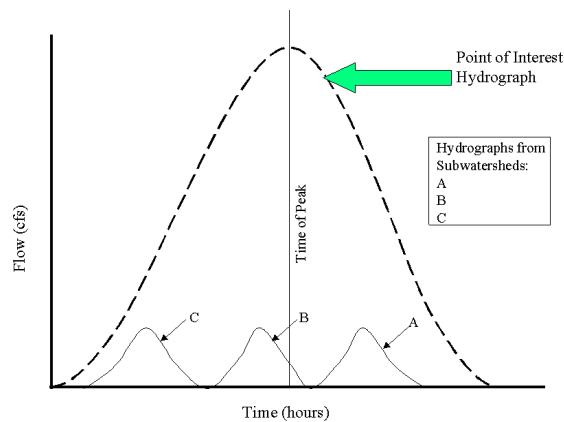
While some overbank and extreme flooding events are inevitable, the goal is to control the frequency of occurrence for such events such that the level of overbank flooding is the same over time, so that damages to existing infrastructure are not exacerbated by upstream development. Therefore, different management criteria are given for these “overbank” and “extreme” event floods. It must be recognized that there is a difference between the meanings of “storm” and “flood” when considering 5-year storms and 5-year floods. Although a certain quantity of rain may classify a rainfall event as a 5-year storm, this does not mean that same amount of rain will result in a 5-year flood. For example, if the event would occur during a drought, a 5-year storm may result in only a 2-year flood because of the capacity of the soil and ground to absorb water. However, if the same event occurred on top of a snow melt, then a 10-year flood may occur because of the extra water volume present in the melting snow. Similarly, the term “5-year flood” does not mean that this event will occur once every five years. Nor does it mean that once a 5-year event occurs, it will be another five years until that event may occur again. A 5-year event refers to the probability that the event will occur in any given year, which is the inverse of the frequency event. Therefore, a 5-year event has a 20% probability of occurring in any given year.

C. Management District Concept (Overbank and Extreme Event)

The original Act 167 plans for the Brodhead and McMichaels Creek watersheds were based upon the release rate concept where each subarea of the watershed was assigned a release rate (as a percent value). For any development scenario, the post development runoff rate must meet a percent (release rate) of the pre development runoff rate. These release rates were developed by analyzing the individual subarea contribution to the overall watershed runoff. The Management District concept uses the same idea as the release rate concept; however, it displays the final criteria by grouping subareas into “Management Districts” rather than assigning a release rate to each individual subarea. Each Management District contains specific criteria which are to be met in order to address “overbank” and “extreme” design events.

Figure V-4 shows a simplified version of how various subarea hydrographs would contribute to the peak flow at a particular point of interest (POI). As can be seen from Figure V-4, hydrograph "A" peaks after the point of interest hydrograph. In this case, standard detention or reducing post development flows to existing conditions rates would attenuate the flows past A's peak, but would minimally 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 subarea's hydrograph. Standard detention would attenuate flow to a point where it is increasing flow at the POI; therefore, stormwater management controls would need to reduce the outflow to a higher frequency (smaller) storm. Flows in subarea C enter and exit the stream system before the peak flow occurred at the POI; therefore, if possible, it would be advantageous not to detain these flows. Subareas A, B, and C on the sample would fall into districts A, B, and C respectively as shown on the map in Figure V-5 of Appendix D. Development of the design storm criteria was based upon downstream obstruction capacities and problem areas identified in the study, as well as the overall goal of maintaining the existing condition flow at all points in the watershed in the future.

Figure V-4
Relative Timing of Subwatershed Hydrographs



In performing the tasks for the Brodhead / McMichaels Creek Watershed Plan under Act 167, a major goal was to determine where in the watershed stormwater detention was appropriate for new development and, just as importantly, where detention was not appropriate. It was also important to determine to what extent stormwater detention would be required in individual subareas as described above. In Table V-2, the peak rate of proposed conditions runoff would have to be reduced to the peak rate of existing conditions runoff for the design storms specified below. Individual subareas would fall into one of four districts:

Table V-2: Management District Peak Rate Requirements

District	Proposed conditions	(reduce to)	Existing conditions
A	2 – year		1 – year
	5 – year		5 – year
	10 – year		10 – year
	25 – year		25 – year
	50- year		50- year
	100-year		100-year
B-1	2 – year		1- year
	5 – year		2 – year
	10 – year		5 – year
	25 – year		10 – year
	50- year		25- year
	100-year		100-year
B-2	2 – year		1- year
	5 – year		2 – year
	25 – year		5 – year
	50- year		10- year
	100 – year		50 – year
B-3	50- year		10- year
	100 – year		50 – year
C	<p>Note: Section numbers provided herein refer to the Model Ordinance Sections. Provisional Direct Discharge District - Development sites which can discharge directly to the main channel or major tributaries or indirectly to the main channel through an existing stormwater drainage system (i.e., storm sewer or tributary) which meets the "Downstream Hydraulic Capacity Analysis" in Section 305.H and is shown by the design professional to not cause a downstream problem, may allow an increase in flow as long as no downstream harm is demonstrated. However, sites in District C shall comply with the criteria for Water Quality and Streambank Erosion (Ordinance Section 303); and Groundwater Recharge (Ordinance Section 304). If the proposed conditions runoff is intended to be conveyed by an existing stormwater drainage system to the main channel, assurance must be provided that such system has adequate capacity to convey the increased peak flows or will be provided with improvements to furnish the required capacity. When adequate capacity of the downstream system does not exist and will not be provided through improvements, the proposed conditions peak rate of runoff must be controlled to the existing conditions peak rate as required in District A provisions (i.e.10-year proposed conditions flows to 10 year existing conditions flows) for the specified design storms.</p>		

As in District C, development in those subareas designated on Figure V-5 of Appendix D must convey the generated stormwater runoff to a stream or watercourse in a safe manner. **The conveyance must manage the quantity, velocity and direction of resulting stormwater runoff in a manner that adequately protects health and property from possible injury pursuant to Act 167, does not overtax existing conditions drainage facilities and does not cause erosion or sedimentation.** Anyone who proposes no detention must comply with Section 305G, and H of the Model Ordinance. Acceptable velocities shall be based upon criteria contained in the DEP "Erosion and Sediment Pollution Control Program Manual". **A proposed**

flow that is greater than the existing flow can only be released if it would not aggravate a significant obstruction or existing problem area or overload existing storm sewer networks. If this condition could not be satisfied, proper stormwater management, obstruction replacement or standard detention would be required. Additionally, any flow from the 50-year storm not carried by downstream drainage facilities must be addressed and where necessary, additional controls must be installed to assure collection of this water by control facilities where required by the stormwater design.

When discharging peak flows greater than the existing peak flow rates, proper analysis of channel capacity downstream of a development site is essential to insure that the discharge is not creating any new problem areas or aggravating existing drainage problem areas. The analysis must include the assumption of complete build-out of the tributary areas to the channel being evaluated based upon the most current zoning requirements. The analysis must also analyze the future conditions assuming that stormwater detention on development sites is not implemented. In addition, stormwater control measures consistent with the Plan must be assumed in analyzing projected development upstream of the point of evaluation.

Stream channels, watercourses 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 the applicable permits obtained. Any facilities that are subject to Chapter 105 criteria must be designed to be consistent with Chapter 105.

Culverts, bridges, stream enclosures or any other facilities must meet the criteria outlined in DEP Chapter 105 Rules & Regulations. Such facilities shall allow an unimpeded flow to be conveyed.

Table V-3 provides a process to accomplish the required standards and criteria, on a priority basis, looking at means other than detention to promote recharge, improve water quality and prevent streambank erosion and to reduce proposed conditions peak flows to the required existing conditions rate.

<p>TABLE V-3 Process to Achieve the Standards and Criteria in Order of Required Consideration (Ultimate Goal - Match Existing Conditions)</p>
--

1. Maximize use of Nonstructural Stormwater Management BMPs
 - Minimize disturbance of natural features
 - Minimize grading
 - Minimize impervious surfaces, consider pervious surfaces
 - Break up large impervious surfaces
2. Satisfy water quality and streambank erosion requirements
 - Apply BMPs near the source of the runoff
3. Satisfy groundwater recharge (infiltration) / Volume reduction objective
4. Satisfy the runoff peak attenuation objective considering all measures other than detention basins.
5. After satisfying the above requirements, incorporate dual purpose detention measures, if necessary, to attenuate peaks. Dual purpose detention is recommended, e.g., recycling water, wetlands basins, water storage for fire flow, etc.
6. Maximize Nonstructural Stormwater Management Alternatives
 - Minimize disturbance of natural features
 - Minimize grading
 - Minimize impervious surfaces, consider pervious surfaces
 - Break up large impervious surfaces
7. Satisfy Groundwater recharge (infiltration) objective
8. Evaluate needs for treating runoff (water quality objective)
 - Apply BMPs near the source of the runoff
9. Satisfy the runoff peak attenuation objective considering all measures other than detention basins.
10. After satisfying the above requirements, incorporate dual purpose detention measures if necessary to attenuate peaks. Dual purpose detention is recommended (e.g. recycling water, wetlands basins, water storage for fire, etc.)

The required standards and criteria developed are summarized in Table V-4 while recommended standards and criteria can be found in Table V-5. The ultimate goal would be to match the existing conditions hydrograph, not just the existing conditions peak. Nonstructural stormwater management measures (or open space planning) should be evaluated to help achieve this goal. Section V of the Pennsylvania Stormwater Best Management Practices Manual should also be consulted to achieve these goals.

**TABLE V-4
Required Criteria & Standards**

REQUIRED STANDARD

BENEFIT

Stormwater Management
A, B, and C Management Districts

No increase in runoff on a watershed wide basis, stormwater attenuation.

Calculations Methodology
Standard parameters shall be set in the Model Ordinance.

Calculations for consistent stormwater management.

Existing Storm Sewers or Culverts
Discharge into existing storm sewer networks or culverts will be based on system capacity or design storm(s), whichever is more restrictive.

Preserve sewer/culvert capacity thereby reducing Operation and Maintenance and replacement costs.

Discharge of Accelerated Runoff
Only excess accelerated stormwater runoff (after all criteria has been met) shall be safely discharged into existing conditions drainage patterns and storm sewers without adversely affecting properties or causing channel scouring and erosion.

Safe conveyance, continued surface and groundwater quality, flow attenuation.

Inappropriate Outlets
If outlet from stormwater conveyance systems from a development site to a stream, tributary, stabilized channel, or storm sewer is not possible, runoff shall be collected in a BMP and discharged at a non-erosive rate. Outlets discharging onto adjacent property owner(s)' properties must have appropriate easements for said discharge. Where an NPDES permit for stormwater discharges associated with construction activities is required, Refer to the DEP Guidance Document titled "Off-Site Discharges of Stormwater to Areas that are not Surface Waters", as amended, and the DEP FAQ titled "Chapter 102 Off-Site Discharges of Stormwater to Non-Surface Waters", as amended.

Safe conveyance, continued surface and groundwater quality, flow attenuation.

District C
Those areas designated in Figure V-5 as being in District C shall safely discharge runoff directly into an existing conditions conveyance system with no detention or attenuation of greater than the 5-year storm, if the system has the capacity.

Allows excess runoff to exit watershed system prior to peak while still meeting water quality and groundwater recharge goals.

TABLE V-4 (cont.)
Required Criteria & Standards

REQUIRED STANDARD

BENEFIT

Wetlands

Network with administrative and regulatory agencies involved with work within wetland areas to help promote the protection of those resources.

Infiltration, surface and groundwater recharge, stream baseflow, water quality, flow attenuation, detention.

Recharge/Infiltration/Retention

Infiltration and retention BMP's are preferred over standard detention basins, where soil and physical conditions permit. Impacts on subsurface mine pools and Karst areas should be evaluated before recommending this type of practice.

Groundwater/stream baseflow recharge, flow attenuation.

Water Quality

Provide adequate storage and treatment facilities necessary to capture and treat the Water Quality Volume (WQv). See Section V.B.2.b for calculation methodology for WQv.

Allows pollutants to settle thus providing improved water quality.

**TABLE V-5
Recommended Criteria & Standards**

RECOMMENDED STANDARD

BENEFIT

Erosion and Sediment Pollution Control

Network with administrative and regulatory agencies involved with earth disturbance activities.

Infiltration, structure integrity, surface water quality, safe conveyance, stream, culvert, and channel capacity.

Floodplains

Those floodplains in which the floodplain stores water shall not be filled nor covered with impervious surface which may reduce the storage capacity. Floodplains should be vegetated with native plants where possible.

Natural stormwater detention/flood control downstream.

Roof Drains, Residential/Commercial

Prevent all roof drains from directly discharging into storm sewers, roadside ditches or channels. Discharge to lawn, recharge basin or storage facilities for re-use.

Promotes infiltration, flow attenuation and increases runoff time of concentration.

Pervious Surfaces

The use of pervious materials will be encouraged for parking surfaces and sidewalks. Aquifer recharge beds are encouraged.

Infiltration, groundwater recharge.

Stormwater BMP's

Concentrate on locating facilities within areas conducive to recharge and accommodate recharge to meet management district requirements. No stormwater structures are allowed in floodplains that would reduce the storage volume.

Infiltration, groundwater recharge, stream baseflow.

Steep Slopes

Regulate activities in steep slope areas where management of stormwater by structure is inappropriate. Slopes should be vegetated with native vegetation.

Stream base flow, flow attenuation, conveyance integrity, surface water quality.

Stream Bank Protection

Reduce 2-year proposed conditions flow to 1-year existing conditions flow.

Reduces the number of erosive flows thereby reducing stream bank erosion.

Green Roof

Construct rooftop gardens

Flow attenuation and small storm retention

The references in the Reference Section of this Plan should be consulted to aid the design engineer in BMP selection and design. Riparian buffer width that is recommended is 150 feet of a vegetative mix measured from the top of bank on both sides of the stream.

Note: See the Model Ordinance for standards with more detailed criteria.

D. Alternative Runoff Control Techniques

Some runoff control techniques are "structural" stormwater management controls meaning that they are physical facilities for runoff abatement. Others are "non-structural" controls, referring to land use management techniques geared toward minimizing storm runoff impacts through control of the type and extent of new development throughout the study area. The Brodhead Creek and McMichaels Creek Watershed Stormwater Management Plan is based on the assumption that new development of various types will occur throughout the study area (except as regulated by floodplain regulations) and that structural controls will be required to minimize the runoff implications of the new development.

1. Nonstructural Runoff Controls - Non-structural 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 are recommended. Non-structural BMPs are increasingly recognized as a critical feature of stormwater BMP plans, particularly with respect to site design. In most cases, non-structural BMPs shall be combined with structural BMPs to meet all stormwater requirements. The key benefit of non-structural BMPs is that they can reduce the generation of stormwater from the site; thereby reducing the size and cost of structural BMPs. In addition, they can provide partial removal of many pollutants. The non-structural BMPs have been classified into broad categories including, but not limited to:
 - Natural area conservation
 - Limiting disturbed areas
 - Conservation design

A more detailed discussion on nonstructural Stormwater BMPs can be found in the Pennsylvania Stormwater Best Management Practice Manual.

2. Structural Runoff Controls - Structural controls for managing storm runoff can be categorized as either volume controls or rate controls. Volume controls are designed to prevent a certain amount of the total rainfall from becoming runoff by providing an opportunity for the rainfall to infiltrate into the ground. Greater opportunity for infiltration can be provided by minimizing the amount of impervious cover associated with development, by draining impervious areas over undisturbed areas or into specific infiltration devices, and by using grassed swales or channels to convey runoff in lieu of storm sewer systems. Rate controls are designed to regulate the peak discharge of runoff by providing temporary storage of runoff which otherwise would leave the site at an unacceptable peak value. Rate controls, much more so than volume controls, are adaptable to regional considerations for controlling much larger watershed areas than one development site.
 - a. Innovative BMPs - The use of traditional and innovative Best Management Practices (BMPs) is encouraged to meet the recharge, water quality and quantity criteria established in this Plan. The Pennsylvania Handbook of Best Management Practices for Developing Areas prepared by the Pennsylvania Association of Conservation Districts, Inc., Spring, 1998, BMP Manuals referenced in or the PA PCSM BMP manual as revised and amended , should be used to design and maintenance of these practices/facilities.
 - b. Temperature Sensitive BMPs – Runoff from blacktop during hot summer months can provide a “slug” of warm water into the streams, which could affect trout and other organisms in the stream. Therefore, the temperature and quality of water and streams shall be maintained through the use of temperature sensitive BMPs and stormwater conveyance systems. Temperature sensitive BMPs are simply those BMPs which help reduce the temperature of the discharge of the BMP, typically by shading or by providing temporary underground storage. A list of some temperature sensitive BMPs and the source for further information on them can be found in Table V-6.

TABLE V-6
Temperature Sensitive BMPs
To minimize temperature increases caused by new
development in watersheds Stormwater BMP designs should:

- Provide shading for pools and channels (particularly south side)
- Maintain existing forested buffers
- Bypass available baseflow and/or springflow
- Utilize underground storage where possible
- Utilize recharge

- c. Quantity Control - Post development runoff from a site must not exceed the applicable existing conditions rate applied to the subwatershed where the site is located. This runoff control can be obtained in a number of different ways. The applicant must select the technique that is the most appropriate to the type of project and physical characteristics of the site. Best Management Practices can be utilized to manage water quality, ground water, recharge, streambank erosion and quantity (peak and volume).The

runoff control(s) most applicable to a development site may vary widely depending upon site characteristics such as:

- Type of development proposed
- Soil characteristics (hydrologic soil group, etc.)
- Subsurface conditions (high water table, bedrock, etc.)
- Topography (steepness of slope, etc.)
- Existing drainage patterns
- Economics
- Advantages and disadvantages of each technique
- Applicable performance standard

A more detailed discussion on structural Stormwater BMPs can be found in the Pennsylvania Stormwater Best Management Practice Manual.

E. Sub-Regional (Combined Site) Storage

Traditionally, the approach to stormwater 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 that 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 stormwater storage facility in the most hydrologically advantageous location.

The goal should be the development and use of the most cost-effective and environmentally sensitive stormwater runoff controls. These controls will significantly improve the capability and flexibility of land developers and communities to control runoff consistent with the Brodhead and McMichaels Creek Stormwater Management Plan.

An advantage to combining efforts is to increase the opportunity to utilize stormwater control facilities to meet other community needs. For example, certain stormwater 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 stormwater management objectives.

To take this concept a step further, there is also the possibility that the stormwater could be managed "off-site"; that is, in a location off the property(s) in question. These stormwater management facilities could be constructed in an offsite location more hydrologically advantageous to the watershed. These facilities 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.

F. Regional Detention Facilities

Another aspect of the control philosophy is the provision for regional detention alternatives. The major advantage of a regional facility is the ability to control the runoff from large watershed areas with a single facility rather than one facility for each development site in the tributary area. A single facility may be more aesthetically acceptable than many smaller basins and would offer the benefit of much more efficient maintenance.

The potential for locating regional facilities within the Brodhead and McMichaels Creek Watershed was not evaluated as part of the plan. However, criteria to follow when investigating

the potential for a regional basin should include the following six parameters:

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

While the feasibility of a regional basin was beyond the scope of this plan, the potential does exist for implementing regional detention alternatives within the Brodhead and McMichaels Creek Watersheds. In the original Brodhead Creek Act 167 Watershed Plan, locations of existing and proposed regional detention facilities were evaluated. Please refer to those Plans for locations and feasibility. The most likely alternatives would involve relatively small tributary areas representing several development sites. For the purposes of this Plan, any regional alternatives would require the initiative of a developer or group of developers to propose a regional facility. The funding, design criteria, maintenance provisions and other applicable considerations would be the product of Developer-Municipal-County discussions. There are no specific recommendations for locations of regional detention facilities incorporated in this Plan. However, since the Management Districts were developed based upon subarea delineations of tributaries to the Brodhead and McMichaels Creeks, the same Management District criteria would be applied to a "regional" facility controlling the entire subarea. Decisions between individual development detention facilities and facilities for entire subareas therefore depend upon the type of development(s) proposed conditions and the cost-effectiveness of each control alternative.

G. "No Harm Option"

A developer has the option to prove to the municipality that the increase in runoff generated from his site above the allowable release rate will cause "no harm" anywhere in the watershed. The No Harm Option is used when a developer can prove that the proposed conditions hydrographs can match existing conditions hydrographs, or if it can be proved that the proposed conditions will not cause increases in peaks at all critical points downstream.

Several developers within the same subwatershed could independently show that they would cause no harm. However, the cumulative effect of these contributions could significantly increase the flow. Therefore, proof of no harm would have to be shown if the entire subarea(s) within which the proposed development is located would be developed and the cumulative effect would not create a problem anywhere in the watershed. The impact of the increase in flow would have to be followed downstream until the increase diminishes due to additional flow from tributaries and/or stream attenuation.

H. "Hardship Option"

The plan and its standards and criteria were designed to maintain existing conditions peak flows throughout the Brodhead and McMichaels 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 is not able to meet the stormwater standards due to lot conditions or if conformance would become a hardship to an

owner, the hardship option may be applied. The landowner would have to plead his/her case to the Governing Body 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.

I. Exemptions

The following land use activities are exempt from the provisions of the Model Ordinance:

1. High Tunnels that meet the following three factors:
 - a) Factor 1, Usage: High Tunnel structures must be used for one of the following purposes to be considered for exemption:
 - High tunnel systems that are used for the production, processing, keeping, storing, sale or shelter of an agricultural commodity. An agricultural commodity includes the production of plants used for human or animal feed, forestry, and horticultural purposes including the production and raising of livestock and poultry and the products they generate.
 - High tunnel facilities used for the storage of farm equipment and farm supplies
 - b) Factor 2, Construction: High tunnel structures must be constructed following all of the following criteria:
 - Constructed using metal, wood or plastic frame;
 - The materials used for covering the frames of the high tunnels include plastic, woven textile or other flexible coverings; and
 - The floor of the high tunnel needs to be composed of soil, crushed stone, matting, pavers, a floating concrete slab or a combination of these materials.
 - c) Factor 3, Siting: High tunnel structures must be sited following the following criteria:
 - High tunnel structures that result in an impervious area less than or equal to 25% of all structures located on the owner's total contiguous land area; and
 - The high tunnel facility must meet at least one of the following criteria:
 - Must be located at least 100 feet from any perennial stream or other watercourse, public road, or neighboring property line; or
 - Must be located at least 35 feet from any perennial stream or other watercourse, public road or neighboring property line where the slope of the area where the facility is placed is not greater than 7 percent; or
 - There is a diversion system or buffer built and managed consistent with this plan that ensures that the runoff from the high tunnel does not directly drain into a stream or other watercourse.

The following land use activities are exempt from the Drainage Plan submission requirements of the Model 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 and floodplain management requirements.

4. Impervious surface (See definition) - 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 the Ordinance. These criteria shall apply to the total development even if development is to take place in phases. The date of the original Brodhead McMichaels Stormwater 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.

Additional exemption criteria include:

5. 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.
6. HQ and EV streams - This exemption shall not relieve the Applicant from meeting the special requirements for watersheds draining to high quality (HQ) or exceptional value (EV) waters, identified and Source Water Protection Areas (SWPA) and requirements for nonstructural project design sequencing, water quality and streambank erosion, and groundwater recharge.
7. Drainage problem - If a drainage problem is documented or known to exist downstream of, or expected from the proposed conditions activity, then the municipality may require a Drainage Plan Submittal.

VI. PRIORITIES FOR IMPLEMENTATION OF THE PLAN

The Brodhead Creek and McMichaels Creek Watershed Stormwater Management Plan preparation process is complete with Monroe County's adoption of the Draft Plan and submission of the Final Plan to DEP for approval. Procedures for the review and adoption of the Plan are included in Section VIII. Subsequent activities to carry out the provisions of the Plan are considered by DEP to be part of the implementation of the Plan. The initial step of Plan implementation is DEP approval. DEP approval sets in motion the mandatory schedule of adoption of Municipal Ordinance provisions to implement the stormwater management criteria. Brodhead Creek and McMichaels Creek Watershed Municipalities will have six months from DEP approval within which to adopt the necessary Ordinance provisions. Failure to do so could result in the withholding of state funds to the Municipality(ies) per Act 167.

Additional implementation activities are the formal publishing of the Final Plan after DEP approval, development of a local program to coordinate with DEP regarding permit reviews for stream encroachments, diversions, etc., and development of a systematic approach for correction of existing storm drainage problem areas. The priorities for Plan implementation are presented in detail below in (essentially) chronological order.

A. DEP Approval of the Plan

Upon adoption of the Plan by Monroe County, the Plan is submitted to DEP for approval. The DEP review process involves determination that all of the activities specified in the approved Scope of Study have been satisfactorily completed in the Plan. Further, 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 stormwater plans for the basin 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 Plan

Consistent with the Brodhead Creek and McMichaels Creek Watershed Scope of Study, the Monroe County Planning Commission will publish the 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 Brodhead Creek and McMichaels Creek Act 167 Storm Water Management Ordinance will be published for use by the Municipalities.

C. Development of a Local Program to Coordinate with DEP Regarding Chapter 105 and Chapter 106 Permit Application Reviews

Stream encroachments, stream enclosures, waterway diversions, water obstructions and other activities regulated by Chapter 105 and Chapter 106 of DEP's Rules and Regulations may have an impact on the effectiveness of the runoff control strategy developed for the Brodhead Creek and McMichaels Creek Watershed. Activities of this type may modify the conveyance characteristics

of the study area and, hence, impact on the relative timing of peak flows and/or the ability of the conveyance facilities to safely transport peak flows. Therefore, to ensure that the DEP permitting process is consistent with the adopted and approved Plan, a local review of Chapter 105 and Chapter 106 permit applications should be coordinated with the DEP review process.

The local review for Monroe County would be performed by the Monroe County Planning Commission and would be accomplished through monitoring of the applications as published in the Pennsylvania Bulletin. The Monroe County Planning Commission would be responsible for providing comments consistent with the adopted Act 167 Plan within the stated DEP review period. Further, the Monroe County Planning Commission would keep records of applications reviewed and the DEP action.

D. Municipal Adoption and Enforcement of Ordinance Provisions to Implement the Plan

The key ingredient for implementation of the Stormwater Management Plan is the adoption and enforcement of the necessary Ordinance provisions by the Brodhead Creek and McMichaels Creek Watershed Municipalities. Provided as part of the Plan is the Model Act 167 Stormwater Management Ordinance which is a single purpose stormwater 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 tying provisions into the existing Subdivision and Land Development Ordinance and Zoning Ordinance. The tying provisions would simply refer any applicable regulated activities within the Brodhead Creek and McMichaels Creek Watershed to the single purpose Ordinance from the other Ordinances. A copy for municipalities without MS4's can be found in Appendix F. A copy for municipalities with MS4's, that contains the MS4 Prohibitions outlined in Article VII of the 2022 DEP Model Stormwater Ordinance, can be found in Appendix G.

It is not required, however, that a Municipality adopt the single purpose Ordinance. At the Municipality's discretion, it may opt to incorporate all of the necessary provisions into the existing Ordinances rather than adopt a separate Ordinance. In this event, the Municipality must ensure that the amended Ordinance satisfactorily implements the approved Plan.

E. Level of Government Involvement in Stormwater Management

The existing institutional arrangements for the management of stormwater include federal, state, and county governments; as well as every Municipality within the watershed.

In the absence of a single entity with responsibility for all aspects of stormwater 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 stormwater concerns.

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

Correction of the existing storm drainage problem areas in the study area is not specifically part of the Act 167 planning process. However, the development of the 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.
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)
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 Brodhead Creek and McMichaels Creek Watershed 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 should be based on a schedule compatible with completing engineering studies on all problem areas within approximately five years. The Brodhead Creek and McMichaels Creek hydrologic model would be available at the Monroe County Planning Commission office to provide flow data as input to the engineering studies.
3. On the priority and cost basis, incorporate implementation of recommended solutions to the drainage problems in the annual Municipal capital budget or the Municipal maintenance budget as funds are available. Solutions for existing stormwater drainage problems may qualify for low interest loans from the Pennsylvania Infrastructure Investment Authority (PENNVEST) or other grant sources. 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 Plan. Rather, it represents one systematic method to approach the problems uniformly throughout the study area 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 increases in peak flows with development.

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 level (in combination with continuing voluntary coordination at the watershed level), participation by the county in the technical review, 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 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 be otherwise subject to municipal regulation.

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 Figure VI-1 of Appendix D 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 Figure VI-1 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 watershed stormwater plan as are reasonably necessary to prevent injury to health, safety or other property. Such measures shall include 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 that otherwise adequately protects health and property from possible injury.

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

VII. PLAN REVIEW, ADOPTION AND UPDATING PROCEDURES

A. Plan Review and 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 County 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 County Commissioners.

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, 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. Procedure for Updating the Plan

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

1. Monitoring of the Plan Implementation – The Monroe County Planning Commission will be responsible for monitoring the implementation of the Plan by maintaining a record of all development activities within the study area. Development activities are defined as those activities regulated by the Stormwater Management Plan as included in the recommended Municipal Ordinance. Specifically, the Monroe County Planning Commission will monitor the following data records:
 - a. All subdivision and land developments subject to review per the Plan which have been approved within the study area.
 - b. All building permits subject to review per the Plan which have been

approved within the study area.

2. Review of Adequacy of Plan – The Watershed Plan Advisory Committee will be convened periodically to review the Stormwater Management Plan and determine if the Plan is adequate for minimizing the runoff impacts of new development. At a minimum, the information to be reviewed by the Committee will be as follows:
 - a. Development activity data as monitored by the Monroe County Planning Commission.
 - b. Information regarding additional storm drainage problem areas as provided by the Municipal representatives to the Watershed Plan Advisory Committee.
 - c. Zoning amendments within the study area.
 - d. Information associated with any regional detention alternatives implemented within the study area.
 - e. Adequacy of the administrative aspects of regulated activity review.

The Committee will review the above data and make recommendations to the County as to the need for revision to the Brodhead Creek and McMichaels Creek Watershed Stormwater Management Plan. Monroe County 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 County will adopt resolutions stating that the Plan has been reviewed and been found satisfactory to meet the requirements of Act 167 and forward the resolution to DEP.

VIII. REFERENCES

Delaware River Basin Commission, Pocono Creek Pilot Project: Goal Based Watershed Management, Phase I Report (DRAFT), June 2002

Monroe Co. Planning Commission, Brodhead Creek Watershed Act 167 Stormwater Management Plan (1991)

Monroe Co. Planning Commission, McMichaels Creek Watershed Act 167 Stormwater Management Plan (1988)

Borton-Lawson Engineering, Act 167 Stormwater Management Plan – Phase I – Scope of Study Update / Brodhead Creek and McMichaels Creek Watershed, Monroe County

Maryland Department of the Environment, Maryland Stormwater Design Manual, Volume I & II

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.

Appendix A
Stormwater Problem Area Survey
Sample and Results

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

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Storm Water Problem Areas

11. Are there watershed wide or local storm water problems emerging since the the Act 167 Plan was implemented?

Yes

No

12. If you answered "Yes", please explain what issues emerged:

13. What areas related to storm water management do you see pertinent that the plan does not address properly, i.e. water quality, stream bank erosion?

14. How would you improve the ordinance, or which sections should be revised, i.e. "Maintenance provisions, etc"?

15. Are there items that municipalities and citizens would want addressed to improve management of runoff?

16. What training or educational needs do you need to help in implementation of the Plan and ordinance?

17. What aspects of storm water could you use additional instruction, i.e. stormwater plan review, computations, BMP's, alternative site development ideas?

Done

Done

2021 Stormwater Hotspot Survey Results

Map ID (Figure IV-1)	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 IV-1)	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 IV-1)	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@lelighttownship.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'; 'slaverdure@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

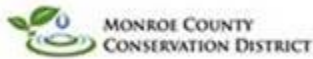
DRBC) with the proposed plan. MCCD will act as the clearing house for these comments and will provide them to DEP when the plan is submitted.

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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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.

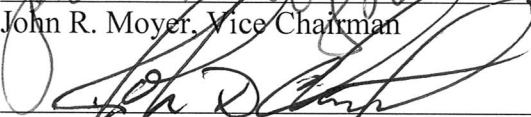
MONROE COUNTY BOARD OF COMMISSIONERS



Sharon S. Laverdure, Chairman

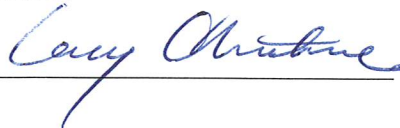


John R. Moyer, Vice Chairman



John D. Christy, Commissioner

ATTEST:



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HELP WANTED CONTINUED

SECURITY GUARDS
Legion Security is looking for immediate hire unarmed security guards.

LEGALS CONTINUED

Esq.,
410 Broad Street,
Milford, PA 18337
42/44B(34)

PUBLIC NOTICE
Notice is hereby given that the Board of Supervisors of the Township of Dingman will hold a hearing upon and consider for adoption an ordinance regulating sewage holding tanks, a summary of which is below. Said Hearing will be held at 7:00 pm on June 7, 2022 at the Dingman Township Building, 118 Fisher Lane, Milford, PA. The full text of the proposed amendment can be viewed at the Township Offices, at dingmantownship.org, the offices of the Pike County Dispatch, 105 W Catherine St, Milford, & the Law Library of the Pike County Courthouse, Broad Street, Milford.

HOLDING TANK ORDINANCE
AN ORDINANCE OF DINGMAN TOWNSHIP, PIKE COUNTY, PENNSYLVANIA, PROVIDING FOR AND REGULATING USE OF HOLDING TANKS AND IMPOSING FINES FOR VIOLATIONS OF THIS ORDINANCE.

Section 1. Purposes
Section 2. Definitions
Section 3. Right and Privileges Granted
Section 4. Rules and Regulations
Section 5. Rules & Regulations to b in Conformity with Applicable Law
Section 6. Rates and Charges
Section 7. Exclusiveness of Rights & Privileges

LEGALS CONTINUED

be publicly read at the Board of Supervisors meeting at approximately 6:00 PM. All documents and solicitation details are available at no cost at PennBid™ - <https://pennbid.procurement.com>. Click on the "Solicitations" then "View" tabs. Bids must be accompanied by a certified check or bid bond issued by a Surety licensed to conduct business in the Commonwealth of Pennsylvania, in the amount of at least 10 percent (10%) of the total bid. The successful bidder will be required to furnish and pay for a Satisfactory Performance and Payment Bond and Labor and Material Bond in an amount of 100% of the contract amount. A Certificate of Insurance, showing proof of Workers Compensation Coverage, must also be submitted. The project will require minimum wages and salaries to meet the PA Prevailing Wage requirements. The Contractor must ensure that employees and applicants are not discriminated against because of their race, color, religion, sex, national origin or handicap. Award of the Contract, will be to the lowest responsible bidder, but the Owner reserves the unqualified right to reject any or all bids and to waive any informalities permitted by law. Bids may be held by the Township for a period of 60 days from

LEGALS CONTINUED

funding from FEMA and PEMA. The Watershed Planning Committee, with representatives from each municipality, along with our state and local partners, has worked this past year to update the Plan 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, Tunkhannock. The Draft Plan can be found for review online at <https://www.mcconservation.org/act-167-plans-and-maps.html>, and hard copy viewing available at the Pike County Commissioners office, Pike County Office of Community Planning, and the Greene Township offices.

PUBLIC NOTICE
The second public meeting on Pike

LEGALS CONTINUED

by Matamoras Borough until 3:00 p.m., on Tuesday June 14, 2022 at the Matamoras Municipal Building, 10 Ave I Matamoras PA 18336 for the following in place paving projects:
Project #1:
• 312 Tons Super-pave 9.5mm Scratch Course
• 771 Tons Super-pave 9.5mm 180LB/SY Wearing Course
All materials must meet PennDOT Publication 408 Specifications and Standards. Bidders must be PennDOT prequalified and must supply proof of prequalification. Proposals must be on forms provided by the Borough. Proposal forms, specifications and bid information can be obtained at the Matamoras Borough Office at the above address or by calling 570-491-4771 Monday through Friday, between the hours of 8:30 a.m. to 3:30 p.m. A MANDATORY Pre-Bid meeting will be held at 10:00 a.m. on Thursday June 2, 2022 at the Matamoras Borough Office Building on 10 Avenue I, Matamoras PA, 18336, all interested bidders **MUST** attend. For further information contact Harry Prey at 570-491-4771, between the hours of 8:00 a.m. to 3:30 p.m. Monday through Friday. All bids must be accompanied by a certified check or bid bond in the amount of ten (10%) percent of the bid made payable to

LEGAL CONTINUED

A PUBLIC HEARING WILL BE HELD ON JUNE 9, 2022 AT 7:30 PM EST AT THE SHIP TOWNSHIP OFFICE OF SUPERVISOR AT 159 TWIN ROAD, SHIP PA, REGISTRATION OF M C. LEWIS TO CONSOLIDATE 2 IN WALKER SHORES CITY. TAX 049.04-05-37 049.04-05-38 43/

PUBLIC NOTICE
A PUBLIC HEARING WILL BE HELD ON JUNE 9, 2022 AT 7:30 PM EST AT THE SHIP TOWNSHIP OFFICE OF SUPERVISOR AT 159 TWIN ROAD, SHIP PA, REGISTRATION OF V BEKISZ TO CONSOLIDATE 7 IN WALKER SHORES TOWNSHIP. TAX NUMBERS: 06-60, 049.02-06-81, 049.02-06-83, 049.02-06-84. 43/

ADMINISTRATIVE NOTICE
Estate of Mary Bertino who was a resident of 311 Avenue Matamoras, Pennsylvania, 18336 County, deceased. PETER BE JESSIE BE JORJA BE and BERNA KOUTSIALIS been appointed PERSONAL

**Broadhead & McMichaels Creek Act 167 Plan
Public Hearing**

June 1, 2022 – 10:30am

Pike County Administration Building

1. Call Hearing to Order
2. Announcements
 - a. Introductions
 - b. Draft Plan available for review
 - i. Online
 - ii. Pike County Commissioners Office
 - iii. Pike County Community Planning Office
 - c. Advertised in Pike County Dispatch on May 19, 2022
3. Public Comments
4. Close Hearing

Broadhead and McMichael's Creek
Act 167 Public Hearing
June 1, 2022 10:30am
Pike County Administration Building

Public Hearing Minutes

Broadhead and McMichael's Creek Act 167 Public Hearing was held June 1st, 2022. It was called to order at 10:31 AM in the Pike County Commissioners Administration Building Meeting room.

The meeting was called to order by Michael Mrozinski, Pike County Planning Director. In attendance was Lori Kerrigan, Head Resource Conservationist and Drew Wagner, PE Hydraulic Engineer from the Monroe County Conservation District. Pike County Commissioners Matthew Osterberg, Ron Schmalzle, and Tony Waldron were also in attendance. There was no public in attendance.

The draft plan was available for review online and at the Pike County Commissioner's Office and the Pike County Office of Community Planning. It was advertised in the Pike County Dispatch on May 19, 2022, and the Tri-County Independent on May 17, 2022. Michael Mrozinski called for any comments or questions. No verbal or written comments were received in the Pike County Commissioner's office or Pike County Planning office and there were no comments at the public hearing. The public hearing was closed at 10:36 AM

Respectfully Submitted,
Michael Mrozinski, Pike County Planning Director

PIKE COUNTY COMMISSIONERS

PIKE COUNTY ADMINISTRATION BUILDING
506 BROAD STREET
MILFORD, PA 18337
570-296-7613
FAX: 570-296-6055

MATTHEW M. OSTERBERG
RONALD R. SCHMALZLE
ANTHONY WALDRON

COMMISSIONERS



GARY R. ORBEN
CHIEF CLERK

THOMAS F. FARLEY, ESQUIRE
COUNTY SOLICITOR

RESOLUTION NO. 22-22 ACT 167 STORMWATER MANAGEMENT PLAN RENEWAL BRODHEAD AND MCMICHAEL CREEKS 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 stormwater management plan and renew or update said plan every five (5) years for each designated watershed; and

WHEREAS, the purpose of the Brodhead and McMichaels 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 Brodhead and McMichaels Watershed shall utilize the criteria and standards as found in the watershed stormwater management plan;


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


Duly presented and adopted by the Pike County Board of Commissioners, Pike County, Pennsylvania on June 1, 2022.

BOARD OF COMMISSIONERS OF PIKE COUNTY

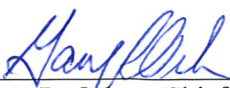



Matthew M. Osterberg, Chairman


Ronald R. Schmalzle, Vice Chairman


R. Anthony Waldron, Commissioner

Attest:


Gary R. Orben, Chief Clerk
June 1, 2022

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



CHESTNUTHILL TOWNSHIP

P.O. Box 243, 271 Route 715
Brodheads ville, PA 18322
Phone: 570-992-7247
Fax: 570-992-2225

www.chestnuthilltpa.gov
email: info@chestnuthilltpa.gov



Date: March 1, 2022

Monroe County Conservation District
c/o Lori Kerrigan
8050 Running Valley Road
Stroudsburg, PA 18360

Re: Model ACT 167 Stormwater Management Ordinance Review

Dear Monroe County Conservation District,

Per your request, our Township engineer Christopher McDermott has reviewed the Model ACT 167 Stormwater Management Ordinance sent on January 28, 2021, for consistency with other plans and programs affecting the watershed.

Please see the attached document with his comments.

Sincerely,

A handwritten signature in red ink that reads "David Albright".

David Albright
Township Manager

Chris McDermott's comments on the proposed Model Act 167 Stormwater Management Ordinance revisions are as follow :

Page 19:

- At the Township discretion
- 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. may
- C. MS4 requirements for water quality shall be used where applicable in addition to the

Page 29:

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 Brodhead and McMichaels Creek Watershed. These flow values can be obtained from the original Act 167 watershed storm water management plans. NEED TO MAKE THIS INFORMATION READILY AVAILABLE PERHAPS THE MCCD WEBSITE
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.

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Page 30:

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.

NEED TO IDENTIFY WHAT MODIFIED RATIONAL METHOD IS ACCEPTABLE

30

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.

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NEED TO IDENTIFY WHAT MODIFIED RATIONAL METHOD IS ACCEPTABLE

TO: Chestnuthill Township Supervisors

CC: David Albright, Township Manager; Chris McDermott, Township Engineer

FROM: Monroe County Conservation District

DATE: April 19, 2022

RE: **Comment Responses**
Brodhead Creek and McMichael Creek Watershed Act 167
Stormwater Management Plan Renewal

We appreciate your feedback on the proposed Act 167 Plan Renewal for the Brodhead Creek and McMichael Creek Watershed. Our responses to your comments are below in italics.

At the Township discretion

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. *may*

In an effort to make reviews consistent, the Technical committee agreed that where an NPDES permit was required that the water quality components of the NPDES permit were greater than the requirements in the Act 167 Model Ordinance and would therefore satisfy the water quality requirements of the Plan.

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 Brodhead and McMichaels Creek Watershed. These flow values can be obtained from the original Act 167 watershed storm water management plans.

NEED TO MAKE THIS INFORMATION READILY AVAILABLE PERHAPS THE MCCD WEBSITE.

The information is available on the MCCD website.

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-I 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.

NEED TO IDENTIFY WHAT MODIFIED RATIONAL METHOD IS ACCEPTABLE

The accepted rational method should be the method which most closely replicates the volumes generated from the SCS method.

March 1, 2022
Project No: 10205.398

Via email: lkccd@ptd.net

Monroe County Conservation District
8050 Running Valley Road
Stroudsburg Pa, 18301

ATTENTION: LORI KERRIGAN, TECHNICAL SECTION SUPERVISOR

SUBJECT: Act 167 Ordinance Draft Comments

Dear Lori:

Thank you for providing the draft of the updated Act 167 Stormwater Management Ordinance (Draft Ordinance) to the Borough of East Stroudsburg. As requested, we offer the following questions and comments regarding the draft ordinance provided.

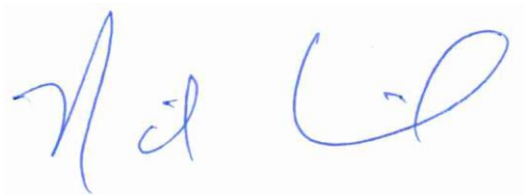
1. **Consistency with the NPDES permit program** – Several revisions have been included in the Draft Ordinance to update sections of the previous Act 167 Ordinance, prepared prior to current NPDES permit requirements, for consistency with NPDES requirements. We recommend that, with the goal of consistency between the Draft Ordinance and the NPDES permit requirements, the documents be even further coordinated to include items such as the required infiltration volumes, minimum infiltration basin drain times, stormwater management agreements and as built plan requirements to name a few.
2. **Consistency with the DEP 2022 Model Stormwater Ordinance.** – Municipalities in the MS4 program are required to adopt a stormwater ordinance consistent with the DEP 2022 Model Stormwater Ordinance. An email from DEP comments that municipalities in the MS4 program will be required to “blend” the DEP model and the Act 167 ordinance to meet both requirements. In the Brodhead Creek watershed, a substantial number of municipalities are included in the MS4 program. It seems appropriate to blend this Draft Ordinance with the DEP 2022 Model Stormwater Ordinance for consistency upfront rather than requiring each municipality to perform the “blend” on an individual basis. While there may be specific MS4 requirements that may not apply to all municipalities, the goal should be to provide overall consistency in ordinance format and content between the local municipalities.
3. **DRBC Review of the Draft Ordinance** – The ordinances under the current Brodhead-McMichael’s Creek Act 167 Plan satisfy the Delaware River Basin Commission (DRBC) Non-Point Source Pollution Control (NPSPCP) requirements. It is critical that any updated Act 167 Stormwater Management Ordinance to be adopted, continue to satisfy the DRBC to meet nonpoint source pollution requirements, which is a condition for local Municipalities and Authorities providing water and sewer service to meet under their Dockets. It has been indicated

the Draft Ordinance has been forward to the DRBC for comment. It must be confirmed that the DRBC will accept the proposed Draft Ordinance to meet the requirements for non-point source pollution if adopted by the municipalities.

The aforementioned comments are related to the general format and content of the Draft Ordinance. We would be glad to discuss the draft ordinance in more detail related to these comments if desired.

Sincerely,

RKR HESS, A DIVISION OF UTRS, INC.



Nathan Oiler, P.E.
Director of Land Development Engineering Services

cc: East Stroudsburg Council (*via email*)
Sam D'Alessandro, East Stroudsburg Zoning Officer (*via email*)
John Prevoznik (*via email*)
Monroe County Planning Commission (*via email*)
David Kovach, Manager of Permit Review Program – DRBC (*via email*)

TO: East Stroudsburg Borough Council

CC: Nate Oiler, PE – Township Engineer, Sam D’Alessandro – Zoning Officer, John Prevoznik

FROM: Monroe County Conservation District

DATE: April 19, 2022

RE: **Comment Responses**
Brodhead Creek and McMichael Creek Watershed Act 167
Stormwater Management Plan Renewal

We appreciate your feedback on the proposed Act 167 Plan Renewal for the Brodhead Creek and McMichael Creek Watershed. Our responses to your comments are provided below in *italics*:

1. Consistency with the NPDES permit program – Several revisions have been included in the Draft Ordinance to update sections of the previous Act 167 Ordinance, prepared prior to current NPDES permit requirements, for consistency with NPDES requirements. We recommend that, with the goal of consistency between the Draft Ordinance and the NPDES permit requirements, the documents be even further coordinated to include items such as the required infiltration volumes, minimum infiltration basin drain times, stormwater management agreements and as built plan requirements to name a few.

Coordination between Chapter 102 NPDES requirements and this Act 167 plan have been carefully considered with an eye to forthcoming NPDES program and guidance changes. This update was completed to come into compliance with the 5 year renewal requirement of the Act. Further plan and model ordinance revisions will be forthcoming as the program changes are rolled out to maintain consistency.

2. Consistency with the DEP 2022 Model Stormwater Ordinance. – Municipalities in the MS4 program are required to adopt a stormwater ordinance consistent with the DEP 2022 Model Stormwater Ordinance. An email from DEP comments that municipalities in the MS4 program will be required to “blend” the DEP model and the Act 167 ordinance to meet both requirements. In the Brodhead Creek watershed, a substantial number of municipalities are included in the MS4 program. It seems appropriate to blend this Draft Ordinance with the DEP 2022 Model Stormwater Ordinance for consistency upfront rather than requiring each municipality to perform the “blend” on an individual basis. While there may be specific MS4 requirements that may not apply to all municipalities, the goal should be to provide overall consistency in ordinance format and content between the local municipalities.

After discussion with DEP MS4 program, it was determined that an optional section would be included in the plan and model ordinance to assist those MS4 municipalities.

3. DRBC Review of the Draft Ordinance – The ordinances under the current Brodhead- McMichael’s Creek Act 167 Plan satisfy the Delaware River Basin Commission (DRBC) Non- Point Source Pollution Control (NPSPCP) requirements. It is critical that any updated Act 167 Stormwater Management Ordinance to be adopted, continue to satisfy the DRBC to meet nonpoint source pollution requirements, which is a condition for local Municipalities and Authorities providing

water and sewer service to meet under their Dockets. It has been indicated the Draft Ordinance has been forward to the DRBC for comment. It must be confirmed that the DRBC will accept the proposed Draft Ordinance to meet the requirements for non-point source pollution if adopted by the municipalities.

DRBC has provided their concurrence.

February 28, 2022

Ms. Michelle Arner
Zoning & Codes Officer
Jackson Township Planning Commission
PO Box 213
Reeders, PA 18352

RE: Update Model Act 167 Review
Jackson Township, Monroe County
Hanover Project JT22-19

Dear Ms. Arner:

Per the Supervisor's request, we have reviewed the revised Model Act 167 Ordinance and offer the following comments:

1. Section 303.A – For projects that require an NPDES permit, the water quality requirements of that permit should be used, per Section 303.B. However, the water quality criteria described in Section 303.A requires reducing the 2-year post-development flow rates to the pre-development 1-year flow rates, and to reduce the infiltration to take a minimum of 24 hours to dewater. The peak flow rate reduction of 2 year post- to 1-year pre-development for flow rates is handled through enactment of the Sub-Area Map (Appendix D), so it is unnecessary to include here for water quality purposes, especially since it is not applicable for “no detention” areas.

Furthermore, this section also requires the infiltration to occur within a minimum of 24 hours. In Hydrologic Soil Groups A and B, this will not be practical. A typical standard depth for infiltration volume retention is one foot. To dewater over 24 hours, the infiltration rate would have to be slower than 0.5 inches per hour. The soils naturally infiltrate faster than 0.5 inches per hour, so limiting infiltration to have to occur slower than 0.5 inches per hour does not match the natural infiltration process and would require bringing in clay soils to mix in with the in-situ soils. I recommend eliminating this section altogether and follow the requirements for an NPDES permit.

2. Section 303.G – I recommend removing the word infiltration and replacing it with “discharge to surface or ground water”, as this language is used in previous sections of the ordinance, and it is a better description for what is intended by this section. This revision should also be made to sections 304.A.3.d, and 307.B.
3. Section 303.K.3 and 303.K.4 – These sections reference a variance for buffers. However, there is no process described for applying for and obtaining a “variance”. This term hints at a zoning hearing board decision, but I would recommend a waiver process, not just for

- buffer requirement relief, but for any section of the ordinance. A process should be described whereas the planning commission reviews the waiver request, makes a recommendation to the board of supervisors/commissioners/council, and they would vote on approval or disapproval of the requested waiver.
4. Section 304.A.4 – The calculation methodology here is different from the calculations for an NPDES permit. I recommend removing Section 4 or revise it to match PADEP requirements for the NPDES permit, which includes infiltration of the difference in the 2-year 24-hour storm event using the SCS Method for volume calculation. Other caveats, such as 20% of existing impervious must be assumed to be meadow in good condition and all pervious surfaces must be assumed to be meadow in good condition for all pre-development volume calculations must be included here, as well. The goal, as I understand it, is to have one set of requirements for peak flow rate and volume calculations. Therefore, no matter if an NPDES is required, the requirements for this permit should still be utilized.
 5. Section 304.B.2 – The requirements for the infiltration testing should reference the current version of the PADEP BMP Manual, not an ASTM section.
 6. Section 305.A – A more legible and distinct map for the Sub-area mapping should be provided. Mapping provided online does not have road labels, stream labels or other features shown that would help in identifying the project site location. Perhaps these could be uploaded to the PADEP EMap GIS system as a shapefile.
 7. Section 306.A – The SCS method is great for volume calculation, but it often is dramatically over-conservative for peak flow rate calculation. However, using the modified rational method with an artificially high time of concentration as required in Section 306.E would result in much lower (and probably under-conservative) peak flow rates.
 8. Section 307.C – The requirement for one-foot of freeboard should be limited to centralized detention basins, or basins exceeding 3 feet in height. A one-foot deep rain garden should not have to be more than doubled in size to accommodate this arbitrary requirement.
 9. Section 403.A.4 – There should be some form of exemption here. Requiring Conservation District approval for a single family residence that happens to go over 5,000 square feet of impervious coverage due to driveway length (for instance) on top of requiring engineering and permit fees for stormwater design and permit preparation for the same seems to be over-regulation, especially if they are under one acre of earth disturbance.
 10. Section 405.C – This section should also include exemption language.

Thank you for the opportunity to review this model ordinance. If you have any questions, please contact the undersigned.

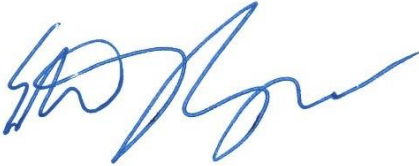
Ms. Michelle Arner
Zoning & Codes Officer

3

February 28, 2022

Respectfully,

HANOVER ENGINEERING

A handwritten signature in blue ink, appearing to read 'S. Caiazzo', written over the company name.

Salvatore J. Caiazzo, PE
Township Engineer

Cc: Renee Miller, Jackson Township Secretary
Lori Kerrigan, Monroe County Conservation District

sjc:jfm

S:\Projects\Municipal\Jackson Township\2022\JT22-19 Model Act 167 Ordinance Review\Docs\2022-02-28-Act 167 Review.docx

TO: Jackson Township Supervisors

CC: Michelle Arner, Salvatore Caiazzo, PE Township Engineer

FROM: Monroe County Conservation District

DATE: April 19, 2022

RE: **Comment Responses**
Brodhead Creek and McMichael Creek Watershed Act 167
Stormwater Management Plan Renewal

We appreciate your feedback on the proposed Act 167 Plan Renewal for the Brodhead Creek and McMichael Creek Watershed. Our responses to your comments are below in italics.

1. Section 303.A – For projects that require an NPDES permit, the water quality requirements of that permit should be used, per Section 303.B. However, the water quality criteria described in Section 303.A requires reducing the 2-year post-development flow rates to the pre-development 1-year flow rates, and to reduce the infiltration to take a minimum of 24 hours to dewater. The peak flow rate reduction of 2 year post- to 1-year pre-development for flow rates is handled through enactment of the Sub-Area Map (Appendix D), so it is unnecessary to include here for water quality purposes, especially since it is not applicable for “no detention” areas.

NPDES permitted sites will follow the water quality provisions of the NPDES Permit as indicated by the model ordinance. Water quality standards for those projects which do not require an NPDES permit need to be included in the model ordinance and plan. Reducing the flow rate from the 2 year storm to the 1 year storm helps to increase runoff attenuation in the BMP which provides time for total suspended solids to settle out in order to address the water quality component.

Furthermore, this section also requires the infiltration to occur within a minimum of 24 hours. In Hydrologic Soil Groups A and B, this will not be practical. A typical standard depth for infiltration volume retention is one foot. To dewater over 24 hours, the infiltration rate would have to be slower than 0.5 inches per hour. The soils naturally infiltrate faster than 0.5 inches per hour, so limiting infiltration to have to occur slower than 0.5 inches per hour does not match the natural infiltration process and would require bringing in clay soils to mix in with the in-situ soils. I recommend eliminating this section altogether and follow the requirements for an NPDES permit.

The requirement of this section is for provisions to be made so that the discharge from the facility takes a minimum of 24 hours to drain from the facility, measured from the point where the maximum volume of water is achieved. Discharge of this runoff may be through a combination of discharge from the outlet structure, infiltration or evapotranspiration. Eliminating this section and strictly applying the NPDES water quality requirements would add additional design and BMP requirements for the

smaller projects which do not currently exist. Additionally, a detailed analysis of the design requirements is beyond the scope of this plan renewal.

2. Section 303.G – I recommend removing the word infiltration and replacing it with “discharge to surface or ground water”, as this language is used in previous sections of the ordinance, and it is a better description for what is intended by this section. This revision should also be made to sections 304.A.3.d, and 307.B.

Acknowledged and incorporated.

3. Section 303.K.3 and 303.K.4 – These sections reference a variance for buffers. However, there is no process described for applying for and obtaining a “variance”. This term hints at a zoning hearing board decision, but I would recommend a waiver process, not just for buffer requirement relief, but for any section of the ordinance. A process should be described whereas the planning commission reviews the waiver request, makes a recommendation to the board of supervisors/commissioners/council, and they would vote on approval or disapproval of the requested waiver.

The Zoning Hearing Board has exclusive jurisdiction to hear appeals related to stormwater enforcement for activities not associated with Subdivision and Land Development or PRD’s. Appeals related to stormwater enforcement for activities associated with Subdivision and Land Development or PRD’s go to the governing body. See MPC Sections 909.1(a)(8) and 909.1.(b)(6). We would recommend discussing this with your Township Solicitor prior to adoption.

4. Section 304.A.4 – The calculation methodology here is different from the calculations for an NPDES permit. I recommend removing Section 4 or revise it to match PADEP requirements for the NPDES permit, which includes infiltration of the difference in the 2- year 24-hour storm event using the SCS Method for volume calculation. Other caveats, such as 20% of existing impervious must be assumed to be meadow in good condition and all pervious surfaces must be assumed to be meadow in good condition for all pre-development volume calculations must be included here, as well. The goal, as I understand it, is to have one set of requirements for peak flow rate and volume calculations. Therefore, no matter if an NPDES is required, the requirements for this permit should still be utilized.

Eliminating this section and strictly applying the NPDES requirements would add additional design and BMP requirements for the smaller projects which do not currently exist.

5. Section 304.B.2 – The requirements for the infiltration testing should reference the current version of the PADEP BMP Manual, not an ASTM section.

Acknowledged and incorporated.

6. Section 305.A – A more legible and distinct map for the Sub-area mapping should be provided. Mapping provided online does not have road labels, stream labels or other features shown that would help in identifying the project site location. Perhaps these could be uploaded to the PADEP EMap GIS system as a shapefile.

The Sub-area mapping has been updated. An on-line GIS resource is available.

7. Section 306.A – The SCS method is great for volume calculation, but it often is dramatically over-conservative for peak flow rate calculation. However, using the modified rational method with an artificially high time of concentration as required in Section 306.E would result in much lower (and probably under-conservative) peak flow rates.

The SCS method was selected to maintain consistency with PA DEP calculation methodology. The modified rational method was included to allow the designer to utilize this method and adjust its parameters to achieve a similar stormwater facility volume when compared to SCS. This was done so that a comparable sized facility would be provided for the project regardless of the methodology used.

8. Section 307.C – The requirement for one-foot of freeboard should be limited to centralized detention basins, or basins exceeding 3 feet in height. A one-foot deep rain garden should not have to be more than doubled in size to accommodate this arbitrary requirement.

Acknowledged and incorporated.

9. Section 403.A.4 – There should be some form of exemption here. Requiring Conservation District approval for a single family residence that happens to go over 5,000 square feet of impervious coverage due to driveway length (for instance) on top of requiring engineering and permit fees for stormwater design and permit preparation for the same seems to be over-regulation, especially if they are under one acre of earth disturbance.

This section does not require review and approval by the Conservation District. It states that any reviews or approvals obtained from the Conservation District should be provided with the Drainage Plan. The requirement for review is found in Section 405.C


10. Section 405.C – This section should also include exemption language.

A written E&S plan is required for all earth disturbances greater than 5,000sqft. Review and approval of E&S plans by the Conservation District ensures compliance with PA DEPs Chapter 102 regulations.

Memo

TO: Stroud Township Supervisors

CC: Daryl Eppley, Manager; Todd Weitzmann, Solicitor

FROM: Donna Alker, P.E., Staff Engineer/Planning Administrator 

DATE: February 11, 2022

RE: Brodhead Creek and McMichael Creek Watershed
Act 167 Stormwater Management Plan Renewal

The Monroe County Conservation District has provided final draft copy of the Act 167 Stormwater Management Plan Renewal to all municipalities in the WPAC to review for consistency with other plans and programs prior to public notice and adoption. Based on my review, I have the following comments:

1. Several of the comments, below involve recommendations that will make the proposed Act 167 Plan easier to understand and more useful, including comments related to: logical plan organization; consistency with respect to the terminology used; use of accurate titles of referenced documents; the availability of the referenced documents; and clearly worded standards. Much of the poor organization and wording is carried over from the previous plan. This update is an opportunity to improve upon that plan.
2. I continue to recommend that the PADEP 2022 Model Stormwater Ordinance be used as a template for the model ordinance in the Act 167 Plan Update. PADEP stated its intention in publishing the 2022 Model Stormwater Ordinance as a model for counties to use in the development of Act 167 recommended ordinances. The 2022 Model Stormwater Ordinance also contains language that meets the regulatory requirements for MS4's. In my opinion, the language and organization of the 2022 Model Stormwater Ordinance is a significant improvement over the model ordinances in the current and proposed Act 167 Plan Updates. Any provisions related specifically to the MS4 regulatory requirements could be made optional for Non-MS4 municipalities.
3. Page 7 - The status of municipal adoption of the 2003 Stormwater Management Ordinance is only listed for 9 of the 17 municipalities in the Brodhead/McMichael watershed. The status for the other 8 municipalities should be listed. If the others have not adopted the ordinance, it should be listed that way or the wording should be changed to state "the following municipalities have adopted the 2003 Stormwater Management Ordinance".
4. Pages 7 & 8 – There are references to the Pocono Creek Pilot Study, the Pocono Creek Study and the Pocono Creek Plan. My understanding is the final report resulting from the pilot study is titled "Framework for Sustainable Watershed Management – Pocono Creek", dated May 2009. The references should be changed to refer to the final report. Terms used should be consistent.
5. Page 10 – The technical track dates noted as "In progress" and January 2022" need to be updated.
6. Page 12 – In the 2nd paragraph following Table IV-1, the statement "the stormwater management ordinance provisions to reduce post-development peak rates to pre-development peak rates" is not completely accurate. There is a large area in the watershed where peak rates are not required to be reduced or are required to be reduced below the pre-development rates. The sentence that follows that should be expanded to note where in the watershed the existing conditions peak flows were to be maintained. I believe it was to maintain peak flows in major watercourses.
7. Page 14 - The word "their" in Paragraph B should be "its".

8. Page 19 – Paragraph b references the requirements in the model ordinance, which is the reverse of how it should be. The model ordinance should be based on the Act 167 Plan provisions. If there are general water quality requirements or goals on which the ordinance provisions are based, they should be stated in the Act 167 Plan.
9. Page 19 – the second paragraph of b – The objective should be to promote settlement of pollutants by detaining the proposed conditions 2-year storm to the existing conditions 1-year storm. The detention requirement is the method to achieve the objective.
10. Page 22 – Toward the end of the second paragraph there is a reference to a figure in the model ordinance. The reference should only be to Figure V-5 in Appendix D of the Act 167 Plan. There shouldn't be two separate maps to show the same information. The ordinance should refer to the map in the plan.
11. Table V-2 – The description for District C refers to Section 305.H, which is a section in the model ordinance rather than the plan. There shouldn't be references to the model ordinance since the model ordinance is meant to be based on the plan, not the other way around.
12. Page 23 – The map reference in the paragraph below the table should reference the map in the Plan not the map in the model ordinance.
13. Tables V-3, V-4 and V-5 are included in the Management District Concept section, however, they also apply to water quality and volume control and should be moved to a more general section.
14. Table V-3 – The heading states the ultimate goal as matching existing conditions, however in some cases the requirement is to change the conditions, such as in the Provisional Direct Discharge District C.
15. Page 25 and 29 – The reference to “Pennsylvania’s PaDEP BMP Manual” should be changed to the actual title of the document, “Pennsylvania Stormwater Best Management Practices Manual”, unless the abbreviated term is included in a definitions section. The date of the manual should also be referenced.
16. Table V-4
 - a. Under the “Calculation Methodology” heading the provision should be reworded to state “Standard parameters shall be set in the Model Ordinance”.
 - b. Under the heading “Discharge of Accelerated Runoff”, the meaning of the required standard is unclear. Does it mean stormwater runoff shall be safely discharged into existing conditions drainage patterns and storm sewers without adversely affecting properties or causing channel scouring and erosion, or is there more to it?
 - c. Under the heading “Inappropriate Outlets”, the DEP Guidance Document and FAQ referenced should be included in an Appendix to the Plan.
 - d. Under the heading District C, the reference should be to the map included in the Act 167 Plan rather than a map in the model ordinance. The meaning of the required standard is not clear. Does it mean runoff shall be safely discharged to an existing conveyance system of adequate capacity, or is there more to it?
 - e. Under the heading “Wetlands”, the required standard is not clear.
 - f. Under the heading “Recharge/Infiltration/Retention”, the wording of the required standard should be revised for clarity. The way the standard is worded it seems to imply a preference for subsurface BMP’s, which is not the goal. Better wording might be “Infiltration and retention BMP’s are preferred over standard detention basins, where soil and physical conditions permit. Impacts on subsurface mines pools and Karst areas must be evaluated before recommending this practice”.
 - g. Under the heading “Water Quality”, a reference to the section that states how to calculate WQv must be provided.
17. Table V-5
 - a. The standard under the heading “Erosion and Sediment Pollution Control” is not clear.
 - b. Under the heading “Roof Drains, Residential/Commercial”, the standard should say “prevent roof drains from directly discharging to …”

- c. Under the heading “Pervious Surfaces”, the second sentence needs to be reworded for clarity.
 - d. The heading “Structures” should be changed to “Stormwater BMP’s”.
 - e. The term “critical steep slopes”, used under the heading “Slopes”, is not defined.
 - f. Under the heading “Stream Bank Protection”, the wording in the benefits column needs to be revised as the flow will be reduced not the storms.
18. Page 29 - It’s not clear if the paragraph at the top of the page is intended to be part of Table V-5. Those provisions should be moved to a more general section, as should Table V-5. See Comment 16, above. The model ordinance note is poorly worded.
 19. Page 29 – Section D should be titled “Runoff Control Techniques”. The use of the word “Alternative” leads one to believe the techniques in this section are alternative to techniques in some other section.
 20. Tables V-6, V-8, V-9 and V-10 should be replaced with a reference to the Pennsylvania Stormwater Best Management Practice Manual.
 21. Pages 43 & 44 – In Paragraphs 3 and 6, the references to Sections 302, 303, and 304 are references to sections in the model ordinance. The references to those sections should be deleted from the language in the body of the Plan. They should only appear in the language of the model ordinance.
 22. It’s awkward to include the model ordinance within the body of the Act 167 Plan. My recommendation is to include it as an appendix and reference it in Paragraph D on Page 113. If it is to remain in the body, the page numbering for the Act 167 Plan should not restart at 1 for the model ordinance, it should follow page numbering of the Act 167 Plan.
 23. Page 113 – Paragraph D the reference should be to the “Model Act 167 Stormwater Management Ordinance”, which is the title of the model ordinance, rather than “Brodhead Creek and McMichaels Creek Watershed –Act 167 Stormwater Management Ordinance”.
 24. Page 114 – In Paragraph 3, I believe the term “cost bases” should be “cost basis”.
 25. Page 115 – There is a reference to an Obstruction Map in Paragraph G.1. A copy of that map should be included in the Plan and a reference to its location should be added to this section is needed.
 26. Page 117 – The mention of Wayne and Carbon Counties in the third paragraph is in error as the watershed does not extend into those counties.
 27. Appendix A – It would be helpful to include some location information for the stormwater hotspots listed in the table in addition to the longitude and latitude.
 28. Appendix C – In the Monroe County Municipal Stormwater Management Ordinance Status List, the buffer information for Stroud Township must be revised. The buffer requirements are found in Chapter 23 of the Township Code, the Stormwater Management Chapter. 150’ buffers for stream and wetlands (100’ inner buffer and 50’ outer buffer) are required. The buffer requirements in the Zoning Ordinance were superseded by the 2010 Stormwater Ordinance.
 29. Appendix C – The purpose of the sample municipal ordinance matrix is not clear. Was it intended that the matrix be filled in and included in the plan?
 30. The inset on Figure IV-1 should show the hotspot numbers.
 31. Figure V-5, the management district map is somewhat better than the map included with the 2003 plan but is still inferior to the maps included in the original Brodhead Creek and McMichaels Creek Act 167 Plans. The original maps more clearly showed the underlying USGS map with roads, contour lines, etc.
 32. A definitions section should be added to the Plan. There is a definitions section in the model ordinance but not in the Plan.
 33. Model Ordinance Page 19 – The West Nile Virus Guidance referenced in Paragraph I should be included in an appendix to the model ordinance. It may be better to require minimizing the potential for mosquito production be considered in the design of wetlands and wet basins in accordance with that reference rather say “Biology shall be incorporated”.
 34. The meaning of the information shown in brackets in bold red text in the model ordinance should be set forth.

35. Model Ordinance Page 27 – The requirement isn't always to control peak runoff to the existing conditions rate. In District C peak rates may be increased. In the B Districts a reduction of peak rates is required. The new sentence should be reworded.
36. Model Ordinance Page 29 – The flow values referenced in G.4 should be included in an Appendix in the updated Act 167 Plan.
37. The applicability of the method described in Appendix E of the model ordinance should be set forth in the body of the model ordinance.

TO: Stroud Township Supervisors

CC: Daryl Eppley, Manager; Todd Weitzmann, Solicitor; Donna Alker, P.E., Staff
Engineer/Planning Administrator

FROM: Monroe County Conservation District

DATE: April 19, 2022

RE: **Comment Responses**
Brodhead Creek and McMichael Creek Watershed Act 167
Stormwater Management Plan Renewal

We appreciate your feedback on the proposed Act 167 Plan Renewal for the Brodhead Creek and McMichael Creek Watershed. Our responses to your comments are below in italics.

1. Several of the comments, below involve recommendations that will make the proposed Act 167 Plan easier to understand and more useful, including comments related to: logical plan organization; consistency with respect to the terminology used; use of accurate titles of referenced documents; the availability of the referenced documents; and clearly worded standards. Much of the poor organization and wording is carried over from the previous plan. This update is an opportunity to improve upon that plan.
At this time, our goal is to renew the Act 167 Plan in order to meet the requirements of the Act. Our intention is to pursue a more detailed, comprehensive update in the future.
2. I continue to recommend that the PADEP 2022 Model Stormwater Ordinance be used as a template for the model ordinance in the Act 167 Plan Update. PADEP stated its intention in publishing the 2022 Model Stormwater Ordinance as a model for counties to use in the development of Act 167 recommended ordinances. The 2022 Model Stormwater Ordinance also contains language that meets the regulatory requirements for MS4's. In my opinion, the language and organization of the 2022 Model Stormwater Ordinance is a significant improvement over the model ordinances in the current and proposed Act 167 Plan Updates. Any provisions related specifically to the MS4 regulatory requirements could be made optional for Non-MS4 municipalities.
Evaluating the restructuring of the Model Ordinance to be consistent with the 2022 Model Ordinance will be part of the comprehensive update effort referenced above. We will address the differences in the organization of the documents as we move forward with updating the plan.

We created a separate ordinance for MS4 municipalities that includes the regulatory requirements found in Article VII of the 2022 Model Ordinance.
3. Page 7 - The status of municipal adoption of the 2003 Stormwater Management Ordinance is only listed for 9 of the 17 municipalities in the Brodhead/McMichael watershed. The status for the other 8 municipalities should be listed. If the others have not adopted the ordinance, it should be listed that way or the wording should be changed to state "the following municipalities have adopted the 2003 Stormwater Management Ordinance".
This table has been removed from the plan.

4. Pages 7 & 8 -There are references to the Pocono Creek Pilot Study, the Pocono Creek Study and the Pocono Creek Plan. My understanding is the final report resulting from the pilot study is titled "Framework for Sustainable Watershed Management- Pocono Creek", dated May 2009. The references should be changed to refer to the final report. Terms used should be consistent. *Terminology has been updated for consistency.*
5. Page 10 - The technical track dates noted as "In progress" and January 2022" need to be updated. *The table has been updated with the current status of each goal.*
6. Page 12 - In the 2nd paragraph following Table IV-1, the statement "the stormwater management ordinance provisions to reduce post-development peak rates to pre-development peak rates" is not completely accurate. There is a large area in the watershed where peak rates are not required to be reduced or are required to be reduced below the pre-development rates. The sentence that follows that should be expanded to note where in the watershed the existing conditions peak flows were to be maintained. I believe it was to maintain peak flows in major watercourses. *This statement has been updated to:*

“Although the land use of the watershed has become more urbanized since the original Plan adoptions, the storm water management ordinance provisions to reduce post-development peak rates to pre-development peak rates of runoff have been implemented where it was found to be necessary.”
7. Page 14 - The word "their" in Paragraph B should be "its". *The statement is referring to standards and criteria, making the plural possessive “their” correct.*
8. Page 19 - Paragraph b references the requirements in the model ordinance, which is the reverse of how it should be. The model ordinance should be based on the Act 167 Plan provisions. If there are general water quality requirements or goals on which the ordinance provisions are based, they should be stated in the Act 167 Plan. *The reference to the model ordinance has been removed. The water quality requirements and goals on which the ordinance provisions are based are outlined in the Plan.*
9. Page 19 - the second paragraph of b - The objective should be to promote settlement of pollutants by detaining the proposed conditions 2-year storm to the existing conditions 1-year storm. The detention requirement is the method to achieve the objective. *This statement has been updated to:*

“For the water quality volume (WQv), the objective is to promote settlement of pollutants through detaining the proposed conditions’ 2- year, 24-hour design storm to the existing conditions 1-year flow using the SCS Type II distribution.”
10. Page 22-Toward the end of the second paragraph there is a reference to a figure in the model ordinance. The reference should only be to Figure V-5 in Appendix D of the Act 167 Plan. There shouldn't be two separate maps to show the same information. The ordinance should refer to the map in the plan. *The model ordinance reference has been removed.*

The model ordinance is the working piece of the Plan and will typically be viewed separately from the Plan contents once municipalities have adopted it. For ease of use, the Watershed Management District Map is being kept in both the Plan contents and in the model ordinance.

11. Table V-2 -The description for District C refers to Section 305.H, which is a section in the model ordinance rather than the plan. There shouldn't be references to the model ordinance since the model ordinance is meant to be based on the plan, not the other way around.
Comment Acknowledged.
12. Page 23 -The map reference in the paragraph below the table should reference the map in the Plan not the map in the model ordinance.
This statement has been updated to reference the map in the Plan.
13. Tables V-3, V-4 and V-5 are included in the Management District Concept section, however, they also apply to water quality and volume control and should be moved to a more general section.
These tables relate to the content in Table V-2, which is why they are included in this section.
14. Table V-3 - The heading states the ultimate goal as matching existing conditions, however in some cases the requirement is to change the conditions, such as in the Provisional Direct Discharge District C.
The direct discharge district and other districts are meant to match existing timing of the watershed which matches existing conditions of the watershed.
15. Page 25 and 29- The reference to "Pennsylvania's PaDEP BMP Manual" should be changed to the actual title of the document, "Pennsylvania Stormwater Best Management Practices Manual", unless the abbreviated term is included in a definitions section. The date of the manual should also be referenced.
The abbreviation in this statement has been changed to the full title of the document.
16. Table V-4
 - a. Under the "Calculation Methodology" heading the provision should be reworded to state "Standard parameters shall be set in the Model Ordinance."
The standard has been updated to reflect this change.
 - b. Under the heading "Discharge of Accelerated Runoff", the meaning of the required standard is unclear. Does it mean stormwater runoff shall be safely discharged into existing conditions drainage patterns and storm sewers without adversely affecting properties or causing channel scouring and erosion, or is there more to it?
There are instances where there could be an increase in runoff, i.e. "excess accelerated stormwater runoff." For example, projects located in Management District C. If there is such an increase, this accelerated runoff needs to be discharged in a manner which does not adversely affect properties or cause channel scouring and erosion, as stated in the standard and District C criteria. An applicant would need to provide an analysis indicating this objective is being met, such as a downstream hydraulic capacity analysis per District C criteria outlined in Table V-2.
 - c. Under the heading "Inappropriate Outlets", the DEP Guidance Document and FAQ referenced should be included in an Appendix to the Plan.
Since the FAQ is a living document, any updates to it would require us to restart the process of submitting the Act 167 plan renewal in order to have the most up-to-date document in our plan. For that reason, it is referenced in the Plan as "as amended."
 - d. Under the heading District C, the reference should be to the map included in the Act 167 Plan rather than a map in the model ordinance. The meaning of the required standard is not clear. Does it mean runoff shall be safely discharged to an existing conveyance system of adequate capacity, or is there more to it?
The standard has been updated to reference Figure V-5. Correct, the standard states that runoff shall be safely discharged to an existing conveyance system of adequate capacity. Per the Plan "Those areas designated in Figure V-5 as being in District C shall safely discharge runoff directly into an existing conditions conveyance system with no detention or attenuation of greater than the 5-year storm, if the system has the capacity."

- e. Under the heading "Wetlands", the required standard is not clear.
The standard has been updated to "Network with administrative and regulatory agencies involved with work within wetland areas to help promote the protection of those resources."
- f. Under the heading "Recharge/Infiltration/Retention", the wording of the required standard should be revised for clarity. The way the standard is worded it seems to imply a preference for subsurface BMP's, which is not the goal. Better wording might be "Infiltration and retention BMP's are preferred over standard detention basins, where soil and physical conditions permit. Impacts on subsurface mines pools and Karst areas must be evaluated before recommending this practice".
This standard has been updated to reflect the suggested changes.
- g. Under the heading "Water Quality", a reference to the section that states how to calculate WQV must be provided.
Reference to Section V.B.2.b. added.

17. Table V-5

- a. The standard under the heading "Erosion and Sediment Pollution Control" is not clear.
The standard has been updated to "Network with administrative and regulatory agencies involved with earth disturbance activities."
- b. Under the heading "Roof Drains, Residential/Commercial", the standard should say "prevent roof drains from directly discharging to ... "
The word "directly" has been added.
- c. Under the heading "Pervious Surfaces", the second sentence needs to be reworded for clarity.
The second sentence has been removed.
- d. The heading "Structures" should be changed to "Stormwater BMP's".
The heading has been updated to reflect the suggested change.
- e. The term "critical steep slopes", used under the heading "Slopes", is not defined.
The word critical has been removed from the standard.
- f. Under the heading "Stream Bank Protection", the wording in the benefits column needs to be revised as the flow will be reduced not the storms.
The wording has been updated to reflect the suggested change.

18. Page 29 - It's not clear if the paragraph at the top of the page is intended to be part of Table V-5. Those provisions should be moved to a more general section, as should Table V-5. See Comment 16, above. The model ordinance note is poorly worded.
The sequence is intentional as Table V-5 references standards and criteria associated with BMP's. The model ordinance note has been updated.

19. Page 29- Section D should be titled "Runoff Control Techniques". The use of the word "Alternative" leads one to believe the techniques in this section are alternative to techniques in some other section.
Alternative is referring to non-structural controls as opposed to traditional structural controls, as described in the first paragraph of Section D.

20. Tables V-6, V-8, V-9 and V-10 should be replaced with a reference to the Pennsylvania Stormwater Best Management Practice Manual.
These tables have been removed a reference to the BMP manual has been added.

21. Pages 43 & 44- In Paragraphs 3 and 6, the references to Sections 302, 303, and 304 are references to sections in the model ordinance. The references to those sections should be deleted from the language in the body of the Plan. They should only appear in the language of the model ordinance.
These references have been removed.
22. It's awkward to include the model ordinance within the body of the Act 167 Plan. My recommendation is to include it as an appendix and reference it in Paragraph D on Page 113. If it is to remain in the body, the page numbering for the Act 167 Plan should not restart at 1 for the model ordinance, it should follow page numbering of the Act 167 Plan.
The ordinance has been moved out of the body of the text and into an appendix.
23. Page 113 - Paragraph D the reference should be to the "Model Act 167 Stormwater Management Ordinance", which is the title of the model ordinance, rather than "Brodhead Creek and McMichaels Creek Watershed -Act 167 Stormwater Management Ordinance".
The title has been updated.
24. Page 114-In Paragraph 3, I believe the term "cost bases" should be "cost basis".
This has been corrected.
25. Page 115 - There is a reference to an Obstruction Map in Paragraph G.1. A copy of that map should be included in the Plan and a reference to its location should be added to this section is needed.
The obstruction map is included in previous plans and included here by reference.
26. Page 117 - The mention of Wayne and Carbon Counties in the third paragraph is in error as the watershed does not extend into those counties.
This has been corrected.
27. Appendix A - It would be helpful to include some location information for the stormwater hotspots listed in the table in addition to the longitude and latitude.
Coordinates are the most accurate location information for these stormwater hotspots as there are not addresses associated with each site.
28. Appendix C - In the Monroe County Municipal Stormwater Management Ordinance Status List, the buffer information for Stroud Township must be revised. The buffer requirements are found in Chapter 23 of the Township Code, the Stormwater Management Chapter. 150' buffers for stream and wetlands (100' inner buffer and 50' outer buffer) are required. The buffer requirements in the Zoning Ordinance were superseded by the 2010 Stormwater Ordinance.
Comment acknowledged
29. Appendix C -The purpose of the sample municipal ordinance matrix is not clear. Was it intended that the matrix be filled in and included in the plan?
Prior to adoption by the Municipality, the matrix should be completed.
30. The inset on Figure IV-1 should show the hotspot numbers.
The inset has been updated with the hotspot reference numbers.
31. Figure V-5, the management district map is somewhat better than the map included with the 2003 plan but is still inferior to the maps included in the original Brodhead Creek and McMichaels Creek Act 167 Plans. The original maps more clearly showed the underlying USGS map with roads, contour lines, etc.
The interactive version of Figure V-5 is available on our website. This mapping is referenced in the 4th paragraph of Section II.A
<https://www.mcconservation.org/act-167-renewal-documents-ndash-for-public-notice.html>

32. A definitions section should be added to the Plan. There is a definitions section in the model ordinance but not in the Plan.
Comment Acknowledged.
33. Model Ordinance Page 19- The West Nile Virus Guidance referenced in Paragraph I should be included in an appendix to the model ordinance. It may be better to require minimizing the potential for mosquito production be considered in the design of wetlands and wet basins in accordance with that reference rather say "Biology shall be incorporated".
It was the Technical Committees desire to remove this material and include a reference to the previous plan.
34. The meaning of the information shown in brackets in bold red text in the model ordinance should be set forth.
Those bracketed sections are to be filled in by each municipality
35. Model Ordinance Page 27 -The requirement isn't always to control peak runoff to the existing conditions rate. In District C peak rates may be increased. In the B Districts a reduction of peak rates is required. The new sentence should be reworded.
Comment addressed
36. Model Ordinance Page 29- The flow values referenced in G.4 should be included in an Appendix in the updated Act 167 Plan.
It was the Technical Committees desire to remove this material and include a reference to the previous plan.
37. The applicability of the method described in Appendix E of the model ordinance should be set forth in the body of the model ordinance.
Comment Addressed



1155 Red Fox Road | East Stroudsburg | Pennsylvania 18301
Ph: 570-223-5082 | Fax: 570-223-5086
www.smithfieldtownship.com

March 1, 2022

Monroe County Conservation District
c/o Lori Kerrigan, CPESC
8050 Running Valley Rd
Stroudsburg, PA 18360

RE: Act 167 Update Comments

Dear Ms. Kerrigan:

Per the requirements of the Act 167 Update process, Smithfield Township conveys this letter with our comments on the draft Brodhead Creek & McMichael Creek Watershed Stormwater Management Plan.

Smithfield Township is pleased that the plan provides for a renewal of the existing policy and makes critical updates to Best Management Practices. Given increased development in Smithfield and pending MS-4 requirements, we are pleased to assist in supporting this plan, and have no further comments on the stormwater management plan.

If you have any questions regarding our comments, please do not hesitate to contact the Township office.

Sincerely,

Jacob A. Pride
Chairman, Board of Supervisors

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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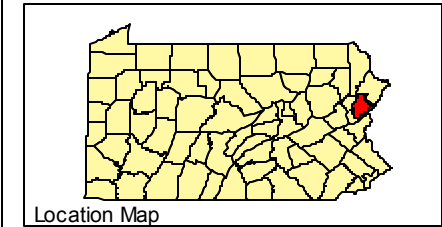
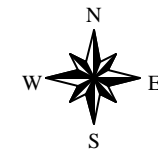
Appendix C

Municipal Ordinance Matrix

(Reserved for Future Updates Upon Plan Adoption)

Appendix D

Maps



Basemap
 Brodhead-McMichaels
 Watershed
 Monroe County, PA

ACT 167
 Stormwater Management
 Plan Update
 Phase II

Figure II-1

Map Legend

- Watershed Boundaries
- Municipal Boundaries
- County Boundaries
- Roads
- Railroads
- Streams
- Lakes
- Townships
- Boroughs

Prepared For:
 Monroe County Planning Commission
 &
 Monroe County Conservation District

Notes:
 Portions of these maps were generated from existing data sources as listed below. This existing data was utilized for base mapping purposes and is shown on the maps for spatial reference only. This data did not enter into any computations or affect the reliability of the hydrologic analysis. Borton-Lawson Engineering has found some inaccuracies in some of this data and has corrected the data in locations where these discrepancies were obvious, however, it was not a part of this Act 167 Plan to correct all the base data.

Data Sources:
 Roads - PennDOT
 Streams, Lakes - PennDOT
 Municipal Boundaries - PennDOT



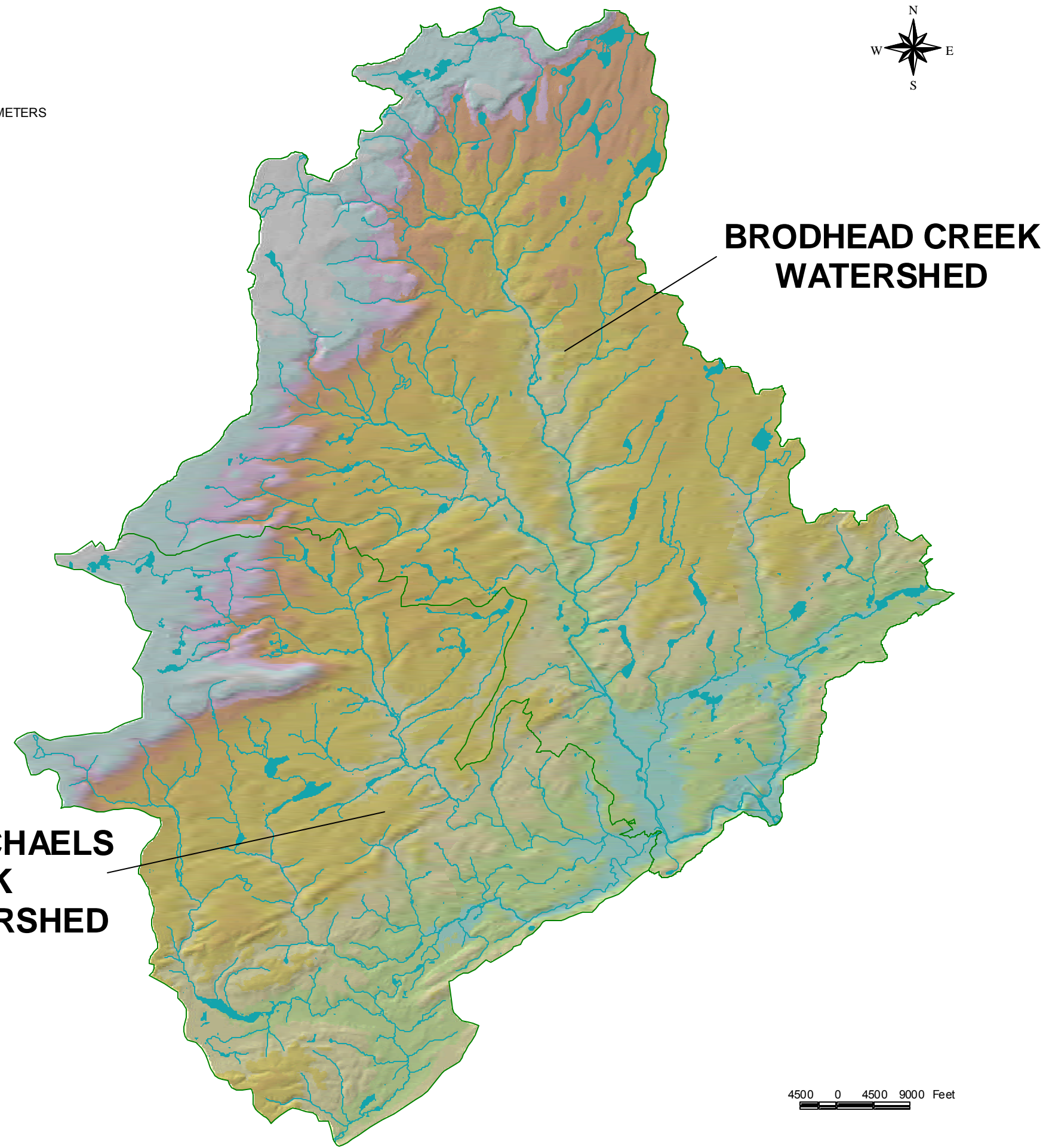
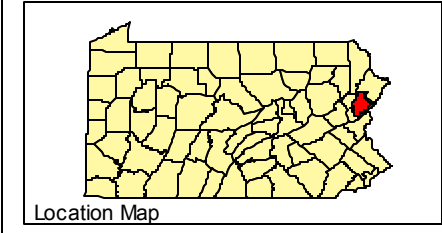
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 570-821-1999 Fax 570-821-1990
6814 Chris phalt drive
 Suite 200
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 610-837-5916 Fax 610-837-5918

World Wide Web : <http://www.borton-lawson.com>



Prepared By: PAR	Checked By:
Project Number: 2001-1014-00	Date: August 2003

- ELEVATION IN METERS**
- 87 - 151
 - 152 - 215
 - 216 - 279
 - 280 - 343
 - 344 - 408
 - 409 - 472
 - 473 - 536
 - 537 - 600
 - 601 - 665



Digital Elevation Model
 Brodhead-McMichaels
 Watershed
 Monroe County, PA

ACT 167
 Stormwater Management
 Plan Update
 Phase II

Figure II-2

Map Legend

- Watershed Boundaries
- Streams
- Lakes

Prepared For:
 Monroe County Planning Commission
 &
 Monroe County Conservation District

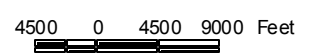
Notes:
 Portions of these maps were generated from existing data sources as listed below. This existing data was utilized for base mapping purposes and is shown on the maps for spatial reference only. This data did not enter into any computations or affect the reliability of the hydrologic analysis. Borton-Lawson Engineering has found some inaccuracies in some of this data and has corrected the data in locations where these discrepancies were obvious, however, it was not a part of this Act 167 Plan to correct all the base data.

Data Sources:
 Roads - PennDOT
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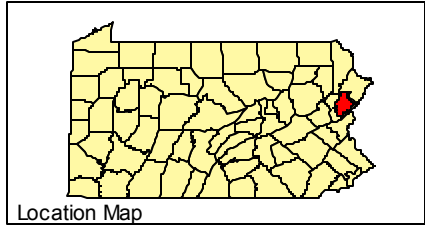
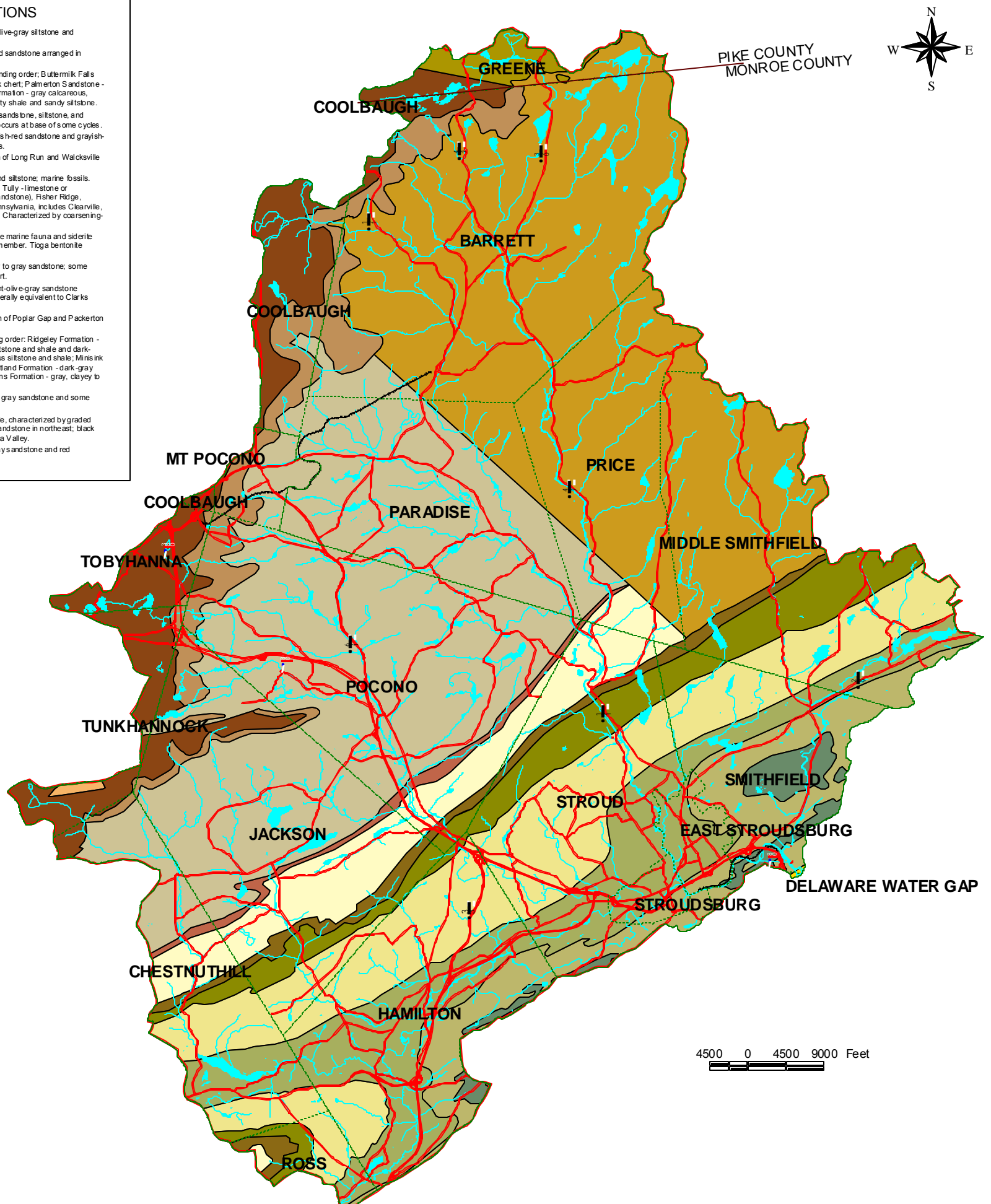


**McMICHAELS
 CREEK
 WATERSHED**

**BRODHEAD CREEK
 WATERSHED**

Prepared By: PAR	Checked By:
Project Number: 2001-1014-00	Date: August 2003








- GEOLOGIC FORMATIONS**
-  Beaverdam Member of Catskill Fm - Alternating olive-gray siltstone and sandstone; marine fossils.
 -  Bloomsburg Fm - Grayish-red siltstone, shale, and sandstone arranged in fining-upward cycles.
 -  Buttermilk Falls thru Esopus Fm Undiv - In descending order; Buttermilk Falls Limestone - gray fossiliferous limestone and black chert; Palmerton Sandstone - massive white siliceous sandstone; Schcharie Formation - gray calcareous, argillaceous siltstone; Esopus Formation - gray silty shale and sandy siltstone.
 -  Duncannon Member of Catskill Fm - Grayish-red sandstone, siltstone, and claystone in fining-upward cycles; conglomerate occurs at base of some cycles.
 -  Long Run Member of Catskill Fm - Gray and grayish-red sandstone and grayish-red siltstone and claystone in fining-upward cycles.
 -  Long Run and Walksville Member - Combination of Long Run and Walksville Member descriptions.
 -  Mahantango Fm - Gray, brown, and olive shale and siltstone; marine fossils. Includes following members, in descending order: Tully - limestone or calcareous shale; Sherman Ridge, Montebello (sandstone), Fisher Ridge, Dalmatia, and Turkey Ridge. In south-central Pennsylvania, includes Clearville, Frame, Chaneyville, and Gander Run Members. Characterized by coarsening-upward cycles.
 -  Marcellus Fm - Black, carbonaceous shale; sparse marine fauna and siderite concretions. Contains local limestone ("Purcell") member. Tioga bentonite included at base in eastern Pennsylvania.
 -  Packerton Member of Catskill Fm - Greenish-gray to gray sandstone; some laterally persistent conglomerate beds in lower part.
 -  Poplar Gap Member of Catskill Fm - Gray and light-olive-gray sandstone conglomerate containing intermittent red beds; laterally equivalent to Clark's Ferry, Sawmill Run, and Berry Run Members.
 -  Poplar Gap and Packerton Member - Combination of Poplar Gap and Packerton Member descriptions.
 -  Ridgeley Fm-Coeymans Fm Undiv - In descending order: Ridgeley Formation - white siliceous sandstone; Shriver Chert - gray siltstone and shale and dark gray chert; Port Ewen Shale - dark gray calcareous siltstone and shale; Minisink Limestone - dark gray clayey limestone; New Scotland Formation - dark gray fossiliferous shale and clayey limestone; Coeymans Formation - gray, clayey to sandy limestone.
 -  Townsensing Member of Catskill Fm - Dominantly gray sandstone and some siltstone; freshwater fossils.
 -  Timmers Rock Fm - Olive-gray siltstone and shale, characterized by graded bedding; marine fossils; some very fine grained sandstone in northeast; black shale of Harrell Formation at base in Susquehanna Valley.
 -  Walksville Member of Catskill Fm - Greenish-grays and sandstone and red siltstone and claystone in fining-upward cycles.



Geology
Brodhead-McMichaels
Watershed
Monroe County, PA

ACT 167
 Stormwater Management
 Plan Update
 Phase II

Figure II-3

- Map Legend**
-  Watershed Boundaries
 -  Municipal Boundaries
 -  County Boundaries
 -  Roads
 -  Railroads
 -  Streams
 -  Lakes

Prepared For:
 Monroe County Planning Commission
 &
 Monroe County Conservation District

Notes:
 Portions of these maps were generated from existing data sources as listed below. This existing data was utilized for base mapping purposes and is shown on the maps for spatial reference only. This data did not enter into any computations or affect the reliability of the hydrologic analysis. Borton-Lawson Engineering has found some inaccuracies in some of this data and has corrected the data in locations where these discrepancies were obvious, however, it was not a part of this Act 167 Plan to correct all the base data.

Data Sources:
 Roads - PennDOT
 Streams, Lakes - PennDOT
 Municipal Boundaries - PennDOT



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 570-821-1999 Fax 570-821-1990

6814 Christoph drive
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World Wide Web : <http://www.borton-lawson.com>

Prepared By: PAR
 Project Number: 2001-1014-00

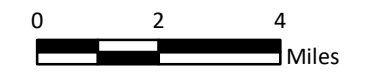
Checked By:
 Date: August 2003

STORMWATER HOT SPOTS

2021 SURVEY RESPONSES
MONROE COUNTY, PENNSYLVANIA

FIGURE IV-1

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



1:200,000

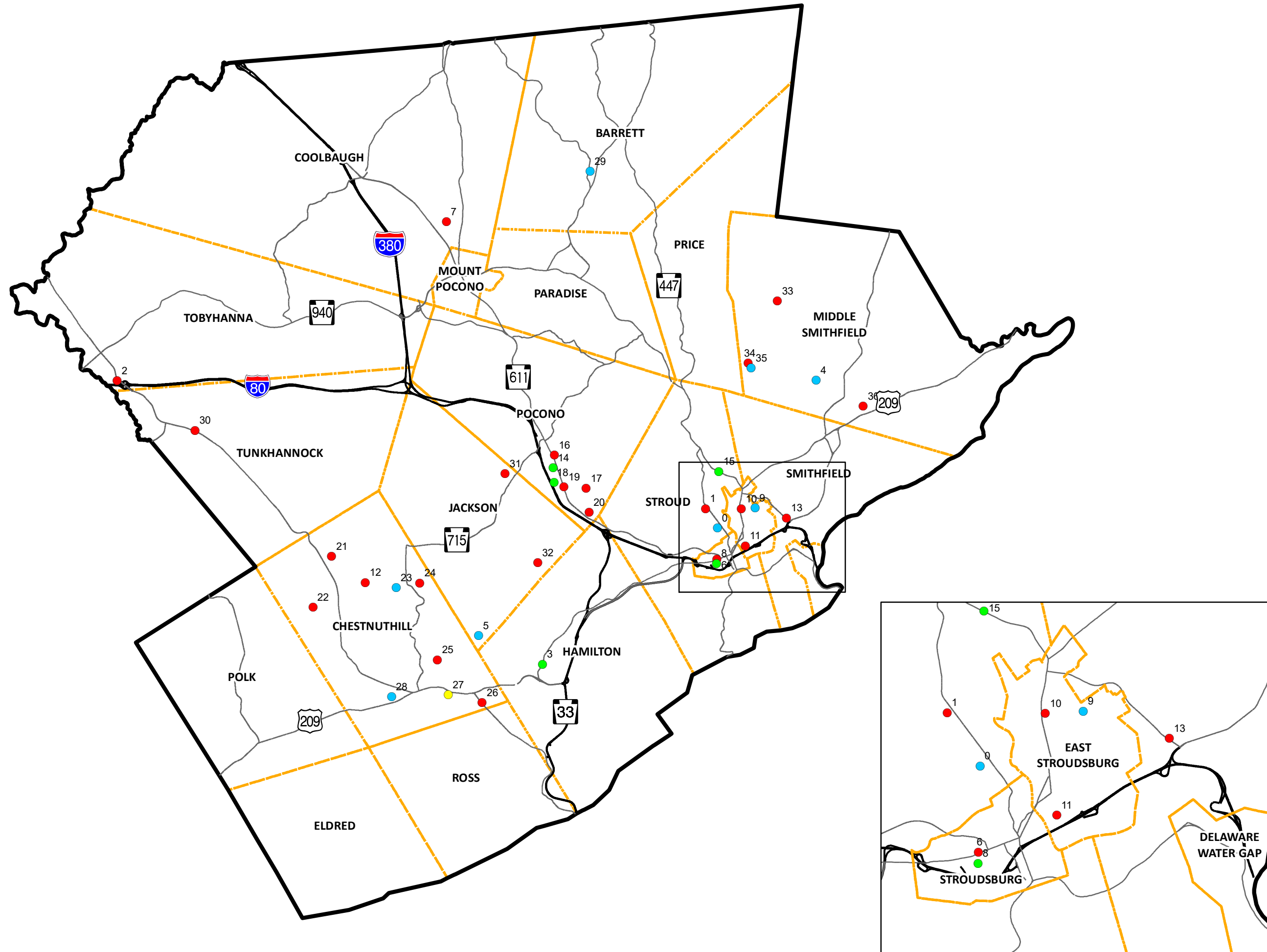


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mcpc@monroecountypa.gov
January 2022



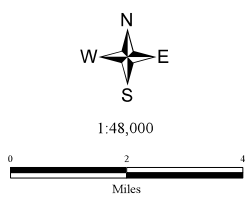
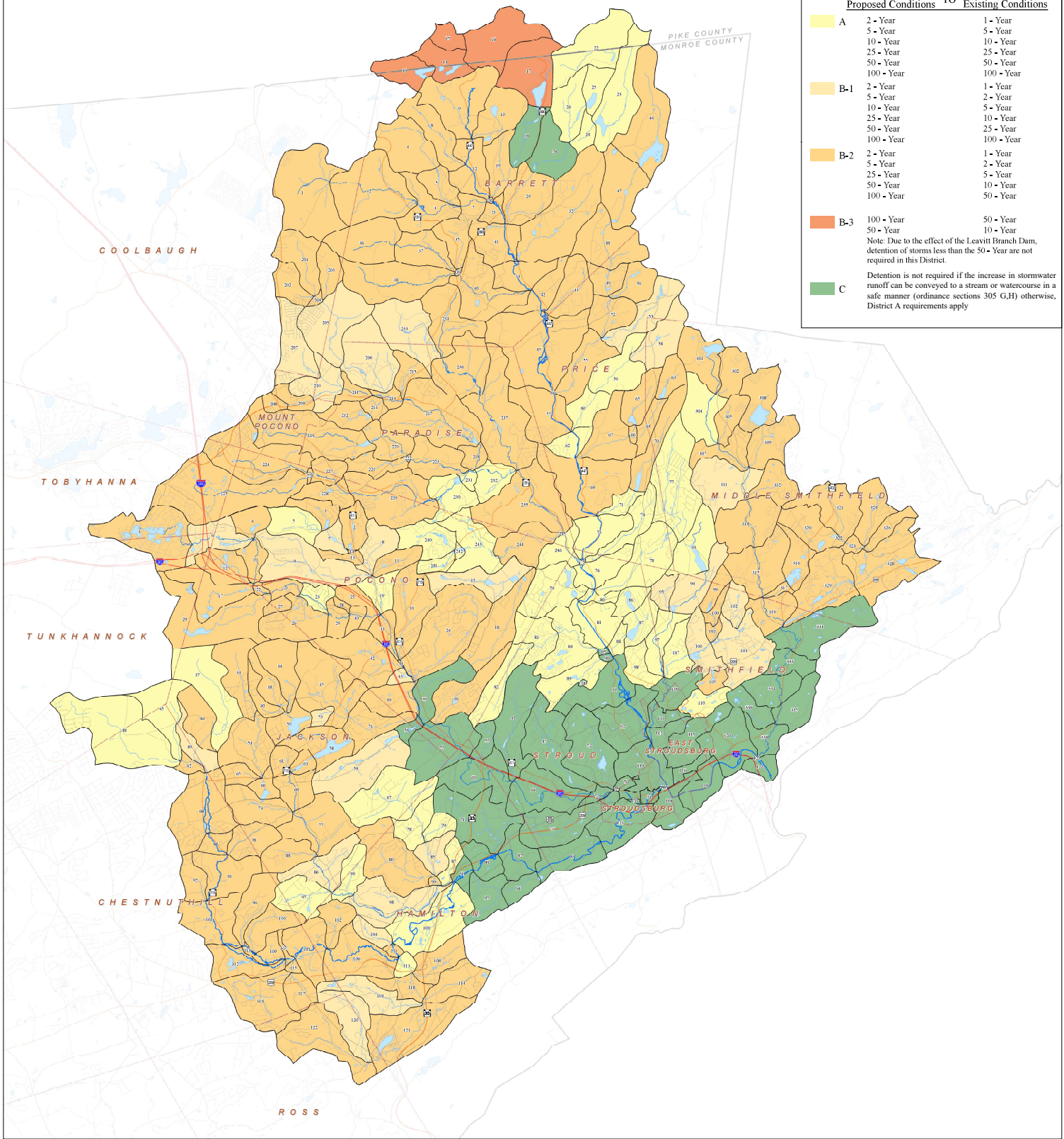
MANAGEMENT DISTRICTS BRODHEAD - MCMICHAEL WATERSHEDS MONROE COUNTY, PENNSYLVANIA

Figure V-5 - Management Districts

	Designed Storm Proposed Conditions	TO	Designed Storm Existing Conditions
A	2 - Year		1 - Year
	5 - Year		5 - Year
	10 - Year		10 - Year
	25 - Year		25 - Year
	50 - Year		50 - Year
B-1	2 - Year		1 - Year
	5 - Year		2 - Year
	10 - Year		5 - Year
	25 - Year		10 - Year
	50 - Year		25 - Year
B-2	2 - Year		1 - Year
	5 - Year		2 - Year
	25 - Year		5 - Year
	50 - Year		10 - Year
	100 - Year		50 - Year
B-3	100 - Year		50 - Year
	50 - Year		10 - Year
C			1 - Year
			2 - Year

Note: Due to the effect of the Leavitt Branch Dam, detention of storms less than the 50 - Year are not required in this District.

Detention is not required if the increase in stormwater runoff can be conveyed to a stream or watercourse in a safe manner (ordinance sections 305 G,H) otherwise, District A requirements apply



- Legend**
- Subwatershed Boundary
 - County Boundary
 - Municipal Boundary
 - Waterbody
 - Stream
 - Interstate
 - US Traffic Route
 - PA Traffic Routes
 - Ramps
 - State Routes
 - Municipal Roads
 - Private Roads
 - Private Driveways
 - Trails

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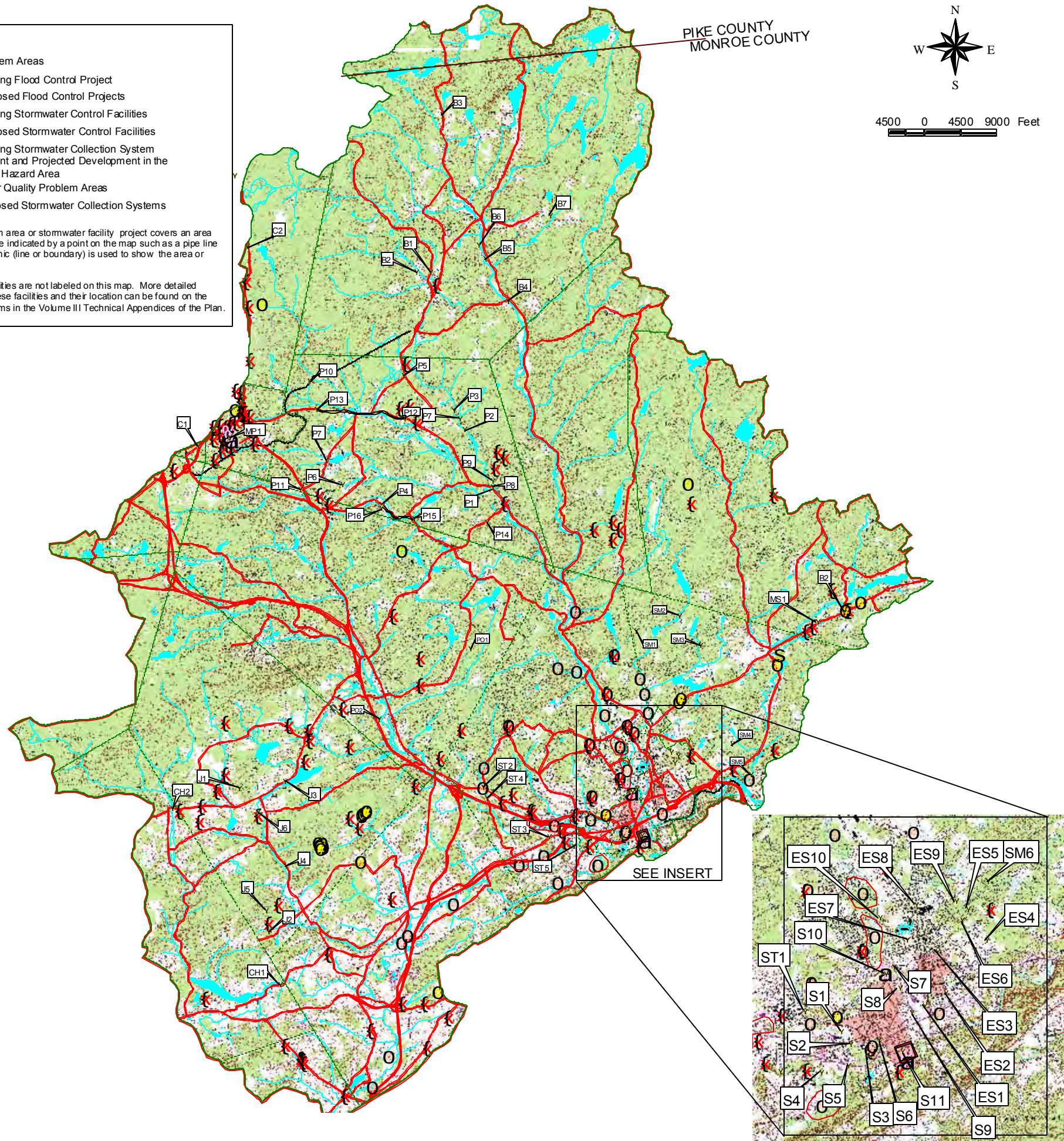


PREPARED BY:
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 (570) 517-3100
mcp@monroecountypa.gov
 June 2021

- Legend**
- Y** Problem Areas
 - T** Existing Flood Control Project
 - O** Proposed Flood Control Projects
 - ¥** Existing Stormwater Control Facilities
 - ⊙** Proposed Stormwater Control Facilities
 - #** Existing Stormwater Collection System
 - Present and Projected Development in the Flood Hazard Area
 - S** Water Quality Problem Areas
 - a** Proposed Stormwater Collection Systems

Note: If a problem area or stormwater facility project covers an area larger than can be indicated by a point on the map such as a pipe line or region, a graphic (line or boundary) is used to show the area or project limits.

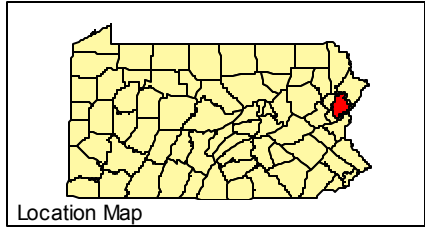
Storm water facilities are not labeled on this map. More detailed information of these facilities and their location can be found on the problem area forms in the Volume III Technical Appendices of the Plan.



PIKE COUNTY
MONROE COUNTY



4500 0 4500 9000 Feet



Problem Areas
Brodhead-McMichaels
Watershed
Monroe County, PA

ACT 167
Stormwater Management
Plan Update
Phase II

Figure VI-1

Map Legend

- Watershed Boundaries
- Municipal Boundaries
- County Boundaries
- Roads
- Railroads
- Streams
- Lakes

Prepared For:
Monroe County Planning Commission
&
Monroe County Conservation District

Notes:
Portions of these maps were generated from existing data sources as listed below. This existing data was utilized for base mapping purposes and is shown on the maps for spatial reference only. This data did not enter into any computations or affect the reliability of the hydrologic analysis. Borton-Lawson Engineering has found some inaccuracies in some of this data and has corrected the data in locations where these discrepancies were obvious, however, it was not a part of this Act 167 Plan to correct all the base data.

Data Sources:
Roads - PennDOT
Streams, Lakes - PennDOT
Municipal Boundaries - PennDOT

**Borton
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ENGINEERING**

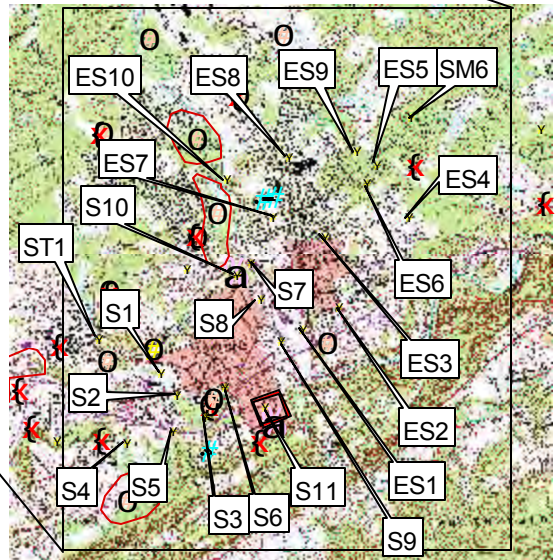
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Bath, PA 18014
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World Wide Web : <http://www.borton-lawson.com>

Prepared By: PAR
Project Number: 2001-1014-00

Checked By:
Date: August 2003



SEE INSERT

Appendix E
DEP Levee Data



Bureau Of Waterways Engineering
Rachel Carson State Office Building
P. O. Box 8460
Harrisburg, PA 17105-8460

FAX TRANSMITTAL SHEET

TO: Paul DeBarry

FAX NO. 610-837-5918

PHONE NO. 610-837-5917

FROM: Joseph G. Capasso

OFFICE PHONE NO. (717) 787-3411

FAX NO. 717-772-0409

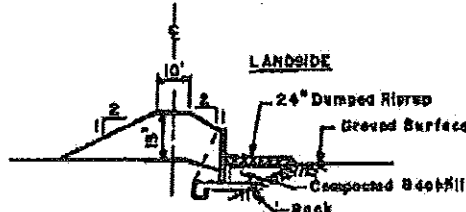
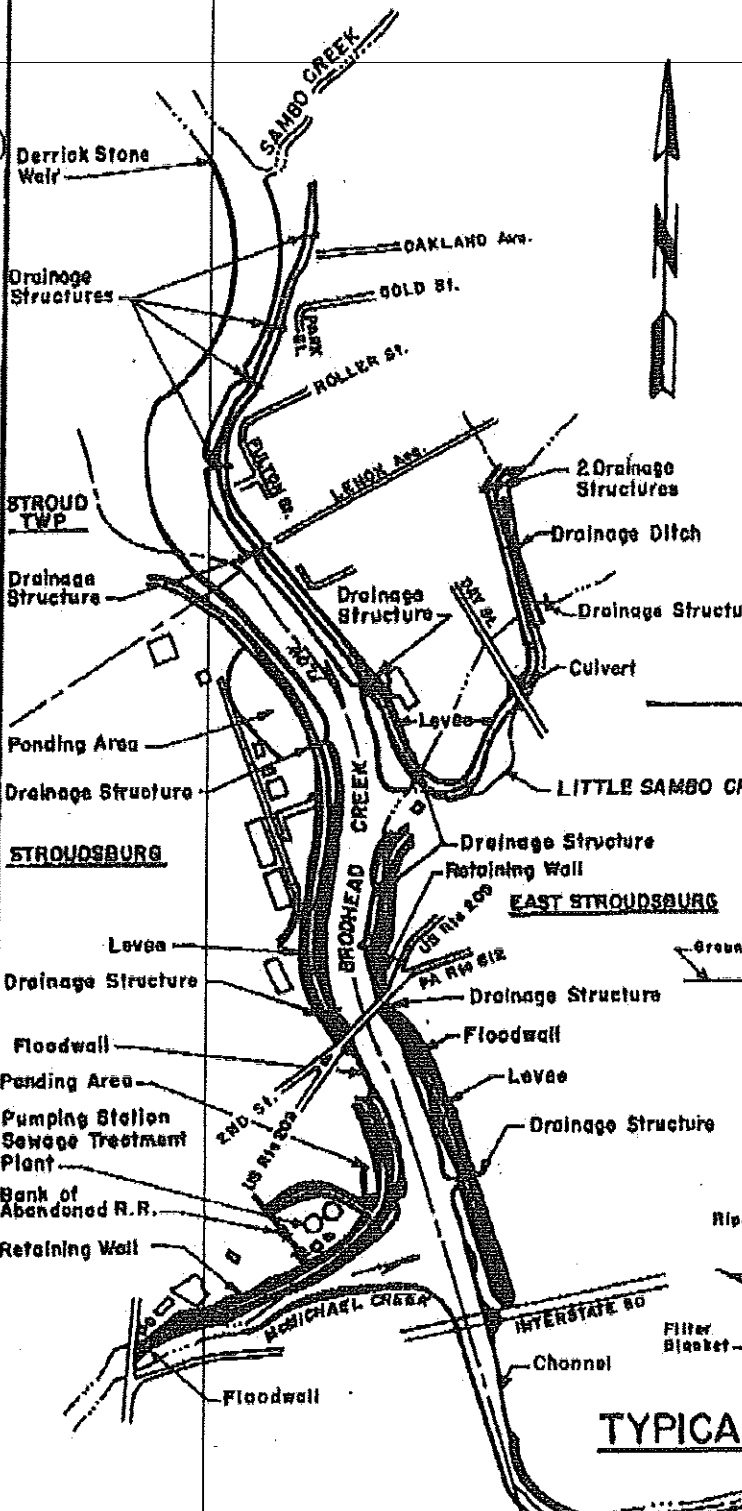
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DATE: Thursday, August 28, 2003

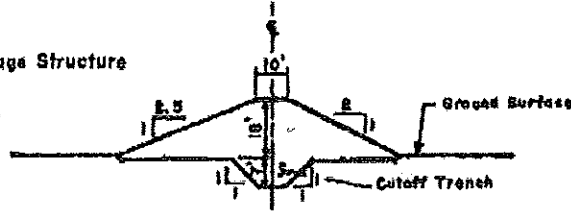
SPECIAL INSTRUCTIONS TO RECEIVER:

STROUDSBURG
MONROE CO.

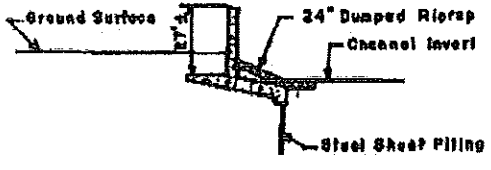
**GENERAL
LOCATION MAP**



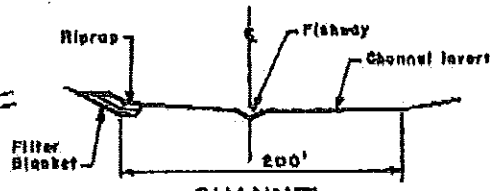
CONCRETE RETAINING WALL



LEVEE



FLOODWALL



CHANNEL

TYPICAL CROSS SECTIONS

No Scale

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

C 45 : 1

**STROUDSBURG AND
EAST STROUDSBURG
FLOOD PROTECTION**

PLAN
1000' 0 1000'

STROUD
TWP

STROUDSBURG AND EAST STROUDSBURG FLOOD PROTECTION, C45:1

LOCATION: Brodhead, McMichael and Little Sambo Creeks, Stroudsburg and East Stroudsburg Boroughs and Stroud Township, Monroe County

QUADRANGLE: Stroudsburg, Latitude: 40°59'00", Longitude: 75°11'30"

SPONSOR: Boroughs of Stroudsburg and East Stroudsburg

PROJECT DESCRIPTION: This project consisted of the improvement of 11,800 feet of earth channel, including widening, cleaning, and realignment; construction of 16,000 feet of earth levees, including 15 drainage structures equipped with emergency sluice gates; construction of 560 feet of reinforced concrete floodwall and 390 feet of concrete retaining wall; and construction of both a sanitary sewage and storm water pumping station. Channel slopes were protected with rock riprap at critical areas. Two ponding areas were provided to allow interior runoff to collect during high stream stages.

Improvements to the interior drainage system and installation of staff gauges were completed in 1964.

DESIGNER: Fridy, Gauker, Truscott and Fridy, Inc., Philadelphia, Pa.

CONTRACT NO.: C45:1

PERMIT NO.: 13627

BID OPENING: May 13, 1960

CONTRACT AWARD: May 31, 1960

LOW BIDDER: Elmhurst Contracting Co., Corona, N.Y

PROJECT COMPLETED: October 9, 1962

CONSTRUCTION COST: \$1,591,233.77

DRAINAGE CRITERIA:	DRAINAGE AREA	FLOOD OF RECORD (August 19, 1955)	FIS 100-YEAR DISCHARGE
Brodhead Creek:			
Below McMichael Creek	258 SM	68,800 CFS	36,000 CFS
Above McMichael Creek	146 SM	-----	26,000 CFS
McMichael Creek:	107 SM	5,740 CFS	10,300 CFS

Maximum Channel Bottom Width: 220 FT

Levee Top Width: 10 FT

Land Slope 1V to 2H

Stream Slope 1V to 2.5H

Pumping Station:

Sewage - 2 Pumps at 100 gallons per minute (GPM) each

Storm Water - 2 Pumps at 800 gallons per minute (GPM) each

QUANTITIES:

902,375 C.Y.	Excavation (All Types)	16 EA.	Drainage Structures
506,770 C.Y.	Rolled Embankment	1 EA.	Sewage Pumping Station
39,230 S.Y.	Dumped Riprap	1 EA.	Storm Pumping Station
3,260 C.Y.	Concrete	38 AC.	Seeding

Project turned over to sponsor for operation and maintenance on October 17, 1962.

STROUDSBURG LEVEE STABILIZATION PROJECT, C45:1, DGS 180-27

PROJECT DESCRIPTION: Riprap was placed on the left bank levee from the Gold Street area upstream to Sambo Creek. Rock riprap was also placed from the bottom of the existing riprap down to a depth of 5 feet below the channel invert on the remaining length of levee. A control structure was installed across the channel invert to minimize future degradation of Brodhead Creek.

DESIGNER: Department

CONTRACT NO.: DGS 180-27.1

PERMIT NO.: Unknown

BID OPENING: May 14, 1980

CONTRACT AWARD: June 25, 1980

LOW BIDDER: Allegheny Mountain Construction Co., Galton, Pa.

PROJECT COMPLETED: April 14, 1981

CONSTRUCTION COST: \$923,000.00

DESIGN CRITERIA:

Same as Stroudsburg and East Stroudsburg Flood Protection.

QUANTITIES:

68,000	C.Y.	Excavation
21,500	S.Y.	18-Inch Riprap
10,000	S.Y.	20-Inch Riprap
25,000	C.Y.	Filter Blanket

Appendix F

Model Stormwater Ordinance for

Municipalities with No MS4's

**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 Brodhead and McMichaels Creek watersheds 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 Brodhead and McMichaels Creek Watersheds, 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 Brodhead and McMichaels 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 Brodhead and McMichaels 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 Brodhead and McMichaels watersheds 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 reproducible, 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 Brodhead and McMichaels Watersheds 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 "Brodhead and McMichaels 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 Brodhead and McMichaels Creek Watersheds which do not fall under the exemption criteria shown in Section 402 shall submit a drainage plan consistent with the Brodhead and McMichaels 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.
- 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.

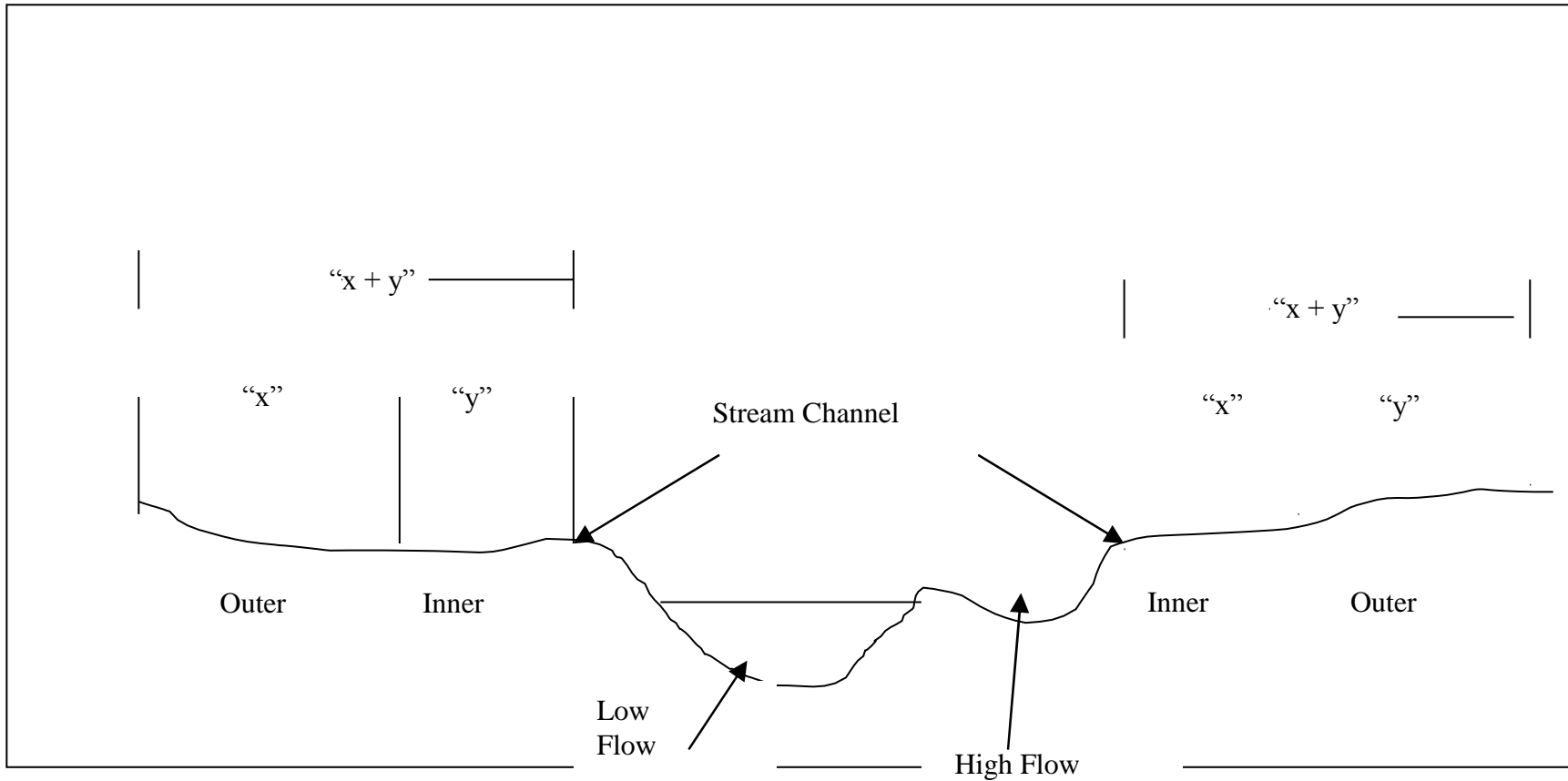


Figure 303.1 Stream Buffer

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.)

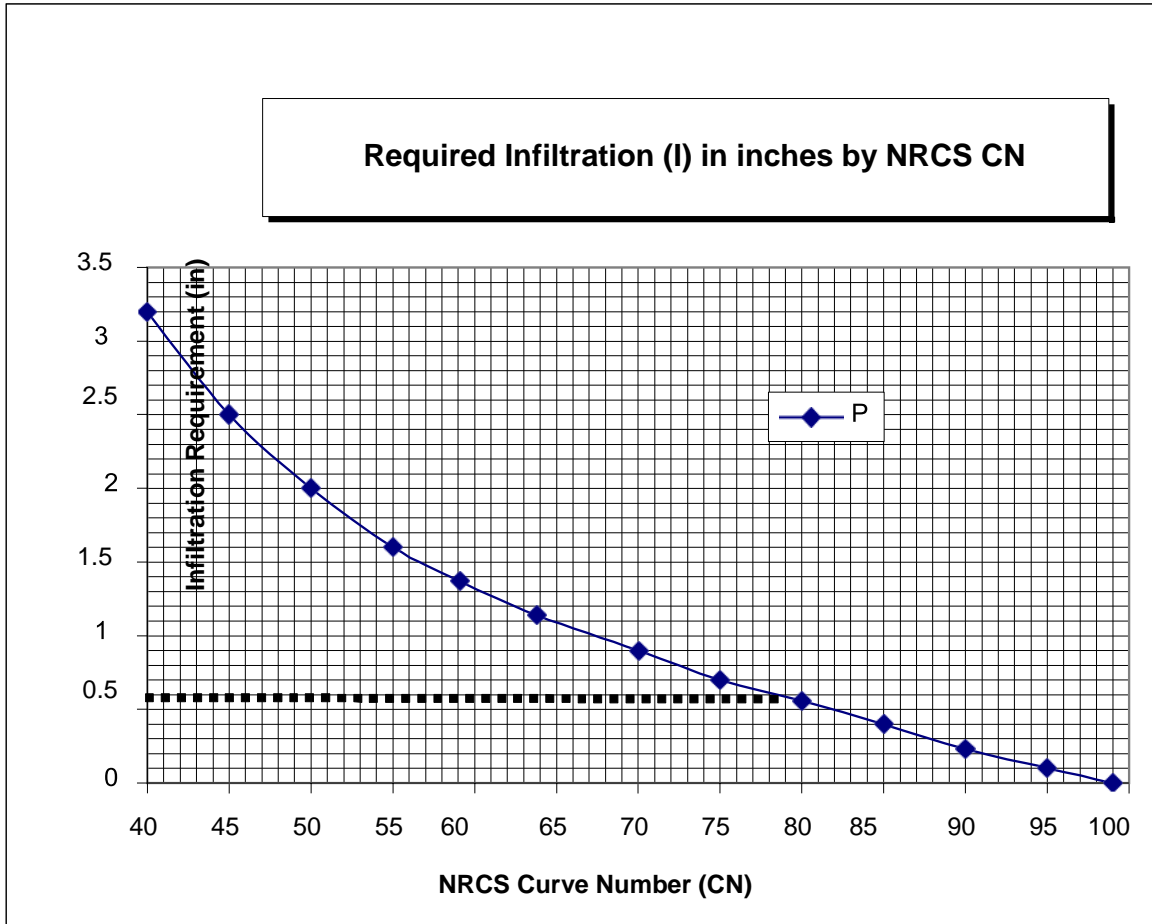


Figure 304.1. Infiltration requirement based upon NRCS Curve Number.

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 or other method as described in the PA DEP Stormwater BMP Manual as amended 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 Brodhead and McMichaels 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 Brodhead and McMichaels Creek Watershed for the various design storms are shown in Table 305.1. Development sites located in each of the A and B Districts must control proposed conditions peak runoff rates to existing conditions peak runoff rates for the design storms in accord with Table 305.1. District C may allow increases in post development flows where adequate downstream conveyances exist.

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

District	Proposed conditions	(reduce to)	Existing conditions
A	2 – year		1 – year
	5 – year		5 – year
	10 – year		10 – year
	25 – year		25 – year
	50- year		50- year
	100-year		100-year
B-1	2 – year		1- year
	5 – year		2 – year
	10 – year		5 – year
	25 – year		10 – year
	50- year		25- year
	100-year		100-year
B-2	2 – year		1- year
	5 – year		2 – year
	25 – year		5 – year
	50- year		10- year
	100 – year		50 – year
B-3	50- year		10- year
	100 – year		50 – year
C	<p>Provisional Direct Discharge District - Development sites which can discharge directly to the main channel or major tributaries or indirectly to the main channel through an existing stormwater drainage system (i.e., storm sewer or tributary) which meets the "Downstream Hydraulic Capacity Analysis" in Section 305 H and is shown by the design professional to not cause a downstream problem, may allow an increase in flow as long as no downstream harm is demonstrated. However, sites in District C shall comply with the criteria for Water Quality and Streambank Erosion (Ordinance Section 303); and Groundwater Recharge (Ordinance Section 304). If the proposed conditions runoff is intended to be conveyed by an existing stormwater drainage system to the main channel, assurance must be provided that such system has adequate capacity to convey the increased peak flows or will be provided with improvements to furnish the required capacity. When adequate capacity of the downstream system does not exist and will not be provided through improvements, the proposed conditions peak rate of runoff must be controlled to the existing conditions peak rate as required in District A provisions (i.e.,10-year proposed conditions flows to 10 year existing conditions flows) for the specified design storms.</p>		

- 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 Brodhead and McMichaels 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 Brodhead and McMichaels 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 / treat runoff from the 100 year storm 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 Brodhead and McMichaels 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. Please see Appendix E for the procedure to follow those projects that meet the exemption requirements.
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 Brodhead and McMichaels 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 Brodhead and McMichael 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 Brodhead and McMichael 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 Brodhead and McMichael Creek 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.		\$ _____
3,500-43,460 s.f.		\$ _____
>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

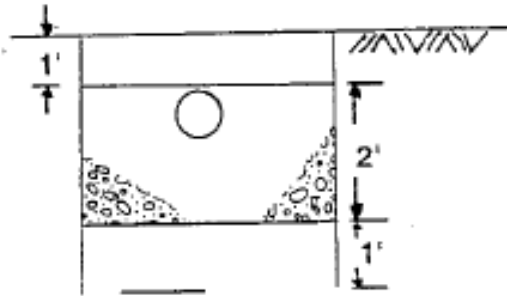
2,208 S.F.

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.

GUTTER OUTLET	REQ'D VOL.(C.F.) FROM FIGURE 1	DEPTH OF AGGREGATE FT.	TRENCH WIDTH FT.		
1	118	2	3		
2	118	2	3		
3	30	2	3		
GUTTER OUTLET	VOLUME OF STORAGE PER FT. OF TRENCH*	VOLUME OF STORAGE PER FT. OF PIPE**	TOTAL	TOTAL LENGTH OF TRENCH REQ'D (FT.)	
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

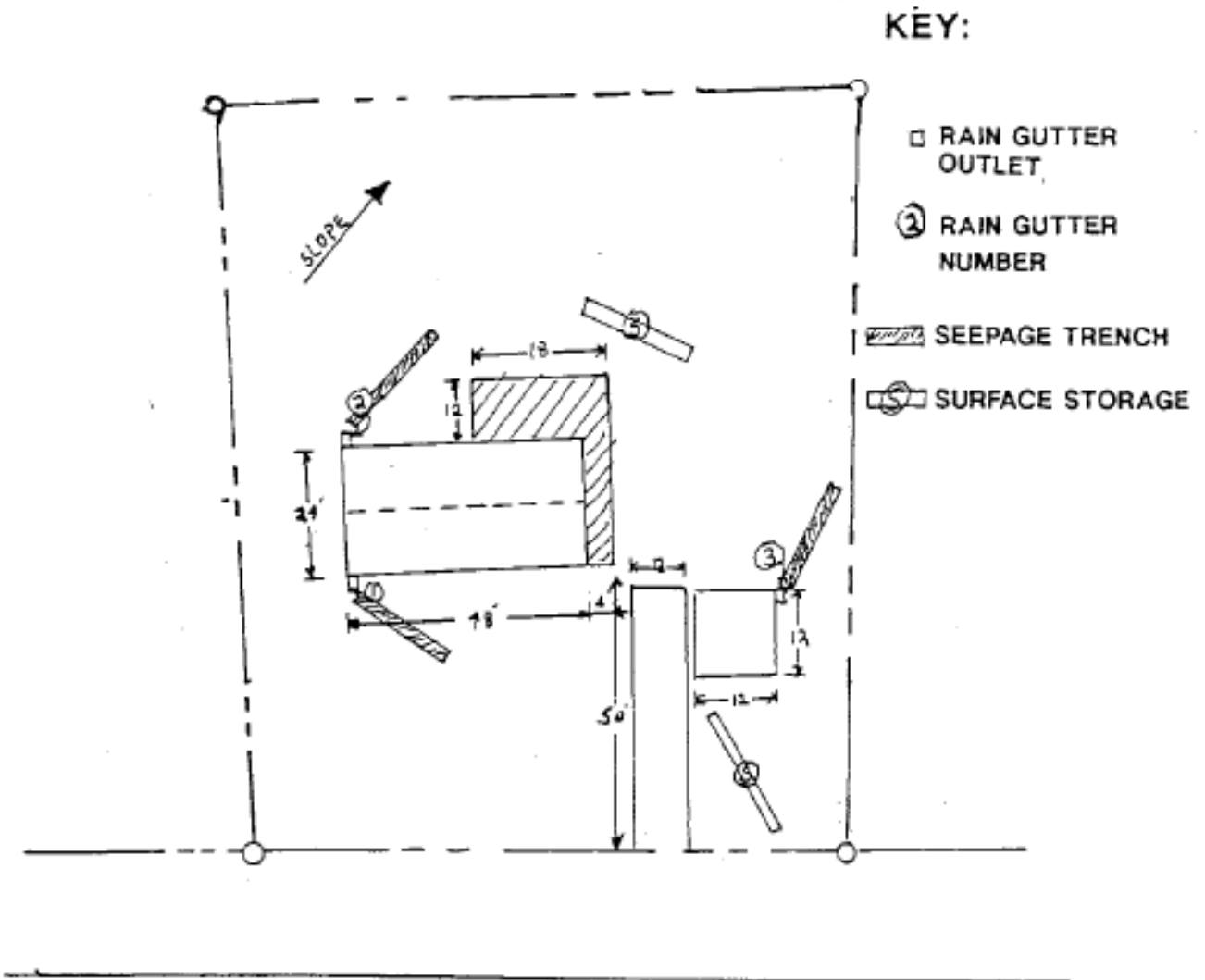
*** Wood decks with spacing between boards are exempt from the calculations.

STEP 5.

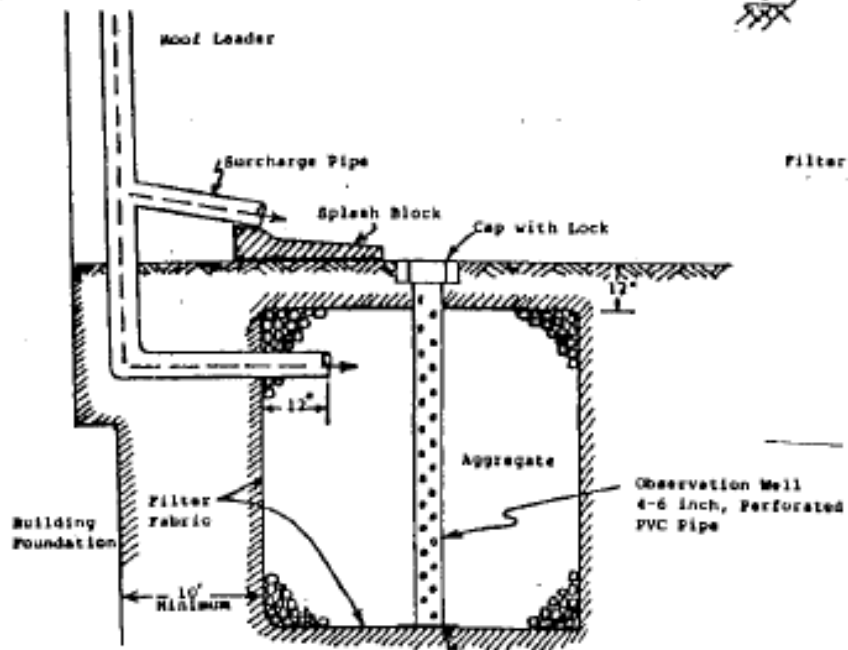
Determine remainder of impervious surfaces which requires detention and required storage volume from Figure 2.

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

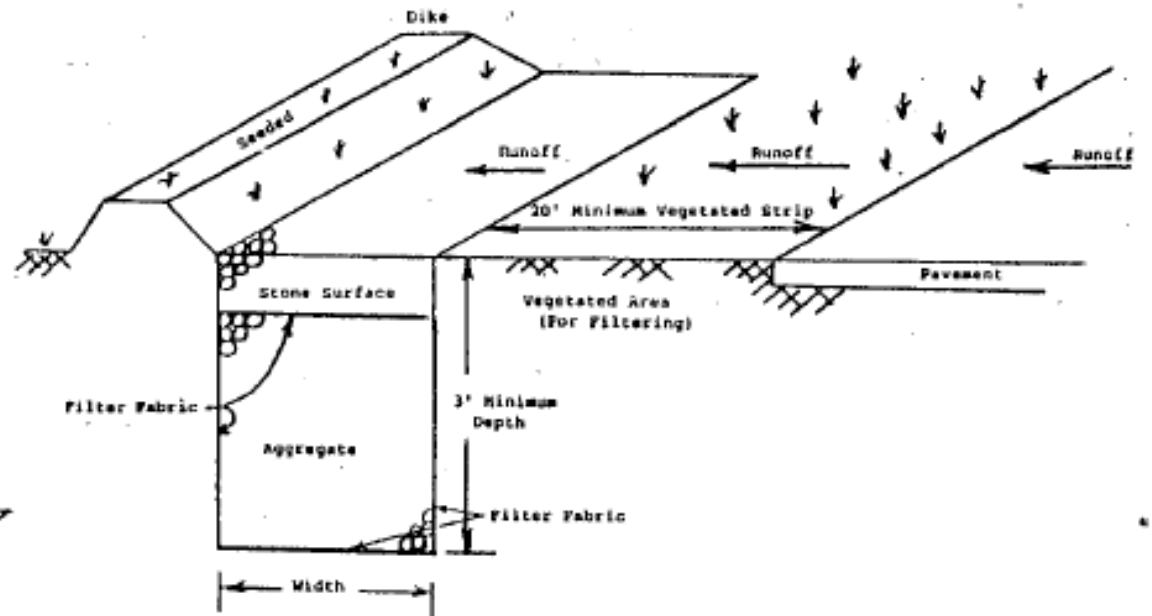
Use trench 6' wide by 1' deep x 31 feet long or 2 - 6' x 1' x 16' trenches in locations shown on plan.



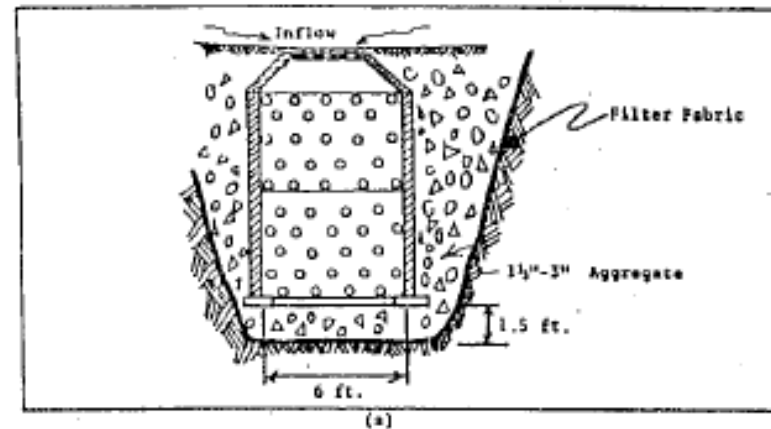
TYPICAL LOT LAYOUT



Typical Dry Well Cross Section

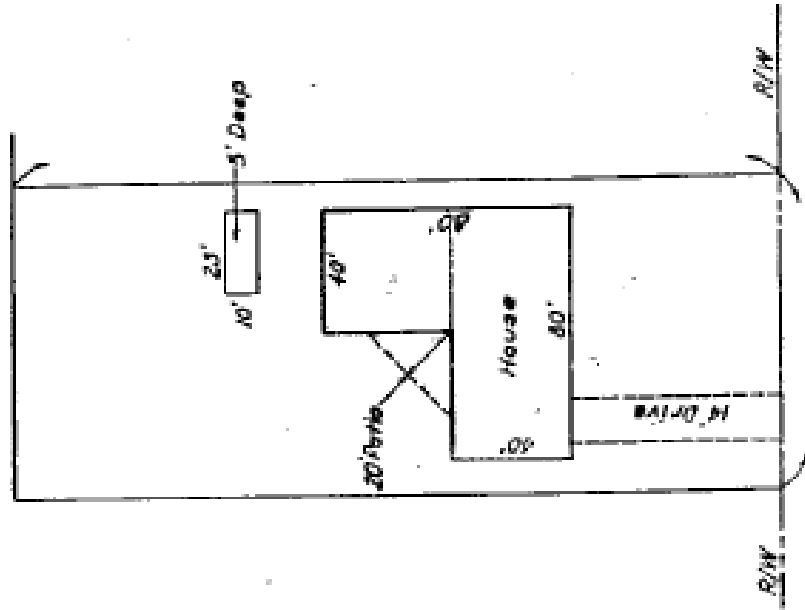


Typical Section of Infiltration Trenches
Modified after Frederick Co., MD. (1979)

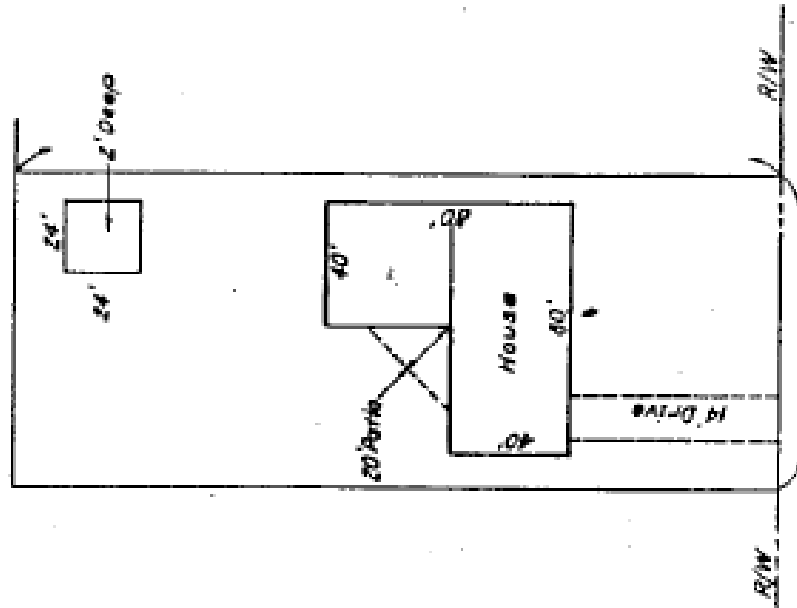


Source: Modified from Sullivan (1981)

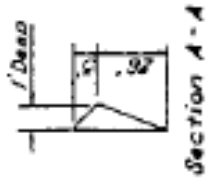
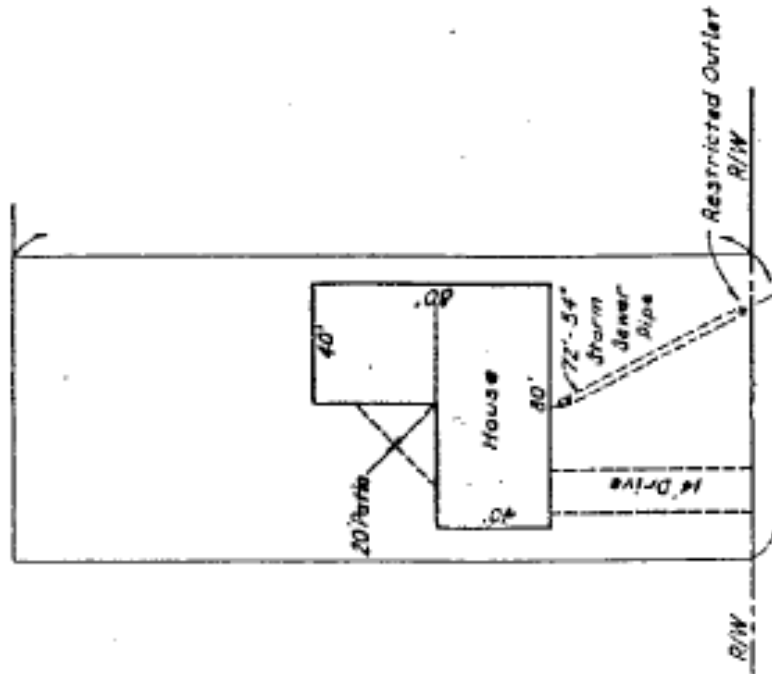
ON-SITE STORM WATER MANAGEMENT
 ALTERNATE NO. 4
 UNDERGROUND TANK STORAGE



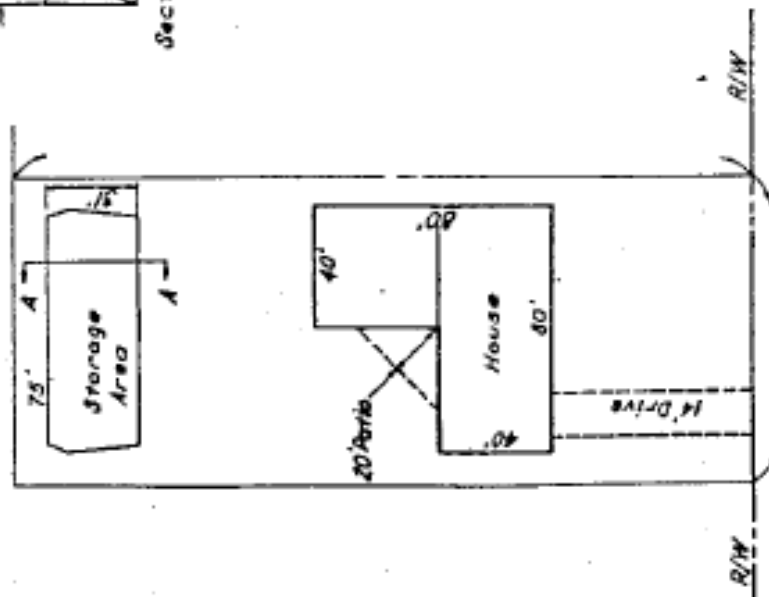
ON-SITE STORM WATER MANAGEMENT
 ALTERNATE NO. 3
 POND STORAGE



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



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



Appendix G

Model Stormwater Ordinance for

Municipalities with MS4's

ACT 167 MODEL 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 Brodhead and McMichaels Creek watersheds 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 Brodhead and McMichaels Creek Watersheds, 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 Brodhead and McMichaels 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 Brodhead and McMichaels 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 Brodhead and McMichaels watersheds 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 reproducible, 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 Brodhead and McMichaels Watersheds 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 "Brodhead and McMichaels 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 Brodhead and McMichaels Creek Watersheds which do not fall under the exemption criteria shown in Section 402 shall submit a drainage plan consistent with the Brodhead and McMichaels 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.
- 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.

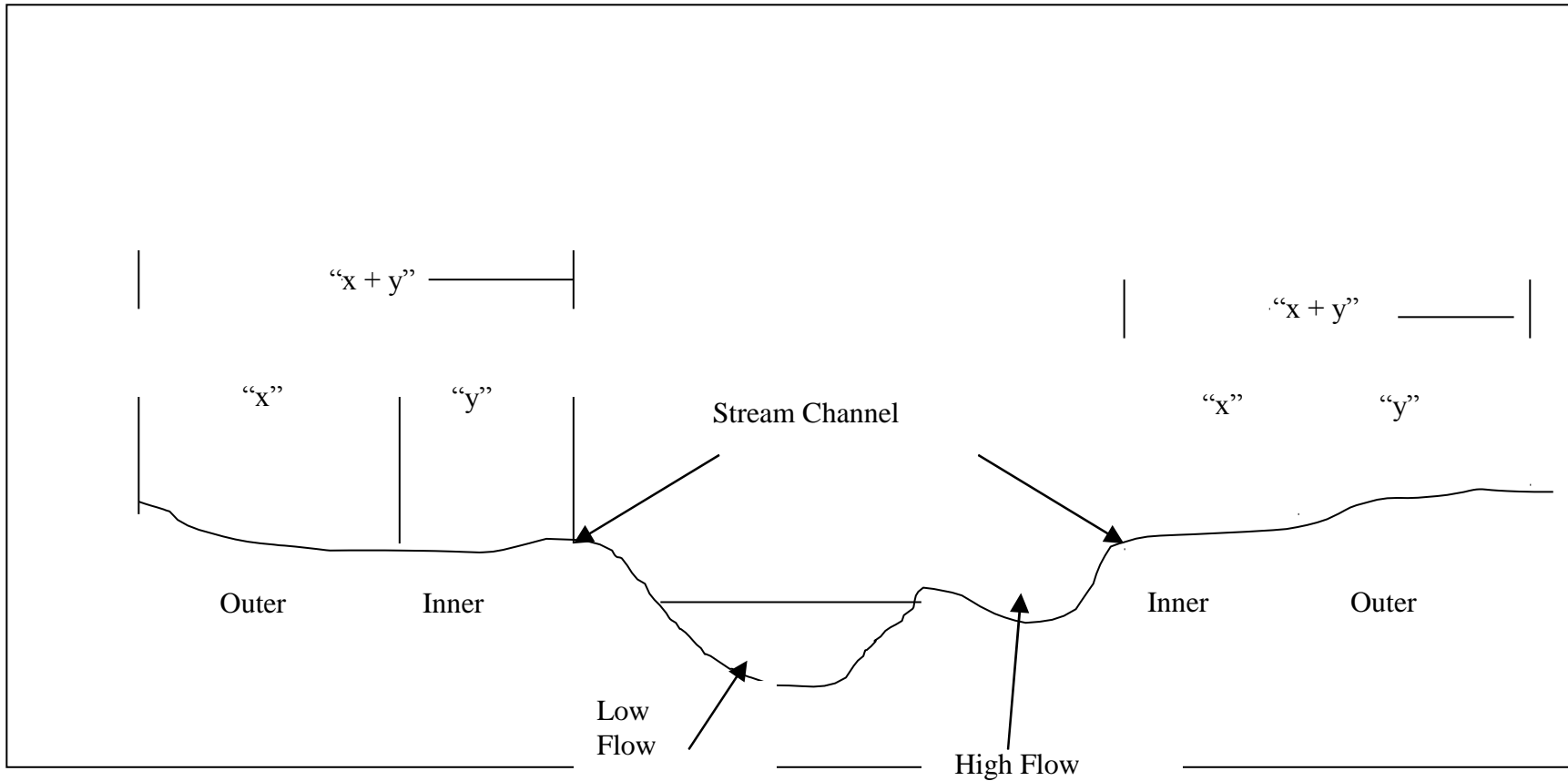


Figure 303.1 Stream Buffer

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.)

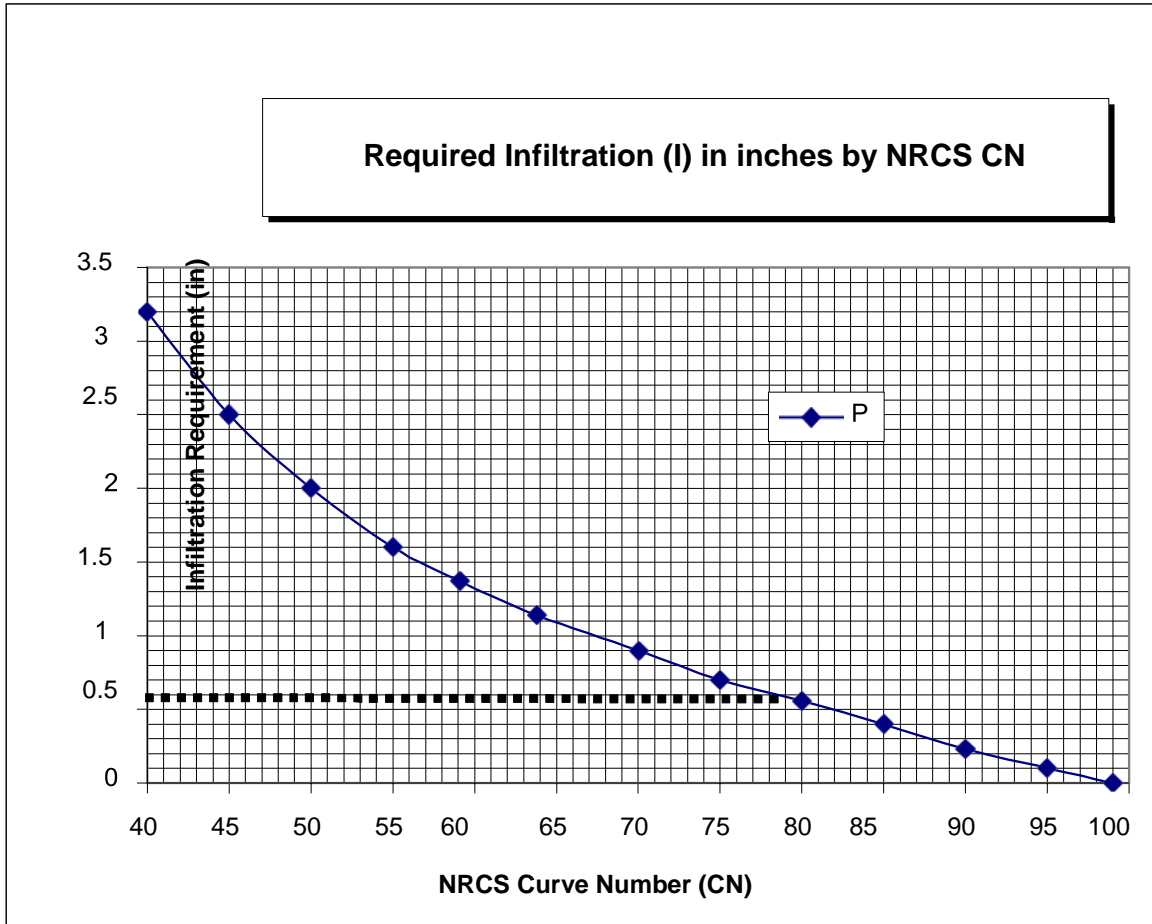


Figure 304.1. Infiltration requirement based upon NRCS Curve Number.

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 or other method as described in the PA DEP Stormwater BMP Manual as amended/ treat runoff from the 100 year storm 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 Brodhead and McMichaels 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 Brodhead and McMichaels Creek Watershed for the various design storms are shown in Table 305.1. Development sites located in each of the A and B Districts must control proposed conditions peak runoff rates to existing conditions peak runoff rates for the design storms in accord with Table 305.1. District C may allow increases in post development flows where adequate downstream conveyances exist.

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

District	Proposed conditions	(reduce to)	Existing conditions
A	2 – year		1 – year
	5 – year		5 – year
	10 – year		10 – year
	25 – year		25 – year
	50- year		50- year
	100-year		100-year
B-1	2 – year		1- year
	5 – year		2 – year
	10 – year		5 – year
	25 – year		10 – year
	50- year		25- year
	100-year		100-year
B-2	2 – year		1- year
	5 – year		2 – year
	25 – year		5 – year
	50- year		10- year
	100 – year		50 – year
B-3	50- year		10- year
	100 – year		50 – year
C	<p>Provisional Direct Discharge District - Development sites which can discharge directly to the main channel or major tributaries or indirectly to the main channel through an existing stormwater drainage system (i.e., storm sewer or tributary) which meets the "Downstream Hydraulic Capacity Analysis" in Section 305 H and is shown by the design professional to not cause a downstream problem, may allow an increase in flow as long as no downstream harm is demonstrated. However, sites in District C shall comply with the criteria for Water Quality and Streambank Erosion (Ordinance Section 303); and Groundwater Recharge (Ordinance Section 304). If the proposed conditions runoff is intended to be conveyed by an existing stormwater drainage system to the main channel, assurance must be provided that such system has adequate capacity to convey the increased peak flows or will be provided with improvements to furnish the required capacity. When adequate capacity of the downstream system does not exist and will not be provided through improvements, the proposed conditions peak rate of runoff must be controlled to the existing conditions peak rate as required in District A provisions (i.e.,10-year proposed conditions flows to 10 year existing conditions flows) for the specified design storms.</p>		

- 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 Brodhead and McMichaels 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 Brodhead and McMichaels 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 Brodhead and McMichaels 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. Please see Appendix E for the procedure to follow those projects that meet the exemption requirements.
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 Brodhead and McMichaels 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 Brodhead and McMichael 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 Brodhead and McMichael 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 – PROHIBITIONS

Section 801. Prohibited Discharges and Connections

- A. Any drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter a regulated small MS4 or to enter the surface waters of this Commonwealth is prohibited.
- B. No person shall allow, or cause to allow, discharges into a regulated small MS4, or discharges into waters of this Commonwealth, which are not composed entirely of stormwater, except (1) as provided in paragraph C below and (2) discharges authorized under a state or federal permit.
- C. The following discharges are authorized unless they are determined to be significant contributors to pollution of a regulated small MS4 or to the waters of this Commonwealth:
 - 1. Discharges or flows from firefighting activities.
 - 2. Discharges from potable water sources including water line flushing and fire hydrant flushing, if such discharges do not contain detectable concentrations of Total Residual Chlorine (TRC).
 - 3. Non-contaminated irrigation water, water from lawn maintenance, landscape drainage and flows from riparian habitats and wetlands.
 - 4. Diverted stream flows and springs.
 - 5. Non-contaminated pumped ground water and water from foundation and footing drains and crawl space pumps.
 - 6. Non-contaminated HVAC condensation and water from geothermal systems.
 - 7. Residential (i.e., not commercial) vehicle wash water where cleaning agents are not utilized.
 - 8. Non-contaminated hydrostatic test water discharges, if such discharges do not contain detectable concentrations of TRC.
- D. In the event that the municipality or DEP determines that any of the discharges identified in Subsection C significantly contribute pollutants to a regulated small MS4 or to the waters of this Commonwealth, the municipality or DEP will notify the responsible person(s) to cease the discharge.

Section 802. Roof Drains and Sump Pumps

Roof drains and sump pumps shall discharge to infiltration or vegetative BMPs wherever feasible.

Section 803. Alteration of Stormwater Management BMPs

No person shall modify, remove fill, landscape, or alter any stormwater management BMPs, facilities, areas, or structures that were installed as a requirement of this Ordinance without the written approval of the Municipality.

ARTICLE IX-ENFORCEMENT AND PENALTIES

Section 901. 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 902. 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 903. 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.

- B. 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.
- C. 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.
- D. 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.
- E. 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.

F. 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 904. 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 905. 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 906. 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 Brodhead and McMichael Creek 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

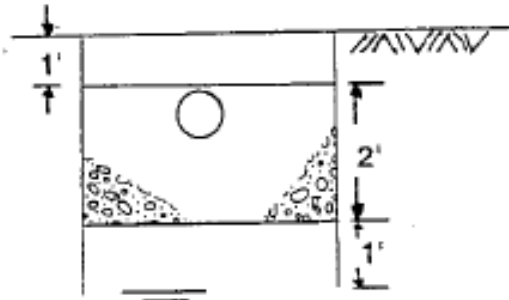
2,208 S.F.

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.

GUTTER OUTLET	REQ'D VOL.(C.F.) FROM FIGURE 1	DEPTH OF AGGREGATE FT.	TRENCH WIDTH FT.		
1	118	2	3		
2	118	2	3		
3	30	2	3		
GUTTER OUTLET	VOLUME OF STORAGE* PER FT. OF TRENCH	VOLUME OF STORAGE** PER FT. OF PIPE	TOTAL	TOTAL LENGTH OF TRENCH REQ'D (FT.)	
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

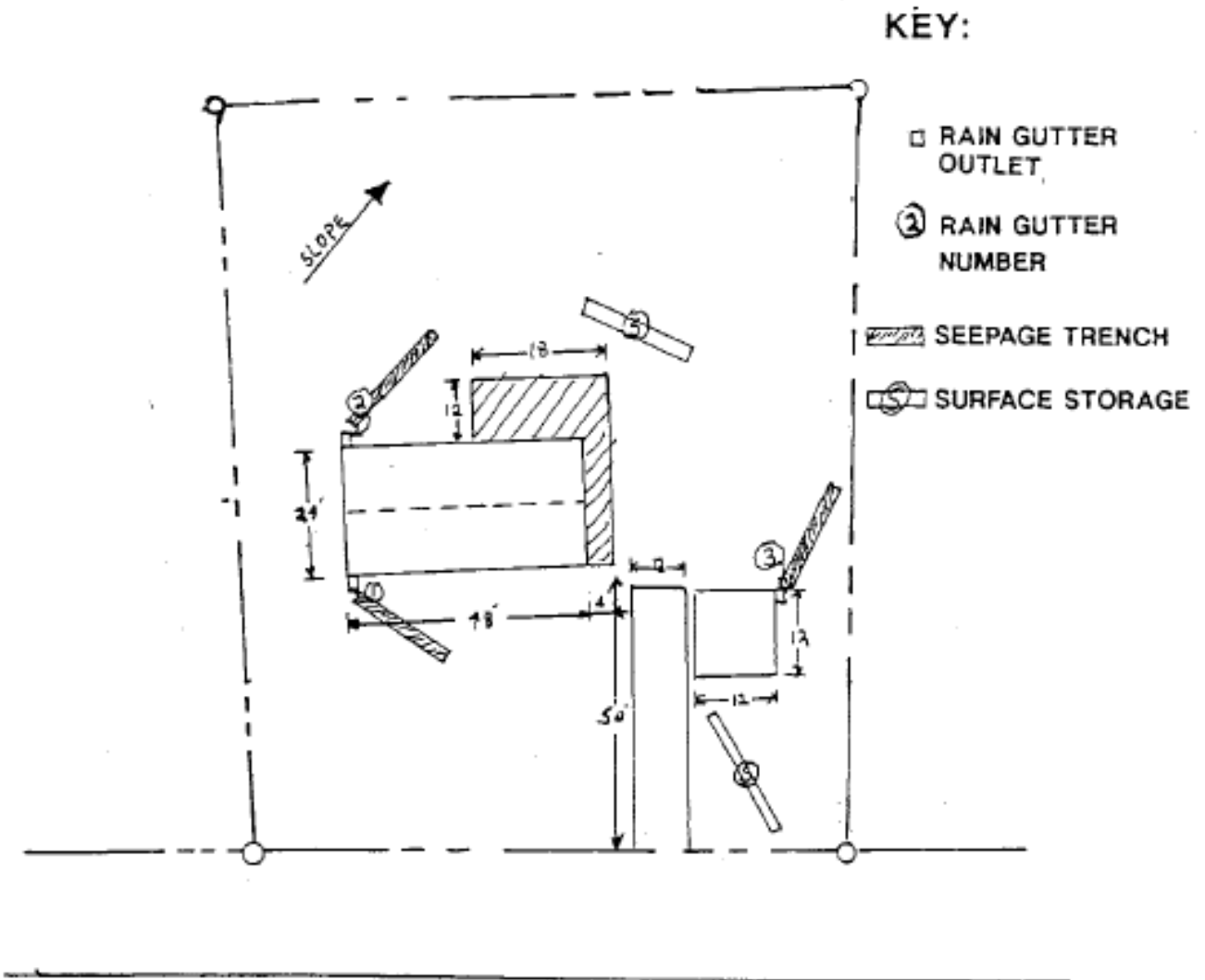
*** Wood decks with spacing between boards are exempt from the calculations.

STEP 5.

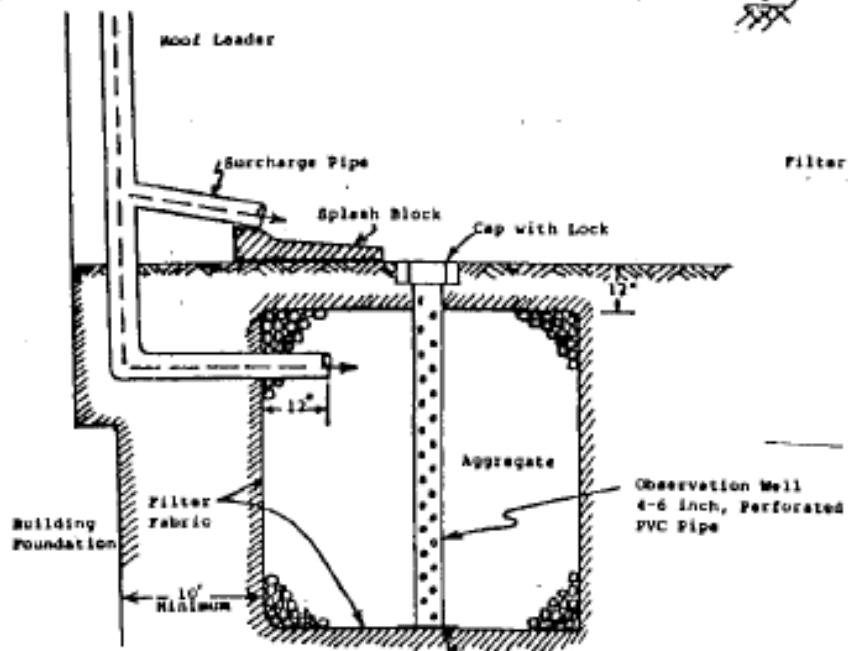
Determine remainder of impervious surfaces which requires detention and required storage volume from Figure 2.

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

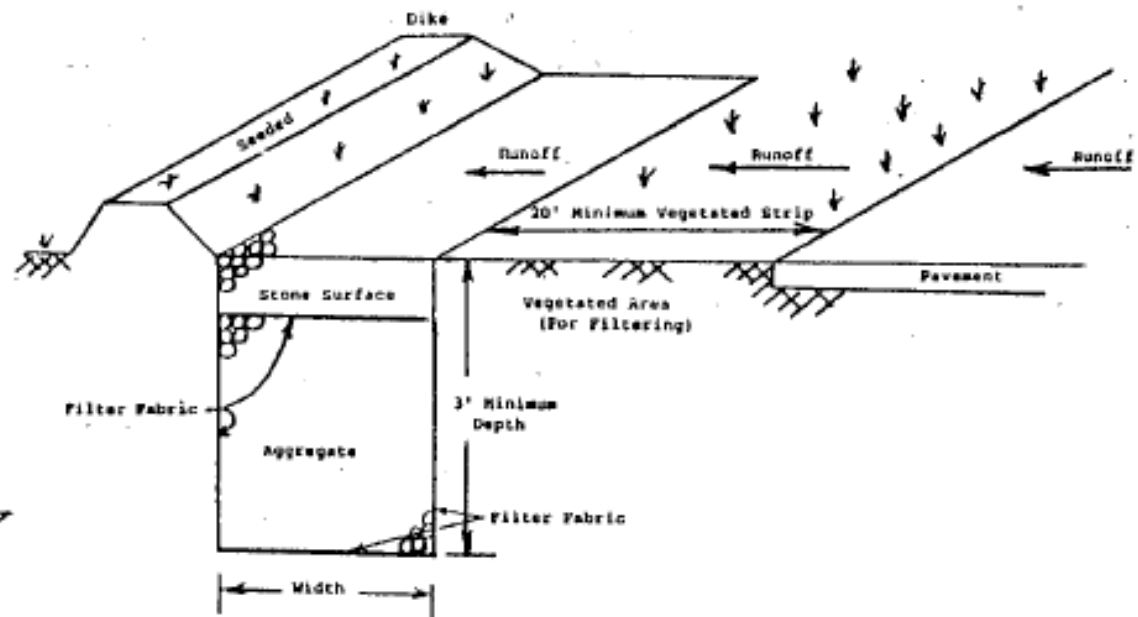
Use trench 6' wide by 1' deep x 31 feet long or 2 - 6' x 1' x 16' trenches in locations shown on plan.



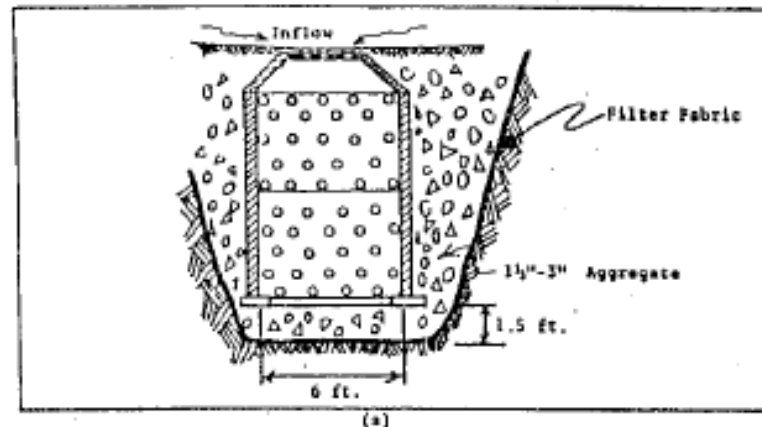
TYPICAL LOT LAYOUT



Typical Dry Well Cross Section

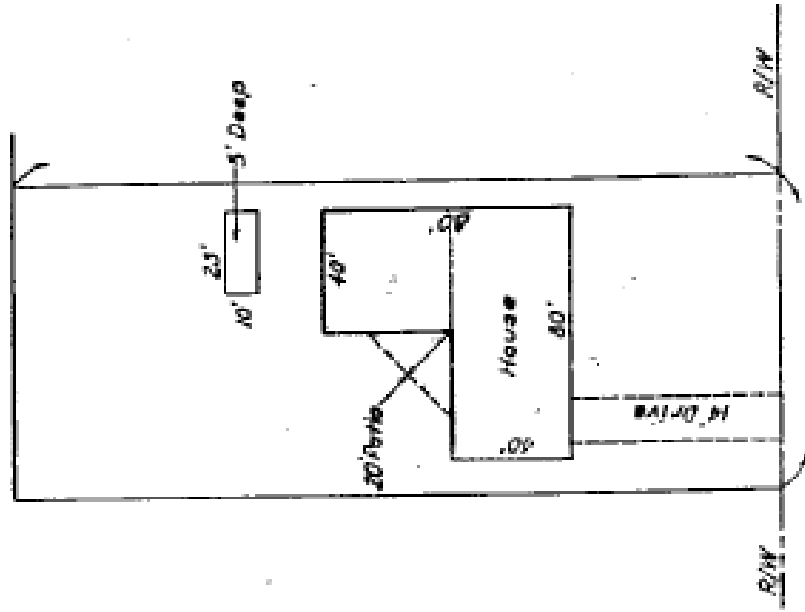


Typical Section of Infiltration Trenches
Modified after Frederick Co., MD. (1979)

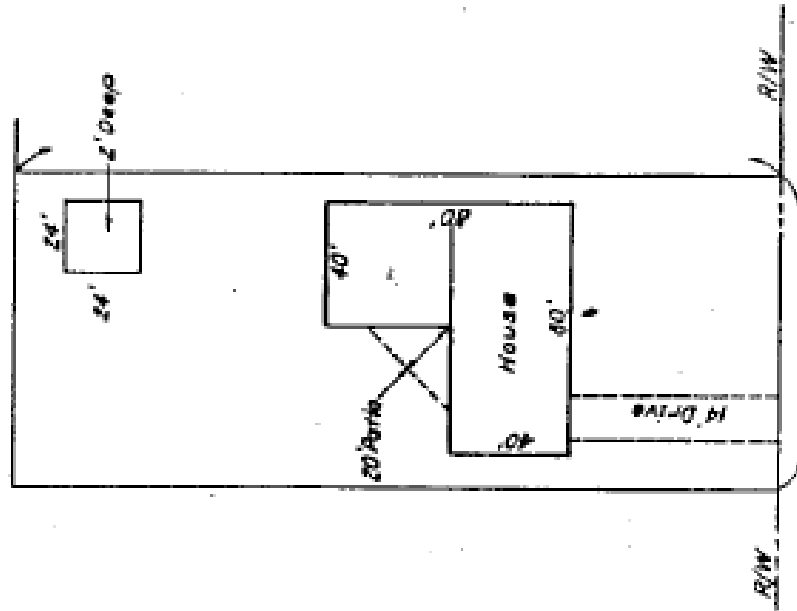


Source: Modified from Sullivan (1981)

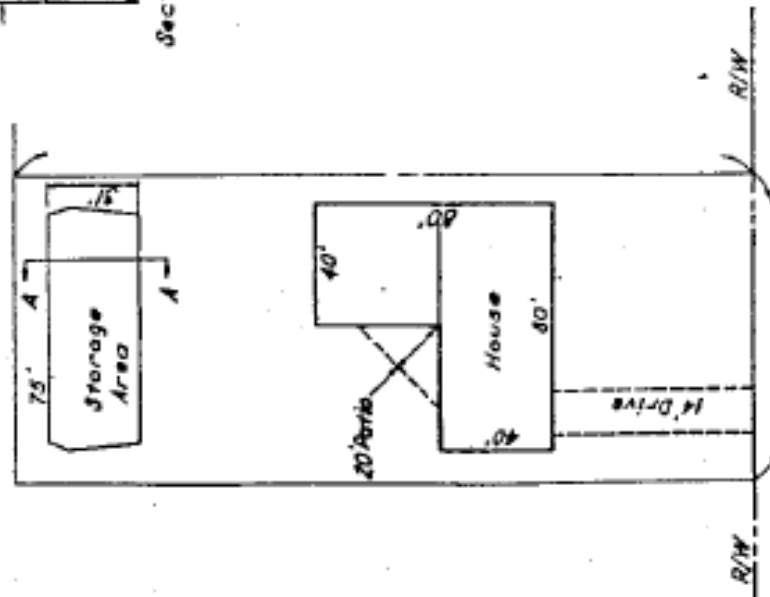
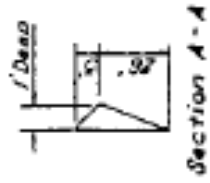
ON-SITE STORM WATER MANAGEMENT
ALTERNATE NO. 4
UNDERGROUND TANK STORAGE



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



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



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

