Fishing Creek/Cedar Run Watershed
- Act 167 -
Stormwater Management Plan

FISHING CREEK/CEDAR RUN WATERSHED

- ACT 167 -

STORMWATER MANAGEMENT PLAN

The Clinton County Conservation District prepared this storm water management plan with assistance from Sweetland Engineering and Associates, Inc. and the Department of Environmental Protection. The Department of Environmental Protection, under the authority of Act 167, has provided a grant covering 75% of the funding required to produce the Plan.

Adopted by Clinton County Board of Commissioners, December 13, 1995

Approved by PA DEP Bureau of Stormwater and Sediment Control, March, 1996

ACKNOWLEDGMENTS

Sweetland Engineering & Associates, Inc. would like to thank the Clinton County Board of Commissioners for the opportunity to work on this project. It has been challenging and rewarding.

The Clinton County Board of Commissioners, represented by Commissioners Larry Kephart, Robert Ohl and Miles Kessinger, have been actively involved with this project. A Watershed Plan Advisory Committee (WPAC) was formed in 1991 to encourage mutual understanding and cooperation among various groups that have an interest in the Fishing Creek/Cedar Run Watershed. Meetings of this WPAC were held in the Porter Township Municipal Building during the formative period of this Fishing Creek/Cedar Run Watershed Storm Water Management Plan.

Members of the Watershed Plan Advisory Committee:

James C. Bechdel, Bald Eagle Township Supervisor
Harry McKeague, Castanea Township Secretary
Nancy Sember, Crawford Township Secretary
Ralph Brungart, Greene Township Supervisor
Robert Miller, Lamar Township Supervisor
R. Dale Weaver, Logan Township Secretary
Beulah Brungard, Loganton Borough Secretary
Ted Jodun, Mill Hall Borough Secretary
Elaine Miller, Porter Township Secretary
Helen & Joe Fahy, Gregg Township Supervisor
Ruth Ann Weight, Marion Township Secretary
Rick Bair, Miles Township Secretary
Samuel Markel, Spring Township Secretary
Charles Snyder, Walker Township Secretary
Henry Sanders, Lewis Township Supervisor
Janet Lynch, Washington Township Secretary
Nevin Courter, 64 Water Company, Inc.
Lamar Township Authority
Fritz McGrail, Walker Township Water Association
Harry M. Barner, Nittany Water Company
Jon McCloskey, Eastville Water Company

William Leitch, Greenburr Water Company
Richard Miller, Jr., Tylersville Water Company
Martin Tressler, Booneville Water Company
Cheryl Donnely, Spring Township Water Authority
Fred Courter, Rote Mutual Water Company
Robert Gentzel, Bull Run Water Association
Dr. Lester Kleckner
Kerry Moore
Perry Ilgen
Richard C. Bowman, Jr.
Larry Dotterer
David B. Proctor, Lock Haven University
Dr. John Way, Lock Haven University
Robert Roach, Big Fishing Creek Cottage Association
Leslie W. Johnson, Bald Eagle State Forest
Byron J. McKernan, DEP Bureau of Public Water Supply
PA Fish & Boat Commission
David Jostenski, DEP-SWM & Sediment Control
Durla Lathia, Chief, DEP-SWM & Sediment Control
Dennis Bernhardy, PA Game Commission
Robert Orso, PA Department of Transportation
Paul Brann, Union County Solicitor
Union County Commissioners
Shannon Rossman, Union County Planning Commission
Ted Retallack, Union County Conservation District
Lycoming County Solicitor
Lycoming County Commissioners
Bill Jamison, Lycoming County Planning Commission
Lycoming County Conservation District
James M. Raback, Centre County Solicitor
Centre County Commissioners
Robert Donaldson, Centre County Planning Office
Robert Sweitzer, Centre County Conservation District
Lewis Steinberg, Clinton County Solicitor
Larry Kephart, Clinton County Commissioner
Miles Kessinger, Clinton County Commissioner
Robert Ohl, Chairman, Clinton County Commissioners
Timothy Holladay, Director, Clinton County Planning Commission

Rich Manning, Sweetland Engineering & Associates
Dave Sweetland, Sweetland Engineering & Associates
Suzanne Foust, Conservation District Manager

District Manager Sue Foust and Storm Water Management Planning/GIS Consultant Scott Mazzetti of the Clinton County Conservation District directed and managed this project for the Clinton County Commissioners. Brad Baylor, Michael Seyler, Harry Rippey, and Harold Gardner assisted during the data collection phase of the project. The efforts of all members of the staff and board of directors of the conservation district are appreciated.

We would like to thank everyone who reviewed the draft before final publication of this plan. Especially, we would like to thank the following reviewers for written comments: Timothy Holladay of Clinton County Planning Commission and Durla Lathia and David Jostenski of DEP Land and Water Conservation, Storm Water Management and Erosion Control.

The following members of the staff at Sweetland Engineering & Associates, Inc. were assigned to this project and were directly responsible for its completion:

Anthony Sundle	Project Engineer
Richard Manning	Project Manager
David Sweetland	Principal-in Charge

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CHAPTER 1

INTRODUCTION

Background of the Fishing Creek/Cedar Run Study

Clinton County has prepared this document to comply with the Stormwater Management Act of 1978 (Act 167). This Act requires each county in Pennsylvania to prepare and adopt stormwater management plans for each designated watershed in their county. The Fishing Creek/Cedar Run Watershed (hereinafter referred to as the Combined Watershed) is Clinton County's second stormwater management plan. It is an important plan because the potential for development and land use change in this watershed is increasing due to its proximity to both The Pennsylvania State University and Lock Haven University. Accordingly, this plan provides a mechanism for municipalities within the Combined Watershed to plan for and manage increased runoff associated with possible future development and land use change. Figure 1-1 contains the location maps of the Combined Watersheds.

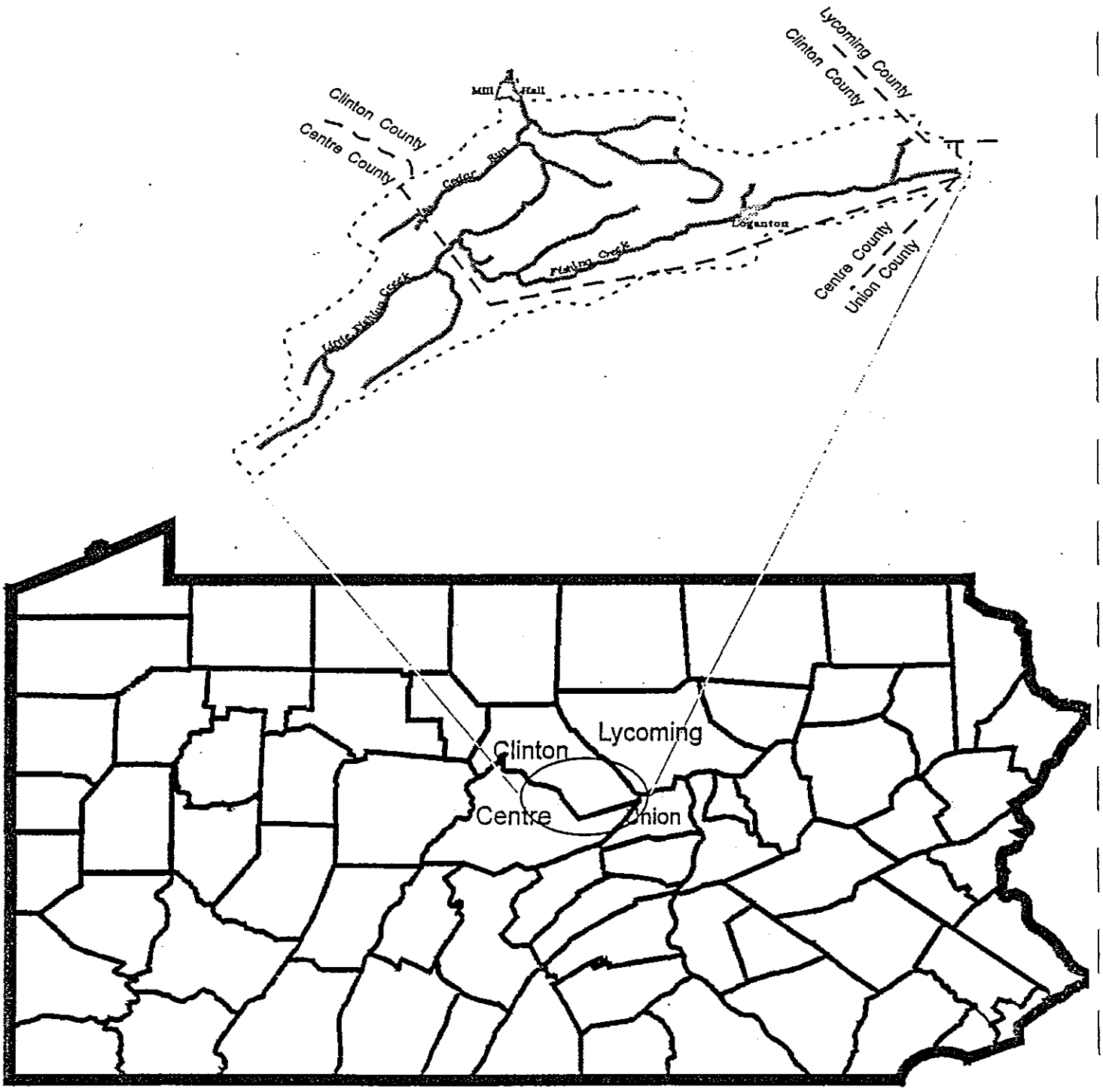
Requirements of Act 167

The following summary includes the basic elements of Act 167 in terms of specific responsibilities assigned to various units of state and local government:

1. Each county shall develop regional stormwater management plans for each watershed within its boundaries, recognizing that most watersheds will cross county boundaries, and will require collaboration with neighboring counties.
2. Each municipality will adopt local ordinances and engineering design criteria which conform to the provisions of their respective stormwater management plans.
3. Developers must implement stormwater management techniques that meet the standards and criteria set forth in the appropriate municipal ordinances, as supported by the watershed stormwater management plan. In general, these stormwater management techniques will ensure that post-development runoff rates throughout the watershed do not exceed pre-development levels.
4. PA DEP will serve as the review agency for each watershed stormwater management plan submitted by the counties. The Act 167 planning process involves three essential steps:

FIGURE 1-1

LOCATION MAPS
FISHING CREEK/CEDAR RUN WATERSHED



a. Documentation of existing watershed characteristics, including land use, soils, runoff conditions, peak flows, sub-area timing relationships, existing storm drainage problems, and flow obstructions. The existing conditions in the watershed represent the base line for evaluating the effects of future runoff caused by land development.

b. Preparation of a watershed stormwater management plan to manage stormwater based on possible future development and land use change within the watershed. The plan would include criteria and performance standards for managing urban runoff, and a listing of alternative stormwater management techniques.

c. Development of priorities for implementing stormwater management practices within each municipality in accordance with the objectives set forth in the watershed stormwater management plan. This step is crucial to the entire planning process, since local level control is the only mechanism by which we can achieve total watershed-wide stormwater management. While this may seem contradictory to our objective of watershed-wide planning, we ask the reader to bear in mind that responsibility for managing excessive stormwater would reside with each municipality, in accordance with Act 167.

Goals and Limitations of Fishing Creek/Cedar Run Watershed Stormwater Management Plan

Attempts at stormwater management often are on a municipal boundary or development site basis and do not consider downstream communities or properties. Accordingly, the purpose of this plan is to provide a watershed-wide approach to stormwater management since runoff does not recognize municipal boundaries. By treating the watershed as a single unit, we achieve a coordinated approach to stormwater management that enables us not only to maintain runoff peaks, but to allow for timing relationships of runoff.

This stormwater management plan will not control or reduce development within the Combined Watersheds. However, the plan will provide standards and criteria that can be incorporated into local ordinances to manage and maintain peak runoff flows throughout the Combined Watersheds as development occurs. Also, it is not the intent of this plan to solve existing flooding or runoff problems, but to identify them for future correction and assure that problems do not get worse. More specifically, this plan does not require the municipalities to correct the existing drainage problems.

Watershed Plan Advisory Committee (WPAC)

The Act allows municipalities, conservation districts and other interest groups to provide input and direction during.the planning process through participation in a Watershed Plan Advisory Committee. The committees' representatives include:

COUNTY AGENCIES

Clinton County Commissioners
Clinton County Conservation District
Clinton County Planning Commission
Clinton County Solicitor's Office
Centre County Commissioners
Centre County Conservation District
Centre County Planning Commission
Centre County Solicitor
Union County Commissioners
Union County Conservation District
Union County Planning Commission
Union County Solicitor
Lycoming County Commissioners
Lycoming County Cons. District
Lycoming County Planning Comm.
Lycoming County Solicitor

STATE AGENCIES

Bald Eagle State Forest
PA Fish and Boat Commission
PA Game Commission
PA Department of Transportation
PA DEP Water Supply and Community Health

FEDERAL AGENCIES

USDA Natural Resources Conservation Service (Formerly SCS)

CLINTON COUNTY MUNICIPALITIES

Bald Eagle Township
Castanea Township
Crawford Township
Greene Township
Lamar Township
Logan Township
Loganton Borough
Mill Hall Borough
Porter Township

CENTRE COUNTY MUNICIPALITIES

Gregg Township
Marion Township
Miles Township
Spring Township
Walker Township

LYCOMING COUNTY MUNICIPALITIES

Washington Township

UNION COUNTY MUNICIPALITIES

Lewis Township

WATER COMPANIES

Booneville Water Company
Bull Run Water Assoc. Inc.
Eastville Water Company
Greenburr Water Company
Mackeyville Water Company
Nittany Water Company
Rote Mutual Water Company
Spring Township Water Authority
Tylersville Water Company
Walker Township Water Assoc.
64 Water Company, Inc.

OTHER PARTIES

Big Fishing Creek Cottage Association
Lock Haven University

This committee promoted municipal involvement that insured inter-municipal cooperation and ultimately aided in the overall preparation of the plan. The success and effectiveness of the Fishing Creek/Cedar Run Stormwater Management Plan are contingent upon the continued cooperation and input from the municipalities.

Sweetland Engineering and Other Plan Participants

Sweetland Engineering & Associates, Inc., the Planning Consultant, of State College, Pennsylvania was the Lead Agency's engineering consultant for Stormwater Management Planning. The Consultant was responsible for preparing the technical components of this plan including Model Selection, Calibration, and Runs, and developing the Technical Standards and Criteria of the model ordinance.

Clinton County Conservation District (hereinafter referred to as the Lead Agency) was the agency responsible for preparing this stormwater management plan, while Centre, Lycoming and Union County Government Offices are participating organizations. Specific government offices from each county that are participating in the planning process are listed under the WPAC section above.

CHAPTER 2

CHARACTERISTICS OF THE FISHING CREEK CEDAR RUN WATERSHED

Hydrologic Features

The Combined Watershed consists of four sub-watersheds including Fishing Creek (99.5 square miles), Little Fishing Creek (42.1 square miles), Long Run (24.4 square miles) and Cedar Run (15 square miles). The total drainage area of the Combined Watershed is approximately 181 square miles.

The Fishing Creek watershed originates east of the Borough of Carroll in Union County, flowing first through Sugar Valley and then through the upper portion of Nittany Valley for a total distance of 42 miles. Sinkholes are very prominent throughout the 27 miles of southwestward travel through Sugar Valley. As a result, this section of Fishing Creek experiences intermittent flow during dry months as the water drains underground through the limestone topography. The northwest flowing segment from Tylersville to Lamar exhibits perennial flow except for a small area of intermittent flow upstream of the Fish Hatchery at Tylersville. From Lamar, Fishing Creek flows northeast to Mill Hall where it discharges into Bald Eagle Creek.

Little Fishing Creek with its Roaring Run and Laurel Run tributaries emanates near Pleasant Gap in Centre County, flowing a distance of 15.8 miles northeast to its confluence with Fishing Creek at Lamar.

Long Run, including the Cooper Run, Pepper Run, Washburn Run, and Chub Run tributaries, travels 13.3 miles northwest from its origin near Logan Mills in Clinton County to Salona where it discharges into Fishing Creek.

The Cedar Run Watershed beginning east of Jacksonville, Centre County, travels 8.7 miles northeast and merges with Fishing Creek at Cedar Springs in Clinton County.

Topography & Regional Geology

As a part of the Appalachian Mountains, the Combined Watershed exhibit the classic topography of this mountain system, consisting of 3 northeast-southwest trending mountain ridge complexes separated by 2 inter-mountain valleys. The Sugar Valley mountain complex forms the eastern boundary of the watershed succeeded to the northwest by the Big Mountain

Complex. The western border of the watershed is delineated by the crestline of Bald Eagle Mountain. These mountain ridges are composed of sedimentary sandstones and quartzite of the Bald Eagle, Juniata, Tuscarora and Clinton Formations. The Reedsville shale and the shaly limestone Coburn-Nealmont Formations provide the transition between ridge and valley.

Of the two inter-mountain valleys, Sugar Valley is situated on the eastern side of the watershed while the upper portion of Nittany Valley composes the western member of the valley sequence. These valleys are constructed from Ordovician Carbonates of the Bellefonte, Axeman, and Nittany Formations. The Upper Cambrian Gatesburg Formation, the oldest geologic formation in the watershed, is expressed in the western region of Nittany Valley.

Drainage System

The Combined Watershed display the classic transverse drainage system found almost exclusively within the central and southern Appalachian Mountains of the eastern United States. The mainstem of the Combined Watershed, Fishing Creek, is the dominant consequent stream carving 3 watergaps through the mountain ridges. The main tributaries flowing on the valley floors compose the subsequent streams of the system while the streams flowing from the slopes of the mountain ridges form the obsequent and resequent streams and complete the classic drainage pattern of the watershed.

Soil Associations and SCS Hydrologic Soil Groups

The primary soil associations in the Combined Watershed include Dekalb-Clymer-Cookport, Hagerstown-Wiltshire, Murril-Buchanon-Laidig, Pope-Barbour-Sequatchie and Lehew-Ungers-Albrights. Dekalb-Clymer-Cookport soil association makes up the majority of the Combined Watershed. The most common land use associated with these soils is forest land. Hagerstown-Wiltshire soils primarily occur in Nittany and Sugar Valleys. Extensive farming operations dominate these valleys. Murril-Buchanon-Laidig soils occur on the moderately sloping edges of Nittany and Sugar valleys. Pope-Barbour-Sequatchie soils border Fishing Creek and Long Run in Mackeyville and Rote, respectively. Lastly, Lehew-Ungers-Albrights association occurs primarily on the North facing slope of Rainsares Mountain in Lamar Township. Soil Association data (IDRISI-GIS map images) are available for review at the Clinton County Conservation District.

The USDA Natural Resources Conservation Service (formerly SCS) collected and digitized the soil data for the Combined Watershed as a part of the 1995 update of the Clinton County Soil Survey. Towson State University converted these data into IDRISI-GIS. A Hydrological Soil Group (HSG) category was assigned to each soil type according to the HSG Inventory in Appendix A of the SCS Technical Release-55 (TR-55), 1986. The basis for Hydrologic Soil Group classification is the infiltration rate of the bare soil after prolonged wetting. This classification system includes 4 categories: Hydrologic Soil Groups A, B, C, and D. Table 2-1 lists the infiltration rate, runoff potential, and soil texture for each HSG.

Table 2-1
Runoff Potential, Infiltration Rate and Soil Texture
of the Hydrologic Soil Groups
(from Soil and Water Conservation Technical Guide Pennsylvania, 1991)

Hydrologic Soil Group	Runoff Potential	Infiltration Rate	Soil Texture
A	low	high	sand, or sandy loam
B	moderate	moderate	silt loam or loam
C	moderate to high	low	sandy clay loam
D	high	very low	clay loam or clay

Only hydrologic soil groups B, C, and D occur within the Combined Watershed (Plate 4). Specifically, HSG B soils occupy 28% of the Combined Watershed. HSG B soils occur primarily in the agricultural valleys. The majority (59%) of the soils within the Combined Watershed are classed as HSG C, and are associated with the steeper, forested regions. Hydrologic soil group D soils exist mostly in Centre County just south of Little Fishing Creek and immediately south of Roaring Run. In Clinton County, HSG D soils are common in Mill Hall and Sugar Valley, but occupy only very small areas throughout the remainder of the Clinton County portion of the Combined Watershed. Overall, HSG D soils occupy 8% of the Combined Watershed. The remainder of the Combined Watershed is primarily stony land and quarries (5%).

Existing Land Use and Land Cover

The United States Geological Survey (USGS) derived the land use and land cover data from digital USGS, 1:250,000-scale base maps. Towson State University converted these data into IDRISI GIS. These data identify 9 land use types according to an Anderson Level II categorization. Table 2-2 lists the total acreage and percentages of each land use type in the Combined Watershed.

Table 2-2
Land Use Classification for the
Fishing Creek/Cedar Run Watershed

LAND USE TYPE	ACRES	PERCENTAGE
Residential	841	0.72
Comm/Indust	111	0.10
Impervious Surfaces	1421	1.22
Crop, Pasture	35,822	30.79
Orchards, Nurseries	30	0.03
Other Agriculture	66	0.06
Forest	77,624	66.72
Strip Mines	72	0.06
Open Space	354	0.30
Total	116,341	100.00

Existing land use in the Combined Watershed (Plate 1) is primarily forest with agriculture dominating the valleys. Forest land comprises about 67% of the Combined Watershed. A large portion of this forest land is either Bald Eagle State Forest, Tiadaghton State Forest or State Game Lands 255 and 295. Most of the logging in the Combined Watershed occurs on private land, but some does occur on state lands. Recreationists have private hunting and summer camps dispersed throughout the forest land.

Agriculture is the second most common land use in the Combined Watershed. Most of the farmlands are located in the wide limestone valleys. Major farming enterprises include dairy, beef, poultry, grain and produce. The most common crops are corn, wheat and hay.

Residential land use is centered around Mackeyville, Lamar, Cedar Springs, Mill Hall, Mingoville, Nittany, Hublersburg, and Loganton. State Routes 880, 64 and 220, and Interstate 80 are the most highly traveled roads. Commercial land in the Combined Watershed is primarily in Mill Hall.

Future Land Use and Land Cover

The future land use data were derived for the Combined Watershed from the existing land use data using IDRISI-GIS. Plate 2 (Future Land Use and Land Cover) contains the primary changes to the existing land use plate.

The future land use changes were determined based on the planning studies, growth rates, and other information that was available as of February, 1995. Please note that the parameters of planning studies may change prior to actual plan implementation.

Sub-Area Characteristics

As shown on Plate 4, the Combined Watershed was divided into 118 sub-areas. Fishing Creek, Little Fishing Creek, Long Run, and Cedar Run sub-watersheds contain 58, 33, 15, and 12 sub-areas, respectively. The Consultant delineated the sub-area boundaries and Towson State University digitized them into IDRISI-GIS. The Consultant determined the sub-area boundaries based on drainage and land use characteristics, and adjusted the boundaries of some sub-areas in order to utilize stream crossings with known flow characteristics as points of interest through which all runoff from that sub-area flows. Table A-1 in Appendix A contains a summary of the average hydrologic characteristics for each sub-area and sub-watershed.

SCS Runoff Curve Numbers

SCS runoff curve numbers (CN) were calculated for each sub-area in the Combined Watershed using land use classes in Chapter 2 of SCS TR-55. Geology, land use, hydrologic soil groups, hydrologic connectivity, and time of concentration of runoff were used to determine the curve numbers. The hydrologic connectivity (Figure 6-1) is the flow direction or pattern of runoff from sub-area to sub-area. The time of concentration for each sub-area is the time for runoff to travel from the hydraulically most distant point within the sub-area to the sub-area outlet. Both the hydrologic connectivity and time of concentration are important in determining the impact of upstream runoff on downstream areas. Average weighted curve numbers were calculated for

each sub-area and listed in Table A-1. The table includes both existing and future average weighted CN's.

Precipitation and Design Storms

There are no known rain gauges within the Combined Watershed. In the absence of actual storm rainfall data, "design" storms that have a time distribution as devised by Natural Resource Conservation Service or Pennsylvania Department of Transportation (PA DOT) are used for hydrologic modeling. The Consultant obtained the depths of the design storms from the PA DOT Field Manual of Storm Intensity-Duration-Frequency (IDF) Charts, Region 3 (1986). Table 2-3 shows the 24-hour design storm depths for the 2 through 100-year return period storms.

The mean annual precipitation throughout the Combined Watershed averages 40 to 42 inches according to the Water Resources Bulletin No. 16, Pennsylvania Gazetteer of Streams Part II, 1984.

Table 2-3
24-Hour Design Storm Depths
and 24 Hour Duration's
(after PA DOT IDF Charts, 1986)

Return Period (years)	24-Hour Duration (inches)
2	2.60
5	3.10
10	3.70
25	4.60
50	5.10
100	6.00

Stream Flow and Estimated Design Floods

The stream flows utilized in the Flood Insurance Studies within the Combined Watershed were based on approximate statistical methods. These flows, and flows computed from other methods, were compared to estimated streamflows from the hydrologic model during model calibration, as discussed later in this report.

Flood Insurance Studies

Flood Insurance Studies have been prepared by the Federal Emergency Management Agency (FEMA) or the Department of Housing and Urban Development (HUD), to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Many of these Flood Insurance Studies include detailed delineation studies. Detailed delineation studies in the Combined Watershed include: Little Fishing Creek from its confluence with Fishing Creek in Porter Township to an access road in Walker Township about 3000 feet from the Clinton and Centre County boundary and from Legislative Route 14027 to the old railroad grade in Mingoville; Long Run from its confluence with Fishing Creek to approximately 0.6 mile upstream of Township Route 362 (Wetzel Road) in Lamar Township; Roaring Run from its confluence with Little Fishing Creek to the intersection of T-907 and T-605 in Walker Township; and Fishing Creek from its confluence with Bald Eagle Creek to the Legislative Route 18006 bridge over Fishing Creek in Porter Township. Data from detailed studies include floodplain boundaries, floodways, design storm-flood profiles for the 10, 50, 100, and 500 year storms, and summaries of the drainage area-peak discharge relationships for specific streams. These Flood Insurance Studies are available for review from either the municipality in which the stream is located or from the Clinton and Centre County Conservation Districts.

Existing and Future Floodplain Development

Development within currently urbanizing areas of the Combined Watershed will be primarily regulated by floodplain management regulations enacted by the local municipalities. Act 166 required all municipalities in the Combined Watershed to enact ordinances that regulate the type and extent of development within floodplain areas. Specifically, these ordinances limit future floodplain development to that which would not significantly alter the carrying capacity of the floodplain or be subject to a high damage potential.

The Combined Watershed shall be regulated by the following criteria:

1. Damage potential of existing floodplain development will remain unchanged, for storm events representing the two-year through 100-year return period events, through implementation of the stormwater management criteria included in the Fishing Creek/Cedar Run Watershed Stormwater Management Plan.
2. Damage potential for future floodplain development will be minimized by only permitting specific types of development which are damage resistant consistent with the Floodplain

Management Act as implemented through municipal floodplain regulations and the Department of Environmental Protection Chapter 105 - Dam Safety and Waterway Management Regulations and Chapter 106 - Floodplain Management Regulations.

3. Damage potential of existing and future floodplain development may be reduced with implementation of remedial measures in areas subject to inundation. The effectiveness and design life of any remedial measures would be enhanced by implementation of the Stormwater Management Plan.

CHAPTER 3

EXISTING STORM DRAINAGE PROBLEMS AND HYDRAULIC OBSTRUCTIONS

Existing Drainage Problems

Existing drainage problems in the Combined Watershed include the flooding of residential streets, township routes, state routes, residential properties, and commercial properties. The Lead Agency obtained this information from the local municipalities via questionnaires and other letters of request. Table 3-1 is an inventory of the existing storm drainage and flooding problems in the Combined Watershed.

Table 3-1
Inventory of Existing Drainage Problems in the Fishing Creek/Cedar Run Watershed

Sub-Area	Identifier	Calculated Capacity	Comments	Preliminary Recommended Solutions
12	T6-1 * Greene Twp	848	Property flooding SR2002	
12-14 (border)	T3-22 * Greene Twp	6376	Roadway and property flooding T352 (Stover Rd)	
17, 18	T3-11, T3-8 Greene Twp	18, 194	Roadway and property flooding T415 (Hopple Hollow)	
62-63 (border)	T5-7 * Walker Twp	950	Roadway and property flooding T467 at Little Fishing Creek Bridge	
75	T5-5 Walker Twp	21	Soil erosion and sedimentation T467 (McClain, Rodgers Rd) at the Roaring Run Bridge	

* Designates a significant obstruction

Table 3-1 (cont.)
Inventory of Existing Storm Drainage Problems in the Fishing Creek/Cedar Run Watershed

Sub-Area	Identifier	Calculated Capacity	Comments	Preliminary Recommended Solutions
77	T1-32 Porter Twp	5509	Sedimentation SR0064 east of T468	
77	T1-34 * Porter Twp	4917	Property flooding SR0064 left branch of Fishing Creek too much flow for stream crossing	
79	T2-62 * Porter Twp	1289	Roadway and property flooding SR2004 between Mackeyville and Clintondale	
79	T2-62 * Porter Twp	1289	Roadway and property flooding SR2004 between Mackeyville and Clintondale	
80	T2-64 * Porter Twp	19399	Roadway and property flooding SR2004 between Mackeyville and Clintondale	
83	T2-66 Porter Twp	4075	Roadway and property flooding T328 & SR2004 at Walizer Brdg.	
111	T2-23 Lamar Twp	21	Flooding Bob Quiggle property	

* Designates a significant obstruction

Table 3-1 (Cont.)
Inventory of Existing Storm Drainage Problems in the Fishing Creek/Cedar Run Watershed

Sub-Area	Identifier	Calculated Capacity	Comments	Preliminary Recommended Solutions
112	T2-32 Lamar Twp	5	Roadway and property flooding and soil erosion East end of T353	
114	T2-15 Lamar Twp	288	Roadway and property flooding SR 477 across from Karstetter's Welding	
118	T2-6 * Mill Hall Boro	11336	Roadway and property flooding Church Street Hse #600-#622	
118	T2-84 Lamar Twp	8806	Property flooding SR 477 Confer's Gas	

Survey of Significant Obstructions

Obstructions along channels limit flow capacity and can potentially cause significant ponding or diversion of water. The Lead Agency identified 103 significant hydraulic obstructions within the Combined Watershed. These obstructions were determined "significant" based on the following distinction:

> An obstruction in a stream or channel shall be deemed "significant" if it has an estimated flow capacity which is less than the 10-year return period peak flow from the calibrated hydrologic model of a watershed prepared as part of the Act 167 Plan.

Table 3-2 lists the significant obstructions and their structure sizes and hydraulic capacities (bank full).

Table 3-2
Inventory of Significant Hydraulic Obstructions in the Fishing Creek/Cedar Run Watershed

Identifier	Sub-area	Calculated Capacity	Pipe Size	Description
T4-24	1	385	72"	Breon Road
T4-25	2	5	16"	SR 2002
T4-27, 28	2	1550, 1464	18x8, 17x8	SR 0080
T4-12	3	624	11x6	Sugar Valley Narrows Road
T4-17	3	129	53"	Sugar Valley Narrows Road
T4-13	4	133	54"	Sugar Valley Narrows Road
T4-18	5	107	54"	Breon Road
T4-11	7	56	42"	Fourth Gap Road
T4-18	8	107	54"	I-80
T4-1	10	3217	45x7	Winter Rd - Summer Road connection

Table 3-2 (cont.)
Inventory of Significant Hydraulic Obstructions in the Fishing Creek/Cedar Run Watershed

Identifier	Sub-area	Calculated Capacity	Pipe Size	Description
NONE	11			Sinkhole - @ Eastville
T3-22	12	6376	36x13	Connect Rd 13,000 feet East of 477 (Stover Rd)
NONE	13			Sinkhole -
T3-25	14	1594	22.3x7	Private Drive
T3-27	15	1584	19.4x7.7	Private Drive
T3-10	17	106	50"	Hopple Hollow Road
T3-18	18	1304	124"	Rte 477
T3-29	19	6536	48.4x11	Rte 477
NONE	20			Sinkhole - East of Sugar Grove School
T3-30	21	1072	3 - 6.7'	T351
T3-34	22	3015	35x8	SR 2009
NONE	23			Sinkhole - Bull Run Gap
T3-33	24	54	36"	SR 2009
NONE	25			Sink - Green Burr Gap
NONE	26			Sinkhole - Wolfs Gap
T2-78	27	50557	23x10.3	SR 2007-Logan Mills
NONE	28			Sink Schrekengast Gap
T6-7	29	18365	136x11	Rte 880
NONE	30			Sinkhole Spangler Gap

Table 3-2 (cont.)
Inventory of Significant Hydraulic Obstructions in the Fishing Creek/Cedar Run Watershed

Identifier	Sub-area	Calculated Capacity	Pipe Size	Description
T6-5	31	3144	38x8	Summer Road
NONE	32			Sinkhole Colvey Gap
T6-3	33	5744	49x10	SR 2002
T6-2	35	105	48"	Bear Run (SR 2002)
T6-1	40	848	19x5	SR 2002
T5-1	41	8728	74x10	SR 2002
T1-35	43	6097	25.8'x 7.2'	LR 18041 Hatchery below Sink
T4A-6	45	1421	23x6.3	34000' east of 0144
T4A-5	46	625	15.1x4.7	Private Drive
T4A-11	47	105	48"	T461
T4A-3	48	193	5.8x4	T470
T4A-2	50	1043	15.5x6.7	Private Drive
T4A-1	51	527	19.6x3.4	Private Drive
T5-17	54	316	10.9x3.6	Private Drive
T5-22	55	473	13x4	T695
T5-13	56	436	14.5x3.7	Private Drive
T5-11	58	4540	56x8	Rte 64
T5-8	61	5767	61x8	Rte 64
T5-7	62	950	21x5	T467
T5-3	63	21	24"	SR 0064

Table 3-2 (cont.)
Inventory of Significant Hydraulic Obstructions in the Fishing Creek/Cedar Run Watershed

Identifier	Sub-area	Calculated Capacity	Pipe Size	Description
T5-1	64	8728	74x10	SR 2002
T1-41	65	1014	25.8'x 4.52'	Private Drive
NONE	74			Sinkhole
T1-40	75	3177	27.8x 9.78	Rte 64
T1-33	76	4501	48'x8.5'	Private Drive
T1-34	77	4917	42.9'x 9.8'	SR 0064 @ Clintondale
T1-30	77	11132	100x9.6	SR 0064
T2-62	79	1289	42x9	Rte 120
T2-64	80	19399	42x12	Rte 120
T2-65	81	4075	57x7	Rte 120
T2-69	82	58	7.9x2.6	Mackeyville Road
T2-51	83	24060	59x15	LR 18030
T2-48	84	2939	36x8	Rte 120
T2-44	85	1131	14.8x9.8	I-80
T2-45	86	25	4.5x3	Mackeyville Rote Rd LR 18030
T2-47	87	612	12.5x5.3	T358
T2-85,90	88	15137	69x9.5	Rte120 Cedar Springs
T1-17	91	285	15'x2.6	LR 18008
T1-15	92	54	42"	LR 18008
T1-12	93	314	60" & 54"	T321

Table 3-2 (cont.)
Inventory of Significant Hydraulic Obstructions in the Fishing Creek/Cedar Run Watershed

Identifier	Sub-area	Calculated Capacity	Pipe Size	Description
T1-5	97	522	14.2'x 4.3'	SR 2018 above Pavin
T1-3	98	1511	38.8x4.5	T321 @ Pavin
T1-2	99	3879	77.6x5.4	SR 2018
T3-14	101	88	4.7x3.2	Cherry Run Road
T3-7E	102	2148	161"	I-80
T3-7	103	2316	166"	I-80
T3-3	104	1136	20.6x5.8	Mt. Riansares Road
T3-39	105	907	15x6.2	Mt. Riansares Road
T3-1	106	1010	16x6	Rte 477
T2-40	107	364	6x6	I-80
T2-37	108	2431	34x7	Private Drive Just above Sinkhole
T2-28	109	88	40"	T357 Int Nittany Rd
T2-31C	110	196	52"	T364
T2-21	112	288	17x3	T364
T2-33	113	1594	35x5	Rte 477
T2-14	114	288	11x3.5	Rte 477 below Lamar School (Chub Run)

Table 3-2 (cont.)
Inventory of Significant Hydraulic Obstructions in the Fishing Creek/Cedar Run Watershed

Identifier	Sub-area	Calculated Capacity	Pipe Size	Comments
T2-10	115	1436	28'x5.5	Salona Stone Quarry
T2-12	115	1820	36x5.5	Rte 477 @ Salona
T2-8	116	222	66"	Rte 220
T2-9	117	341	8x5	Rte 64
T2-1,2,3,4, 5,6,7	118	4310, 15073, 21819	82x5.5	3 @ Rte 220

CHAPTER 4

EXISTING MUNICIPAL ORDINANCES

Municipal Ordinance Evaluation

Table 4.1 shows the types of Land Use and Land Development Ordinances governing each of the sixteen municipalities in the Combined Watershed. Please take note that the majority of the municipalities do not have a specific requirement for stormwater management. However, stormwater management for Crawford and Logan Townships is regulated by the Clinton County Sub-Division and Land Development Ordinance (SDLD). Likewise, stormwater management for Gregg, Walker, Marion, and Miles Townships is regulated by the Centre County SDLD Ordinance. These SDLD Ordinances require that post development runoff levels do not exceed pre-development runoff levels.

Table 4-1
Existing Municipal Ordinance Matrix
Fishing Creek/Cedar Run Watershed

MUNICIPALITY	Stormwater Regulation	Sub-division and Land Development Ordinance	Floodplain Management Regulation	Zoning Ordinance
Washington Twp.	Y	Y	Y	Y
Lewis Twp.	N	N	Y	N
Spring Twp.	Y	Y	Y	Y
Gregg Twp.	N	Y	Y	N
Walker Twp.	N	N	Y	Y
Marion Twp.	N	N	Y	Y
Miles Twp.	N	N	Y	N
Porter Twp.	Y	Y	Y	Y
Logan Twp.	N	N	Y	N

Y = Yes N = No

Table 4-1 (cont.)
Existing Municipal Ordinance Matrix
Fishing Creek/Cedar Run Watershed

MUNICIPALITY	Stormwater Regulation	Sub-division and Land Development Ordinance	Floodplain Management Regulation	Zoning Ordinance
Lamar Twp.	Y	Y	Y	Y
Mill Hall Boro.	Y	Y	Y	Y
Bald Eagle Twp.	Y	Y	Y	Y
Castanea Twp.	N	Y	Y	Y
Greene Twp.	N	Y	Y	Y
Loganton Boro.	N	N	Y	Y
Crawford Twp.	N	N	Y	Y
Clinton County	Y	Y	Y	Y
Centre County	Y	Y	N	N

Y = Yes N = No

Municipalities with existing comprehensive zoning, building, subdivision and land development codes and ordinances can incorporate stormwater standards into their existing ordinances. Alternatively, the municipalities in the Combined Watershed may consider adopting a freestanding stormwater management ordinance. As such, this plan contains a model ordinance that the municipalities can adopt either unchanged or amended, but all amended versions must retain the exemption criteria. Chapter 10 (Model Ordinance), Chapter 8 (Standards and Criteria), and Chapter 11 (Plan Implementation) of this plan each offer more information about the ordinance.

CHAPTER 5

FLOOD PROTECTION PROJECTS AND STORMWATER COLLECTION SYSTEMS

Existing and Proposed Stormwater and Flood Protection Facilities

DEP Bureau of Flood Protection Projects provided The Lead Agency with the results of the Flood Protection Feasibility Study along Fishing and Bald Eagle Creeks in Mill Hall and Bald Eagle Township, Clinton County. The Department of Environmental Resources' publication "SWP-10 STATE WATER PLAN FOR SUBBASIN #9" recognized this as a severe floodprone area. Both communities are subject to overbank flows from Fishing and Bald Eagle Creeks with $6.35 million in damages reported from the 1972 disaster. The 100-year flood damages in Mill Hall were updated for the study to $10,700,000. This figure does not include some companies that went out of business as a result of the 1972 flood.

A flood protection project was devised to protect Mill Hall and the commercial district along Hogan Boulevard in Bald Eagle Township from 100-year floods on Fishing Creek and backwater along Bald Eagle Creek. Compacted earth levees and concrete capped sheet pile walls were considered to contain floods within the channel. Four bridges (Peale, Church, and Main Streets, and Conrail) would have to be removed or replaced to a higher level at the expense of the owners or the local project sponsor. The estimated construction cost of this project including the local costs of replacing bridges and removing buildings is more than $20 million.

The levees and walls extending above the ground along the streambanks would detract from the aesthetics of the area. The higher bridges with raised approaches would disrupt the existing street network and alter traffic patterns. These factors and the high cost and complexity of the project make it impractical from a structural as well as an economic standpoint. For this reason the project is not recommended.

This feasibility study, the only proposed flood protection project considered in the Combined Watershed, provides an example of the costs for a large scale flood protection project in this watershed. Any organization producing plans for new facilities in the future should develop and submit the plans to the appropriate municipalities, as described in the model ordinance contained in Chapter 10 of this report.

CHAPTER 6

HYDROLOGY MODEL SELECTION

Criteria for Model Selection

It was essential that the hydrology model for this watershed-wide stormwater management plan have the capability to represent variable land use throughout the watershed and to produce a full hydrograph response from each sub-area. The objective of model development was to provide a hydrologic analysis tool which can be used to: (1) establish baseline runoff conditions under present land use in the Combined Watershed; (2) quantify the impact of future land use conditions on runoff peaks, volumes, and sub-area timing relationships; and (3) evaluate alternative stormwater runoff management techniques.

The following criteria were used to select a hydrologic computer model for the Combined Watershed:

1. The model should produce a full hydrograph and must be capable of evaluating variable soils and land use conditions. The model should be able to route hydrographs through different stream reaches and identify principal runoff source areas at selected points-of-interest. The model should also compute sub-area release rates, or provide travel time and peak flow information from which these release rates may be developed.
2. The model must be able to evaluate the hydrologic effects of land use change, channel modification, and stormwater management practices.
3. The selected model must be computationally efficient and its data input requirements must be compatible with data readily obtained for the Combined Watershed.

Models Considered for the Fishing Creek/Cedar Run Watershed

There are a number of hydrology models and methods that satisfy the criteria described above. The following list includes the most prominent hydrology models and methods available at the time of this study:

1. The HEC-1 computer program developed by the U.S. Army Corps of Engineers, Hydrologic Engineering Center, is a comprehensive rainfall-runoff computer model for simulating runoff hydrographs from multiple storm events. It was developed originally for large natural watersheds, but has been modified recently to accommodate small, urbanizing

basins. The most recent release of HEC-1 was in September, 1990, and introduces additional stream reach routing techniques. This program has the capability to model flow diversions, and provides output regarding travel times and peak flows that can be used to compute sub-area release rates. HEC-1 is appropriate for use on the Combined Watershed.

2. PSRM (Aron, 1992) is a single-event, rainfall-runoff computer model that was developed to simulate small urban and suburban watersheds having simple storm drainage networks. PSRM assumes that all runoff occurs as sheet flow on an overland surface. The "peak flow presentation table" is a feature of PSRM output that identifies sub-areas that contribute a substantial amount of runoff to the total hydrograph peak at a downstream point-of-interest. This feature can be used to locate possible sites for regional stormwater management facilities. The channel routing capability of PSRM is adequate for short reaches of channel or storm sewer. The channel routing technique is capable of modeling storm sewer surcharge and out-of-bank channel flow. PSRM is appropriate for use on the Combined Watershed.

3. The SCS computer model TR-20 (1969), revised in 1983, has been an important tool for stormwater and flood protection project formulation in undeveloped watersheds for many years. TR-20 is based on the SCS soil-cover-complex or runoff curve number (CN) for rainfall losses, a dimensionless unit hydrograph for sub-area runoff, and an attenuated kinematic wave routing method for channels. Reservoir routing is accomplished using the Modified Plus or Storage Indication Method. TR-20 was developed for the purpose of evaluating hydraulic structures and their impacts on watershed hydrology. TR-20 can model flow diversions, and provides travel time and peak flow output that can be used to develop release rates. TR-20 is appropriate for use on the Combined Watershed.

4. The SCS TR-55 procedure (1986) is a design storm method for analyzing small, developing watersheds. It has full hydrograph capability, based on the tabular hydrograph application to a 24-hour design storm, and is able to determine local impacts and downstream effects of land use change on the hydrology of an area. It was developed as a simple approximation to TR-20 by SCS in 1975, and was revised in 1986. TR-55 does not have the capability to model diversion or reservoir flows: therefore, it was not considered appropriate for use on the Combined Watershed.

Summary of the Hydrology Model Used for Fishing Creek/Cedar Run

The model chosen for the Combined Watershed was the SCS computer model TR-20. TR-20 is appropriate for use on the Combined Watershed as it meets all selection criteria previously discussed. From a practical perspective, it is likely that the majority of hydrologic computations for future land development projects within the Combined Watershed will be completed using a desktop hydrologic procedure, such as TR-55 which is a simplification of the TR-20 methodology. The 24-hour storm was selected because there are no provisions in the TR-55 procedure to compute runoff for storm duration's other than the 24-hour storm. It was expected that the use of the 24-hour storm in the hydrologic model selected here, and in all future hydrologic computations using a procedure such as TR-55, would result in consistent peak flow results.

CHAPTER 7

APPLICATION OF SELECTED HYDROLOGIC MODEL

Development of a Model for the Fishing Creek/Cedar Run Watershed

1. The Combined Watershed was divided into sub-areas to analyze flows and flow relationships. The sub-areas were delineated based on the location of stream confluence points and surveyed hydraulic (in-stream) obstructions using information provided by the Lead Agency. Data concerning land use, curve number, impervious fraction, overland slope, overland flow length, and Manning's roughness coefficient (n) were compiled for each sub-area. This information was compiled using data input into the IDRISI-GIS supplied to the Consultant by the Lead Agency and USGS Quadrangle mapping.
2. The hydrologic connectivity of each of the individual sub-areas and major drainage elements located within the study area was established (See Technical Manual).
3. The 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour design rainfall depths were determined based on the Pennsylvania Department of Transportation Intensity-Duration-Frequency curves for Region 3 (Aron, et al., 1986). Design hydrographs were generated for use in the hydrologic model. Storm events of various durations were computed for TR-20 test runs. The peak flows at various points of interest in the test runs were compared to flows based on peak flow computational methods (PSU IV, USGS Regional Flood Frequency Estimates, and FEMA FIS).
4. Channel travel times and bank-full discharge capacities were computed for the major drainage elements connecting each sub-area in the Combined Watershed. Cross-section and longitudinal slope information provided by field survey and topographic mapping were used to determine these values.

The sequence of hydrologic operations in TR-20 for the Combined Watershed is basic to any watershed rainfall-runoff simulation, and is described below:

1. Surface runoff was computed by the SCS unit hydrograph method for each sub-area to produce a sub-area outflow hydrograph. The SCS curve number was applied to the design storm rainfall to produce rainfall excess.
2. Each sub-area hydrograph was routed along the main channel of each stream length to the next sub-area inflow point using the Modified Attenuated Kinematic (Modified Att-Kin) Procedure. This procedure results in no attenuation of the peak for channel

reaches with short hydraulic travel times (amounts of time it takes sub-area runoff to reach a downstream point-of-interest) relative to the overall modeling time step.

3. Sub-area hydrographs and routed hydrographs from upstream sub-areas were hydrologically combined at selected points of interest along the main channel to produce watershed peak flows.

4. Due to the significant presence of karst features within the Combined Watershed, a runoff curve number (CN) reduction technique was employed to calibrate the runoff model to various peak flow methodologies. The CN reduction technique used was developed for and utilized in the Hogestown Run/Trindle Spring Run Act 167 Stormwater Management Plan in Cumberland County prepared by Hartman & Associates, Inc. in Camp Hill, and provided by the Pennsylvania Department of Environmental Protection for use in this Plan. Table 7-1 lists the reduced runoff curve numbers.

Table 7-1
Curve Number (CN) Reduction Relationship
(Hogestown Run/Trindle Spring Run Act 167 Stormwater Management Plan in Cumberland County)

SCS Curve Number	Adjusted Curve Number
100	100
90	84
80	68
70	52
60	36
50	20

The data collection within the Combined Watershed included land use, soils, and geology. The use of these three parameters resulted in the land use being categorized by SCS hydrologic soil type (A - D) and either karst or non-karst geology. The procedure outlined above was used to reduce the CN based on karst geology while the CN in non-karst regions remained unchanged.

The SCS Curve Number weighting procedure used in the Combined Watershed is outlined below:

1) Analyze each sub-area based on land use, SCS soil type, and karst or non-karst geology.
2) Assign SCS CN's to soil type/land use category for non-karst regions based on Table 2-2 of the USDA SCS Technical Release 55.
3) Assign the same SCS CN's to soil type/land use categories for karst regions (with no reduction factors).
4) To establish a baseline comparison for the peak flows within the Combined Watershed, PSU IV (Aron, Kibler, and White 1981) and USGS-IND were used to estimate peak flows at various places within the Combined Watershed. The Federal Emergency Management Agency (FEMA) predicted peak flows within the limits of their detailed study area in the Flood Insurance Study (FIS). All three of these peak flow generators were used in comparison with the TR20 computed peak flows for the Combined Watershed.
5) TR20 test runs were made for comparison with the peak flow methods above. Test runs were developed varying from no karst area CN reduction to a maximum reduction (indicator = 20). Four rainfall duration events were considered for the model test run comparison (6 hr, 8 hr, 12 hr, & 24 hour storm events). However, due to the size of the Combined Watershed (181 sq mi), only the 12 hour and 24 hour duration events were considered for use. Table 7-2 presents a comparison of flows using various indicators and peak flow methods.

Table 7-2
12 Hour Duration 100-Year Storm Event Peak Flow Comparison
Fishing Creek/Cedar Run Watershed
Crop/Pasture CN = Pasture CN

Sub-Area No.	Drainage Area (sq mi)	Adjusted CN (cfs)	Unadjusted CN (cfs)	USGS-IND (cfs)	PSU IV (cfs)	F.I.S. (cfs)	PA Bull 13 (cfs)
19	28.9	5947	7758	4890			
27	42.7	7585	9262	6617			
29	47.2	7772	9891	7151			
40	10.8	4622	4422	2280			
43	74.8	12165	14837	10218			
55	15.2	4118	5064	2972			
64	25.5	4759	6047	4438			
74	14.7	4677	4784	2896			
75	15.3	4677	4809	2987			
77	118.2	18611	22901	14567			
83	129.5	19013	23514	15635			
88	138.8	19803	25164	16498			
100	15.1	4102	8590	2957	2762		4854
108	11.4	6123	6272	2518			
112	7.7	4159	6036	1754			
115	23.1	9498	11835	4110	4402	3820	6939
118	181.8	27156	34735	20337	19610	22300	32600

Based on the flow comparison in Table 7-2, it appeared that we would get results closest to peak flow values if we used a CN reduction based on an indicator value of 20. However, to verify that using this large a reduction would not skew the model, we compared hydrograph timing relationships and percentage of contribution to peak flows for the 100-year storm event using four comparison test models:

24 Hour Duration - AB indicator = 40

12 Hour Duration - AB indicator = 40

24 Hour Duration - AB indicator = 20

12 Hour Duration - AB indicator = 20

The results of these model runs showed that the AB indicator and shortened duration event did not affect the timing relationship of the hydrologic models, while the peaks were reduced to values more in line with the various peak flow methods - especially the lower frequency storm events. Table 7-3 presents a comparison of the TR20 flows for all computed storm events versus the USGS-IND peak flows.

Table 7-3
24 Hour Storm Flow Peak Comparison Between TR20 and USGS-IND Values
Fishing Creek/Cedar Run Watershed
(Curve Numbers are based on Crop/Pasture CN = Pasture CN)
(AB Indicator = 20 for all Data - Existing Conditions)

		Peak Flow Values for TR20 and USGS										
Design Storm	Flow Source	Sub-area Number/Drainage Area (sq mi)										
		19	27	29	40	43	55	64	83	88	108	118
		28.85	42.71	47.23	10.77	74.84	15.18	25.52	129.46	138.75	11.37	181.76
1-YR	TR20	181	183	175	156	257	103	115	499	505	203	589
1-YR	USGS	717	972	1051	334	1501	436	652	2296	2422	349	2986
2-YR	TR20	533	519	520	430	729	280	308	1424	1475	531	1814
2-YR	USGS	1178	1597	1726	549	2467	716	1071	3772	3980	573	4906
5-YR	TR20	1059	988	1010	810	1513	579	631	2830	2895	1018	3571
5-YR	USGS	1878	2545	2752	875	3932	1142	1708	6012	6344	913	7820

Table 7-3 (cont.)
24 Hour Storm Flow Peak Comparison Between TR20 and USGS-IND Values
Fishing Creek/Cedar Run Watershed
(Curve Numbers are based on Crop/Pasture CN = Pasture CN)
(AB Indicator = 20 for all Data - Existing Conditions)

Peak Flow Values for TR20 and USGS												
Design Storm	Flow Source	Sub-area Number/Drainage Area (sq mi)										
		19	27	29	40	43	55	64	83	88	108	118
		28.85	42.71	47.23	10.77	74.84	15.18	25.52	129.46	138.75	11.37	181.76
10-YR	TR20	1746	1690	1730	1360	2857	1057	1157	5103	5177	1801	6352
10-YR	USGS	2476	3356	3628	1154	5183	1505	2251	7925	8362	1203	10309
25-YR	TR20	3067	3073	3144	2329	5424	1980	2223	9622	9655	3248	11801
25-YR	USGS	3356	4549	4917	1564	7025	2040	3052	10743	11336	1631	13974
50-YR	TR20	3921	3983	4074	3018	7209	2605	2954	12758	12750	4181	15386
50-YR	USGS	4090	5544	5993	1906	8562	2487	3719	13093	13815	1988	17031
100-YR	TR20	5759	5923	6033	4569	10680	3944	4505	18655	18587	5977	22173
100-YR	USGS	4890	6617	7151	2280	10218	2972	4438	15635	16494	2373	20337

Table 7-4 presents a percentage comparison between the TR20 peak flows and the USGS-IND peak flows. Of note in Table 7-4 is that the peak flows in general show a high correlation in the lower frequency events such as the 50-year and 100-year storms. This would be expected in a karst region where large flows exceed the capacity of karst features. In the higher frequency events, the TR20 peak flows are significantly lower than the USGS-IND. Again, this is to be expected since the USGS-IND peak generation does not account for karst geology, which can significantly reduce higher frequency storm peaks.

Table 7-4
Percentage Comparison of TR20/USGS Peak Flows
Fishing Creek/Cedar Run Watershed
(Curve Numbers are based on Crop/Pasture CN = Pasture CN)
(AB = 20 for all Data - Existing Conditions)

Percentage Comparison of Flow Values by Storm Event and Sub-area											
Storm	Sub-Area Number										
Event	19	27	29	40	43	55	64	83	88	108	118
1-YR	25%	19%	17%	47%	17%	24%	18%	22%	21%	58%	20%
2-YR	45%	33%	30%	78%	30%	39%	29%	38%	37%	93%	37%
5-YR	56%	39%	37%	93%	38%	51%	37%	47%	46%	112%	46%
10-YR	71%	50%	48%	118%	55%	70%	51%	64%	62%	150%	62%
25-YR	91%	68%	64%	149%	77%	97%	73%	90%	85%	199%	84%
50-YR	96%	72%	68%	158%	84%	105%	79%	97%	92%	210%	90%
100-YR	118%	90%	84%	200%	105%	133%	102%	119%	113%	252%	109%

Based on the results of the analysis, the SCS Curve Numbers were reduced using an AB Indicator value of 20. The Curve Numbers for the hydrologic models are presented in Table A-1.

Table 7-5 presents the existing conditions sub-area and sub-watershed peak discharges where the sub-area flows represent the peak runoff from the individual sub-area at the sub-area outlet and the sub-watershed flows represent the portion of the total watershed above the sub-area outlet.

Table 7-5
Existing Conditions Sub-Area and Sub-Watershed Peak Discharges (cfs)
Fishing Creek/Cedar Run Watershed

Sub-Area No.	Drainage Area		2-Year		5-Year		10-Year		25-Year		50-Year		100-Year	
	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed
1	1.26	1.26	49	49	111	111	211	211	402	402	527	527	776	776
2	0.31	1.57	70	73	117	136	183	251	293	471	359	611	484	889
3	1.30	1.30	79	79	155	155	271	271	484	484	618	618	882	882
4	1.63	1.63	104	104	210	210	377	377	681	681	874	874	1252	1252
5	0.88	0.88	49	49	99	99	176	176	318	318	408	408	585	585
6	1.29	6.67	101	334	198	687	344	1244	609	2268	776	2923	1099	4217
7	0.92	0.92	99	99	185	185	313	313	542	542	683	683	955	955
8	1.38	2.29	70	142	144	286	260	510	475	914	614	1172	886	1677
9	1.57	1.57	115	115	242	242	442	442	809	809	1041	1041	1496	1496
10	2.40	12.94	76	501	185	1054	371	1931	734	3507	977	4520	1461	6531
11	1.51	1.51	68	68	153	153	292	292	555	555	726	726	1066	1066
12	3.28	17.73	18	423	60	856	157	1463	380	2632	541	3432	882	5114
13	1.72	1.72	98	98	188	188	323	323	570	570	726	726	1030	1030
14	2.89	22.34	8	474	31	961	141	1615	475	2906	737	3734	1320	5492
15	0.60	22.94	1	464	5	932	21	1556	73	2751	116	3545	211	5238
16	1.13	1.13	8	8	35	35	101	101	255	255	365	365	596	596
17	0.94	0.94	45	45	86	86	148	148	262	262	334	334	476	476
18	1.53	2.47	292	295	493	503	775	794	1250	1291	1536	1593	2079	2171
19	2.31	28.85	6	533	23	1059	94	1746	315	3067	489	3921	876	5759
20	0.56	0.56	55	55	107	107	186	186	326	326	413	413	582	582

Table 7-5 (cont.)
Existing Conditions Sub-Area and Sub-Watershed Peak Discharges (cfs)
Fishing Creek/Cedar Run Watershed

Sub-Area No.	Drainage Area		2-Year		5-Year		10-Year		25-Year		50-Year		100-Year	
	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed
21	2.51	31.92	10	531	33	1039	87	1736	214	3107	306	3989	504	5899
22	1.52	33.43	6	467	20	892	61	1535	164	2795	241	3631	407	5429
23	2.09	2.09	101	101	232	232	450	450	861	861	1128	1128	1657	1657
24	1.64	3.73	11	83	42	215	119	450	297	936	425	1277	698	1924
25	0.91	0.91	53	53	122	122	235	235	446	446	582	582	850	850
26	1.53	1.53	90	90	169	169	288	288	503	503	639	639	903	903
27	3.11	42.71	26	519	82	988	196	1690	446	3073	622	3983	992	5923
28	0.96	0.96	81	81	154	154	262	262	455	455	577	577	813	813
29	3.56	47.23	21	520	77	1010	215	1730	541	3144	777	4074	1280	6033
30	3.14	3.14	122	122	268	268	505	505	956	956	1251	1251	1838	1838
31	2.83	53.20	9	530	35	1051	119	1811	352	3289	530	4257	920	6281
32	1.32	1.32	55	55	149	149	309	309	632	632	841	841	1256	1256
33	1.08	55.59	21	528	73	1054	171	1833	375	3347	514	4329	797	6369
34	2.54	58.13	199	533	386	1084	669	1884	1179	3434	1500	4435	2128	6507
35	1.28	1.28	35	35	92	92	193	193	394	394	528	528	801	801
36	2.27	2.27	246	246	456	456	765	765	1308	1308	1645	1645	2300	2300
37	1.91	4.18	139	341	277	652	487	1085	870	1924	1115	2452	1588	2485
38	1.67	5.85	146	389	292	714	517	1202	922	2163	1177	2787	1671	4021
39	3.14	8.99	168	425	335	811	593	1379	1069	2376	1372	3082	1967	4663
40	1.78	10.77	120	430	243	810	432	1360	780	2328	1003	3018	1435	4569

Table 7-5 (cont.)
Existing Conditions Sub-Area and Sub-Watershed Peak Discharges (cfs)
Fishing Creek/Cedar Run Watershed

Sub-Area No.	Drainage Area		2-Year		5-Year		10-Year		25-Year		50-Year		100-Year	
	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed
41	2.59	72.78	173	699	370	1460	678	2769	1253	5283	1618	7036	2334	10423
42	1.27	1.27	150	150	274	274	457	457	780	780	989	979	1359	1359
43	0.79	74.84	5	729	21	1513	62	2857	158	5424	228	7209	375	10680
44	2.14	2.14	81	81	184	184	351	351	672	672	882	882	1299	1299
45	2.12	4.26	12	66	42	175	116	382	290	820	416	1124	685	1748
46	1.73	5.98	12	72	62	188	193	408	521	877	751	1206	1231	1877
47	0.97	0.97	131	131	228	228	368	368	608	608	754	754	1033	1033
48	0.66	1.63	32	141	68	262	124	444	229	769	297	973	430	1367
49	1.70	1.70	0	0	3	3	11	11	52	52	96	96	207	207
50	0.59	9.91	89	182	162	390	270	744	456	1481	569	1997	786	3056
51	1.13	11.04	146	233	269	477	448	887	759	1682	950	2221	1317	3345
52	0.41	11.46	96	264	164	521	265	944	429	1743	528	2285	716	3423
53	1.28	1.28	0	0	0	0	4	4	23	23	50	50	135	135
54	0.87	13.61	32	276	80	548	165	998	328	1859	436	2445	651	3695
55	1.57	15.18	10	280	36	579	104	1057	263	1980	379	2605	624	3944
56	1.22	16.40	76	306	160	616	292	1100	537	2039	693	2682	1000	4055
57	1.63	1.63	9	9	41	41	131	131	348	348	505	505	844	844
58	0.86	18.88	119	336	216	672	357	1194	601	2210	751	2905	1037	4395
59	1.41	20.29	1	311	1	622	1	1130	1	2143	1	2837	1	4322
60	1.15	21.44	0	306	0	615	0	1120	7	2137	15	2835	52	4318

Table 7-5 (cont.)
Existing Conditions Sub-Area and Sub-Watershed Peak Discharges (cfs)
Fishing Creek/Cedar Run Watershed

Sub-Area No.	Drainage Area		2-Year		5-Year		10-Year		25-Year		50-Year		100-Year	
	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed
61	1.60	23.03	3	306	11	624	41	1142	143	2186	226	2901	417	4417
62	0.75	23.79	5	308	18	628	50	1150	125	2203	179	2924	294	4454
63	0.80	24.58	3	309	14	631	46	1157	132	2218	195	2943	334	4483
64	0.94	25.52	0	308	0	631	0	1157	6	2223	13	2954	54	4505
65	0.82	26.34	0	307	0	629	1	1154	6	2223	14	2956	55	4512
66	2.08	2.08	112	112	258	258	493	493	942	942	1229	1229	1798	1798
67	1.66	3.74	131	191	252	421	434	724	761	1356	966	1736	1363	2443
68	1.53	5.26	125	233	243	483	421	768	743	1499	945	1948	1336	2741
69	2.11	7.37	166	291	319	571	550	881	963	1752	1223	2290	1725	3270
70	1.16	1.16	46	46	107	107	206	206	398	398	523	523	772	772
71	1.51	2.68	147	159	287	322	500	576	879	1051	1115	1348	1572	1925
72	1.59	11.64	71	413	139	789	242	1285	432	2498	554	3271	792	4746
73	0.46	0.46	9	9	31	31	75	75	167	167	232	232	362	362
74	2.58	14.68	31	406	107	768	261	1253	595	2432	825	3193	1305	4691
75	0.63	15.31	0	403	2	763	6	1251	41	2426	78	3187	172	4689
76	0.69	42.34	0	637	0	1234	3	2169	13	4032	28	5377	72	7995
77	1.02	118.2	2	1352	7	2698	31	4878	114	9297	182	12440	337	18321
78	2.87	121.1	33	1362	98	2727	224	4940	491	9372	676	12475	1060	18285
79	1.97	123.0	54	1374	145	2752	306	4983	629	9441	844	12555	1279	18391
80	0.76	123.8	33	1383	70	2768	130	5009	241	9486	313	12611	456	18467

Table 7-5 (cont.)
Existing Conditions Sub-Area and Sub-Watershed Peak Discharges (cfs)
Fishing Creek/Cedar Run Watershed

Sub-Area No.	Drainage Area		2-Year		5-Year		10-Year		25-Year		50-Year		100-Year	
	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed
81	2.13	125.9	87	1404	217	2804	438	5069	870	9586	1151	12733	1712	18634
82	2.23	2.23	140	140	327	327	329	329	1207	1207	1575	1575	2300	2300
83	1.31	129.5	17	1424	60	2830	146	5103	331	9622	459	12758	724	18655
84	1.64	1.64	29	29	84	84	185	185	396	396	539	539	834	834
85	3.26	3.26	361	361	677	677	1152	1152	1982	1982	2496	2496	3484	3484
86	1.68	4.95	5	303	16	576	48	1005	137	1822	204	2340	353	3356
87	1.11	6.06	34	312	91	616	190	1090	387	1982	517	2554	778	3692
88	1.59	138.8	111	1475	227	2895	406	5177	733	9655	941	12750	1436	18587
89	0.77	0.77	3	3	13	13	54	54	165	165	254	254	441	441
90	1.42	2.20	0	3	0	13	0	54	8	165	17	254	61	454
91	0.99	3.18	9	10	32	38	80	108	188	288	263	421	421	715
92	1.07	1.07	0	0	0	0	3	3	14	14	33	33	104	104
93	1.22	5.47	5	14	19	49	73	133	219	361	328	551	568/	1018
94	1.49	6.96	31	31	91	105	201	269	426	657	579	952	893	1662
95	1.85	1.85	9	9	9	9	9	9	9	9	9	9	9	9
96	0.64	0.64	6	8	24	24	64	64	155	155	219	219	353	353
97	0.73	3.22	9	17	30	45	72	121	164	294	227	418	360	680
98	1.78	11.96	36	60	117	192	270	477	591	1157	807	1672	1248	2800
99	0.81	12.77	34	74	87	229	180	554	357	1312	473	1914	705	3249
100	2.33	15.10	27	90	91	263	220	645	500	1556	694	2266	1100	3893

Table 7-5 (cont.)
Existing Conditions Sub-Area and Sub-Watershed Peak Discharges (cfs)
Fishing Creek/Cedar Run Watershed

Sub-Area No.	Drainage Area		2-Year		5-Year		10-Year		25-Year		50-Year		100-Year	
	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed	Sub-Area	Sub-Shed
101	0.91	0.91	71	71	127	127	209	209	352	352	441	441	612	612
102	1.13	2.04	87	112	107	217	298	277	531	667	667	854	960	1214
103	0.87	2.91	76	164	154	323	275	608	491	1085	627	1387	891	1977
104	2.12	5.04	178	256	346	522	502	995	1060	1833	1347	2368	1903	3421
105	0.80	0.80	37	37	86	86	165	165	317	317	415	415	609	609
106	1.27	1.27	98	98	202	202	361	361	655	655	840	840	1200	1200
107	1.06	1.06	184	184	336	336	555	555	951	951	1187	1187	1638	1638
108	3.20	11.37	232	531	410	1020	670	1801	1129	3248	1415	4181	1963	5977
109	1.38	1.38	125	125	256	256	460	460	841	841	1078	1078	1538	1538
110	2.21	3.60	42	153	132	367	300	724	652	1411	890	1863	1377	2764
111	2.18	2.18	7	7	27	27	87	87	249	249	371	371	639	639
112	1.93	7.70	78	174	184	413	359	891	694	1850	915	2508	1353	3889
113	1.51	20.59	7	664	28	1365	97	2549	275	4768	407	6236	693	9140
114	1.36	21.95	2	656	3	1357	34	2548	133	4798	215	6284	403	9254
115	1.15	23.10	3	649	13	1353	48	2545	149	4769	226	6232	397	9157
116	0.90	0.90	14	14	45	45	105	105	233	233	321	321	505	505
117	1.07	1.07	84	84	168	168	297	297	531	531	679	679	966	966
118	2.84	181.8	144	1814	284	3571	497	6352	891	11801	1142	15386	1633	22173

CHAPTER 8

STANDARDS AND CRITERIA

Introduction

Stormwater management problems are not confined to site or municipal boundaries; they may be watershed-wide in scope. Therefore, effective stormwater management is accomplished through the development of performance standards and criteria that consider the basin-wide impacts of runoff caused by site development. Traditionally, stormwater management has been applied to individual sites only, without consideration for the impact of post-development runoff from individual sites on the entire watershed. Prior to early 1980, effects of the traditional stormwater management approach were not considered. Watershed planning during the past decade has utilized an approach known as the "release rate method" to address the impact of post-development runoff from individual sites on the entire watershed.

In an effort to simplify the regulations and requirements for rural watersheds where development potential is limited to a few areas or corridors, other stormwater techniques have been utilized to identify critical development areas within the Combined Watershed. This method is based on the future development conditions within the Combined Watershed as identified by the planning organizations involved in the study. Future conditions peak flow projections were compared to the existing conditions peak flow estimates to compute the increased peak flows due to projected development within the Combined Watershed. Critical development areas within the watershed were identified as areas where sub-watersheds peak flows increased by ten (10%) percent or greater in the 10-year storm event.

The Fishing Creek/Cedar Run Watershed is a rural watershed where future development impacts are predicted to be limited along a corridor as shown on Plate 2. These critical areas are identified in Table 8-1. This corridor has been identified as an area of critical development where additional stormwater requirements may need to be implemented beyond traditional standards where post development flow cannot exceed pre-development levels.

Table 8-1
Adjusted Curve Number Comparison and
Critical Development Area Identification in the
Fishing Creek/Cedar Run Watershed
(Curve Numbers are based on Crop/Pasture CN = Pasture CN)

Sub-area No.	Area (sq mi)	Exist CN AB=20	Future CN AB=20	% Karst	CN Change	Critical Devel. Area
1	1.25	64.0	64.0	0%		NO
2	0.32	72.5	72.5	0%		NO
3	1.30	66.9	66.9	2%		NO
4	1.64	66.3	66.3	19%		NO
5	0.88	66.4	66.4	0%		NO
6	1.30	67.4	67.4	31%		NO
7	0.92	68.7	68.7	0%		NO
8	1.38	65.8	65.8	11%		NO
9	1.58	65.8	65.8	16%		NO
10	2.40	62.6	62.6	79%		NO
11	1.52	64.1	64.1	6%		NO
12	3.27	56.1	56.1	78%		NO
13	1.72	67.4	67.4	2%		NO
14	2.89	53.0	53.0	72%		NO
15	0.60	52.2	52.2	90%		NO
16	1.13	56.8	56.8	63%		NO
17	0.93	67.1	67.1	0%		NO
18	1.54	72.2	72.2	0%		NO
19	2.30	52.8	52.8	72%		NO
20	0.56	67.8	67.8	6%		NO
21	2.51	55.0	55.6	90%	0.6	NO
22	1.51	54.5	54.5	97%		NO
23	2.09	63.9	63.9	3%		NO
24	1.65	56.5	56.5	65%		NO
25	0.91	64.3	64.3	0%		NO
26	1.53	67.9	67.9	1%		NO
27	3.12	57.7	57.7	62%		NO
28	0.95	68.2	68.3	2%		NO
29	3.55	56.1	56.1	62%		NO
30	3.17	64.2	64.3	1%		NO
31	2.81	53.8	53.8	65%		NO
32	1.31	62.3	62.3	0%		NO
33	1.07	59.8	59.9	47%		NO
34	2.55	67.5	67.5	0%		NO
35	1.28	61.7	61.7	20%		NO
36	2.26	69.0	69.0	0%		NO
37	1.92	66.9	66.9	0%		NO
38	1.67	67.0	67.0	0%		NO
39	3.14	66.4	66.4	0%		NO
40	1.78	66.5	66.5	0%		NO

Table 8-1 (cont.)
Adjusted Curve Number Comparison and
Critical Development Area Identification in the
Fishing Creek/Cedar Run Watershed
(Curve Numbers are based on Crop/Pasture CN = Pasture CN)

Sub-area No.	Area (sq mi)	Exist CN AB=20	Future CN AB=20	% Karst	CN Change	Critical Devel. Area
41	2.59	65.6	65.6	0%		NO
42	1.27	69.4	69.4	0%		NO
43	0.79	56.3	58.1	34%	1.9	YES
44	2.13	63.8	63.8	0%		NO
45	2.12	56.0	56.0	0%		NO
46	1.72	56.4	56.4	0%		NO
47	0.97	71.0	71.1	0%		YES
48	0.67	65.4	73.1	36%	7.8	YES
49	1.70	46.5	51.2	79%	4.8	YES
50	0.59	69.6	78.6	3%	9.0	YES
51	1.13	69.4	69.4	0%		YES
52	0.42	71.7	71.7	0%		YES
53	1.28	43.8	43.8	77%		YES
54	0.88	62.5	62.5	10%		YES
55	1.57	56.2	56.2	40%		YES
56	1.22	65.6	65.6	27%		YES
57	1.63	55.9	55.9	0%		YES
58	0.86	69.8	69.8	3%		YES
59	1.41	49.1	49.1	90%		YES
60	1.15	39.9	39.9	92%		YES
61	1.59	51.5	51.5	67%		YES
62	0.75	56.4	56.4	49%		YES
63	0.80	54.7	56.4	57%	1.7	YES
64	0.94	40.0	41.7	99%	1.7	YES
65	0.82	40.6	42.7	100%	2.1	YES
66	2.07	64.3	64.3	0%		NO
67	1.66	67.9	67.9	0%		NO
68	1.52	67.6	67.6	0%		NO
69	2.10	67.8	67.8	0%		NO
70	1.16	63.7	63.7	0%		NO
71	1.52	67.6	67.6	0%		NO
72	1.59	66.5	66.5	0%		NO
73	0.46	59.5	59.5	0%		NO
74	2.58	58.6	58.6	0%		NO
75	0.64	47.7	55.9	45%	8.2	YES
76	0.68	44.1	53.5	100%	9.4	YES
77	1.03	51.6	53.5	100%	1.9	YES
78	2.86	58.9	61.2	63%	2.3	YES
79	1.96	61.6	62.5	76%	0.9	YES
80	0.76	64.9	65.5	68%	0.7	NO

Table 8-1 (cont.)
Adjusted Curve Number Comparison and
Critical Development Area Identification in the
Fishing Creek/Cedar Run Watershed
(Curve Numbers are based on Crop/Pasture CN = Pasture CN)

Sub-area No.	Area (sq mi)	Exist CN AB=20	Future CN AB=20	% Karst	CN Change	Critica Devel. Area
81	2.13	62.9	62.9	22%		NO
82	2.23	64.2	64.2	13%		NO
83	1.31	58.9	58.9	69%		NO
84	1.64	60.2	60.6	82%	0.4	NO
85	3.25	68.7	68.7	1%		NO
86	1.69	53.1	53.1	96%		NO
87	1.11	61.9	61.9	69%		NO
88	1.59	66.4	66.4	39%		NO
89	0.77	54.1	54.1	94%		NO
90	1.42	39.6	39.6	97%		NO
91	0.99	57.8	57.8	73%		NO
92	1.07	42.6	42.6	100%		NO
93	1.22	54.3	54.3	85%		NO
94	1.49	60.5	60.5	74%		NO
95	1.86	55.9	56.3	100%	0.4	NO
96	0.64	57.6	57.6	100%		NO
97	0.73	58.6	58.6	100%		NO
98	1.78	60.0	60.2	80%	0.2	NO
99	0.81	62.6	62.6	61%		NO
100	2.33	58.6	58.6	85%		NO
101	0.90	69.9	69.9	0%		NO
102	1.13	67.2	67.2	6%		NO
103	0.87	66.9	66.9	2%		NO
104	2.12	67.6	67.6	0%		NO
105	0.81	64.0	64.0	0%		NO
106	1.27	66.4	66.4	0%		NO
107	1.06	69.5	69.5	0%		NO
108	3.22	69.9	69.9	1%		NO
109	1.38	66.5	66.5	12%		NO
110	2.21	60.0	60.0	46%		NO
111	2.19	53.9	53.9	71%		NO
112	1.93	63.5	63.5	18%		NO
113	1.50	54.9	54.9	60%		NO
114	1.36	51.1	51.1	98%		NO
115	1.15	53.5	53.5	100%		NO
116	0.91	59.3	59.3	39%		NO
117	1.07	66.8	66.8	15%		NO
118	2.84	66.6	66.6	36%		NO

Performance Standards

The following standards shall be applied to all development within the Combined Watershed to promote flow attenuation, erosion and sediment control and flood control.

1. The following General Standards shall be applied to all development within the Combined Watershed to promote flow attenuation, erosion and sediment control and to minimize impacts of runoff on existing drainage problems and potential future problems.

   a. All site development in the Combined Watershed creating impervious cover in accordance with Table 8-2 shall submit a drainage plan consistent with the Fishing Creek/Cedar Run Stormwater Management Plan to the municipality for review.

      This criteria shall apply to the total proposed development even if development is to take place in stages. Impervious cover shall include, but not be limited to, any roof, parking or driveway areas and any new streets and sidewalks. Any areas designed to initially be gravel or crushed stone shall be assumed to be impervious for the purposes of comparison to the waive criteria.

Table 8-2
Act 167 Stormwater Management Exemption Criteria

Total Parcel Size	Minimum Distance* (feet)	Impervious Areas Exempt from Ordinance	% on 1 Acre Plot
< 1 acre	0	5000 sq. ft.	46%
1-2 acres	100	10,000 sq. ft.	23%
2-5 acres	250	15,000 sq. ft.	17%
> 5 acres	500	20,000 sq.ft.	9.2%

*The minimum distance between the proposed impervious area and/or stormwater controls / structure discharge point to the downslope property line.

   b. Runoff from a site should not be concentrated nor increased runoff discharged onto adjacent property without first evaluating impacts on downstream properties or conveyance channels.

Table 8-3
Stormwater Control for Development Sites in the Fishing Creek/Cedar Run Watershed

Type of Storm	Control for Development in any sub-area	Control for Development in Sub-areas Designated as "Critical Areas"
2 Year	2 Year Pre-development Peak Run-Off	2 Year pre-Development Peak Run-Off
10 Year	10 Year Pre-development Peak Run-Off	2 Year Pre-development Peak Run-Off
25 Year	25 Year Pre-development Peak Run-Off	25 Year Pre-development Peak Run-Off

2. Detention/Infiltration Standards

   Post-development rates of runoff from any development site shall not exceed the peak rates of runoff prior to development for the 2, 10, and 25 year design storms. That is, facilities for the control of stormwater from a development site must be designed for both the 2, 10, and 25 year design storms. In addition, development within sub-areas designated as "Critical Development Areas" shall limit the peak rate of runoff from the post-development 10 year storm so as not to exceed the pre-development 2 year storm peak runoff.

3. Design Criteria for Stormwater Management Facilities

   a. Any stormwater facility located on state highway rights-of-way shall be subject to approval by the Pennsylvania Department of Transportation.

   b. Any stormwater management facility required or regulated by this ordinance shall be designed to provide an emergency spillway to handle flow up to and including the 100-year post-development conditions. The height of embankment must be set to provide a minimum 1.0 foot of freeboard above the maximum pool elevation computed when the facility functions for the 100-year post-development inflow. However, criteria for design and construction of stormwater management facilities are not the same criteria that are used in the permitting of dams under the DEP Dam Safety Program. Depending upon the physical characteristics of a dam, a dam permit may be required and the design will have to meet the provisions of Chapter 105 of the Dam Safety and Encroachments Act. Depending on the physical characteristics of a dam, the design could require that anywhere from a 50-year to a PMF storm event be considered.

c. Any drainage conveyance facility that doesn't 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. Roadway crossings located within designated floodplain areas must be able to convey runoff from a 100-year design storm with a minimum 1.0 foot of freeboard measured below the lowest point along the top of roadway. Any facility located within a PADOT right-of-way must meet PADOT minimum design standards and permit submission requirements.

d. Storm sewers must be able to convey post-development runoff from a 25-year design storm without surcharging inlets.

e. Adequate erosion protection shall be provided along all open channels, and at all points of discharge.

4. Calculation Methodology

Stormwater runoff from all development sites shall be calculated using either the rational method for drainage areas of 20 acres or less or a soil-cover-complex methodology.

a. Runoff curve numbers listed in Table A-1 of Appendix A are to be used in SCS/NRCS methodologies such as TR-55.

b. Rational "C" values listed in Table B-2 of Appendix B are to be used for the Rational formula.

c. 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. For drainage areas greater than 20 acres in size, the design storm hydrograph shall be computed using a calculation method that produces a full hydrograph. The Lead Agency may approve the use of any generally accepted full hydrograph approximation technique for drainage areas that contain less than 20 acres. Any full hydrograph approximation technique shall use a total runoff volume that is consistent with the volume from a method that produces a full hydrograph.

d. 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.

Figure B-1 from the PADOT "Rainfall Duration Frequency Tables for Pennsylvania" provides the rainfall depths to be used for the 2, 10, and 25 year storms.

e. All calculations using the Rational Method shall use rainfall intensities consistent with appropriate times of concentration for overland flow and return periods. Times of concentration for overland flow shall be calculated using the methodology presented in Chapter 3 of Urban Hydrology for Small Watersheds, SCS, TR-55 (as amended or replaced from time to time by SCS/NRCS). Times of concentration for channel and pipe flow shall be computed using Manning's equation.

f. Where uniform flow is anticipated, Manning's 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.

g. 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.

Use of Performance Standards and Criteria

The methodology for determining required stormwater controls for a regulated activity is shown in Figure 8-1 and outlined below:

1. Compute:

   a. Pre-development hydrograph at the site discharge point for the 2, 10, and 25 year, 24 hr. storm.

   b. Post-development hydrograph at the site discharge point incorporating any "non-detention" techniques such as pervious areas, swales, infiltration trenches, etc.

   Note: Hydrographs may be obtained from SCS/NRCS methods such as TR-55 (or from use of the "modified" rational formulas, for drainage areas of 20 acres or less).

2. Compare:

   Post-development hydrographs with pre-development hydrographs. If the peak rate of runoff and the shape of the hydrographs are nearly identical, stormwater management has been achieved. Detention will not be required. If not, proceed to Item 3.

3. Design:

   Detention/retention facilities, in conjunction with any non-detention techniques, such that post-development peak rates from the site will not exceed pre-development levels for the 2, 10, and 25 year storms for development activities not located in "Critical Development Areas" while developments within "Critical Development Areas" shall additionally limit the post-development 10 year storm peak rate to the 2 year pre-development peak rate.

CHAPTER 9

STORMWATER MANAGEMENT TECHNIQUES

Introduction

Techniques to lessen the impact of stormwater runoff from both existing and proposed land uses fall into two broad categories; structural, and non-structural. Structural stormwater management techniques utilize physical means to reduce or manage runoff. Stormwater detention basins, infiltration trenches, and grassed waterways are all examples of structural stormwater management techniques. It is important to note that many structural techniques should not be used in areas where limestone is prevalent, especially infiltration trenches because they accelerate sinkhole production. Non-structural stormwater management techniques generally refer to land use restrictions used to manage the amount and extent of land use changes. Floodplain, subdivision, and zoning regulations are all examples of effective non-structural stormwater management techniques.

The following sections present a summary of stormwater management alternatives for the Combined Watershed. The applicability of particular stormwater management techniques in individual sub-areas is site specific. It is important to consider on-site characteristics such as topography, soils, sub-surface geology, water table configuration, existing and proposed land uses, land requirements, and regulatory controls to determine the suitability of a particular stormwater management technique.

Structural Stormwater Management Techniques

Structural stormwater management techniques can be divided into two categories, volume reduction and peak reduction techniques. Volume reduction techniques decrease the amount of stormwater that runs off a site by increasing the infiltration fraction of precipitation. Peak reduction techniques decrease the magnitude of peak flows while increasing the duration of runoff period.

The next section provides a discussion of volume reduction and rate reduction techniques that may be appropriate for use in the Combined Watershed. Table 9-1 lists a description of the techniques, applicability, advantages and disadvantages, maintenance requirements, and approximate construction costs (where available) of these techniques.

Volume Reduction Techniques

Land use changes and development in the watershed will increase the volume of runoff. Reductions in the amount of runoff from new developments accomplished through the prudent implementation of a stormwater management plan for the site will play an important role in the success or failure of the watershed-wide stormwater management plan. Volume reduction techniques can be a valuable part of any stormwater management plan.

Some volume reduction techniques decrease runoff from a site by routing water to the subsurface and the local water table. Planners and developers must ensure that these types of volume reduction techniques do not degrade the water quality of local aquifers. Title 25, Chapter 97 (Industrial Wastes) Underground Disposal, Section 97.71, clearly refers to stormwater runoff as potential pollution unless, "the disposal is close enough to the surface so that the wastes will be absorbed in the soil mantle and be acted upon by the bacteria naturally present in the mantle before reaching the underground or surface waters." Discharges to sinkholes are not acceptable because of accelerated sinkhole production and groundwater contamination.

Developers typically use volume reduction techniques in conjunction with peak reduction techniques as part of the overall stormwater management plan. Volume reduction techniques normally are not sufficient by themselves to provide adequate attenuation of stormwater runoff, except for use at individual homes and small parking lots. Volume reduction techniques help decrease the size of the peak reduction facilities, thereby lowering capital costs.

Peak Reduction Techniques

Peak reduction techniques are generally temporary storage facilities that decrease peak flows from a site. Proper design of peak reduction facilities can decrease peak discharges to acceptable values within the constraints of the watershed-wide stormwater management plan. The design of peak reduction facilities must consider pre-development peak flows, anticipated post-development peak flows, applicable release rates, and site constraints. A site-by-site approach to the design of peak reduction facilities in the watershed is undesirable and may actually increase downstream peak flows.

Non-Structural Stormwater Management Techniques

Non-structural stormwater management techniques rely primarily on federal, state, and local regulations. Applicable federal laws regulating activities in waters of the United States include, but are not limited to, Section 404 of the Clean Water Act (PL 92-500) and the River and Harbor Act of 1899. These laws regulate activities such as filling, dredging, and wetland encroachment. State regulations include, but are not limited to, the Dam Safety and Encroachment Act (P.L.177) which regulates activities such as stormwater detention pond outflows into receiving streams in or near waters of the Commonwealth. The Dam Safety and Encroachment Act is under the jurisdiction of the PA DEP. On the local level, ordinances such as zoning, subdivision, floodplain management, and stormwater management regulate development. All non-structural stormwater management techniques affect runoff by regulating land use.

Table 9-1
Structural Stormwater Management Techniques
Fishing Creek/Cedar Run Watershed

Description	Applicability	Advantages	Disadvantages	Maintenance
VOLUME REDUCTION TECHNIQUES				
1-Drain runoff from impervious areas over pervious areas	Use in low density development areas outside principal drainageways. Do not use in natural or man made drainageways.	a. Inexpensive to install and maintain b. Promotes groundwater recharge c. Promotes green space preservation	May degrade groundwater quality	a. Periodic inspections for sedimentation b. Harvest vegetation and collect thatch
2-Infiltration pits, trenches and dry wells	Use when soil permeability is below bottom of structure, and runoff is free of particulate matter	a. Inexpensive to construct b. Provides groundwater recharge c. Reduces pipe capacities and costs when used in conjunction with storm sewer bedding d. Reduces ponding and local flooding e. Multi-purpose use f. Effective for controlling "first flush" pollutants	a. Requires sediment free runoff (otherwise filters may be required) b. Limited to small applications c. Clogged systems must be replaced d. Must provide contingencies for ponding in a clogged or full system e. Accelerates sinkhole production	Must clean and maintain sediment filters
3-Concrete grid and modular pavement	Use on large parking areas and on-street parking. Use as erosion control devices in drainageways and at detention basin outfalls (must be protected from undermining)	a. Increased flexibility eases repair of underground utilities, replacement of pavement units, and installation of signs and plantings b. Flexibility prevents buckling c. Aesthetically pleasing	a. Installation expensive and labor intensive b. Susceptible to damage from fertilizers and de-icing agents c. Shifting units result in uneven surface and present a safety hazard d. Potential groundwater quality degradation	a. Maintain vegetation in voids b. Reset shifted units and replace broken units

Table 9-1 (cont.)
Structural Stormwater Management Techniques
Fishing Creek/Cedar Run Watershed

Description	Applicability	Advantages	Disadvantages	Maintenance
4-Porous asphalt pavement	Use in low volume traffic areas not subjected to heavy loads or the turning or stopping action of large vehicles. Requires a permeable soil sub-base	a. Reduces or eliminates additional storage facilities b. Water free surfaces enhance skid resistance c. Eliminates need for crowns and cross slopes d. Increases groundwater recharge	a. Asphalt cement prone to stripping by de-icing agents b. Prone to clogging problems c. Susceptible to freeze/thaw damage if adequate sub-surface drainage is not provided d. Increased aggregate base or asphalt thickness required e. More expensive than conventional pavement f. Conveys oils and solvents to groundwater g. Weeds may grow through pavement	Remove debris and sediment from surface
5-grassed waterways, filter strips, and seepage areas	Use in small developments with open space for stormwater control and along roadside drainage systems	a. Less expensive than curbs and gutters b. Enhances groundwater recharge c. Eliminates flooding of roadways from inlet by-passing d. Multi-purpose recreational use e. Plantings in filter strips effectively screens parking areas f. Positive aesthetics, increases time of concentration, and enhances infiltration	a. Requires more regular maintenance than curb and gutter systems b. Requires wider right-of-ways c. Driveway culverts trap debris d. May require guide rails along roadway e. May not be compatible with local subdivision f. Receptacle for lawn debris g. Sedimentation discourages vegetative growth h. Seepage areas accumulate contaminants in upper layers of soil i. Overflows from seepage areas may damage down stream areas j. May accelerate sinkhole production	a. Remove obstructions along drainageways & repair erosion & sedimentation damage b. Maintain vegetation & remove dead material c. Maintain soil permeability to eliminate insect breeding problems

Table 9-1 (cont.)
Structural Stormwater Management Techniques
Fishing Creek/Cedar Run Watershed

Description	Applicability	Advantages	Disadvantages	Maintenance
Peak Reduction Techniques				
1-Detention basins	Use in practically any situation	a. Provides local & watershed-wide stormwater control b. Enhances sediment and debris control c. Ease of constructability d. Considerable design flexibility e. May enhance groundwater recharge f. May reduce downstream erosion problems g. Effective for controlling "first flush" pollutants h. Multi-purpose use	a. Converts sheet flow to point discharges b. May promote sinkhole development in Karst terrain c. Shallow sloped bottoms discourages vegetative growth d. Standing water is a safety concern e. Reduces amount of salable land f. Undersized outlets collect debris g. Concentrates pollutants in the soil	a. Maintenance access must be provided b. Remove debris c. Fill localized depressions to eliminate insect breeding d. Maintain earthwork to prevent piping around outlet structure & erosion on spillway e. Maintain veg.
2-Oversized conveyance system storage	Use anywhere storm sewers can be installed	a. Does not use valuable land space b. Minimal maintenance needs	a. Sediment accumulation must be flushed from the system b. Constrictions in on-line systems may trap debris in inaccessible locations c. Additional cost of oversized storm sewer and constricted outlets	Periodic inspection and cleaning of storm sewers
3-Parking lot storage	Use wherever large paved lots can be used to temporarily store runoff without causing safety concerns or inconvenience	a. Easily incorporated into parking lot grading b. Reduces downstream storage requirements	a. Can cause inconvenience b. Requires significant slope on parking area to limit spread of water c. May cause hazardous conditions in winter weather	a. Remove debris at outlet b. Must keep parking lots clean

Table 9-1 (cont.)
Structural Stormwater Management Techniques
Fishing Creek/Cedar Run Watershed

Description	Applicability	Advantages	Disadvantages	Maintenance
3-Parking lot storage	Use wherever large paved lots can be used to temporarily store runoff without causing safety concerns or inconvenience	a. Easily incorporated into parking lot grading b. Reduces downstream storage requirements	a. Can cause inconvenience b. Requires significant slope on parking area to limit spread of water c. May cause hazardous conditions in winter weather	a. Remove debris at outlet b. Must keep parking lots clean
4-Rooftop detention	Use on large flat roofs in highly urbanized settings	a. Requires no additional land space b. Poses no safety hazard or inconvenience to general public c. Stored water con be used for landscape maintenance d. May significantly impact local runoff problems	a. Failure generally leads to on-site property damage b. Not well suited to retrofitting c. Little impact on watershed-wide runoff control d. May require modification to local building codes e. May not receive regular inspection and maintenance f. Results in higher roof loadings	a. Routine leak detection inspections b. Downspouts must be kept free of debris
5-Cistern storage	Use anywhere construction costs are not prohibitive	a. Cisterns are unobtrusive b. Can easily be fit into existing sites c. Provides a free source of non-potable water d. Sumps are well suited for residential roof drainage e. Effective for controlling "first flush" pollutants	a. Difficult to clear accumulated debris b. Difficult to drain, may require pump c. Requires large volume if no outlet is provided d. Susceptible to deterioration, expensive and difficult to maintain	Regular inspection and debris removal

Table 9-1 (cont.)
Structural Stormwater Management Techniques
Fishing Creek/Cedar Run Watershed

Description	Applicability	Advantages	Disadvantages	Maintenance
Other Peak Reduction Techniques with Limited Potential				
1-Gravel parking lots & driveways	Use in log term parking areas and on very small lots	a. Reduces runoff b. Reduces construction costs	a. Runoff fraction increases as gravel consolidates b. Mud con become a major problem c. Susceptible to pothole development d. Material may be removed during large storm events	a. Fill potholes b. Excavate soft spots and muddy areas, and replace with new, clean aggregate
2-Rooftop gardens	Use wherever adequate space is available	Provides free source of non-potable water	Extremely limited effect on local and watershed-wide runoff control	Not available

CHAPTER 10

PLAN IMPLEMENTATION

In order to implement the Fishing Creek/Cedar Run Watershed Act 167 Stormwater Management Plan, the county planners and municipal officials must review the plan. The County Board of Commissioners must then formally adopt the Plan. The Department of Environmental Protection will approve the plan after reviewing the County Adoption Resolution and Plan Review Comments, as well as the plan itself. Implementation of the Plan will be the responsibility of the municipalities within the Combined Watershed subsequent to County adoption and DEP approval. Options are available to the municipalities for implementing the plan. The municipalities can either adopt the Model Stormwater Management Ordinance included with this plan, or they may incorporate the provisions of the Plan into existing ordinances.

Standards and criteria developed by this Plan and put forth in the model ordinance are intended to apply only to the portion of each municipality lying within the Combined Watershed. It will be necessary, therefore, to implement the model ordinance in such a way that would not only avoid conflict with existing regulations, but would allow the existing regulations to remain in effect in the areas of each municipality not covered by the Plan.

Regardless of how the municipalities implement the plan, Act 167 requires municipal compliance subsequent to County adoption and DEP approval. Further, the local municipality through their qualified agent (i.e. municipal engineer) should review the method used to implement the resulting regulatory structure to ensure compliance with the Plan, and to avoid regulatory conflicts and inconsistencies. Following is the sequence of events that must take place to implement this Plan:

1. Submission of the Plan to DEP, as adopted by Clinton County, and Plan approval from DEP.
2. Municipal adoption of the model ordinance or integration of the Plan's provisions into existing regulations.

   Municipal adoption is a critical step. It is important that the municipalities implement the standards and criteria of the Plan correctly, especially if they choose to integrate the standards and criteria into existing regulations. In either case, we recommend that the resulting regulatory framework be reviewed by DEP for compli-

ance with the provisions of the Plan, and consistency among the various regulations. Ideally, municipalities will adopt the model ordinance for ease of implementation, compliance with the Plan, and consistency among the watershed's municipalities. Municipalities would then tie the model ordinance into existing ordinances by referring regulated activities within the Fishing Creek/Cedar Run Basin to the adopted model ordinance. Municipalities must then send a copy of the municipal resolution to the Department of Environmental Protection, notifying them of compliance with adopted regulations.

3. Municipal Review of Drainage Plans.

   The municipality, through its qualified agent such as the municipal engineer, will receive stormwater drainage plans for all activities regulated by the ordinance. The municipality will then review the plans for compliance with the standards and criteria of the plan and shall approve or disapprove the drainage plans.

4. Remediation of Existing Storm Drainage Problems.

   During the planning process, the Lead Agency obtained and generated data on existing storm drainage problems. Municipalities should use these data to develop a systematic, prioritized strategy to remedy existing problems. However, neither the plan nor the Stormwater Management Act 167 mandates the remediation of these problems. Watershed planning is intended to ensure that existing problems do not intensify and that new problems do not occur. Therefore, as municipalities meet these objectives through proper implementation of this Plan's provisions, they may consider the remediation of existing problems as the next logical step in a Stormwater Management Program.

   To assist municipalities in obtaining funds to address these problems, the Pennsylvania Infrastructure Investment Authority (PENNVEST) is authorized to provide low interest loans to municipalities for stormwater projects. Municipalities within the Combined Watershed should prioritize existing problems by severity, impact, and cost and consider the PENNVEST program for their financing.

CHAPTER 11

FISHING CREEK/CEDAR RUN WATERSHED ACT 167 STORMWATER MANAGEMENT MODEL ORDINANCE

ARTICLE I
GENERAL PROVISIONS

SECTION 101. STATEMENT OF FINDINGS

The governing body of [Municipal name] 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 flood-plain 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 [Municipal name] and all the people of the Commonwealth, their resources, and the environment.

SECTION 102. PURPOSE

The purpose of this Ordinance is to promote health, safety, and welfare within the Fishing Creek/Cedar Run watershed by minimizing the damages described in **Section 101.A** of this Ordinance through provisions designed to:

A. Manage accelerated runoff and erosion and sedimentation problems at their source by regulating activities that cause these problems.
B. Utilize and preserve the existing natural drainage systems.
C. Encourage recharge of groundwater where appropriate and prevent degradation of groundwater quality.
D. Maintain existing flows and quality of streams and watercourses in [Municipal name] and the Commonwealth.
E. Preserve and restore the flood-carrying capacity of streams.
F. Provide proper maintenance of all permanent stormwater management facilities that are constructed in [Municipal name].
G. Provide performance standards and design criteria for stormwater management and planning.

SECTION 103. STATUTORY AUTHORITY

[Municipal name] is empowered to regulate land use activities that affect runoff by the authority of the Stormwater Management Act, Act 167 of 1978, as amended by Act 63, 32 P.S., P.L. 864, Section 680.1.

SECTION 104. APPLICABILITY

This Ordinance shall only apply to those areas of [Municipal name] that are located within the Fishing Creek/Cedar Run Watershed, as delineated on Plate 1 of this Ordinance.

This Ordinance shall only apply to permanent stormwater management facilities constructed as part of any of the Regulated Activities listed in this Section. Stormwater management and erosion and sedimentation control during construction activities are specifically not regulated by this Ordinance, but shall continue to be regulated under existing laws and ordinances.

> This Ordinance contains only stormwater management performance standards and design criteria. Local stormwater management design criteria (e.g. inlet spacing, inlet type, collection system details, outlet structure design, etc.) should be determined by the municipal engineer, and incorporated in this ordinance, an appendix, or separate section.

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

A. Land development.
B. Subdivision
C. Construction of new or additional impervious or semi-pervious surfaces (driveways, parking lots, etc.).
D. Construction of new buildings or additions to existing buildings.
E. Diversion or piping of any natural or man-made stream channel.
F. Installation of stormwater management facilities or appurtenances thereto.

SECTION 105. REPEALER

Any ordinance of [Municipal name] 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

For the purposes of this chapter, 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, 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 or occupied."

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 landowner or developer who has filed an application for approval to engage in any Regulated Activities as defined in Section 104 of this Ordinance.

Cistern - An underground reservoir or tank for storing rainwater.

Conservation District - The [insert county name] County Conservation District.

Culvert - A structure with appurtenant works which carries a stream 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 semi-fluid, or a refuse bank, fill or structure for highway, railroad or other purposes which does or may impound water or another fluid or semi-fluid.

Department- The Pennsylvania Department of Environmental Protection (DEP) or its successor agencies.

Designated Representative - The entity designated by the municipality to review Drainage Plans, inspect stormwater management structures, and otherwise enforce all regulations as outlined in the [insert municipality] Watershed Stormwater Management Ordinance.

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.

Developer - A person, partnership, association, corporation, or other entity, or any responsible person therein or agent thereof, that undertakes any Regulated Activity of this Ordinance.

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

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

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.

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

Floodplain - Any land area susceptible to inundation by water from any natural source or delineated by applicable Department of Housing and Urban Development, Federal Insurance Administration Flood Hazard Boundary Maps as being a special flood hazard area, or as otherwise defined by the Flood Plain Management Act, Act 166, of the Commonwealth of Pennsylvania. Also included are areas that comprise Group 13 Soils, as listed in Appendix A of the Pennsylvania Department of Environmental Protection (PA DEP) Technical Manual for Sewage Enforcement Officers (as amended or replaced from time to time by PA DEP).

Groundwater Recharge - Replenishment of existing natural underground water supplies.

Impervious Surface - A surface that prevents the percolation of water into the ground.

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

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 buildings, or (b) the division or allocation of land or space 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) any subdivision of land; (iii) any lot improvements regulated under the Municipal Zoning Regulations.

Land Disturbance - Any activity involving grading, tilling, digging, or filling of ground or stripping of vegetation or any other activity that causes an alteration to the natural condition of the land.

Municipality - [The City, Borough or Township of [insert county name] County, Pennsylvania.

NRCS - U.S. Department of Agriculture, Natural Resources Conservation Service (formerly SCS).

Open Channel - A drainage element in which stormwater flows with 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.

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

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

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

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

Retention Basin - An impoundment in which stormwater is stored and not released during the storm event. Stored water may be released from the basin at some time after the end of the storm.

Return Period - The average interval, in years, within which a storm event of a given magnitude can be expected to recur. For example, the 25-year return period rainfall would be expected to recur on the average once every twenty-five years.

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

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

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

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 ground.

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 a Curve Number (CN).

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 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 total amount of 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. 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 stormwater runoff in the Fishing Creek/Cedar Run Watershed adopted by [insert county name] County as required by the Act of October 4, 1978, P.L. 864, (Act 167), and known as the "Fishing Creek/Cedar Run Watershed Act 167 Stormwater Management Plan."

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.

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, transfer of ownership, or building or lot development.

Wetland - Those 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, ferns, and similar areas.

ARTICLE III
STORMWATER MANAGEMENT

SECTION 301. GENERAL REQUIREMENTS

A. 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.

B. The existing points of concentrated drainage that discharge onto adjacent property shall not be relocated and shall be subject to any applicable discharge criteria specified in this Ordinance.

C. 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.

   If diffused flow is proposed to be concentrated and discharged onto adjacent property, the Developer must document that adequate downstream conveyance facilities exist to safely transport the concentrated discharge, or otherwise prove that no erosion, sedimentation, flooding, or other harm will result from the concentrated discharge.

D. Where a Development Site is traversed by watercourses other than permanent streams, a drainage easement shall be provided conforming substantially to the line of such watercourses. The terms of the easement shall prohibit excavation, the placing of fill or structures, and any alterations that may affect adversely the flow of stormwater within any portion of the easement. Also, maintenance and mowing of vegetation within the easement shall be required.

E. 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 (PADOT).

F. The Pennsylvania DEP, Chapter 105, Rules and Regulations, apply to the construction, modification, operation or maintenance of both existing and proposed dams, water obstructions and encroachments throughout the watershed, including work in wetlands. Inquiries on permit requirements or other concerns should be addressed to the Soils and Waterways Section of the applicable DEP Regional Office. Permit requirements or inquiries on dam safety should be addressed to the DEP.

G. Stormwater resulting from land development activities shall not be discharged into sinkholes.

H. Any land development occurring upon the 100-year Floodplain of any waterway within the Fishing Creek/Cedar Run Watershed shall comply with the provisions of the Pennsylvania Floodplain Act.

SECTION 302. STORMWATER MANAGEMENT PERFORMANCE STANDARDS

The following standards shall be applied to all development within the Fishing Creek/Cedar Run Watershed to promote flow attenuation, erosion and sediment control and flood control.

1. The following General Standards shall be applied to all development within the Fishing Creek/Cedar Run Watershed to promote flow attenuation, erosion and sediment control and minimizing impacts of runoff on existing drainage problems and potential future problems.

   a. All site development in the Fishing Creek/Cedar Run Watershed which do not fall under the exemption criteria in Section 402 shall submit a drainage plan consistent with the Fishing Creek/Cedar Run Stormwater Management Plan to [Municipal name] for review.

   This criteria shall apply to the total proposed development even if development is to take place in stages. Impervious cover shall include, but not be limited to, any roof, parking or driveway areas and any new streets and sidewalks. Any areas designed to initially be gravel or crushed stone shall be assumed to be impervious for the purposes of comparison to the waiver criteria.

b. Runoff from a site should not be concentrated or increased runoff discharged onto adjacent property without first evaluating impacts on downstream properties or conveyance channels.

Table 11-1
Stormwater Control for Development Sites
In the Fishing Creek/Cedar Run Watershed

Type of Storm	Control for Development in any Sub-area	Control for Development in Sub-area designated as "Critical Area"
2 Year	2 Year Pre-development Peak Run-off	2 Year Pre-development Peak Run-off
10 Year	10 Year Pre-development Peak Run-off	2 Year Pre-development Peak Run-off
25 Year	25 Year Pre-development Peak Run-off	25 Year Pre-development Peak Run-off

2. Detention/Infiltration Standards

   Minimization of impervious surfaces and infiltration of runoff through seepage beds, infiltration trenches, etc. are encouraged, where soil conditions permit, to reduce the size or eliminate the need for detention facilities.

SECTION 303. DESIGN CRITERIA FOR STORMWATER MANAGEMENT FACILITIES

A. Any stormwater facility located on State highway rights-of-way shall be subject to approval by the Pennsylvania Department of Transportation.

B. Any stormwater management facility required or regulated by this ordinance shall be designed to provide an emergency spillway to handle flow including the 100-year post-development conditions. The height of embankment must provide a minimum 1.0 foot of freeboard above the maximum pool elevation computed when the facility functions for the 100-year post-development inflow. However, criteria for design and construction of stormwater management facilities are not the same criteria that are used in the permitting of dams under the DEP Dam Safety Program. Depending upon the physical characteristics of a dam, a dam permit may be required and the design will have to meet the provisions of Chapter 105 of the Dam Safety and Encroachments Act. Depending on the physical characteristics of a dam, the design could require that anywhere from a 50-year to a PMF (probable maximim flood) storm event be considered.

C. Any drainage conveyance facility that doesn't 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. Roadway crossings located within designated floodplain areas must be able to convey runoff from a 100-year design storm with a minimum 1.0 foot of freeboard measured below the lowest point along the top of roadway. Any facility located within a PADOT right-of-way must meet PADOT minimum design standards and permit submission requirements.

D. Storm sewers must be able to convey post-development runoff from a 25-year design storm without surcharging inlets.

E. Adequate erosion protection shall be provided along all open channels, and at all points of discharge.

SECTION 304. CALCULATION METHODOLOGY

Stormwater runoff from all development sites shall be calculated using either the rational method or a soil-cover-complex methodology. The rational method shall be used for development sites of 20 acres or less.

A. Runoff curve numbers listed in Table A-1 of Appendix A are to be used in SCS methodologies such as TR-55.

B. Rational "C" values listed in Table B-2 of Appendix B are to be used for the Rational formula. Other rational C values may be used with prior approval from the Lead Agency.

C. 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. For drainage areas greater than 20 acres in size, the design storm hydrograph shall be computed using a calculation method that produces a full hydrograph. The municipality may approve the use of any generally accepted full hydrograph approximation technique for drainage areas that contain less than 20 acres. Any full hydrograph approximation technique shall use a total runoff volume that is consistent with the volume from a method that produces a full hydrograph.

D. 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. Figure B-1 from the PADOT "Rainfall Duration Frequency Tables for Pennsylvania" provides the rainfall depths to be used for the 2, 10, and 25 year storms. Rainfall depths may also be obtained from the Pennsylvania Department of Transportation PDT-IDF, Storm Intensity Duration Frequency Charts, 1986.

E. All calculations using the Rational Method shall use rainfall intensities consistent with appropriate times of concentration for overland flow and return periods. 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.

F. 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.

G. 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.

SECTION 305. USE OF PERFORMANCE STANDARDS AND CRITERIA

The methodology for determining required stormwater controls for a regulated activity is shown in Figure 11-1 and outlined below:

1. Compute:

A. Pre-development hydrograph at the site discharge point for the 2, 10, and 25 year, 24 hr. storm.

B. Post-development hydrograph at the site discharge point incorporating any "non-detention" techniques such as pervious areas, swales, infiltration trenches, etc.

Note: Hydrographs may be obtained from NRCS methods such as TR-55, or from use of the "modified" rational formulas.

2. Compare:

Post-development hydrographs with pre-development hydrographs. If the peak rate of runoff and the shape of the hydrographs are nearly identical, stormwater management has been achieved. Detention will not be required. If not, proceed to Item 3.

3. Design:

Detention/retention facilities, in conjunction with any non-detention techniques, such that post-development peak rates from the site shall not exceed pre-development levels for the 2, 10, and 25 year storms for development activities not located in "Critical Development Areas" while developments within "Critical Development Areas" shall additionally limit the post-development 10 year storm to a pre-developed 2 year peak run-off rate.

ARTICLE IV
DRAINAGE PLAN REQUIREMENTS

SECTION 401. GENERAL REQUIREMENTS

For any of the activities regulated by this Ordinance, the final approval of subdivision and/or land development plans, the issuance of any building or occupancy permit, or the commencement of any land disturbance activity may not proceed until the Property Owner or Developer or his/her agent has received written approval of a Drainage Plan from the (municipality name).

SECTION 402. EXEMPTIONS

A. Any Regulated Activity that meets the exemption criteria in Table 11-2 is exempt from the Drainage Plan preparation provisions of this Ordinance. This criteria shall apply to the total development even if development is to take place in phases. Exemption shall not relieve the applicant from providing adequate stormwater management to meet the purpose of this Ordinance.

B. Land disturbance associated with existing one and two single family dwellings, subject to conditions described in A. of this Section.

C. Use of land for gardening for home consumption.

D. Agriculture when operated in accordance with a conservation plan or erosion and sedimentation control plan prepared by the Conservation District. The agricultural activities such as growing crops, rotating crops, filling of soil and grazing animals and other such activities are specifically exempt from complying with the requirements of this Ordinance when such activities are conducted in accordance with a conservation plan prepared by the [insert name] County Conservation District. The construction of buildings, parking lots or any activity that may result in impervious surface which increases the rate and volume of stormwater runoff shall comply with the requirements of this Ordinance.

E. Forest Management operations which are following the Department of Environmental Protection management practices contained in its publication "Soil Erosion and Sedimentation Control Guidelines for Forestry" and are operating under an erosion and sedimentation control plan.

No exemption shall be provided for Regulated Activities as defined in Section 104.E and 104.F of this Ordinance.

Table 11-2
Act 167 Stormwater Management Exemption Criteria

Total Parcel Size	Minimum Distance * (feet)	Impervious Areas Exempt from Ordinance	% of 1 Acre plot
< 1 acre	0	5000 sq. ft.	46%
1-2 acres	100	10, 000 sq. ft.	23%
2-5 acres	250	15, 000 sq. ft.	17%
> 5 acres	500	20, 000 sq. ft.	9.2%

* The minimum distance between the proposed impervious area and/or stormwater controls / structure discharge point to the downslope property line.

SECTION 403. DRAINAGE PLAN CONTENTS

The Drainage Plan shall consist of all applicable calculations, maps, and plans. A note on the maps shall refer to the associated computations and erosion and sedimentation control plan by title and date. The cover sheet of the computations and erosion and sedimentation control plan shall refer to the associated maps by title and date. All Drainage Plan materials shall be submitted to the Municipal Engineer or Designated Representative in a format that is clear, concise, legible, neat, and well organized; otherwise, the Drainage Plan shall be disapproved and returned to the Applicant.

The following items shall be included in the Drainage Plan:

A. General

1. General description of project.
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.

B. Map(s) of the project area shall be submitted on 24-inch x 36-inch or 30-inch x 42-inch sheets and shall be prepared in a form that meets the requirements for recording the offices of the Recorder of Deeds of the appropriate County. The contents of the map(s) shall include, but are not limited to:

1. The location of the project relative to highways, municipalities or other identifiable landmarks.
2. Existing contours at intervals of two feet. In areas of steep slopes (greater than 15 percent), five-feet contour intervals may be used.
3. Existing streams, lakes, ponds, or other bodies of water within the project area.
4. Other physical features including flood hazard boundaries, sinkholes, streams, 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 50 feet of property lines.
6. An overlay showing soil names and boundaries.
7. Proposed changes to the land surface and vegetative cover, including the type and amount of impervious area that would be added.
8. Proposed structures, roads, paved areas, and buildings.
9. Final contours at intervals of two feet. In areas of steep slopes (greater than 15 percent), five-feet contour intervals may be used.
10. The name of the development, the name and address of the owner 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. Horizontal and vertical profiles of all open channels, including hydraulic capacity.
18. Overland drainage paths.
19. A twenty-feet wide access easement around all stormwater management facilities that would provide ingress to and egress from a public right-of-way.
20. 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.
21. A construction detail of any improvements made to sinkholes and the location of all notices to be posted, as specified in this Ordinance.
22. A statement, signed by the landowner, acknowledging the stormwater management system to be a permanent fixture that can be altered or removed only after approval of a revised plan by the Municipal Engineer or Designated Representative.
23. The following signature block for the Municipal Engineer or Designated Representative:

    "I, (Municipal Engineer or Designated Representative), on this date (date of signature), have reviewed and hereby certify that the Drainage Plan meets all design standards and criteria of the Stormwater Management Ordinance."

24. The location of all erosion and sedimentation control facilities.

C. Supplemental Information

1. A written description of the following information shall be submitted.
   a. The overall stormwater management concept for the project.
   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.
2. A soil erosion and sedimentation control plan, including all reviews and approvals, as required by PA DEP.
3. A geologic assessment of the effects of runoff on sinkholes as specified in this Ordinance.
4. 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.
5. A Declaration of Adequacy and Highway Occupancy Permit from the PADOT District Office when utilization of a PADOT storm drainage system is proposed.

D. Stormwater Management Facilities

1. All stormwater management facilities must be located on a map 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

For all activities regulated by this Ordinance, the steps below shall be followed for submission. For any activities that require a PA DEP Joint Permit Application and are regulated under Chapter 105 (Dam Safety and Waterway Management) or Chapter 106 (Floodplain Management) of PA DEP's Rules and Regulations, require a PADOT Highway Occupancy Permit, or require any other permit under applicable state or federal local regulations, the permit(s) shall be part of the plan.

1. The Drainage Plan shall be submitted by the Developer as part of the Preliminary Plan submission for the Regulated Activity.
2. Four (4) copies of the Drainage Plan shall be submitted.
3. Distribution of the Drainage Plan will be as follows:
   a) One (1) copy to [Municipal name] accompanied by the requisite Municipal Review Fee, as specified in this Ordinance.
   b) One (1) copy to the Municipal Engineer.

SECTION 405. DRAINAGE PLAN REVIEW

A. The Municipal Engineer or Designated Representative shall review the Drainage Plan. The Designated Representative shall require receipt of a complete plan, as specified in this Ordinance.

B. The Municipal Engineer or Designated Representative shall review the Drainage Plan for any subdivision or land development against the municipal subdivision and land development ordinance provisions and the provisions of this Ordinance.

C. For activities regulated by this Ordinance, the Municipal Engineer or Designated Representative shall notify [Municipal name] in writing, within 90 calendar days, whether the Drainage Plan is consistent with this Stormwater Management Ordinance. Should the Drainage Plan be determined to be consistent with this Stormwater Management Ordinance, the Municipal

Engineer or Designated Representative will forward an approval letter to the Municipal Secretary.

Should the Drainage Plan be determined to be inconsistent with this Stormwater Management Ordinance, the Municipal Engineer or Designated Representative will forward a disapproval letter to the Municipal Secretary and Developer citing the reason(s) for the disapproval. Any disapproved Drainage Plans may be revised by the Developer and resubmitted consistent with this Ordinance.

D. For Regulated Activities specified in Sections 104.C and 104.D of this Ordinance, the Municipal Engineer or Designated Representative shall notify the Municipal Building Permit Officer in writing, within a time frame consistent with the Municipal Building Code, whether the Drainage Plan is consistent with this Stormwater Management Ordinance and forward a copy of the approval/disapproval letter to the Developer. Any disapproved drainage plan may be revised by the Developer and resubmitted consistent with this Ordinance.

E. For Regulated Activities requiring a PA DEP Joint Permit Application, the Municipal Engineer or Designated Representative shall notify PA DEP whether the Drainage Plan is consistent with this Stormwater Management Ordinance and forward a copy of the review letter to [Municipal name] and the Developer. PA DEP may consider the Municipal Engineer or Designated Representative's review comments in determining whether to issue a permit.

F. [Municipal name] shall not approve any subdivision or land development for Regulated Activities specified in Sections 104.A and 104.B of this Ordinance if the Drainage Plan has been found to be inconsistent with this Stormwater Management Ordinance, as determined by the Municipal Engineer or Designated Representative. All required permits from must be obtained prior to approval.

G. The Municipal Building Permit Office shall not issue a building permit for any Regulated Activity specified in Section 104.C and 104.D of this Ordinance if the Drainage Plan has been found to be inconsistent with this Stormwater Management Ordinance, as determined by the Municipal Engineer or Designated Representative. All required permits from PA DEP must be obtained prior to issuance of a building permit.

H. The Developer shall be responsible for completing an "As-Built Survey" of all stormwater management facilities included in the approved Drainage Plan. The As-Built Survey and an explanation of any discrepancies with the design plans shall be submitted to the Municipal Engineer or Designated Representative for final approval. In no case shall the Municipal Engineer or Designated Representative approve the As-Built Survey until the Municipal

Engineer or Designated Representative receives a copy of an approved Declaration of Adequacy, Highway Occupancy Permit from the PADOT District Office, and any applicable permits from PA DEP.

I. [The municipality]'s approval of a Drainage Plan shall be valid for a period not to exceed one (1) year. This one-year time period shall commence 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 an As-Built Survey of these facilities has not been approved within this one-year time period, then the Municipal Engineer or Designated Representative may consider the Drainage Plan disapproved and may recommend that [Municipal name] revoke any and all permits. Drainage Plans that are considered disapproved by the Municipal Engineer or Designated Representative shall be resubmitted in accordance with Section 407 of this Ordinance.

SECTION 406. MODIFICATION OF PLANS

A modification to a submitted Drainage Plan 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 or Designated Representative), 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.

A modification to an already approved or disapproved Drainage Plan shall be submitted to the Municipal Engineer or Designated Representative, accompanied by the applicable Municipal Engineer or Designated Representative Review Fee. A modification to a Drainage Plan for which a formal action has not been taken by the Municipal Engineer or Designated Representative shall be submitted to the Municipal Engineer or Designated Representative, accompanied by the applicable Municipal Engineer or Designated Representative Review Fee.

SECTION 407. RESUBMISSION OF DISAPPROVED DRAINAGE PLANS

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

ARTICLE V
INSPECTIONS

SECTION 501. SCHEDULE OF INSPECTIONS

A. The Municipal Engineer or Designated Representative shall inspect all phases of the installation of the permanent stormwater management facilities.

B. During any stage of the work, if the Municipal Engineer or Designated Representative determines that the permanent stormwater management facilities are not being installed in accordance with the approved plans, [Municipal name] shall revoke any existing permits until a revised Drainage Plan is submitted and approved, as specified in this Ordinance.

ARTICLE VI
FEES AND EXPENSES

SECTION 601. GENERAL

The fees required by this Ordinance are the Municipal Review Fee (should include all review costs), Application Fee, and Inspection Fees. The Municipal Review and Application fees were established by the resolution of [Municipality Name] to defray review and administrative costs incurred by [Municipality Name] and the Municipal Engineer. All fees shall be paid by the Applicant. Inspection fees shall be established by the Municipal Engineer or Designated Representative, which ever is applicable.

SECTION 602. MUNICIPAL ENGINEER OR DESIGNATED REPRESENTATIVE DRAINAGE PLAN REVIEW FEE

[The municipality shall establish a Review Fee Schedule based on the size of the Regulated Activity and based on the municipalities costs for reviewing Drainage Plans. The municipality shall periodically update the Review Fee Schedule to ensure that review costs are adequately reimbursed.]

SECTION 603. EXPENSES COVERED BY FEES

The fees required by this Ordinance cover:

A. The review of the Drainage Plan by the Municipal Engineer and/or Designated Representative and the Municipal Engineer.
B. The site inspection.
C. The inspection of stormwater management facilities and drainage improvements during construction.
D. The final inspection upon completion of the stormwater management facilities and drainage improvements presented in the Drainage Plan.
E. Any additional work required to enforce any permit provisions regulated by this

Ordinance, correct violations, and assure proper completion of stipulated remedial actions.

F. The Application fee.

SECTION 604. FEE SCHEDULE

A. All Fees as required by this Article shall be enacted by resolution of [municipality name]'s governing body.

B. All subsequent revisions to Fees as required by this Article shall be enacted by resolution of [municipality name]'s governing body.

Following is an example of how a municipality may establish drainage plan review and inspection fees. This may be revised if [Municipal name] has established a more appropriate fee basis to meet its needs.

A fee covering costs to [Municipal name] for Drainage Plan review and inspections shall be established by resolution of [the municipality's governing body]. No approval of the Drainage Plan shall be issued until the requisite fee has been paid. The fee shall be established in accordance with the following schedule:

A. Regulated Activities involving the construction of buildings - [[Municipal name]) shall be entitled to receive a fee at the rate of [??dollars] per one thousand dollars ($1,000) of the costs of construction on the basis of the applicant's con tract price for the construction or bids, including but not limited to the contracts or bids for the general, electrical, plumbing and mechanical contracts. Where the applicant at the time of application certifies that there is no fixed bid or con tract establishing the cost of the construction, the applicant shall estimate the total cost of the construction which shall initially be used for calculation of Drain age plan fee. In such cases, prior to the final approval of the stormwater management control facilities by [Municipal name], the applicant shall submit final bills for construction to reflect the actual costs incurred. In the event that the estimated costs exceeds the actual costs, [Municipal name] shall refund to the applicant any excess fee, likewise if the actual costs exceed the estimated cost, the applicant shall remit the additional monies to [Municipal name].

B. Regulated Activities involving the installation of diversions, piping, or stormwater systems including all ditches, trenches, swales, etc. - [Municipal name] shall be entitled to receive the following fees:

		Fee
1.	First [1,000] lineal feet or fraction thereof	[$??]
2.	Each additional [200] lineal feet or fraction thereof	[$??]

C. Regulated Activities involving non-construction activities -[The municipality] shall be entitled to receive the following fees:

		Fee
1.	First acre or fraction thereof	[$??]
2.	Each additional acre or fraction thereof	[$??]

ARTICLE VII
MAINTENANCE RESPONSIBILITIES

SECTION 701. MAINTENANCE RESPONSIBILITIES

A. The stormwater management plan for the development site shall contain an operation and maintenance plan prepared by the developer 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 stormwater management plan for the development site shall establish responsibilities for the continuing operating and maintenance of all proposed stormwater control facilities, consistent with the following principals:

1. If a development consists of structures or lots which are to be separately owned and in which streets, sewers and other public improvements are to be dedicated to [Municipal name], stormwater control facilities should also be dedicated to and maintained by [Municipal name].

2. If a development site is to be maintained in a single ownership or if sewers and other public improvements are to be privately owned and maintained, then the ownership and maintenance of stormwater control facilities should be the responsibility of the owner 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 final approval of the stormwater management plan. The [governing body] reserves the right to accept the ownership and operating responsibility for any or all of the stormwater management controls.

SECTION 702. MAINTENANCE AGREEMENT FOR STORMWATER FACILITIES DEDICATED TO [Municipal name].

Any stormwater facility dedicated to [Municipal name] shall comply with the provisions of Section 704 A, 2 and 3 and Section 704 B and C.

SECTION 703. MAINTENANCE AGREEMENT FOR PRIVATELY OWNED STORMWATER FACILITIES

A. Prior to final approval of the site's stormwater management plan, the property owner shall sign and record a maintenance agreement covering all stormwater control facilities which are to be privately owned. The agreement shall stipulate that:

1. The owner shall maintain all facilities in accordance with the approved maintenance schedule and shall keep all facilities in a safe and attractive manner.
2. The owner shall convey to [Municipal name] easements and/or rights-of-way to assure access for periodic inspections by [Municipal name] and maintenance, if required.
3. The owner shall keep on file with [Municipal name] the name, address and telephone number of the person or company responsible for maintenance activities; in the event of a change, new information will be submitted to [Municipal name] within ten (10) days of the change.
4. If the owner fails to maintain the stormwater control facilities following due notice by [Municipal name] to correct the problem(s), [Municipal name] may perform the necessary maintenance work or corrective work and the owner shall reimburse [Municipal name] for all costs.

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

(NOTE: This provision is an example of one way a municipality could establish a special fund to finance its maintenance and inspection activities for stormwater retention/detention facilities. It is an optional provision of the ordinance. If a municipality is interested in establishing such a fund, it is recommended that it consult with its solicitor for legal requirements and procedures.)

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 [Municipal name] 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 [Municipal name].
2. If the storage facility is to be owned and maintained by [Municipal name], 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., ball field, lake), [Municipal name] may reduce or waive the amount of the maintenance fund deposit based upon the value of the land for public recreation purposes.

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.

ARTICLE VIII
ENFORCEMENT AND PENALTIES

SECTION 801. RIGHT-OF-ENTRY

Upon presentation of proper credentials, duly authorized representatives of [Municipal name] may enter at reasonable times upon any property within [Municipal name] to investigate or ascertain the condition of the subject property 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, [Municipal name] 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 resort by [Municipal name] from pursuing any and all other remedies. It shall be the responsibility of the owner 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. PENALTIES

A. Any violation of any provision of this ordinance shall be deemed a public nuisance.

B. Each day a violation occurs shall be deemed a separate violation.

C. Any person who or which has violated any provisions of this Ordinance, shall, upon a judicial determination thereof, be subject to civil judgment for each such violation of not more than _____ and 00/100 Dollars ($_____.00), plus costs of suit. Each day that a violation occurs shall constitute a separate offense. All fines shall be paid to the _____ of _____ for its _____ use.

D. In addition, the _____ 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.

Table A-1
Summary of Existing and Future Hydrologic/Land Use Characteristics by Sub-Area

Fishing Creek Mainstem Sub-Watershed

Sub-Area #	Area (acres)	Land Use Type	Amount of Land Use (%)	% Carbonate	Time of Concentration	Existing Weighted Curve Number	Proposed Weighted Curve Number
FC1	803	Paved	0.6	0.0	0.96	64	64
		Forest	99.4				
FC2	200	Paved	26.5	0.0	0.44	72.5	72.5
		Forest	73.5				
FC3	833	Paved	0.9	2.3	1.04	66.9	66.9
		Crop,Pasture	3.1				
		Forest	96.0				
FC4	1050	Paved	2.3	19.3	0.85	66.3	66.3
		Crop,Pasture	13.1				
		Forest	84.6				
FC5	562	Forest	100	0.0	1.03	66.4	66.4
FC6	829	Paved	5.5	31.3	0.78	67.4	67.4
		Forest	94.5				
FC7	589	Crop,Pasture	9.8	0.0	0.64	68.7	68.7
		Forest	90.2				
FC8	881	Paved	0.4	10.5	1.05	65.8	65.8
		Crop,Pasture	12.0				
		Forest	87.6				
FC9	1008	Paved	7.7	16.1	0.59	65.8	65.8
		Crop,Pasture	30.3				
		Forest	62.0				
FC10	1538	Paved	5.8	78.9	0.88	62.6	62.6
		Crop,Pasture	25.1				
		Forest	69.1				
FC11	970	Crop,Pasture	6.5	6.1	0.81	64.1	64.1
		Forest	93.5				
FC12	2096	Crop,Pasture	49.8	78.3	1.51	56.1	56.1
		Forest	50.2				
FC13	1103	Crop,Pasture	0.8	2.4	1.28	67.4	67.4
		Forest	99.2				

Table A-1 (cont.)
Summary of Existing and Future Hydrologic/Land Use Characteristics by Sub-Area

Fishing Creek Mainstem Sub-Watershed (continued)

Sub-Area #	Area (acres)	Land Use Type	Amount of Land Use (%)	% Carbonate	Time of Concentration	Existing Weighted Curve Number	Proposed Weighted Curve Number
FC14	1847	Crop,Pasture	56.7	71.9	0.49	53	53
		Forest	43.3				
FC15	381	Crop,Pasture	62.4	90.1	0.65	52.2	52.2
		Forest	37.6				
FC16	725	Crop,Pasture	53.9	62.8	0.63	56.8	56.8
		Forest	46.1				
FC17	597	Crop,Pasture	9.4	0.0	1.55	67.1	67.1
		Forest	90.6				
FC18	985	Paved	15.3	0.0	0.53	72.2	72.2
		Crop,Pasture	15.4				
		Forest	69.3				
FC19	1475	Residential	2.1	72.2	0.63	52.8	52.8
		Paved	0.4				
		Crop,Pasture	54.2				
		Orchards,Nur	1.5				
		Forest	41.8				
FC20	359	Crop,Pasture	4.1	6.1	0.6	67.8	67.8
		Forest	95.9				
FC21	1604	Residential	1.3	90.1	2.01	55	55.6
		Crop,Pasture	65.9				
		Orchards,Nur	0.5				
		Forest	32.3				
FC22	967	Residential	1.1	97.3	1.28	54.5	54.5
		Crop,Pasture	71.2				
		Forest	27.7				
FC23	1340	Crop,Pasture	3.1	3.0	0.67	63.9	63.9
		Forest	96.9				
FC24	1053	Crop,Pasture	62.6	64.8	0.84	56.5	56.5
		Forest	37.4				
FC25	584	Crop,Pasture	6.5	0.0	0.54	64.3	64.3
		Forest	93.5				
FC26	979	Crop,Pasture	0.1	1.3	1.35	67.9	67.9
		Forest	99.9				

Table A-1 (cont.)
Summary of Existing and Future Hydrologic/Land Use Characteristics by Sub-Area

Fishing Creek Mainstem Sub-Watershed (continued)

Sub-Area #	Area (acres)	Land Use Type	Amount of Land Use (%)	% Carbonate	Time of Concentration	Existing Weighted Curve Number	Proposed Weighted Curve Number
FC27	1994	Residential	0.7	61.9	1.41	57.7	57.7
		Crop,Pasture	58.0				
		Forest	41.3				
FC28	609	Crop,Pasture	0.6	1.5	0.82	68.2	68.3
		Forest	99.4				
FC29	2271	Residential	0.1	62.4	1.01	56.1	56.1
		Crop,Pasture	47.6				
		Forest	52.3				
FC30	2017	Crop,Pasture	2.0	0.2	1.07	64.2	64.3
		Forest	98.0				
FC31	1813	Residential	1.1	64.9	0.9	53.8	53.8
		Crop,Pasture	37.1				
		Forest	61.8				
FC32	838	Forest	100	0.0	0.44	62.3	62.3
FC33	687	Crop,Pasture	26.3	47.2	0.51	59.8	59.9
		Other Agric.	1.3				
		Forest	72.4				
FC34	1629	Crop,Pasture	0.1	0.0	0.81	67.5	67.5
		Forest	99.9				
FC35	821	Forest	100	19.8	0.79	61.7	61.7
FC36	1446	Forest	100	0.0	0.67	69	69
FC37	1228	Forest	100	0.0	0.78	66.9	66.9
FC38	1070	Forest	100	0.0	0.6	67	67
FC39	2010	Forest	100	0.0	1.12	66.4	66.4
FC40	1142	Forest	100	0.0	0.8	66.4	66.5
FC41	1657	Forest	100	0.0	0.63	65.6	65.6
FC42	813	Forest	100	0.0	0.64	69.4	69.4

Table A-1 (cont.)
Summary of Existing and Future Hydrologic/Land Use Characteristics by Sub-Area

Fishing Creek Mainstem Sub-Watershed (continued)

Sub-Area #	Area (acres)	Land Use Type	Amount of Land Use (%)	% Carbonate	Time of Concentration	Existing Weighted Curve Number	Proposed Weighted Curve Number
FC43	508	Crop,Pasture	30.6	34.4	0.7	56.3	58.1
		Other Agric	4.5				
		Forest	64.9				
FC77	657	Residential	7.3	100.0	0.67	51.6	53.5
		Paved	0.2				
		Crop,Pasture	78.9				
		Other Agric	1.4				
		Forest	12.2				
FC78	1829	Residential	1.7	62.8	1.28	58.9	61.2
		Paved	2.4				
		Crop,Pasture	58.3				
		Forest	37.6				
FC79	1252	Paved	4.8	75.6	0.74	61.6	62.5
		Crop,Pasture	70.3				
		Forest	24.9				
FC80	489	Paved	7.1	67.7	1.08	64.9	65.5
		Crop,Pasture	92.9				
FC81	1365	Paved	0.8	21.5	0.61	62.9	62.9
		Crop,Pasture	15.4				
		Forest	81.6				
		Open Space	2.2				
FC82	1429	Paved	0.2	13.0	0.46	64.2	64.2
		Crop,Pasture	5.4				
		Forest	94.4				
FC83	839	Residential	0.3	69.0	0.74	58.9	58.9
		Paved	14.0				
		Crop,Pasture	79.0				
		Forest	6.7				
FC84	1050	Residential	1.6	82.2	0.93	60.2	60.6
		Crop,Pasture	98.4				
FC85	2082	Paved	2.8	1.3	0.61	68.7	68.7
		Forest	97.2				
FC86	1084	Paved	8.5	95.5	1.55	53.1	53.1
		Crop,Pasture	68.5				
		Forest	23.0				

Table A-1 (cont.)
Summary of Existing and Future Hydrologic/Land Use Characteristics by Sub-Area

Fishing Creek Mainstem Sub-Watershed (continued)

Sub-Area #	Area (acres)	Land Use Type	Amount of Land Use (%)	% Carbonate	Time of Concentration	Existing Weighted Curve Number	Proposed Weighted Curve Number
FC87	713	Paved	1.0	68.9	0.68	61.9	61.9
		Crop,Pasture	84.7				
		Open Space	14.3				
FC88	1018	Residential	4.1	39.2	0.74	66.4	66.4
		Crop,Pasture	85.3				
		Open Space	10.6				
FC116	582	Forest	100	38.8	0.76	59.3	59.3
FC117	683	Forest	100	14.7	0.68	66.8	66.8
FC118	1818	Residential	22.5	35.5	1.28	66.6	66.6
		Comm/Indust	5.8				
		Crop,Pasture	20.8				
		Forest	44.6				
		Strip Mines	3.7				
		Open Space	2.7				
Fishing Creek Mainstem Sub-Watershed Total	64798	Residential	1.0	34.6	0.86 (average)	62.8 (average)	62.95 (average)
		Comm/Indust	0.2				
		Paved	1.4				
		Crop,Pasture	27.8				
		Orchards,Nur	0.1				
		Other Agric.	0.1				
		Forest	68.8				
		Strip Mines	0.1				
		Open Space	0.5				

Little Fishing Creek Sub-Watershed

Sub-Area #	Area (acres)	Land Use Type	Amount of Land Use (%)	% Carbonate	Time of Concentration	Existing Weighted Curve Number	Proposed Weighted Curve Number
LF44	1365	Forest	100	0.0	0.97	63.8	63.8
LF45	1355	Forest	100	0.0	1.16	56	56
LF46	1102	Forest	100	0.0	0.37	56.4	56.4
LF47	618	Crop,Pasture	49.8	0.0	0.7	71.0	71.1
		Forest	50.2				

Table A-1 (cont.)
Summary of Existing and Future Hydrologic/Land Use Characteristics by Sub-Area

Little Fishing Creek Sub-Watershed (continued)

Sub-Area #	Area (acres)	Land Use Type	Amount of Land Use (%)	% Carbonate	Time of Concentration	Existing Weighted Curve Number	Proposed Weighted Curve Number
LF48	428	Residential	4.5	36.3	1.02	65.4	73.1
		Crop,Pasture	79.2				
		Forest	2.8				
		Open Space	13.5				
LF49	1089	Crop,Pasture	48.2	78.9	1.24	46.5	51.2
		Forest	51.8				
LF50	379	Residential	0.5	3.4	0.46	69.6	78.6
		Crop,Pasture	36.1				
		Forest	61.5				
		Open Space	1.9				
LF51	723	Crop,Pasture	34.7	0.0	0.56	69.4	69.4
		Forest	65.3				
LF52	266	Crop,Pasture	59.7	0.0	0.34	71.7	71.7
		Forest	40.3				
LF53	817	Crop,Pasture	48.3	76.5	0.82	43.8	43.8
		Forest	51.7				
LF54	560	Crop,Pasture	38.9	9.7	0.66	62.5	62.5
		Forest	61.1				
LF55	1005	Residential	1.7	40.3	0.89	56.2	56.2
		Comm/Indust	0.6				
		Crop,Pasture	43.3				
		Forest	54.4				
LF56	779	Residential	1.5	27.4	0.72	65.6	65.6
		Crop,Pasture	58.5				
		Forest	40.0				
LF57	1044	Forest	100	0.0	0.59	55.9	55.9
LF58	550	Crop,Pasture	44.7	3.3	0.54	69.8	69.8
		Forest	55.3				
LF59	903	Crop,Pasture	76.2	89.7	0.5	49.1	49.1
		Forest	23.8				
LF60	735	Crop,Pasture	50.2	91.6	0.87	39.9	39.9
		Forest	49.8				

Table A-1 (cont.)
Summary of Existing and Future Hydrologic/Land Use Characteristics by Sub-Area

Little Fishing Creek Sub-Watershed (continued)

Sub-Area #	Area (acres)	Land Use Type	Amount of Land Use (%)	% Carbonate	Time of Concentration	Existing Weighted Curve Number	Proposed Weighted Curve Number
LF61	1017	Crop,Pasture	53.8	67.2	0.91	51.5	51.5
		Forest	46.2				
LF62	480	Crop,Pasture	48.4	48.8	0.93	56.4	56.4
		Forest	51.6				
LF63	511	Crop,Pasture	72.2	56.9	0.7	54.7	56.4
		Forest	27.8				
LF64	599	Crop,Pasture	59.2	98.8	0.53	40	41.7
		Forest	40.8				
LF65	526	Residential	2.3	100.0	0.53	40.6	42.7
		Crop,Pasture	47.1				
		Forest	50.6				
LF66	1328	Forest	100	0.4	0.61	64.3	64.3
LF67	1064	Forest	100	0.0	0.86	67.9	67.9
LF68	974	Forest	100	0.0	0.76	67.6	67.6
LF69	1346	Forest	100	0.0	0.85	67.8	67.8
LF70	745	Forest	100	0.0	0.86	63.7	63.7
LF71	972	Forest	100	0.0	0.59	67.6	67.6
LF72	1018	Forest	100	0.0	1.54	66.5	66.5
LF73	295	Forest	100	0.0	0.46	59.5	59.5
LF74	1650	Forest	100	0.0	0.81	58.6	58.6
LF75	407	Crop,Pasture	17.8	44.9	0.45	47.7	55.9
		Forest	82.2				

Table A-1 (cont.)
Summary of Existing and Future Hydrologic/Land Use Characteristics by Sub-Area

Little Fishing Creek Sub-Watershed (continued)

Sub-Area #	Area (acres)	Land Use Type	Amount of Land Use (%)	% Carbonate	Time of Concentration	Existing Weighted Curve Number	Proposed Weighted Curve Number
LF76	437	Residential	8.2	100.0	0.89	44.1	53.5
		Crop,Pasture	40.5				
		Other Agric	5.7				
		Forest	45.6				
Little Fishing Creek Sub-Watershed Total	27089	Residential	0.4	25.0	0.75 (average)	58.52 (average)	59.87 (average)
		Comm/Indust	0.0				
		Crop,Pasture	24.1				
		Other Agric.	0.1				
		Forest	75.2				
		Open Space	0.2				

Cedar Run Sub-Watershed

Sub-Area #	Area (acres)	Land Use Type	Amount of Land Use (%)	% Carbonate	Time of Concentration	Existing Weighted Curve Number	Proposed Weighted Curve Number
CR89	496	Crop,Pasture	70.7	94.3	0.41	54.1	54.1
		Forest	29.3				
CR90	906	Paved	6.0	96.9	0.84	39.6	39.6
		Crop,Pasture	23.8				
		Forest	70.2				
CR91	634	Crop,Pasture	65.4	72.6	0.95	57.8	57.8
		Forest	34.6				
CR92	683	Paved	9.0	100.0	0.63	42.6	42.6
		Crop,Pasture	36.6				
		Forest	54.4				
CR93	781	Paved	4.5	85.4	0.57	54.3	54.3
		Crop,Pasture	49.9				
		Forest	45.6				
CR94	955	Crop,Pasture	51.9	73.7	0.76	60.5	60.5
		Forest	48.1				
CR95	1189	Paved	5.3	100.0	3.42	55.9	56.3
		Crop,Pasture	82.4				
		Forest	12.3				

Table A-1 (cont.)
Summary of Existing and Future Hydrologic/Land Use Characteristics by Sub-Area

Cedar Run Sub-Watershed (continued)

Sub-Area #	Area (acres)	Land Use Type	Amount of Land Use (%)	% Carbonate	Time of Concentration	Existing Weighted Curve Number	Proposed Weighted Curve Number
CR96	410	Crop,Pasture Forest	99.5 0.5	100.0	0.65	57.6	57.6
CR97	465	Crop,Pasture	100	100.0	0.83	58.6	58.6
CR98	1137	Crop,Pasture Forest	67.0 33.0	80.3	0.57	60	60.2
CR99	521	Crop,Pasture Forest	54.9 45.1	60.9	0.52	62.6	62.6
CR100	1491	Residential Crop,Pasture Forest	0.6 73.5 25.9	84.8	0.89	58.6	58.6
Cedar Run Sub-Watershed Total	9669	Residential Paved Crop,Pasture Forest	0.1 2.2 63.2 34.5	87.1	0.92 (average)	55.18 (average)	55.23 (average)

Long Run Sub-Watershed

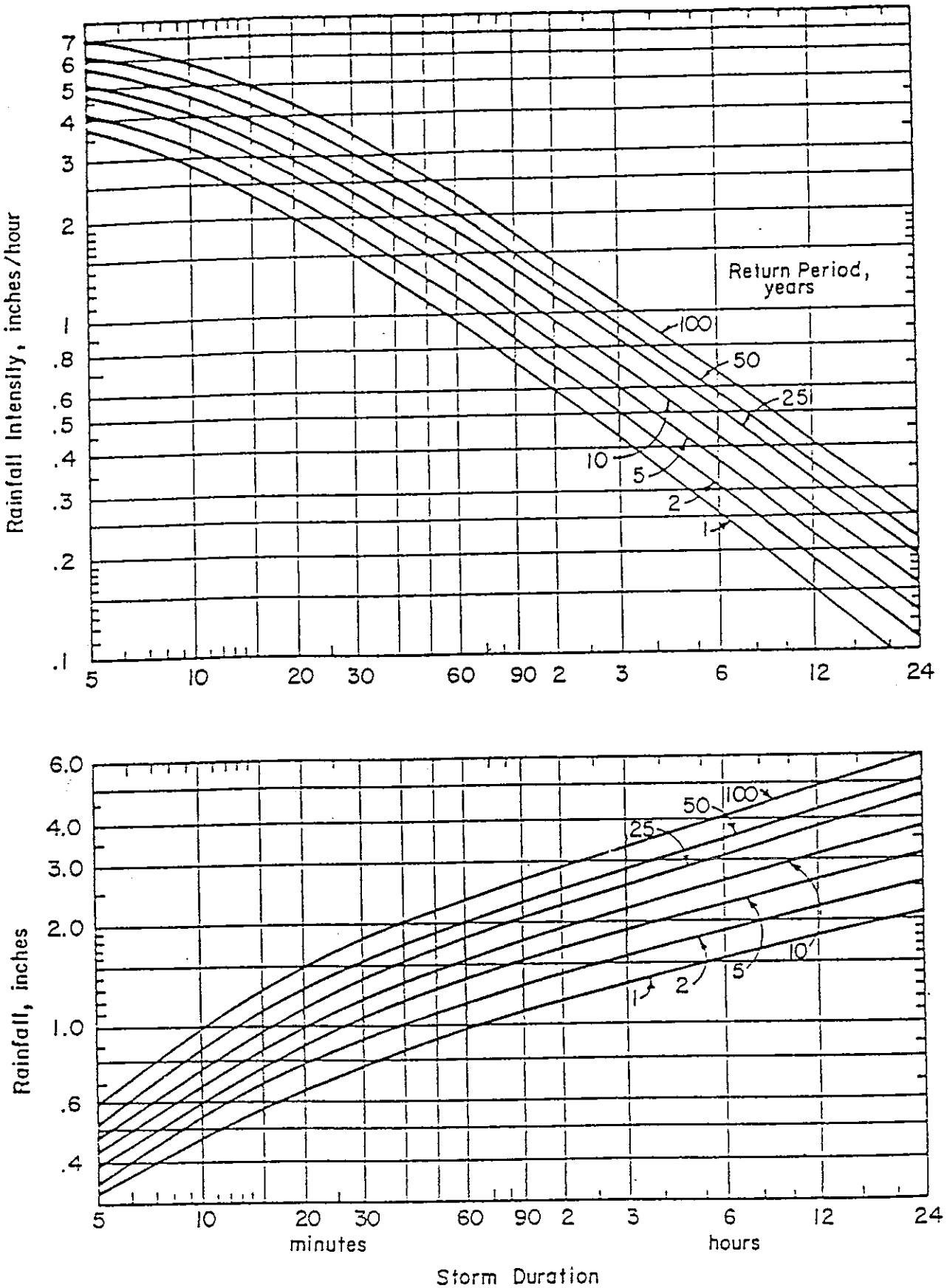
Sub-Area #	Area (acres)	Land Use Type	Amount of Land Use (%)	% Carbonate	Time of Concentration	Existing Weighted Curve Number	Proposed Weighted Curve Number
LR101	579	Forest	100	0.0	1.26	69.9	69.9
LR102	725	Paved Crop,Pasture Forest	2.1 4.2 93.7	5.8	0.77	67.2	67.2
LR103	559	Paved Crop,Pasture Forest	13.3 55.2 31.5	1.8	0.58	66.9	66.9
LR104	1359	Paved Crop,Pasture Forest	4.9	0.0	0.74	67.6	67.6
LR105	521	Crop,Pasture Forest	67.0 33.0	0.0	0.74	64	64

Table A-1 (cont.)
Summary of Existing and Future Hydrologic/Land Use Characteristics by Sub-Area

Long Run Sub-Watershed (continued)

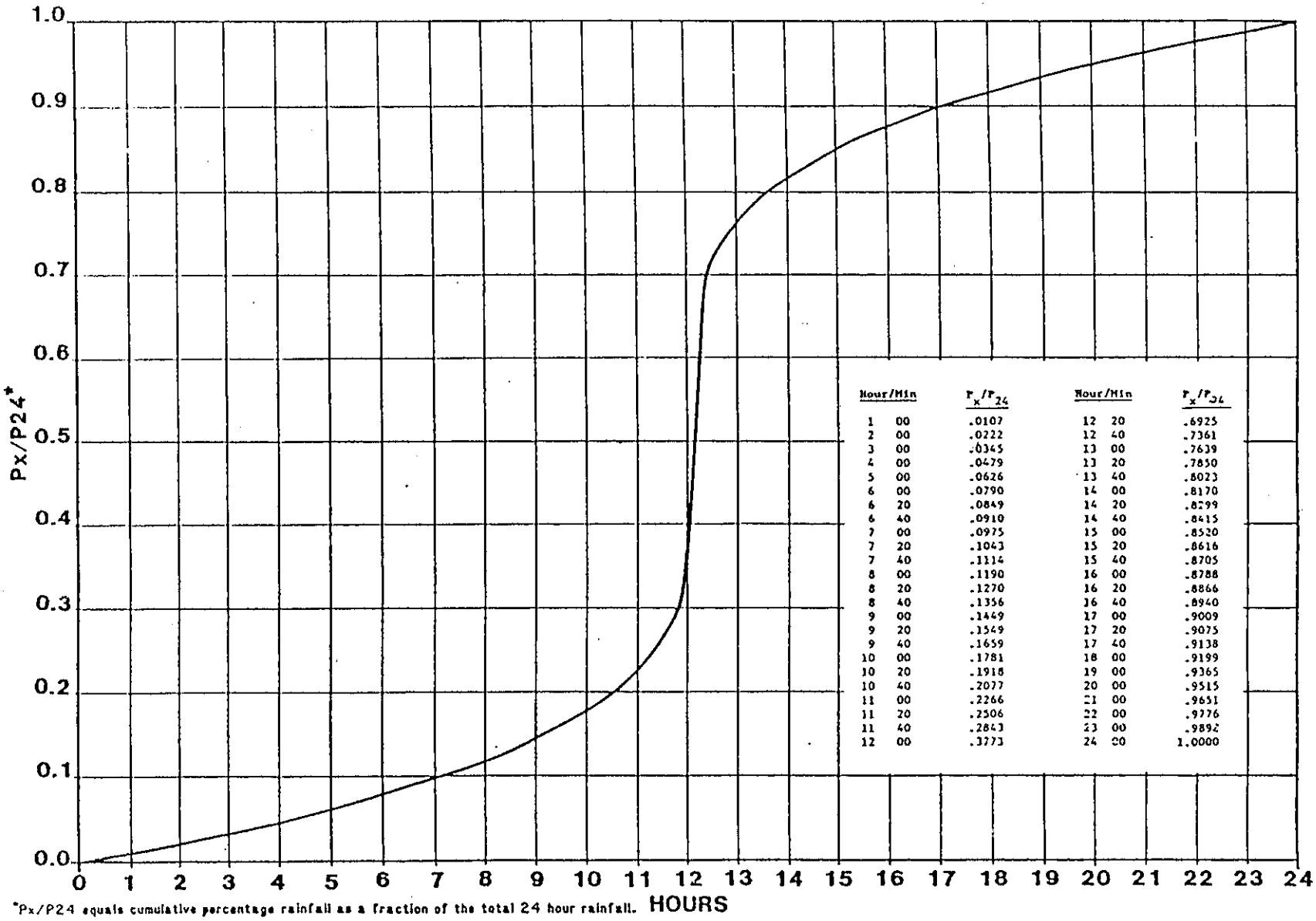
Sub-Area #	Area (acres)	Land Use Type	Amount of Land Use (%)	% Carbonate	Time of Concentration	Existing Weighted Curve Number	Proposed Weighted Curve Number
LR106	810	Crop,Pasture	9.3	0.0	0.62	66.4	66.4
		Forest	90.7				
LR107	676	Paved	2.9	0.0	0.35	69.5	69.5
		Forest	97.1				
LR108	2058	Residential	0.1	0.6	1.45	69.9	69.9
		Paved	6.7				
		Crop,Pasture	0.1				
		Forest	93.1				
LR109	884	Crop,Pasture	10.4	12.1	0.5	66.5	66.5
		Forest	89.6				
LR110	1413	Crop,Pasture	41.3	45.7	0.68	60	60
		Forest	58.7				
LR111	1399	Crop,Pasture	57.2	70.9	1.06	53.9	53.9
		Forest	42.8				
LR112	1232	Residential	0.5	18.2	0.77	63.5	63.5
		Crop,Pasture	60.2				
		Forest	39.3				
LR113	962	Residential	5.3	59.8	0.62	54.9	54.9
		Crop,Pasture	61.9				
		Forest	32.8				
LR114	871	Residential	0.5	97.9	0.72	51.1	51.1
		Crop,Pasture	80.0				
		Forest	19.5				
LR115	736	Residential	3.9	100.0	0.8	53.5	53.5
		Crop,Pasture	75.3				
		Forest	20.2				
		Strip Mines	0.6				
Long Run Sub-Watershed Total	14785	Residential	0.6	28.4	0.78 (average)	62.99 (average)	62.99 (average)
		Paved	2.1				
		Crop,Pasture	34.3				
		Forest	62.9				
		Strip Mines	0.1				

Figure B-1
Design Storm Curves



Source: Aron, G. et. al., 1988, Field Manual of Pennsylvania Department of Transportation Storm Intensity-Duration-Frequency Charts, Department of Civil Engineering and Institute for Research on Land and Water Resources, Pennsylvania State University, University Park, PA.

Figure B-2
SCS Type II Rainfall Distribution



Hour/Min	P_x/P_{24}	Hour/Min	P_x/P_{24}
1 00	.0107	12 20	.6925
2 00	.0222	12 40	.7361
3 00	.0345	13 00	.7639
4 00	.0479	13 20	.7850
5 00	.0626	13 40	.8023
6 00	.0790	14 00	.8170
6 20	.0849	14 20	.8299
6 40	.0910	14 40	.8415
7 00	.0975	15 00	.8520
7 20	.1043	15 20	.8616
7 40	.1114	15 40	.8705
8 00	.1190	16 00	.8788
8 20	.1270	16 20	.8866
8 40	.1356	16 40	.8940
9 00	.1449	17 00	.9009
9 20	.1549	17 20	.9075
9 40	.1659	17 40	.9138
10 00	.1781	18 00	.9199
10 20	.1918	19 00	.9365
10 40	.2077	20 00	.9515
11 00	.2266	21 00	.9651
11 20	.2506	22 00	.9776
11 40	.2843	23 00	.9892
12 00	.3773	24 00	1.0000

*Px/P24 equals cumulative percentage rainfall as a fraction of the total 24 hour rainfall.

Source: U.S. Department of Agriculture, Soil Conservation Service, Engineering Division, 1986, Urban Hydrology for Small Watersheds, Technical Release 55, Washington, DC.

Table B-1
Runoff Curve Numbers and Average Imperviousness For Various Land Uses by Hydrologic Soil Groups

Cover Description Land Use/Cover Type	Average Imperviousness (%)	Curve Numbers For Hydrologic Soil Group A	B	C	D
Open Space (lawns, parks, golf courses, cemetaries, etc.):					
Good condition (grass cover greater than 75%	n/a[a]	39	61	74	80
Impervious Areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	n/a	98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)	n/a	98	98	98	98
Paved; open ditches (including right-of-way)	n/a	98	98	98	98
Urban Districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential Districts by Average Lot Size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Woods:	n/a	30	55	70	77

[a] Not applicable.

Source: U.S. Department of Agriculture, Soil Conservation Service, Engineering Division, 1986, "Urban Hydrology for Small Watersheds," Technical Release 55, Washington, DC.

Table B-2
Runoff Coefficients for the Rational Formula
By Hydrologic Soil Groups and Overland Slope (%)

Land Use	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] 0.14[b]	0.13 0.18	0.16 0.22	0.11 0.16	0.15 0.21	0.21 0.28	0.14 0.20	0.19 0.25	0.26 0.34	0.18 0.24	0.23 0.29	0.31 0.41
Pasture	0.12 0.15	0.20 0.25	0.30 0.37	0.18 0.23	0.28 0.34	0.37 0.45	0.24 0.30	0.34 0.42	0.44 0.52	0.30 0.37	0.40 0.50	0.50 0.62
Meadow	0.10 0.14	0.16 0.22	0.25 0.30	0.14 0.20	0.22 0.28	0.30 0.37	0.20 0.26	0.28 0.35	0.36 0.44	0.24 0.30	0.30 0.40	0.40 0.50
Forest	0.05 0.08	0.08 0.11	0.11 0.14	0.08 0.10	0.11 0.14	0.14 0.18	0.10 0.12	0.13 0.16	0.16 0.20	0.12 0.15	0.16 0.20	0.20 0.25
Residential Lot Size 1/8 Acre	0.25 0.33	0.28 0.37	0.31 0.40	0.27 0.35	0.30 0.39	0.35 0.44	0.30 0.38	0.33 0.42	0.38 0.49	0.33 0.41	0.36 0.45	0.42 0.54
Lot Size 1/4 Acre	0.22 0.30	0.26 0.34	0.29 0.37	0.24 0.33	0.29 0.37	0.33 0.42	0.27 0.36	0.31 0.40	0.36 0.47	0.30 0.38	0.34 0.42	0.40 0.52
Lot Size 1/3 Acre	0.19 0.28	0.23 0.32	0.26 0.35	0.22 0.30	0.26 0.35	0.30 0.39	0.25 0.33	0.29 0.38	0.34 0.45	0.28 0.36	0.32 0.40	0.39 0.50
Lot Size 1/2 Acre	0.16 0.25	0.20 0.29	0.24 0.32	0.19 0.28	0.23 0.32	0.28 0.36	0.22 0.31	0.27 0.35	0.32 0.42	0.26 0.34	0.30 0.38	0.37 0.48
Lot Size 1 Acre	0.14 0.22	0.19 0.26	0.22 0.29	0.17 0.24	0.21 0.28	0.26 0.34	0.20 0.28	0.25 0.32	0.31 0.40	0.24 0.31	0.29 0.35	0.35 0.46
Industrial	0.67 0.85	0.68 0.85	0.68 0.86	0.68 0.85	0.68 0.86	0.69 0.86	0.68 0.86	0.69 0.86	0.69 0.87	0.69 0.86	0.69 0.86	0.70 0.88
Commercial	0.71 0.88	0.71 0.88	0.72 0.89	0.71 0.89	0.72 0.89	0.72 0.89	0.72 0.89	0.72 0.89	0.72 0.90	0.72 0.89	0.72 0.89	0.72 0.90
Streets	0.70 0.76	0.71 0.77	0.72 0.79	0.71 0.80	0.72 0.82	0.74 0.84	0.72 0.84	0.73 0.85	0.76 0.89	0.73 0.89	0.75 0.91	0.78 0.95
Open Space	0.05 0.11	0.10 0.16	0.14 0.20	0.08 0.14	0.13 0.19	0.19 0.26	0.12 0.18	0.17 0.23	0.24 0.32	0.16 0.22	0.21 0.27	0.28 0.39
Parking	0.85 0.95	0.86 0.96	0.87 0.97	0.85 0.95	0.86 0.96	0.87 0.97	0.85 0.95	0.86 0.96	0.87 0.97	0.85 0.95	0.86 0.96	0.87 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: Rawls, W.J., S.L. Wong and R.H. McCuen, 1981, "Comparison of Urban Flood Frequency Procedures," Preliminary Draft, U.S. Department of Agriculture, Soil Conservation Service, Beltsville, MD.

Table B-3
Manning Roughness Coefficients

	Manning's n range
I. Closed Conduits:	
A. Concrete pipe	0.011-0.013
B. Corrugated-metal pipe or pipe arch:	
1. 2-2/3 by 1/2 in. corrugation (riveted) pipe):	
a. Plain or fully coated	0.024
b. Paved invert (range values are for 25 and 50 percent of circumference paved):	
(1) Flow full depth	0.021-0.018
(2) Flow 0.8 depth	0.021-0.016
(3) Flow 0.6 depth	0.019-0.013
2. 6 by 2-in. corrugation (field bolted)	0.030
C. Cast-iron pipe, uncoated	0.013
D. Steel pipe	0.009-0.011
E. Monolithic concrete:	
1. Wood forms, rough	0.015-0.017
2. Wood forms, smooth	0.012-0.014
3. Steel forms	0.012-0.013
F. Cemented rubble masonry walls:	
1. Concrete floor and top	0.017-0.022
2. Natural floor	0.019-0.025
II. Open Channels, Lined (straight alignment):	
A. Concrete, with surfaces as indicated:	
1. Formed, no finish	0.013-0.017
2. Trowel finish	0.012-0.014
3. Float finish	0.013-0.015
4. Float finish, some gravel on bottom	0.015-0.017
5. Gunite, good section	0.016-0.019
6. Gunite, wavy section	0.018-0.022
B. Concrete, bottom float finished, sides as indicated:	
1. Dressed stone in mortar	0.015-0.017
2. Random stone in mortar	0.017-0.020
3. Cement rubble masonry	0.020-0.025
4. Cement rubble masonry, plastered	0.016-0.020
5. Dry rubble (riprap)	0.020-0.030
C. Gravel bottom, sides as indicated:	
1. Formed concrete	0.017-0.020
2. Random stone in mortar	0.020-0.023
3. Dry rubble (riprap)	0.023-0.033
D. Asphalt	
1. Smooth	0.013
2. Rough	0.016
E. Concrete-lined excavated rock:	
1. Good section	0.017-0.020
2. Irregular section	0.022-0.027
III. Open Channels, Excavated (straight alignment, natural lining):	
A. Earth, uniform section:	
1. Clean, recently completed	0.016-0.018
2. Clean, after weathering	0.018-0.020
3. With short grass, few weeds	0.022-0.027
4. In gravelly soil, uniform section, clean	0.022-0.025
B. Earth, fairly uniform section:	
1. No vegetation	0.022-0.025
2. Grass, some weeds	0.025-0.030
3. Dense weeds or aquatic plants in deep channels	0.030-0.035
4. Sides clean, gravel bottom	0.025-0.030
5. Sides clean, cobble bottom	0.030-0.040
C. Dragline excavated or dredged:	
1. No vegetation	0.028-0.033
2. Light brush on banks	0.035-0.050
D. Rock:	
1. Based on design section	0.035
2. Based on actual mean section:	
a. Smooth and uniform	0.035-0.040
b. Jagged and irregular	0.040-0.045
E. Channels not maintained, weeds and brush uncut:	
1. Dense weeks,high as flow depth	0.080-0.120
2. Clean bottom, brush on sides	0.050-0.080
3. Clean bottom, brush on sides, highest stage of flow	0.070-0.110
4. Dense brush, high stage	0.100-0.140
IV. Channels & Swales w/Maintained Vegetation (Values shown are for velocities of 2 & 6 f.p.s.):	
A. Depth of flow up to 0.7 foot:	
1. Bermudagrass, Kentucky bluegrass, buffalograss	
a. Mowed to 2 inches	0.045-0.070
b. Length 4-6 inches	0.050-0.090
2. Good stand, any grass:	
a. Length about 12 inches	0.090-0.180
b. Length about 24 inches	0.150-0.300
3. Fair stand, any grass:	
a. Length about 12 inches	0.080-0.140
b. Length about 24 inches	0.130-0.250
B. Depth of flow 0.7-1.5 feet:	
1. Bermudagrass, Kentucky bluegrass, buffalograss:	
a. Mowed to 2 inches	0.035-0.050
b. Length 4 to 6 inches	0.040-0.060
2. Good stand, any grass:	
a. Length about 12 inches	0.070-0.120
b. Length about 24 inches	0.100-0.200
3. Fair stand, any grass:	
a. Length about 12 inches	0.060-0.100
b. Length about 24 inches	0.090-0.170
V. Street and Expressway Gutters:	
A. Concrete gutter, troweled finish	0.012
B. Asphalt pavement:	
1. Smooth texture	0.013
2. Rough texture	0.016
C. Concrete gutter with asphalt pavement	
1. Smooth	0.013
2. Rough	0.015
D. Concrete pavement:	
1. Float finish	0.014
2. Broom finish	0.016
E. For gutters with small slope, where sediment may accumulate, increase above values of x by	0.002

Source: Chow, V.T., 1959, "Open Channel Hydraulics," McGraw Hill, New York.

Table B-3 (continued)
Manning Roughness Coefficients

	Manning's n range
VI. Natural Stream Channels:	
A. Minor streams (surface width at flood stage less than 100 feet):	
1. Fairly regular section:	
a. Some grass & weeds, little or no brush	0.030-0.035
b. Dense growth of weeks, depth of flow materially greater than weed height	0.035-0.050
c. Some weeks, light brush on banks	0.035-0.050
d. Some weeks, heavy brush on banks	0.050-0.070
e. Some weeks, dense willows on banks	0.060-0.080
f. For trees within channel with branches submerged at high stage, increase all above values by	0.010-0.020
2. Irregular sections, with pools, slight channel meander; increase values given in 1a-e about	0.010-0.020
3. Mountain streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high stage	
a. Bottom of gravel, cobbles and few boulders	0.040-0.050
b. Bottom of cobbles, with large boulders	0.050-0.070
B. Flood plains (adjacent to natural streams):	
1. Pasture, no brush:	
a. Short grass	0.030-0.035
b. High grass	0.035-0.050
2. Cultivated areas:	
a. No crop	0.030-0.040
b. Mature row crops	0.035-0.045
c. Mature field crops	0.040-0.050
3. Heavy weeds,scattered brush	0.050-0.070
4. Light brush and trees:	
a. Winter	0.050-0.060
b. Summer	0.060-0.080
5. Medium to dense brush:	
a. Winter	0.070-0.110
b. Summer	0.100-0.160
6. Dense willows, summer, not bent over by current	0.150-0.200
7. Cleared land w/tree stumps, 100-150 per acre:	
a. No sprouts	0.040-0.050
b. With heavy growth of sprouts	0.060-0.080
8. Heavy stand of timber, a few down trees, little undergrowth:	
a. Flood depth below branches	0.100-0.120
b. Flood depth reaches branches	0.120-0.160
C. Major streams (surface width at flood stage more than 100 ft.): Roughness coefficient is usually less than for minor streams of similar description on account of less effective resistance offered by irregular banks or vegetation on banks. Values of n may be somewhat reduced. Follow recommendation in publication cited if possible. The value of n for larger streams of most regular section, with no boulders or brush, may be in the range of	0.028-0.033

Source: Chow, V.T., 1959, "Open Channel Hydraulics," McGraw Hill, New York.

Table B-4
Permissible Velocities for Channels

Channel Lining	Permissible Channel Velocity[a] (feet per second)
Vegetation	
Alfalfa	2.5 to 3.5
Bermudagrass	4 to 8
Crabgrass	2.5 to 3.5
Crownvetch	3 to 5
Kentucky Bluegrass	4 to 7
Kentucky 31 Tall Fescue	2.5 to 7
Red Clover or Red Fescue	2.5 to 3.5
Reed Canary	3 to 5
Ryegrass	2.5 to 3.5
Small Grains	2.5 to 3
Smooth Brome	3 to 7
Sudan Grass or Timothy	2.5 to 3.5
Bare Earth, Easily Eroded	
Fine Sand	1.5
Sand Loam	1.75
Silt Loam or Alluvial Silts, Loose	2
Firm Loam	2.25
Bare Earth, Erosion Resistant	
Fine Gravel	2.5
Stiff Clay or Alluvial Silts, Firm	3
Loam to Cobbles (graded)	3.75
Silt to Cobbles (graded or Coarse Gravel)	4
Cobbles and Stones or Shales and Hardpans	5
Durable Bedrock	8
Other	
Plastic	4
6" Rip Rap	6
Asphalt	7
9" Rip Rap	8
12" Rip Rap or Wood	9
Concrete or Steel	12

[a] These values, if applied to uniform, straight channels, may be considered in accordance with Chapter 102.12 of the Erosion Control Rules and Regulations. However, slope, soil condition, climate and management must be considered in channel design. If different channel linings exist in a channel, and size and slope do not change, design the channel for the lining with the lower velocity listed. Where velocity ranges are listed, the lower velocity is for design with easily eroded soils and slopes greater than 10%. The higher velocity is for design with erosion resistant soils and slopes less than 5%. Filtration and/or sedimentation in the channel is encouraged. However, this must be considered for velocity determination in the design of the channel cross-section.

Source: Pennsylvania Department of Environmental Resources, 1985, "Soil Erosion and Sedimentation Control Manual," Appendix G7.

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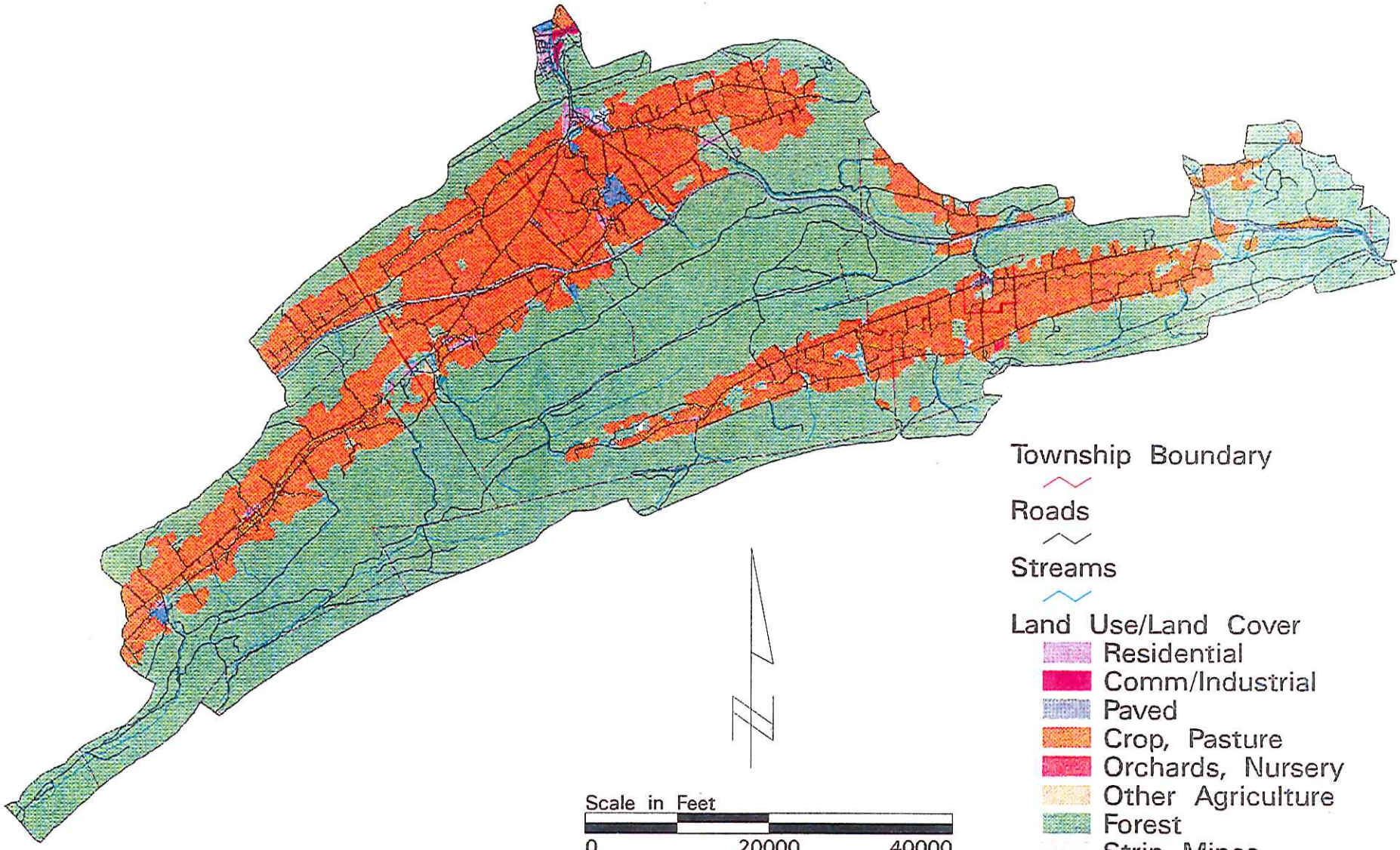
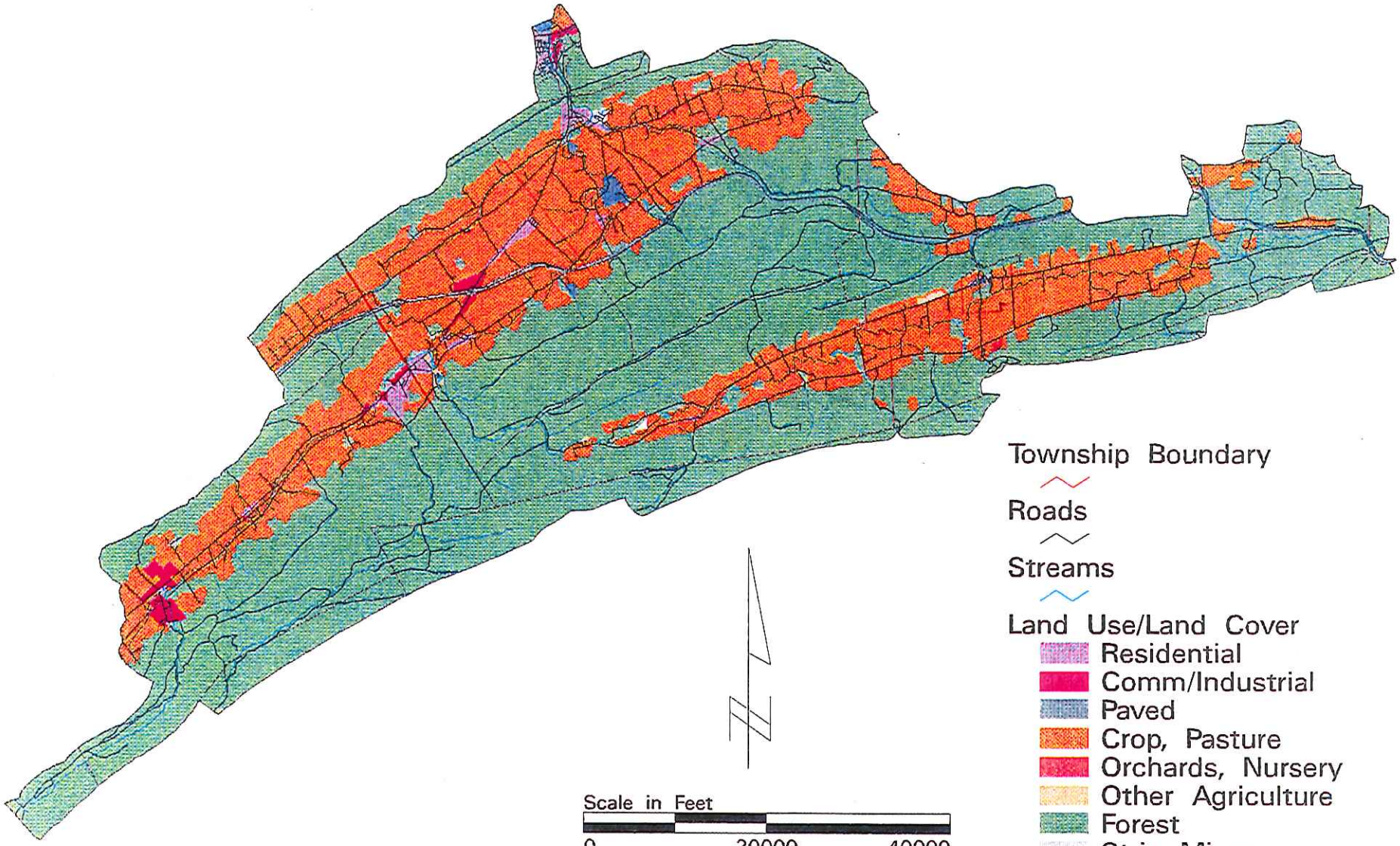
Existing Land Use/Land Cover
Fishing Creek/Cedar Run Watershed



Prepared by: Towson State University GIS Lab

PLATE #1

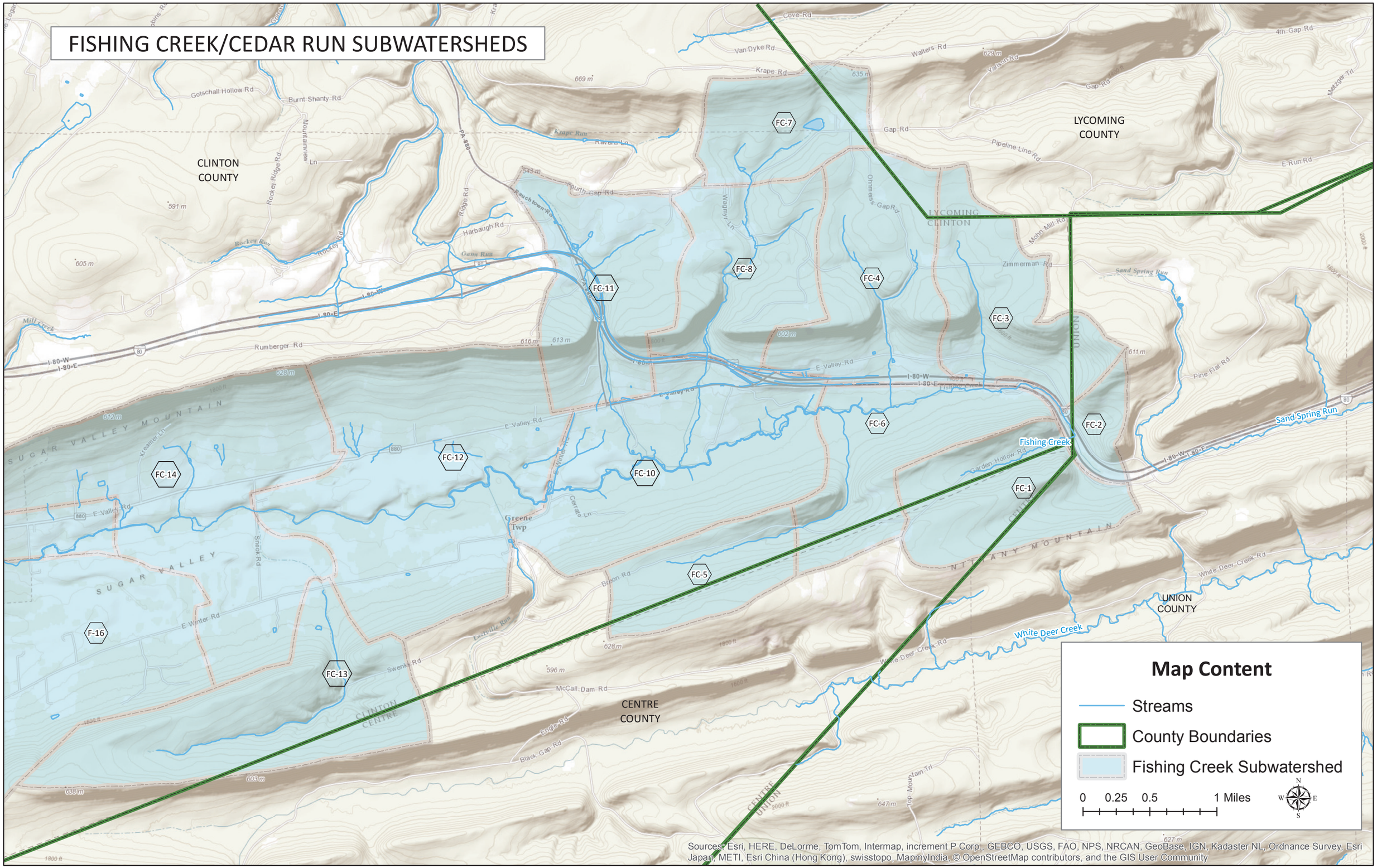
Future Land Use/Land Cover
Fishing Creek/Cedar Run Watershed



Prepared by: Towson State University GIS Lab

PLATE #2

FISHING CREEK/CEDAR RUN SUBWATERSHEDS

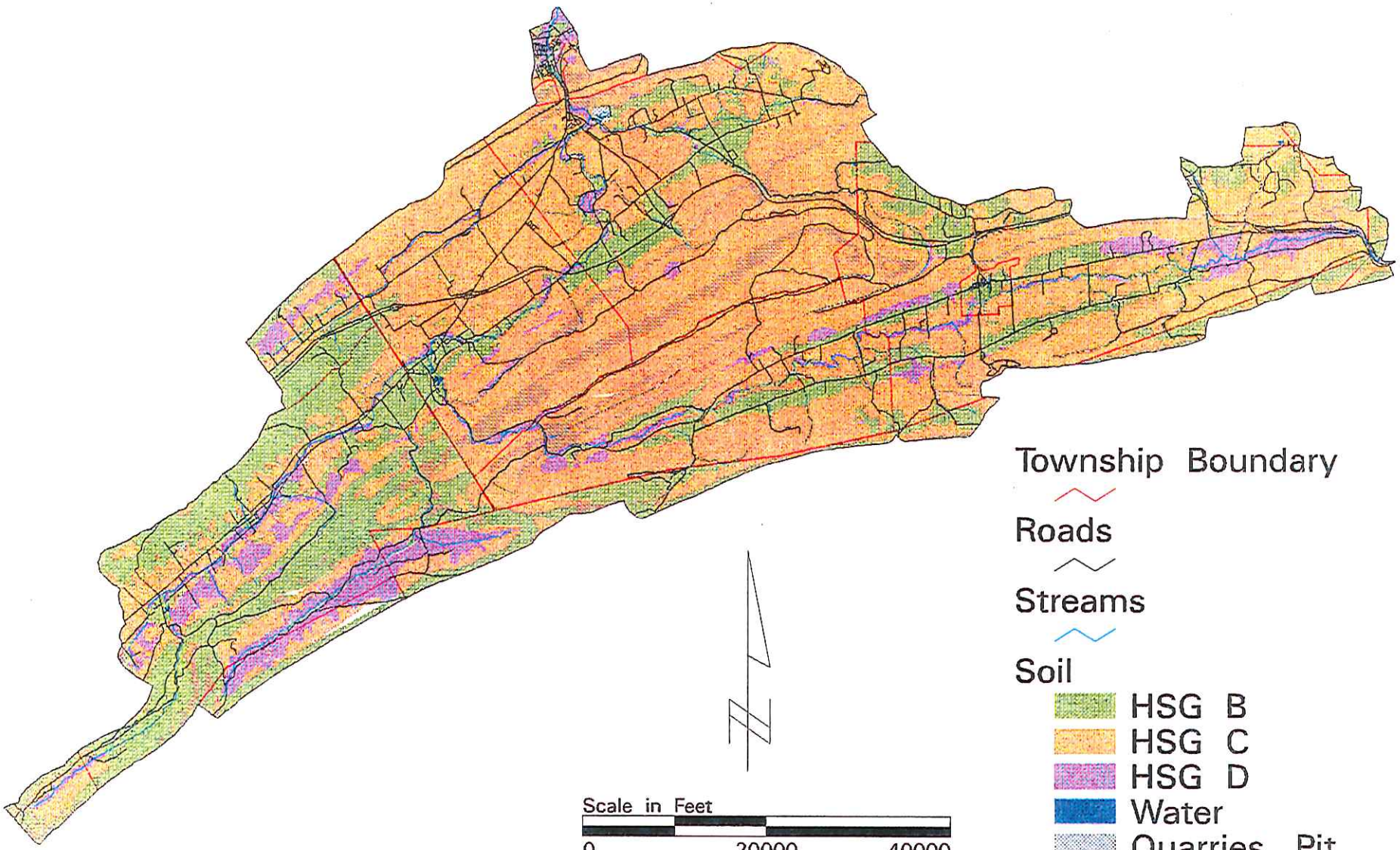


Map Content

- Streams
- County Boundaries
- Fishing Creek Subwatershed

0 0.25 0.5 1 Miles

Hydrologic Soil Groupings
Fishing Creek/Cedar Run Watershed



Prepared by: Towson State University GIS Lab

PLATE #4

CLINTON COUNTY

Daniel L. Vilello, *Chairman*
Miles D. Kessinger, *Vice Chairman*
Dean M. Bottorf

Phone 717-893-4000

Linda K. Bickford, *Chief Clerk*
Lewis G. Steinberg, *Solicitor*

Fax 717-893-4041

COMMISSIONERS

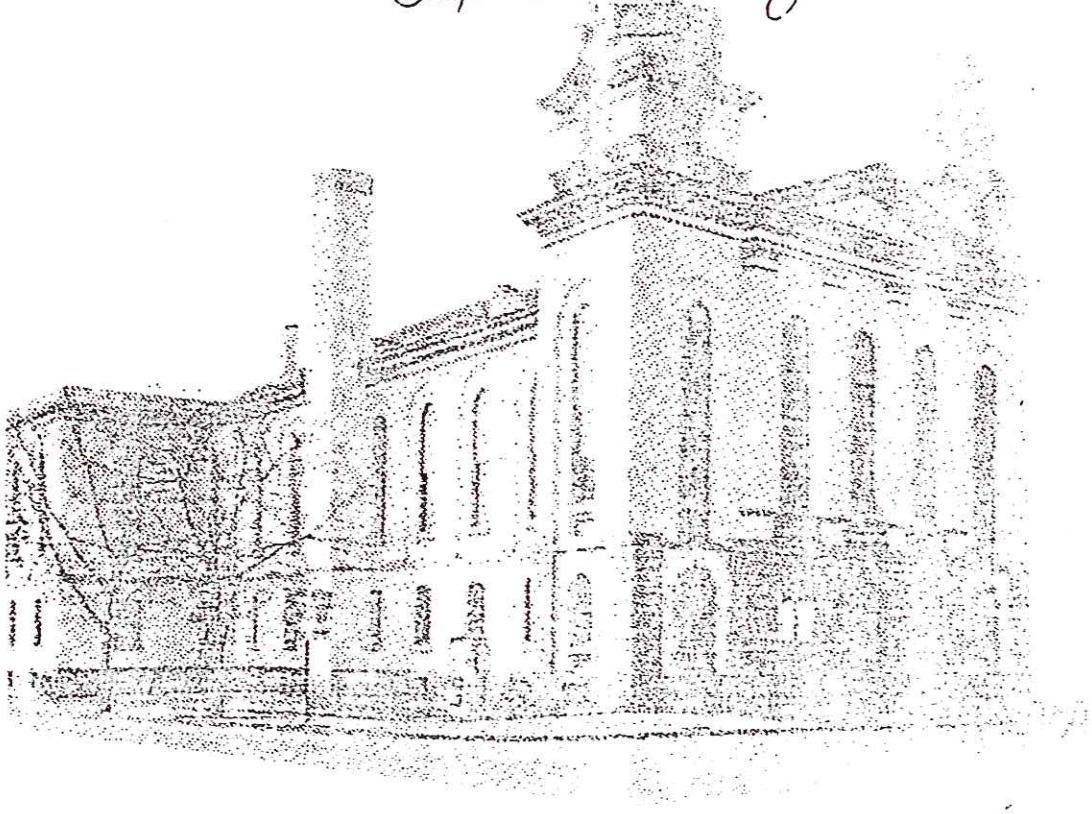
February 20, 1996

TO WHOM IT MAY CONCERN:

I, Linda K. Bickford, Chief Clerk to the Clinton County Commissioners hereby certifies that these are a true copy of the minutes of the Commissioners meeting held on December 13, 1995 where they approved the Stormwater Management Plan.

Linda K. Bickford

Linda K. Bickford, Chief Clerk



COURTHOUSE, LOCK HAVEN, PENNSYLVANIA 17745
CLINTON COUNTY IS AN EQUAL OPPORTUNITY EMPLOYER

Agreement with EADS Group for 1996 retainer fee in the amount

Motion by Mr. Kessinger, seconded by Mr. Kephart. Motion carried. HIRED

Mr. Ohl asked for a motion to approve the transfer of Rose Lucas FROM Domestic Relations to the Court of Common Pleas as Legal Secretary to Judge Saxton effective 1/1/96. Motion by Mr. Kephart seconded by mr. Kessinger. Motion carried. ROSE LUCAS TRANSFER

Mr. Ohl asked for a motion to approve the lateral transfer of Paula Keller from Prothonotary's Office to Domestic Relations Office as Clerk Typist II effective 1/1/96. Motion by Mr. Kephart, seconded by Mr. Kessinger. Motion carried. PAULA KELLER LATERAL TRANSFER

Mr. Ohl asked for a motion to approve the promotion of Keith Linn Fiscal Technician to Fiscal Technician Supervisor in Children & Youth Department effective 12/18/95. Motion by Mr. Kephart, seconded by Mr. Kessinger. Motion carried. KEITH LINN PROMOTED

Mr. Ohl asked for a motion to approve the hiring of John McHenry as Assistant Fiscal Technician in the Children & Youth Department effective 1/1/96. Motion by Mr. Kephart, seconded by Mr. Kessinger Motion carried. JOHN MCHENRY HIRED ASSIST. FISCAL TECH.

Mr. Ohl asked for a motion to approve County Bills: Accts payable: $95,457.12, Payroll P/E 12/1/95: $152,698.30 . Motion by Mr. Kessinger, seconded by mr. Kephart. Motion carried. COUNTY BILLS

The Salary Board was called to order at 10:10 a.m. Details of the Salary Board are in the minutes of the Salary Board. SALARY BOARD

The meeting was adjourned at 10:15 a.m. by motion of Mr. Kessinger seconded by Mr. Kephart. Motion carried. ADJOURNED

Linda K Bickford
Chief Clerk

WEDNESDAY, DECEMBER 13, 1995

PRESENT: Robert Ohl, Larry Kephart, Miles Kessinger, Lee Marshall.

The meeting was called to order at 10:00 a.m. by Chairman Robert Ohl.

The minutes of the previous meeting were approved as written by motion of Mr. Kessinger, seconded by Mr. Kephart. Motion carried. MINUTES APPROVED

Mr. Ohl stated that a hearing was held prior to this meeting on the Fishing Creek StormWater Management Plan asked for a motion to adopt the StormWater Management Plan for the Fishing Creek/ Cedar Run Watershed. Motion by Mr. Kephart, seconded by Mr. Kessinger. Motion carried. (see attached minutes from hearing STORMWATER MANAGEMENT PLAN ADOPTED

Mr. Ohl asked for a motion to adopt Fair Housing Resolution for the Community Development Block Grants each year. Hearings were held 12/2/95 and 12/13/95. Motion by Mr. Kessinger to adopt, seconded by Mr. Kephart. Motion carried. FAIR HOUSING RESOLUTION ADOPTED

Minutes of Public Hearing

Fishing Creek/Cedar Run Watershed Stormwater Management Plan

DATE: December 14, 1995

9:30 A.M. Clinton County Courthouse, Small Court Room on Second Floor

Attendance:
Commissioner Robert Ohl
Commissioner Miles Kessinger
Commissioner Larry Kephart
Mill Hall Councilman Ted Jodun
County Planner Timothy Holladay
Express Newspaper Reporter Daniel Adams
PA Department of Environmental Protection Engineer David Jostenski
Sweetland Engineering Engineer, Project Manager Richard Manning
Conservation District Manager Suzanne S. Foust

Commissioner Chairman Robert Ohl opened the public hearing, calling on Conservation District Manager Suzanne Foust to begin testimony.

Mrs. Foust explained that the Fishing Creek/Cedar Run Watershed Stormwater Management Plan was begun in 1991 and has been completed, ready for adoption by the Clinton County Board of Commissioners. The Conservation District and the County Planning Commission have worked with PA Department of Environmental Protection to prepare this tool that can be used by municipalities and engineering firms for future development planning.

Tim Holladay questioned the procedure of plan review. Who is responsible?

Dave Jostenski answered that if a township wants to relinquish the responsibility to the planning commission, they can sign a cooperative agreement. Dave said he will work with municipalities and their solicitors to adopt ordinances and understand their role in the review process.

Tim Holladay stated his agreement with the plan and agreed that the plan for Fishing Creek/Cedar Run Watershed is needed. He said he supports the plan as presented.

Fishing Creek/Cedar Run Watershed Stormwater Management Plan

Richard Manning spread the map of the watershed and explained the location and sub-watershed designations of the 181 square mile watershed.

Ted Jodun stated that, as he and his associates from the Mill Hall Planning Commission had stated at the WPAC meeting in Spring Township, the Council and Planning Commission are interested in seeing this project approved and feel that it is to the benefit of the municipality to have this plan to assist in future development.

Dave Jostenski said he is pleased to see the completion of this plan and that it will be completed under budget by approximately $60,000.

Commissioner Larry Kephart stated that Centre County will be addressing this Plan for their adoption in 1996.

The hearing adjourned at 9:50 AM with the intent to propose the Plan for adoption at the regularly scheduled Commissioners meeting at 10 AM.

At the regularly scheduled meeting of the Clinton County Board of Commissioners, 10 AM, December 13, 1995, Commissioner Larry Kephart proposed adoption of the Stormwater Management Plan for the Fishing Creek/Cedar Run Watershed. Second by Miles Kessinger. There were no questions or discussion from the floor. The Plan was adopted by the Clinton County Board of Commissioners for the County of Clinton.

Stormwater management plan is developed here

MILL HALL — A stormwater management plan for the Fishing Creek/Cedar Run Watershed has been developed for the municipalities in the drainage basin, which covers 180 square miles in four counties.

Working on behalf of the Clinton County Commissioners, the Clinton County Conservation District and the many municipal officials in the basin have helped develop the plan by working with the Department of Environmental Protection (DEP) and Sweetland Engineering and Associates. The plan guides future development of the watershed. Officials in the other three counties in the basin — Centre, Lycoming and Union — were also involved.

All work was done under the State's Act 167 and receives 75% cost-share funding from DEP. The estimated cost of the plan is over $200,000. Most of the cost to Clinton County (25% of the total) is in-kind services of municipal officials and county employees.

In Clinton County, municipalities in the watershed are: Townships of Bald Eagle, Lamar, Porter, Logan, Greene, Crawford, and Castanea, Mill Hall Borough and Loganton Borough. In Centre County, municipalities are: Gregg, Marion, Miles, Spring, and Walker Townships. Lycoming County's Washington Township and Union County's Lewis Township have very small areas in this watershed.

Work on the plan was started in 1990 with the formation of a Watershed Plan Advisory Committee. Members of the committee were from agencies and organizations who had interest in any land within the watershed and one municipal official from each of the 16 municipalities involved.

During the five years of work on the plan, the Watershed Plan Advisory Committee held six multi-county meetings. At the final two meetings, officials from seven municipalities and two counties met to hear how the plan will work.

The plan is not intended to correct existing stormwater problems. It does require development plans to include drainage methods to protect off-site properties. The total watershed is taken into consideration for planning, rather than just the immediate surrounding properties.

The plan is under review at this time, and a public hearing will be held in Clinton County on Dec. 13. The Clinton County Commissioners are expected to adopt the plan for Clinton County after the hearing.

To review the plan or find out more about the process, call the Clinton County Conservation District at 726-3798. The plan is also available the office of the Clinton County Board of Commissioners.

Commissioners OK Storm Water Plan

by Mark Sohmer

LOCK HAVEN — The Clinton County Commissioners gave their approval to the adoption of the Fishing Creek-Cedar Run storm water management plan at last week's meeting.

The plan has been in development for more than four years. Commissioner Larry Kephart praised the work of the Clinton County Conservation District, the County Planning Commission and the Department of Environmental Protection, saying they did a fantastic job for all the work they put in on the project.

The County Planning Commission will be presenting the commissioners with a recommended list of projects deemed worthy of Community Development Block Grant funding. The commissioners will be selecting the programs that will be receiving funds at their Wednesday, December 20 meeting.

The commissioners also approved some part-time help for the Communications Center. Kevin Ferrara, Jennifer Caprio, and Penny Bechdel were hired at a rate of $4.95 an hour for dispatching duties. The county was down to just one part-time dispatcher. The hirings were effective December 11.

NOTICE
The Commissioners of Clinton County will hold a public hearing on Wednesday, December 13, at 9:30 AM, 3rd floor conference room, Courthouse, to receive comments on the proposed Fishing Creek/Cedar Run Watershed Stormwater Management Plan that will be due for adoption following the hearing.
The Plan can be inspected at the Commissioners' office, Courthouse, Lock Haven, or Clinton County Conservation District, 2 SR 150, Mill Hall, 8:30 AM-4:30 PM.
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