Attachment J
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Final Benchmark

PROPOSED

STATEWIDE COMPREHENSIVE

STORMWATER MANAGEMENT PROGRAM

FOR

DELAWARE

SEPTEMBER 1988

PROPOSED STATEWIDE COMPREHENSIVE STORMWATER MANAGEMENT PROGRAM FOR DELAWARE

prepared by

Kent Conservation District
and
Cooperating Agencies and Organizations

September 1988

ACKNOWLEDGEMENTS

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This project was partially funded by a grant from the Office of Ocean and Coastal Resources, National Oceanic and Atmospheric Administration, made available through the Delaware Department of Natural Resources and Environmental Control.

KENT CONSERVATION DISTRICT
3500 S. duPont Highway
Dover, Delaware 19901
Phone: (302) 697-6176

September 22, 1988

David S. Hugg, III, Executive Assistant
DNREC, Office of Mgt., Budget, and Planning
89 Kings Highway
P.O. Box 1401
Dover, Delaware 19903

Dear Mr. Hugg:

The Kent Conservation District is pleased to submit the final report of a Proposed Comprehensive Stormwater Management Program for Delaware (4 copies).

This report is the product of the project made possible by the grant from the Office of Ocean and Coastal Resources, National Oceanic and Atmospheric Administration, provided through the Department of Natural Resources and Environmental Control.

We feel the proposed stormwater management program is the preferred approach for Delaware in view of ongoing efforts to control erosion and sediment on agricultural land and construction sites and in consideration of adjoining States' stormwater management programs. It utilizes presently established authorities and relationships of conservation districts, counties and municipalities, and state agencies. By amending Chapter 40 of Title 7, Erosion and Sediment Control Law to include stormwater management, a streamlined program encompassing one plan for erosion and sediment control and stormwater management, one plan review and approval process, and one permit is made possible. A draft amendment to Chapter 40, Title 7 and a draft ordinance for counties and municipalities are included in the report.

The Kent Conservation District appreciates the opportunity to conduct this project and trusts the report will be effective in helping to generate an effective stormwater management program in Delaware.

Sincerely,

Robert Winkler

Robert Winkler, Chairman
Kent Conservation District

KENT CONSERVATION DISTRICT
3500 S. duPont Highway
P.O. Box 864
Dover, Delaware 19903
Phone: (302) 697-6176

TO: Advisory Group, Stormwater Management Project

FROM: Robert E. Williams, Project Coordinator
30 Creek Drive, Winding Creek Village
Millsboro, Delaware 19966
(302) 945-1257

SUBJECT: Transmittal of Final Report,
"Proposed Statewide Comprehensive Stormwater Management Program for Delaware."

DATE: September 22, 1988

Attached is a copy of the subject report. We deeply appreciate your assistance in this project. We realize that the report probably does not satisfy everyone in all details. However, after assessing established programs in Maryland, Pennsylvania, and New Jersey; and in view of ongoing efforts in Delaware, we feel the proposed approach is the most logical for Delaware. We gave careful consideration to all suggestions.

Again, we appreciate your help, and trust the report will be useful in generating a stormwater management program in Delaware.

Sincerely,

Bob

Robert E. Williams
Project Coordinator

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PART I

A COMPREHENSIVE STORMWATER MANAGEMENT PROGRAM FOR THE STATE OF DELAWARE

BACKGROUND

Local and state governments have for a number of years managed stormwater runoff to preclude flooding, and for protection of public health and safety. In other words, stormwater runoff has been historically managed from a water quantity perspective.

Recently, the control of stormwater runoff has received much attention in scientific research, government policy, and public concern from a water quality perspective. Such interest has in-fact resulted in the emergence of a new field in water pollution control (i.e. Stormwater Management). This new field stems from the recognition that stormwater runoff can be a principle source of water pollution.

In Delaware, the need for a statewide stormwater management program has been expressed by both public environmental interest groups and various government agencies. Though Delaware has numerous state and local government agencies which presently manage select aspects of the stormwater pollution control field, there is no single stormwater control program which oversees all aspects of stormwater management. As such, agencies with common goals and objectives may be competing for limited resources. Further, duplicate work efforts in the field of stormwater pollution control may be resulting from the lack of a unified approach. Therefore, a streamlining of the existing stormwater pollution initiatives may be best served by a central program - a statewide stormwater management program.

A project plan of work was carried out by the Department of Natural Resources and Environmental Control (DNREC) in conjunction with the conservation districts, counties, and others. Activities included: the identification of the stormwater related programs which exist in Delaware, an overview of stormwater programs in other states; a determination of Delaware's stormwater management needs; the evaluation of alternative stormwater management administrative structures; an assembly of stormwater design criteria; and the resource needs to initiate a statewide stormwater management program and the expected annual costs.

This report presents the findings and conclusions of the stormwater management project, along with a final recommendation for a new statewide stormwater management program. This document is divided into two parts as follows:

Part I - Proposed Stormwater Management Program

This part includes an Executive Summary of relevant sections of the overall project report (Part II, described below), as they relate to the final recommended stormwater management program. In addition, Part I also contains the proposed amendment to the current Erosion and Sediment Control Law (Chapter 40, Title 7) that is recommended for addressing Delaware's comprehensive stormwater management needs.

Part II - Background Information on Stormwater Management

This part is essentially the final report for the project conducted by DNREC (in conjunction with other agencies) to support the development of Delaware's Stormwater Management Program. As such, Part II presents the findings and conclusions of the individual project activities that were previously listed.

Existing Stormwater Management Efforts in Delaware

The Divisions of Soil and Water Conservation and Water Resources of the Department of Natural Resources and Environmental Control and the State's three conservation districts are deeply involved in programs relating to all aspects of water management and nonpoint source pollution control. These include the broad programs of the conservation districts, the Tax Ditch Program, the Erosion and Sediment Control Program, and the Conservation Cost-Share Program. The programs of the USDA, Soil Conservation Service including technical assistance, Watershed Programs, Resource Conservation and Development Program, Flood Plain Management Assistance and Water Quality Management are made available through the conservation districts.

In addition, many state efforts impact on stormwater management. The Quality of Life Act guides orderly planning and development by counties; Land Use Planning Act and County Land Use Plans all impact indirectly on stormwater management.

The Water Resources Division of DNREC operates the National Pollution Discharge Elimination System (NPDES) which issues permits on stormwater point sources and nonpoint sources through treatment requirements and/or on-site best management practices (BMP's).

New Castle County and the City of Newark have had operating stormwater management programs through ordinances adopted in the early 80's. Sussex and Kent Counties cooperate with the counties in the implementation of their Erosion and Sediment Control Program and have required some stormwater management measures in subdivisions and commercial development plans.

In spite of these ongoing efforts, there is no coordinated and uniform approach to stormwater management on a state-wide basis. Except for sediment, little attention has been given to other pollutants such as heavy metals, organics, and hydrocarbons which may be discharged in stormwater.

Delaware's Stormwater Management Needs

In order to determine and identify the "needs" in Delaware, a comprehensive assessment of stormwater management was conducted that involved the comparative evaluation of:

1. On-going programs in Delaware that address stormwater management

2. The actual stormwater runoff and quality problems that exist in the state

3. The types of stormwater management activities that are being implemented in other states with on-going statewide problems (see next section)

This comparative evaluation used various reports, such as the 305(b) report on water quality recently completed for EPA, in developing its conclusions. The findings and recommendations of the stormwater management "needs" evaluation are:

1. Numerous ongoing regulatory programs in Delaware currently address stormwater and "nonpoint source" pollution management in some way.

2. A primary ongoing regulatory program, the Erosion and Sediment Control Program, is presently implementing a type of stormwater management activity, but its regulatory controls only relate to the during-construction phase of new land development projects. No follow-up program is in place to extend the stormwater (and erosion and sediment) management controls required during the construction process to the after-construction period. Also, no current regulatory program is in place to address stormwater problems (both quantity and quality) from past development and/or existing urban areas.

3. The erosion and sediment control program is currently being successfully implemented by the county conservation districts. The conservation districts are, therefore, now in a position to assist with the implementation of an expanded technical and regulatory program that addresses stormwater management.

4. Agricultural, construction and existing urban sources of stormwater runoff (both quantity and quality) are recognized as the three highest priority sources in available state monitoring reports. However, both the agricultural source (through on-going Soil Conservation Programs) and the construction source (through the on-going Erosion and Sediment Control Program) are currently regulated. Therefore, the primary area of emphasis

for a new regulatory program (necessary to address a recognized high priority water quantity and quality problem) should be urban area (both new and existing) stormwater runoff.

These findings and conclusions were instrumental in focusing the attention and direction of the program development project.

Other States' Efforts in Stormwater Management

A study was made of the legislative and regulatory characteristics of on-going statewide stormwater management programs in Florida, Maryland, North Carolina, Pennsylvania, Texas, and Vermont. Part II of this document contains a description of these programs, along with a table of primary program characteristics. A more comprehensive synopsis of the provisions of the state laws establishing stormwater management programs in Maryland, Pennsylvania, and New Jersey is also included in Part II. These three states border on Delaware, have a history of stormwater management efforts, and have comprehensive statewide programs. No one of these state programs would fit Delaware in total, but each contains essential elements which could be applied in Delaware. However, the successful ongoing stormwater management programs in other states have several common characteristics:

a) State level legislation and local level implementation, with requirements and guidelines developed by state level environmental agencies

b) Conservation Districts have been recognized as an excellent agency for local level implementation, including technical support, engineering review, and training

c) Local agencies develop implementation programs and enforce local ordinances for storm runoff control

All of these stormwater management programs are good and well adapted to meet the needs of the particular state. However, understandably, no one would fully fit the needs of Delaware. Nevertheless, we have found them extremely helpful in drafting suitable authorities for a stormwater management program for Delaware, taking into consideration the related ongoing programs in this state.

Alternative Scenarios for Delaware

The following program scenarios were evaluated as to the advantages and disadvantages of each one:

Structure	State	County/Municipality/Other
a.	Establish statewide	Adopt ordinance, rules

	policy, pledge technical assistance to local units.	& regulations to implement ordinance criteria to meet rules and regulations, complete plan review/ approval, inspection, enforcement, and maintenance reviews, issue permits, holds performance bonds
b.	Adopt state statute, regulations, rules, criteria to meet regulations, provide technical training, research coordination assistance to local governments.	Conducts inspections, does plan review, approval, enforcement, adopts ordinance consistent with state statute, issue permits, hold performance bond
c.	Handle entire program.	No actual involvement
d.	Same as b, plus approve county/ district program, provide training, research and coordination, and funding.	District, county develop stormwater program; adopt ordinance; rules to implement ordinance, criteria to meet rules; completes plan review/ approval; inspection, enforcement, and maintenance; issues permits; holds performance bonds.

Structure d. is the preferred program approach for Delaware.

PROPOSED STORMWATER MANAGEMENT PROGRAM FOR DELAWARE

After considering several approaches for both legislative and regulatory aspects, it was concluded that a stormwater management program could be developed and implemented with the least disruption in existing procedures and administration by expanding the conservation program authorized in Chapter 40 of Title 70 to include the control and management of stormwater runoff. To effect such change in the law, a draft amendment has been prepared and is attached hereto as Attachment 1. Also, attached as Exhibit 1 of Part II is a draft of a model ordinance suggested for adoption to implement the proposed legislation.

In addition to the proposed legislation, roles and responsibilities for regulatory agencies have also been proposed as a result of the stormwater management project. These roles and responsibilities are described in the following paragraphs.

The Department of Natural Resources and Environmental Control (DNREC) would have over all responsibility for the statewide stormwater management control with the Divisions of Soil and Water Conservation (SWC) and Water Resources (WR) having specific program and functional responsibilities.

SWC and WR would have joint responsibility for preparing proposed legislation, regulations, program criteria and practice manuals. They would share activities on training, research, obtaining funding, local program review and approval, and monitoring performance of local programs.

WR has the responsibility for water quality standards and administering the National Pollution Discharge Elimination System (NPDES) as it pertains to stormwater management. Stormwater management system outfalls might possibly be permitted under NPDES or other general "permit by rule" program. This process would be addressed in a positive or "proactive" manner including monitoring of selected outfalls for stormwater quality to evaluate on-site stormwater management systems to control nonpoint source pollution control within the site area or watershed.

SWC and the three conservation districts have been designated as the management agencies for non-point source control in Delaware. This includes providing technical assistance, including assistance of the Soil Conservation Service, for the establishment of Resource Management Systems with stormwater management site or watershed plans including
grassed swales, waterways, filter strips, sediment traps and basins, retention, detention, and infiltration practices as well as all erosion and sediment control practices.

WR would have responsibility for standards for technical assistance on control of heavy metals, hydrocarbons, and other non-agricultural pollutants.

The conservation districts would be responsible for local program development, and plan approval; counties and municipalities for local stormwater management ordinances and plan review, issuing permits; performance bonds and plan review fees.

ATTACHMENT 1

PROPOSED AMENDMENT TO CHAPTER 40, TITLE 7 (DELAWARE CODE) FOR STORMWATER MANAGEMENT

Attachment 1

AN ACT

To amend Chapter 40, Title 7, of the Delaware Code to expand the conservation program authorized therein for control of erosion and sedimentation to include the control and management of stormwater runoff.

Be it enacted by the State of Delaware:

Section 1. Statement of Legislative Findings

The General Assembly finds that accelerated stormwater runoff increases flood flows and velocities, contributes to erosion, sedimentation, and degredation of water quality, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undetermines flood plain management and flood control efforts in downstream communities, reduces ground-water recharge, and threatens public health and safety; and that in order to conserve and protect land, water and other resources of the state, a comprehensive program of stormwater management is necessary to the public health, safety and welfare and the protection of the people of the State, their resources and the environment.

Section 2. Purpose and Policy

In consideration of the close interrelation of erosion and sediment control and stormwater management, it is declared to be the purpose and policy of this Act to expand the conservation program authorized in Chapter 40, Title 7, to include a statewide comprehensive and coordinated stormwater management program designed to provide for control and management of stormwater runoff consistent with sound water and land use practices so as to reduce to the extent possible the adverse effects of stormwater runoff on the water and lands of the state, such program to be established and implemented through the Department of Natural Resources and Environmental Control, hereinafter referred to as the "Department," through its Division of Soil and Water Conservation, and in cooperation with the Division of Water Resources and other Divisions of the Department, the conservation districts created under Chapter 39 of Title 7, hereinafter referred to as "districts," counties, municipalities, tax ditch organizations, and other local governments and subdivisions of this state, and other public and private entities.

Section 3. State Stormwater Management Program

(a) The Department shall, in cooperation with appropriate state and federal agencies and governmental subdivisions of the state, develop a state stormwater management program having as one of its primary goals maintenance after development, as nearly as possible, of the predevelopment runoff characteristics, taking into consideration both quantity and quality of water, which program shall be integrated with, and made a part of, a comprehensive state erosion, sediment and stormwater control program.

(b) The Department shall, in carrying out this act, have the power and duty to:

(1) Provide technical and other assistance to districts, counties and municipalities in implementing this act.

(2) Develop and publish minimum standards, guidelines and criteria for stormwater management, and a model stormwater management ordinance for use by counties and municipalities.

(3) Review, in cooperation with appropriate state agencies, and approve all district stormwater management programs and plans and revisions thereof.

(4) Require that appropriate stormwater management provisions be included in all new or amended erosion and sediment control plans developed pursuant to this chapter.

(5) Cooperate with appropriate agencies of the United States or other states or any interstate agency with respect to stormwater management.

(6) Conduct studies and research regarding the causes, effects and hazards of stormwater and methods of stormwater management.

(7) Conduct and supervise educational programs with respect to stormwater management.

(8) Require the submission to the Department of records and periodic reports by districts, tax ditch organizations, county and municipal agencies as may be necessary to carry out this act.

(9) Require an inspection and review by the Department at least every five (5) years of district stormwater management programs and plans and the implementation thereof.

(10) Review and approve designated watersheds for the purpose of this act.

(c) The Department shall, in the exercise of its powers and duties under this act, develop and adopt, no later than six months after passage of this act, regulations for implementation of a stormwater management program, in two phases:

Phase I shall be targeted at preventive measures to be applied to the site plan and subdivision review process, including identification of existing control requirements, and development of plans and ordinances to meet the standards established by the Department, for at least the short term.

Phase II shall provide for the long term comprehensive planning on a watershed basis of alternative preventive stormwater management measures in conjunction with remedial stormwater management measures.

The regulations shall be supplemental to, and coordinated with, regulations heretofore and hereafter adopted with respect to erosion and sediment control, and may be revised from time to time as may be necessary.

(d) The program and regulations shall be made available for public inspection at the office of the Department.

Section 4. District Stormwater Management Programs

(a) Pursuant to regulations promulgated by the Department, each conservation district shall, within one year after adoption of the state regulations, adopt and submit to the Department for approval a stormwater management program for the area within the district, which program may, with respect to Phase II, be limited to a statement of long term stormwater management objectives within a proposed designated watershed. The district shall develop the program in cooperation with any affected county, municipality, tax ditch or other governmental subdivision within the district, and shall periodically review and revise such program, at least every five years. The program shall be coordinated with the district erosion and sediment control program so as to achieve an integrated erosion, sediment and stormwater control program. The program shall require that land development plans include appropriate erosion, sediment and stormwater control measures, all of which measures shall be included in the same application for permit, plan review, and other procedural requirements for plan approval.

(b) The stormwater management program shall be implemented in two coordinated phases.

(1) Phase I Implementation.

(i) Phase I implementation of the stormwater management program shall include:

1. A statement concerning how the program will achieve the goals of the act,

2. A delineation of jurisdictional authority and responsibility in the Phase I program area.

3. An evaluation of existing county, municipal, tax ditch and other local stormwater management plans and ordiances. This evaluation shall examine the consistency of the existing ordinances with regard to the water quanity/quality objectives and the standards, guidelines and criteria established by the Department's regulations.

4. An evaluation of needs including: (A) a general assessment of those items necessary for the municipal, county and/or local ordinances to achieve full compliance with this act including, but not limited to, soil surveys, natural resource inventories and pertinent elements of local and county master plans; (B) an estimate of the technical (personnel and physical resources) and institutional needs necessary to undertake implementation of Phase I; and (C) a suggested fee schedule for implementation, where appropriate.

(ii) Within six months following approval of Phase I of the program by the Department, counties and/or municipalities shall adopt ordinances to regulate development which are to be consistent with, and not less stringent than, the model ordinance developed by the Department. These ordinances shall be amended, as required, following adoption of Phase II of the program.

(2) Phase II Implementation

(i) A supplemental description of proposed Phase II of the district's stormwater management program shall be submitted to the Department not less than one year after Phase I has been approved by the Department. The proposal shall be based upon a detailed analysis of alternative stormwater management approaches for the designated watershed which has been approved by the Department.

(ii) The proposed program for a designated watershed shall consist of a system of nonstructural and/or structural stormwater management measures to mitigate flooding and nonpoint source pollution. The need for regional measures to supplement or replace individual measures or facilities otherwise required at each site of development shall be considered. Plans shall also be developed to address appropriate remedial stormwater control measures. Plans shall take cognizance of the unique character and limitation of the environment in the planning area, and recognize those special conditions where an exception to the requirements of the approved program may be necessary to best manage stormwater runoff.

(iii) Phase II implementation shall be contingent on availability of resources and funding.

(iv) Unless circumstances justify exception or variance, the approved program requirements shall be applicable to all development in the area subject to the program. Exceptions to these requirements must be approved by the Department.

(c) If a district fails to adopt a program as provided in this act, the Department shall, after such hearings or consultations as it deems appropriate, develop and adopt a program for implementation by the district or other local governmental entity.

(d) The district program shall be made available for public inspection at the principal office of the district.

Section 5. Related Activities to be Consistent with Watershed Stormwater Management Programs

After adoption and approval of a stormwater management program in accordance with this act, the location, design and construction within the watershed of stormwater management systems, obstructions, flood control projects, subdivisions and major land developments, highways and transportation facilities, facilities for the provision of public utility services and facilities owned or financed in whole or in part by funds from the state shall be conducted in a manner consistent with the stormwater management program.

Section 6. Failure of Counties to Adopt Implementing Ordinances

(a) If the Department finds that a county or municipality has failed to adopt, or amend, and implement ordinances required by section 4, the Department shall provide written notice of violation to the county or municipality.

(b) Within 60 days of receipt of the notice of violation, the county or municipality shall report to the Department the action which it is taking to comply with such requirement.

(c) If within 180 days of receipt of the notice of violation, the county or municipality has failed to comply with such requirement, the Department may request the Attorney General to take appropriate legal action to enforce compliance.

Section 7. Duty of Persons Engaged in the Development of Land

Any landower and any person engaged in the alteration or development of land which may affect stormwater runoff characteristics shall implement such measures consistent with the provisions of the applicable stormwater management program as are reasonably necessary to prevent injury to health, safety or other property. The landowner shall also coordinate and integrate stormwater management measures into a single erosion, sediment and stormwater management plan.

Section 8. Grants and Reimbursements to Districts, Municipalities and Counties

The Department is authorized to administer grants to districts, municipalities and counties to assist or reimburse them for costs in preparing official stormwater management programs and actual administrative and enforcement and implementation costs and revisions to official programs for stormwater management required by this act.

Section 9. Chapter 40, Title 7, Delaware Code, Applicable to Stormwater Management Programs

The provisions of Chapter 40 relating to the erosion and sediment control program shall be applicable to the stormwater management program authorized by this act except as otherwise provided in this act or as may be inconsistent with such stormwater management program.

Section 10. Appropriations

There is hereby authorized to be appropriated such funds as may be necessary to carry out this act.

Section 11. Definitions

Section 4002 of Chapter 40, Title 7, shall be amended to revise definition (4) and to add defintions (6), (7) and (8) as follows:

(4) "Erosion, sediment and stormwater control plan" or "plan" means a plan for the control of soil erosion, sediment and stormwater resulting from a land disturbing activity.

(6) "Stormwater" means drainage runoff from the surface of the land resulting from precipitation or snow or ice melt.

(7) "Stormwater management" means the application of planning, engineering and construction principles to control the quantity and quality of water.

(8) "Designated watershed" means a watershed designated by a conservation district for Phase II implementation of a district stormwater management program.

Part II - Background Information on Stormwater Management in Delaware — PAGE

PART II

BACKGROUND INFORMATION ON STORMWATER MANAGEMENT IN DELAWARE

Introduction

A plan of work was carried out by the Department of Natural Resources and Environmental Control (DNREC) in conjunction with the Conservation Districts, counties, and others. Activities included: the identification of the stormwater related programs which exist in Delaware, an overview of stormwater programs in other states; a determination of Delaware's stormwater management administrative structures; an assembly of stormwater design criteria; and the resource needs to initiate a statewide stormwater management program and the expected annual costs.

The following sections of Part II present the findings and conclusions of these work activities.

EXISTING STORMWATER MANAGEMENT EFFORTS IN DELAWARE

The Division of Soil and Water Conservation of the Department of Natural Resources and Environmental Control (DNREC) and the State's three conservation districts are deeply involved in programs relating all aspects of water management and non-point source pollution control. These programs are authorized by specific state statutes and annual appropriation bills.

Conservation Districts: Delaware Code, Chapter 39, Title 7.

"It is the policy of the State to provide for the preservation of the productive power of Delaware land and the optimum development and use of certain surface water resources of the state by furthering the conservation, protection, development, and utilization of land and water resources, including the impoundment and disposal of water and by preventing and controlling floodwater and sediment damages, and thereby to preserve natural resources and promote their beneficial use, control floods, prevent impairment of dams and reservoirs, assist in maintaining the navigability of rivers and harbors, preserve wildlife, provide recreation development, protect the tax base, protect public lands and highways, and protect and promote the health, safety, and general welfare of the people of this state."

The conservation districts are governmental subdivisions of the State formed by petition and referendum following the establishment of the State Soil Conservation Commission in 1943. Each district's boundaries coincide with county boundaries and each is governed by a seven member board of supervisors. Four supervisors are elected by landowners voting in local elections and serve four year terms. One supervisor is a member of the county government and serves during his term as a member of the county government. Two supervisors, who must be non-farmers, may be appointed by the Secretary of DNREC for a period of three years upon request of the conservation district. The county agricultural agent serves as secretary of the board.

Services of conservation districts are many and varied. They strive to improve the environment by helping farmers develop and apply conservation plans which control erosion, conserve water and improve water quality, and improve crop, forage, fish and wildlife, and forest production. They help communities and land developers obtain information needed to develop sound community and site plans. They assist state agencies, councils of government, and counties in developing and implementing water quality plans under the Federal Clean Water Act of 1987. They sponsor programs of federal agencies to meet the financial and technical needs of special problem areas of the districts. They provide service where service is needed most - at the local level. (Delaware Resource Conservation Plan - 1980 - 1985).

In a letter dated April 2, 1987, to Mr. William Vanderwende, President of the Delaware Association of Conservation Districts, Governor Michael N. Castle reconfirmed that the Division of Soil and Water Conservation of the DNREC and the three conservation districts, Kent, New Castle, and Sussex are the designated management agencies for non-point source pollution control for agricultural activities, woodland areas, urbanized and construction sites. He further admonished the Division and the three conservation districts to "coordinate with all other concerned resource agencies in the development of an effective program."

Drainage of Land; Tax Ditches: Delaware Code, Chapter 41, Title 7.

4101 Declaration of Policy. "It is declared that the drainage and prevention of flooding of low, wet, swampy, or overflowed lands or lands subject to overflow shall be considered a public benefit and conducive to the public health, safety, and welfare." The purpose of the law is to provide a basis for a uniform system for establishing, financing, administering, maintaining, and dissolving drainage organizations to the end that conservation of soil, water, wildlife, forest and other resources of the State may be accomplished in a workable and practicable manner."

Tax Ditch Organizations through a Superior Court process have abilities by vote and elected managers to:

1) Organize as a subdivision of the State.
2) Establish rights-of-ways.
3) Levy Taxes
4) Carry out construction and maintenance work.
5) Determine a program of operations, and
6) Enter into contracts and agreements.

Subdivisions of the State are not totally autonomous. The organization, rights-of-ways and taxing powers follow a Superior Court process involving Tax Ditch Commissioners appointed by Superior Court and the local conservation districts with assistance from the DNREC. Determinations must be made that the formation of a tax ditch organization is practicable and feasible and is in the interest of the public health, safety, and welfare. Through cost sharing and technical assistance, DNREC and the local conservation districts can greatly influence a tax ditch organization's activities and plan of work. Any work within the tax ditch watershed is under all permit requirements of the State and Federal governments. (Using Tax Ditch Organizations as Total Resource Management Watersheds, Smith, Richard T., Richard Baccino, and Lynn Sprague, March 1987 - Draft)

Erosion and Sediment Control: Delaware Code, Chapter 40, Title 7.

4001. Policy.

The General Assembly finds that erosion continues to be a serious problem throughout the State, and that rapid shifts in land use from agricultural and rural to nonagricultural and urbanizing uses, changes in farm enterprises, operations and ownership, construction of housing, industrial and commercial developments, streets, highways, recreation areas, schools, and universities, public utilities and facilities and other land disturbing activities have accelerated the process of soil erosion and sediment deposition resulting in pollution of the waters of the State and damage to domestic, agricultural, industrial, recreational, fish and wildlife and other resource uses. It is, therefore, declared to be the policy of this chapter to strengthen and extend the present erosion and sediment control activities and programs of this State for both rural and urban lands, and to establish and implement, through the Department of Natural Resources and Environmental Control, hereinafter referred to as "Department" and the soil conservation districts created under Chapter 39 of this title, hereinafter referred to as "districts" in cooperation with counties, municipalities and other local governments and subdivisions of this State, and other public and private entities, a statewide comprehensive and coordinated erosion and sediment control program to conserve and protect land, water, air and other resources of the State. (61 Del. Laws, c. 522, 1.)

4003. State Erosion and Sediment Control Program

The Department shall, in cooperation with appropriate state and federal agencies and political subdivisions of the State, develop and coordinate a comprehensive state erosion and sediment control program.

To implement this program, the Department shall develop and adopt, no later than six months from July 12, 1978, regulations for erosion and sediment control, which regulations may be revised from time to time as may be necessary. The regulations for carrying out the program shall:

1) Be based upon relevant physical and developmental information concerning the watersheds and drainage basins of the State, including, but not limited to, data relating to land use, soils, hydrology, geology, size of land area being disturbed, proximate water bodies and their characteristics, transportation and public facilities and services;

2) Include such survey of lands and waters as may be deemed appropriate by the Department or required by any applicable law to identify areas, including multi-jurisdictional and watershed areas, with critical erosion and sediment problems;

3) Contain conservation standards for various types of soils and land uses, which standards shall include criteria, techniques and methods for the control of erosion and sediment problems;

4) Provide for escrow accounts of performance bonds, as necessary, to insure the financial responsibility of any person engaging in land disturbing activities.

4004. District Erosion and Sediment Control Program

Each district in the State shall, within 1 year after the adoption of the state regulations, develop, in cooperation with appropriate state and federal agencies and political subdivisions of the State, adopt a soil erosion and sediment control program consistent with the state program and regulations for erosion and sediment control. The district program may incorporate county or municipal programs if such programs are consistent with the state program for erosion and sediment control.

Upon adoption of a new or revised district program, the district shall submit the program to the Department for review and approval. If a district fails to submit a program consistent with the state program to the Department within the period specified herein, the Department shall, after such hearing or consultations as it deems appropriate with local interests in the district, develop and adopt an appropriate program to be carried out by the district.

The adopted and approved district program shall be made available for public inspection at the principal office of the district.

Delaware Conservation (Cost-Share) Program

The Conservation Program is authorized under the Conservation Districts Law (Delaware Code, Chapter 39, Title 7) which allows districts to accept financial assistance for the purpose of carrying out their responsibilities. The conservation districts in Delaware maximize every dollar of allocation in the State Legislature's Annual Bond Bill toward the installation of needed conservation practices and systems, thus requiring minimal administration costs.

Water quality problems are being recognized as the primary limitation to Delaware's water supply. Non-point source pollution has been noted as a major factor in these limitations. Emphasis on the cost-share program is one of the best methods to address these concerns.

The State's Conservation Incentive Program provides State funds for cost sharing with landowners who apply soil and water conservation practices.

This program began in fiscal year 1985. The program is managed by the Division of Soil and Water Conservation and implemented by the three (New Castle, Kent and Sussex) Conservation Districts.

Each conservation district has developed a written Conservation Incentive Program tailored to the conservation needs in their district. These programs are updated each year and approved by the Division of Soil and Water Conservation. Cost sharing is generally provided at 50% but does increase depending on the degree of incentive needed and the critical need for protecting a particular resource.

Landowners applying for and using State Cost Share Funds must become cooperators of their respective conservation district, develop an approved resource management plan, apply the conservation practice according to established standards and specifications as certified by technicians provided by each district and sign an agreement to maintain the conservation practice as applied, for ten years. This obligation is passed on to any new owner of the lands involved.

Soil Conservation Service (USDA)

The U.S. Department of Agriculture's Soil Conservation Service (SCS) works in Delaware through the state's three conservation districts which cover the entire state. SCS assists landowners cooperating with the districts develop conservation plans for their lands to control erosion, improve water quality, prevent flooding, improve irrigation water management, and develop or improve wildlife habitat. In addition to assisting individual cooperators, SCS provides soils and other natural resource information to units of government and developers. In cooperation with districts and county governments, SCS reviews site plans for erosion and sediment control and water management. SCS's publication "Urban Hydrology for Small Watersheds", Technical Release 55, 1986, is widely used in stormwater management.

Currently eight (PL-566) watershed projects in Delaware are in some stage of development, covering about 600,000 acres. Of those eight:

1 is completed (Bear Hole)
2 have construction completed (Upper Nanticoke & Marshyhope)
1 has construction underway (Upper Choptank)
1 which has been authorized for operations (Upper Chester is being supplemented to provide for cost-shared land treatment measures aimed at addressing water quality and water conservation.
3 are authorized for planning (Murderkill, St. Jones and Love Creek)
The Love Creek Plan will be completed early in FY 1988, the Murderkill in FY 1989, and the St. Jones in FY 1990.

A supplement has been prepared for the Upper Choptank Plan which provides for mitigation of types 3-7 wetlands impacted by the installation of structural measures. These impacts were assessed in FY 1987 in fulfillment of a commitment made in the 1976 EIS. The first project agreement to implement a mitigation plan was signed in September 1987.

Supplements to the Upper Choptank plan are being prepared which would provide for technical and financial assistance to address water quality and water conservation needs.

Flood Plain Management studies for Mill Creek and Broadkill River have been authorized and completed. An FPMS has been authorized for the Mispillion River, but work has not been initiated due to other priorities. A FPMS has also been authorized for a section of the Christina River in New Castle County. Funds to begin this study will be requested in FY 1989.

A cooperative river basin study for the Coastal Sussex River Basin is in its third and final year. This study supplements the

State's Inland Bay Task Force findings and define the conservation program efforts that will help stop the deterioration of Delaware's bays. A watershed protection plan has been completed for the Love Creek Watershed. The plan is approved for operations. A draft preauthorization planning report and plan of work has been prepared for the Indian River Bay Watershed and is currently under technical review.

--Water Quality Management - The Appoquinimink Rural Clean Water Project in New Castle County was one of the original projects approved nationwide. Since FY 1981, technical and financial assistance has been given to farmers in this 30,000 acre watershed. Best management practices (BMP's) have been planned and applied on 77 farms covering 11,362 critical cropland acres. This amounts to 87% of the cropland acres designated as needing some type of best management practice. In FY 1987, cost-shared BMP's were installed on 2,000 acres of cropland that reduced soil erosion by 10,127 tons. Many program participants are practicing conservation tillage without the need for additional practices or assistance. Conservation tillage, waterways, critical area plantings, and erosion control structures have been significant BMP's in the watershed. Water quality monitoring has shown decreases in total phosphorus and total suspended solids while total nitrogen concentrations have remained relatively constant over the monitoring period.

New Castle County, Delaware, Stormwater Management Program

Stormwater management in New Castle County was recognized as a need and intensively studied as part of the 208 Areawide Water Management Plan development during the 1970's. In 1976, A Report and Perspective on Stormwater Management by Turner, Collic, and Braden, Inc. was issued by New Castle County. In the letter transmitting this report to the county, the consultants who conducted the study said:

> "The detail of the stormwater management program, as presented in the report, is less than originally envisioned because of the lack of adequate data on water quality on which to base a detailed management plan. However, we believe the recommendations of the report can be incorporated into your final program and, when implemented, can provide the beginnings of an effective stormwater management program which will be useful and valuable, which additional data are acquired on which to base a more elaborate management effort."

Program managers in New Castle County feel this statement is still pertinent today, notwithstanding the enactment of a Stormwater Management Ordinance in 1977.

New Castle's program started as a flood control effort with controls based on 100 year storm events. They presently consider 2, 5, or 10 year storm events depending on each situation. Most

storms are under 2 1/2 inches. In addition to flooding, stormwater problems include erosion and sediment control, assigning and carrying out responsibility for maintenance of installed structures and measures, and how to allocate costs in regional stormwater management plans.

Program managers also felt that it is important that control of programs be kept on the local level. Basin plans and designs should be by professional engineers. The County still has no water quality control standards for stormwater management. It was felt that the program has achieved creditability with the focus on flood prevention, drainage and erosion and sediment control. The program was based on good studies, (208, etc.), it established technical and legal controls and minimized off-site damages. Developers and contractors still need to be reminded of what is needed to meet standards for erosion and sediment control, flood prevention, stormwater management and floodplain development.

Approximate number of plans reviewed and inspected and manpower requirements each year for New Castle's program are approximately as follows:

Plan review -- 1 engineer
Field inspection -- 2 inspectors

The County has had full staffing for the stormwater management program for six months. During that period of time, approximately 400 plans of all sizes have been reviewed. At the present time the County has approximately 175 major sites under construction including subdivision, industrial, and commercial developments.

City of Newark, Delaware, Stormwater Management

The City of Newark first issued regulations (ordinances) for stormwater management in 1978. These were revised in 1984, and followed New Castle County's Stormwater Program fairly closely. It was found early on that requirements were difficult to enforce without a local ordinance. The City coordinates closely with the county, especially where drainage basins either originate in the city or the county and affect both.

The City requires separate plans for erosion and sediment control, drainage, flood prevention, and stormwater management. However, the same section, the City Engineers Office, reviews all plans and conducts inspections. It is estimated that 50-100 plans (4-8/month) are processed each year. Approximately three (3) man years are spent on stormwater management at an annual cost approaching $100,000.

Engineers and developers are familiar with requirements and over all, do a good job. The city attempts to keep maintenance

with developers or homeowner associations. The City inspects and also responds to complaints. Plan development is in two stages. First, the developer must present an early conceptual plan showing areas to be saved for structures, etc. Second, the developer must present detailed plans including drawings. Structures are designed for 10 year storms, except on larger drainages, where designs are based on 100 year storms.

There is nothing in the current regulations addressing water quality. However, complaints are occasionally received, primarily on sediment and turbidity.

The City has a program of street sweeping and leaf removal. While these are important, especially from the maintenance of stormwater drainage systems, it is doubtful if fine particles and contaminants would be affected. The need for educational programs on use of fertilizer, and pesticides is recognized.

Benefits from the stormwater management program in Newark include: avoiding downstream flooding, reduction of erosion, protection of property, fewer complaints, better cooperation with engineers, and an effective process for dealing with problems.

Floodplain Management

Congress established the National Flood Insurance Program (NFIP) with passage of the National Flood Insurance Act of 1968. Insurance aspects of the program are administered by the Federal Insurance Administration of the Federal Emergency Management Agency (FEMA). The community participation/eligibility, flood hazard identification, mapping and floodplain management aspects are administered by state and local programs and Support Directorate within FEMA.

The NFIP enables people owning or buying property in the floodplains to insure against flood losses. Through county and local ordinances which establish floodplain districts and set forth standards for their management, a participating community can protect against much of the devastating financial and human loss resulting from future flood disasters.

Community participating in the NFIP is voluntary. However, nonparticipation prohibits grants, loans or guarantees made by such agencies as the Small Business Administration, Federal Housing Administration, and Veterans Administration. By law, if a flood disaster situation occurs in a nonparticipating flood-prone community, no federal assistance for acquisition or construction (insurable property) may be provided in flood hazard areas. (Federal Emergency Management Agency FIA-2/Feb. 1983, Questions and Answers on the National Flood Insurance Program; FEMA, NFIP and Related Regulations, 44 CFR Parts 50-76, June 30, 1987).

In Delaware, Kent County has adopted Floodplain Management Regulations as part of its subdivision ordinance. The towns of Bowers Beach and Frederica operate under the county's regulations. A Community Assistance Program is currently being conducted in Delaware to evaluate local ordinances and assist in making them meet federal requirements for participation in NFIP.

Quality of Life Legislation

a. House Bill 391, February 3, 1988. An Act to amend Title 9, Chapters 26, 49, and 69, Delaware Code relating to counties and comprehensive planning and development.

Comment: Titled the "Quality of Life Act", this is a comprehensive mandate for orderly planning and development by the counties. Although stormwater management is not mentioned specifically, the act contains several references to development of land and natural resources which could well encompass stormwater management, i.e.

5.51 Definitions (19) "Land development regulations" means ordinances enacted by governing bodies for the regulation of any aspect of development and includes any
County government zoning, rezoning, subdivisions, building construction, or sign regulations or any other regulations governing the development of land.

5.55 Required and Optional elements of comprehensive plan: studies and surveys. (6) (d) A conservation element for the conservation, use, and protection of natural resources in the area and which results in the identification of these resources. As a minimum, the element shall consist of such natural area classifications as wetlands, wood uplands, habitat areas, geological areas, hydrological areas, floodplains, aquifer recharge areas, ocean beaches, soils, and slopes. The land use map series contained in the future land use element shall generally identify and depict natural area classifications, such as those enumerated in this section. The land uses identified on said maps shall be consistent with applicable State laws and regulations. Identification and depiction of the above shall be based on the best topographic maps and other information available from state and federal agencies and other sources that the County deems appropriate.
(8) (h) Such other elements as may be peculiar to, and necessary for, the area concerned and as are added to the comprehensive plan by the governing body upon the recommendation of the local planning agency.

Comment: The above provisions would encompass stormwater management as a program protecting natural resources should the counties and municipalities choose to pass such ordinances. A state law outlining a statewide program for stormwater management would give backing to local jurisdictions in such actions and could establish general uniform standards throughout the state. Such a law would be compatible with and strengthen quality of life objectives.

County Land Use Plans

All three counties have recently adopted or are in the process of establishing or strengthening their land use plans. Stormwater management is a reality in New Castle County. Both Kent and Sussex County require some measure of stormwater management in their subdivisions or erosion and sediment control plans and will consider passage of stormwater management ordinances in the not too distant future. A state stormwater management law would facilitate these efforts. Such a law would be compatible with and closely interrelated with the State's Erosion and Sediment Control law. Present staffing structure for erosion and sediment control, with some strengthening might well serve both erosion and sediment control and stormwater management. Technical Advisory Committees (TAC's) in each counties made up of all interested agencies, review proposed subdivision plans.

Delaware's Land Use Planning Act, Delaware Code Chapter 92, Title 29

This law establishes a process for streamlining, coordinating, and simplifying procedures for various state regulatory and review processes prior to development.

Actions subject to the process as stated in the law are:

(1) The adoption or amendment of comprehensive development plans or portions thereof;
(2) The adoption or amendment of capital improvement programs;
(3) A critical area;
(4) Land use planning actions having a significant impact upon more than 1 jurisdiction.

Local jurisdictions are required to notify the State Department of Natural Resources and Environmental Control (DNREC) of proposed land use planning actions. DNREC must notify interested federal and state agencies. Upon receipt of such notice, each agency must submit written comments on the proposal to DNREC and furnish any available pertinent information relevant to the proposed action. DNREC must submit timely copies of any information received to the applicant. Local jurisdictions shall not make final decisions on the proposed action until the State has had time to comment.

Any state agency undertaking a land use planning action shall notify the local jurisdiction 30 days prior to said action.

Delaware's Environmental Legacy

This report presents the conclusions of a broad representation of individuals from the States public and private sectors. Key recommendations included the following:

> "Establish stormwater management programs on a statewide basis with state and local governments coordinating activities. Controls would be designed for priority problems in high-volume basins utilizing a watershed planning approach."

Current suggestions for implementation of Legacy recommendations include several proposals for stormwater management. It is obvious from the above examples that the State of Delaware and local jurisdictions are ready for a statewide stormwater management program. A statewide program would provide:

1) Backing to local jurisdictions for developing ordinances,
2) Uniform expectations and general standards for developers, engineers and agency personnel,
3) Information for public education and training for involved personnel,
4) Provisions for technical assistance,
5) Coordination between jurisdictions with common basins or watersheds, and
6) A system for plan review, inspection, and where necessary, enforcement.

Development Advisory Service (DAS)

The Development Advisory Service (DAS) is comprised of representatives of the Department of Natural Resources and Environmental Control (DNREC), the Department of Health and Social Services, the Department of Transportation, the Department of Agriculture, the Department of State, the Public Service Commission, and the Delaware Development Office. These are state agencies that can advise developers with preliminary information on environmental permits and other requirements for major development projects in the state.

DAS was established by DNREC in 1981 (a spin-off from LUPA) to streamline procedures for meeting permit requirements.

DAS considers the following types of projects:

Residential

Subdivisions

Townhouses
Condominiums
Mobile Home Parks

Commercial

Shopping Centers
Office Complexes

Industrial

Manufacturing Plants
Solid or Hazardous waste facilities or operations

Recreational

Marinas
Campgrounds

The DAS arranges for developers to meet with representatives of all agencies at one time to advise on all permit requirements, standards, and procedures. DAS will refer the developer to other state and federal agencies if necessary.

DAS can save developers time, prevent overlooking permits or approvals required, and avoiding trouble and expense of redesigning plans to meet state requirements.

DAS should be contacted by a developer as soon as:

-consideration is being given to purchasing a property for development,
-the first phase of planning of a development requiring more than one permit,
-expansion of a present development or operation is being considered, and
-prior to obtaining approvals from local jurisdictions.

DAS presently considers stormwater management specifically under the Department of Transportation, Division of Highways, Plans, Specifications and Estimates Section. Stormwater management also comes up for consideration of DNREC, although not required, particularly, the Division of Soil and Water Conservation Drainage Section for drainage plans, tax ditches, drainage easements, and the conservation districts section for sediment and erosion control plans and floodplain management.

If a statewide stormwater management program is adopted, DAS would provide information to developers on permits, requirements and penalties for non-compliance.

Delaware's Nonpoint Assessment and Nonpoint Program Proposal

Under the leadership of DNREC, Division of Soil and Water Conservation, a work group of agency and private sector representatives has prepared a nonpoint source pollution assessment report for the state. This report ranks watersheds by severity of water quality pollution and identifies sources of the pollutants. Stormwater runoff from agriculture, forest, urban, and construction areas is recognized as carrying pollutants to receiving waters. It was also recognized that sources of such pollutants were widely scattered or diffused and, as such, were non-point sources. It is recognized that selected stormwater outfalls need some degree of monitoring for pollutants to evaluate effectiveness of nonpoint source treatment programs.

The program for nonpoint source pollution control also recognizes the need for a statewide stormwater management program.

This project, to develop a comprehensive, statewide stormwater management program for Delaware is timely and compatible.

Stormwater Discharges, Section 122.26 CFR Ch.1 (7-1-87)

(a) **Permit requirement.** Stormwater point sources, as defined in this section, are point sources subject to the NPDES permit program. The Director may issue an NPDES permit or permits for discharges into waters of the United States from a stormwater point source covering all conveyances which are a part of that stormwater discharge. Where there is more than one owner or operator of a single system of such conveyances, any or all discharges into the stormwater discharge system may be identified in the application submitted by the owner or operator of the portion of the system that discharges directly into waters of the United States. Any such application shall include all information regarding discharges into the system that would be required if the dischargers submitted separate applications. Dischargers so identified shall not require a separate permit unless the Director specifies otherwise. All dischargers into a stormwater discharge system must either be covered by an individual permit or a permit issued to the owner or operator of the portion of the system that directly discharges. (See Section 122.21(c) (2) for application deadline for existing stormwater point sources).

In Delaware, the NPDES program permits stormwater point sources and nonpoint sources from industrial plan areas through treatment requirements and/or on-site Best Management Practices (BMP's). We have all been involved (on a case by case basis only) in permitting or requiring BMP's for several commercial and residential locations where problems have been identified or if brought to us by other state agencies.

OTHER STATES' EFFORTS IN STORMWATER MANAGEMENT

An overview of stormwater management programs in Florida, Maryland, New Jersey, North Carolina, Pennsylvania, Texas, and Vermont is presented in Table 1. A synopsis of the provisions of state laws establishing stormwater management programs in Maryland, Pennsylvania, and New Jersey are included in Table 2. These three states border on Delaware, have a history of stormwater management efforts, and have comprehensive statewide programs. No one of these state programs would fit Delaware in total, but each contains essential elements which could be applied in Delaware.

All of these stormwater management programs are good and well adapted to meet the needs of the particular state. However, understandably, no one would fully fit the needs of Delaware. Nevertheless, we have found them extremely helpful in drafting suitable authorities for a stormwater management program for Delaware, taking into consideration the related ongoing programs in this state.

After considering several approaches in drafting these authorities, it was concluded that a stormwater management program could be developed and implemented with the least disruption in existing procedures and administration by expanding the conservation program authorized in Chapter 40 of Title 70 to include the control and management of stormwater runoff.

To effect such change in the law a draft amendment has been prepared and is attached hereto as Exhibit 1. Also, attached as Exhibit 2 is a draft of a model ordinance suggested for adoption to implement the proposed legislation.

Table 1.

SUMMARY OF PRINCIPAL PROVISIONS OF STATE PROGRAMS
PROVIDING FOR STORMWATER MANAGEMENT

	DE	FL	MD	NJ	NC	PA	TX	VT
STATE LAWS								
Stormwater management		x	x	x	(4)	x	x	x
Related state laws:								
Conservation/erosion/ sediment control		x	x	x	x	x	x	
Flood control			x					
METHOD								
Permit system		x	x	x	(5)	x	x	x
Fees		x	x	x		x	x	x
EXEMPTIONS								
Agricultural/silvacultural		(1)	x		x	x	x	x
Small development/single family		x			x	x	x	
Existing developments		x					x	x
Wetlands								x
STATE PROGRAM								
Responsible Agencies								
State legislature						x	x	x
Natural Resources		(2)			x	x		x
Environmental		x	x	x	x	x	x	
Dept. of Community Affairs						x		
Dept. of Health			x					
Water Resources			x				x	x
Other		(3)						
STATE RESPONSIBILITIES								
Publish guidelines/model ordinances			x	x	x	x		
Issue regulations/plan		x	x	x	x	x		x
Establish minimum requirements/ control/standards/ design criteria		x	x	x	x	x	x	x
Coordinate program			x			x	x	
Designate watersheds						x		
Review and approve county/ municipal plans						x		
Provide financial assistance			x	x		x		
Provide technical assistance			x	x		x		
Conduct studies and research			x			x		
Enforcement		x	x	x		x	x	x
Periodic review			x	x			x	
Issue permits		x					x	x
LOCAL PROGRAM								
Responsible Agencies:								
Counties								
Adopt stormwater plan/program		(2)	x			x		
Adopt joint county plan						x		
Adopt ordinances		(2)	x			x		
Establish advisory committee						x		
Review watershed plans of planning agencies						x		
Conduct public hearing						x		
Enforcement		(1)		x		x	x	
Approve plans/ordinances			x	x			x	
Issue permits		(1)			(5)			
Provide technical/financial assistance				x				
Coordinate plans with other entities			x	x		x		
Periodic review				x		x		

Table 1. Con't.

	DE	FL	MD	NJ	NC	PA	TX	VT
Municipalities								
Approve development plans			x				x	
Adopt plans/program		(2)	x	x			x	
Adopt and implement ordinances		(2)	x	x		x	x	
Enforcement				x		x	x	
Coordinate plans/ordinances			x	x			x	
Issue permits			x	x			x	
Conservation Districts								
Review/approve plans			x	x			x	
LANDOWNER/DEVELOPER RESPONSIBILITIES								
Obtain permit or plan approval			x	x	x	x	x	
Comply with permit/ plan requirements			x	x	x	x	x	
TECHNICAL MANUALS AND HANDBOOKS								
State		x	x	x		x		x
Local								
MODEL ORDINANCES								
State agency			x	x		x		
County								
Municipality								
FUNDING								
State								
State to provide percentage			x	90%	x	75%		x
Grants				x		x		
Matching						x		
Fees			x					x
Local								
County			x	x		x		
Municipality			x			x	x	
Fees			x	x			x	
TECHNICAL ASSISTANCE								
State		x			x		x	
Local								
County			x	x				
Municipality			x					
District								

(1) Provided such facilities are part of an approved conservation plan or are operated in accordance with the Silvacultural Best Management Practices Manual.

(2) Department may delegate authority to local governments or water management districts.

(3) Department of Agriculture and Consumer Services

(4) General Powers of Environmental Management Commission (N.C.G.S. Sec. 143-214.1 et. seq.)

(5) Letter of approval.

TABLE 2. SYNOPSIS OF PROVISIONS OF STATE LAWS ESTABLISHING STORMWATER MANAGEMENT PROGRAMS IN MARYLAND, NEW JERSEY, AND PENNSYLVANIA

	Maryland	New Jersey	Pennsylvania
Authority to Regulate Stormwater	Stormwater Management Act 1952	Stormwater Management Act, amending Land Use Law, 1981	Stormwater Management Act 1978 amended by Act of May 24, 1984.
State Responsibilities	Department of Natural Resources. Adopt rules and regulations to establish criteria and procedures for stormwater management. Hold hearings. Provide technical assistance, training, research *and coordination.* Approve state projects. Conduct inspection and review at least every 3 years of programs of counties and municipalities and their field implementation. Department of Health and Mental Hygiene may bring a civil action against violations.	Department of Environmental Protection must issue regulations governing preparation of plans and ordinances. Planning is in two phases: Phase I is targeted at preventative measures to be applied to the site *plan and review process;* Phase II is for long term comprehensive planning of alternative preventive stormwater management measures in conjunction with remedial stormwater management measures. Plans must consider unique character of area. Plans must be coordinated with soil and water conservation plans and regulations. General standards are specified for use as minimums to be applied to major developments.	The Department of Environmental Resources must: Publish guidelines for stormwater management and model ordinances for use by counties and municipalities (following submission to the General Assembly for approval). Coordinate management of stormwater in the commonwealth. Designate watersheds for purposes of the Act, with approval of the Environmental Quality Board. Provide technical assistance to counties and municipalities in cooperation with the Department of Community Affairs. Review and approve county watershed plans. Conduct studies and research. Conduct educational programs. Administer grants to counties to assist in preparing watershed plans. Enforce Act through: 1. Mandamus, or 2. Withholding State funds.

TABLE 2 CONTINUED

	Maryland	New Jersey	Pennsylvania
Local Responsibilities	Counties and municipalities must adopt ordinances to implement a stormwater management program. Ordinance may provide for review and approval of plans by the local soil conservation district. After 7/1/84, no development for residential, commercial, industrial or institutional use may be started without an approved stormwater management plan. A grading or building permit may not be issued without an approved stormwater management plan. A developer must certify that all land clearing, construction, development, and drainage will be done according to the plan. Each county or municipality may adopt a fee system to cover the cost of reviewing stormwater management plans and implementing stormwater management programs.	Municipalities must prepare stormwater management plans and implementing ordinances for approval by the appropriate county unit. The county unit approves or disapproves the plan and ordinance. The plan must conform with municipal, county and state plans. The local county unit must consult with the soil conservation district and must receive a written acknowledgement that there is no duplication with district requirements for erosion control.	Counties must, within 2 years after promulgation of the guidelines, adopt a watershed stormwater management plan for each designated watershed in the county, in consultation with the municipalities in the watershed. Prepare and adopt a joint plan with neighboring counties where a watershed contains land in more than one county. Establish an advisory committee including each municipality and the conservation district. Hold public hearing. Municipalities must: Adopt and implement zoning, subdivision, building code, erosion and sedimentation and other ordinances as are necessary to regulate develdevelopment in the municipality in a manner consistent with the county-adopted watershed plan within six months after approval of the plan.

FEDERAL LEGISLATION, GUIDELINES, INSTRUCTIONS

Federal Legislation

The Clean Water Act of 1972 as amended by the Water Quality Act of 1987. See the Nonpoint Source (NPS) provisions of the 1987 Act attached as Exhibit 1. See also Analysis of Clean Water Act Amendments (H.R. 1) attached as Exhibit 2.

EPA Guidance and Instructions

1. Nonpoint Source Guidance, December 1987, U.S. Environmental Agency, Office of Water, Office of Water Regulations and Standards (Exhibit 3).

   The Introduction to this Guidance contains the following pertinent statements:

   "A. Goals:

   The Water Quality Act of 1987 (WQA) states:

   > It is the national policy that programs for the control of nonpoint sources of pollution be developed and implemented in an expeditious manner so as to enable the goals of this Act to be met through the control of both point and nonpoint sources of pollution.

   "This goal focuses on the importance of controlling nonpoint sources of water pollution. With the enactment of section 319 of the WQA, new direction and significant Federal financial assistance for the implementation of State nonpoint source (NPS) programs has been authorized. The WQA requires two major reports to be completed by August 4, 1988: a State Assessment Report describing the State's NPS problems and a State Management Program explaining what the State plans to do in the next four fiscal years to address their NPS problems. The WQA authorizes financial assistance for developing these reports and for implementing the State's NPS Management Program.

   "B. The State Clean Water Strategy:

   The 1987 legislation mandates a similar approach in information collection, assessment and the subsequent development and implementation of pollution control mechanisms for targeted areas in the new Surface Water Toxics Control, Nonpoint Source, Estuary, Clean Lakes, and Great Lakes program areas. These activities, although conducted under separate program activities, may lead to identifying the same water resources as

being in need of pollution control measures. EPA is encouraging States to develop State Clean Water Strategies as a means of addressing in a strategic way the variety of water pollution sources, their inter-relationships and the many water resources that are threatened.

"E. Program Inter-relationships:

With the WQA, States now have additional support and direction for comprehensive implementation of NPS controls. EPA will encourage States to develop NPS programs which build upon related programs such as Clean Water, Estuaries, Stormwater Permits, Groundwater, Toxics Controls, State Revolving Funds, and Wetlands; and complement and increase the effectiveness of State and local NPS programs already underway. In addition, EPA will encourage States to coordinate their NPS programs with other Federal agencies. For example, USDA's Conservation Reserve and Conservation Compliance Programs play an important role in the implementation of best management practices to reduce agricultural NPS pollution." (Emphasis added)

Other subjects dealt with in this EPA Guidance include: Development of State Assessment Reports and Development of State Management Programs, including criteria for their approval, administrative provisions, and grant application requirements. (For full text of Guidance see Exhibit 3). See also "State Clean Water Strategies, Meeting the Challenges of the Future" Office of Water, EPA, December 1987, Exhibit 4.

Methodology for Analysis of Detention Basins for Control of Urban Runoff Quality, September 1986, EPA Office of Water, Nonpoint Source Branch (Exhibit 5).

The Foreword of this manual states:

"The principal focus of EPA's Nationwide Urban Runoff Program (NURP) was to develop and transfer information that would be of practical utility to planning agencies in determining the need for, and approaches to the control of, pollutant discharges from urban stormwater runoff. One of the specific objectives was to assess the performance characteristics of control techniques, and for those indicated to be feasible candidates, to provide data and analysis procedures to guide and support planning decisions."

"This report describes an analysis methodology and presents graphs and example computations to guide planning level evaluations and design decisions on two techniques for urban runoff quality control. The control techniques addressed, recharge or infiltration devices, and wet pond detention devices

(basins that maintain a permanent pool of water), were shown by the NURP studies to be the most consistently effective at pollutant reduction of any of the Best Management Practices (BMP) approaches considered."

It is also stated in the Introduction that:

"The methodology presented in this report is based on a probabilistic technique that accounts for the inherent variability of the situation it addresses. The analysis has a planning orientation rather than a research one, consistent with the principal focus of the NURP program. The basic objective of the analysis that has been structured is to provide a basis for establishing "first order" design specifications (size, detention time), in terms of a long-term average removal of urban runoff pollutants. A secondary objective for a useful planning tool is that it be sufficiently simple, fast, and economical to apply, so that a large number of alternative scenarios are practical to examine. The methodology presented meets both these requirements, and by comparison with actual performance data and/or projections from more elaborate simulation models, is indicated to provide sufficiently accurate performance projections for the intended purposes.

"Although other approaches are available to a user, the methodology presented in this report is believed to have several advantages. It permits an analysis to be performed without the need for access to a computer. Analyses are simple enough to perform that there is no practical constraint to examining a large number of alternative conditions of interest. These factors and the organization of the computations (input requirements and output format) emphasize the utility for planning purposes."

The presentation of the report is as follows:

Section 2 describes the probabilistic methodology and discusses the rational and use of the performance graphs, and the equations on which they are based.

Section 3 addresses recharge devices and presents a description of the methodology, an example problem, validation tests, and a discussion of the application of the methodology and some limitations and practical considerations.

Section 4 addresses wet pond detention basins using the same format.

Section 5 presents results of a series of analyses using the methodology, illustrating differences in size/performance relationships as influenced by regional differences in rainfall characteristic. These generalized results may be used as an initial screening indication, to be further refined by use of specific parameters in the analysis.

An Appendix provides information to assist the user in estimating values for parameters used in the methodology.

National Urban Runoff Program Report Final Report, December 1984 (Exhibit 6).

The Foreword states:

"The possible deleterious water quality effects on nonpoint sources in general, and urban runoff in particular, were recognized by the Water Pollution Control Act Amendments of 1972. Because of uncertainties about the true significance of urban runoff as a contributor to receiving water quality problems, Congress made treatment of separate stormwater discharges ineligible for Federal funding when it enacted the Clean Water Act in 1977. To obtain information that would help resolve these uncertainties, the Agency established the Nationwide Urban Runoff Program (NURP) in 1978. This five-year program was designed to examine such issues as:

- The quality characteristics of urban runoff, and similarities or differences at different urban locations;

- The extent to which urban runoff is a significant contributor to water quality problems across the nation; and

- The performance characteristics and the overall effectiveness and utility of management practices for control of pollutant loads from urban runoff.

The interim NURP report, published in March 1982, presented preliminary findings of the program. This document is the final report covering the overall NURP program. Several specialized technical reports were in progress when the NURP Report was made. These technical reports are listed in the Preface p. v/vi.

The program was developed, implemented and managed by the Water Planning Division, Office of Water, at EPA Headquarters, Washington, DC. It had the cooperation of the U.S. Geological Survey and assistance of several consultants identified in the report.

As part of the Introduction to this study, the following statement is of particular interest:

"As a result of Section 208 of the Act (WQA 1965), State and local water quality management agencies were designated to integrate water quality activities. As point source discharges were increasingly brought under control and

funds for the construction and upgrading of municipal sewage treatment plants were granted, the awareness of nonpoint source (including urban runoff) as potential contributors to water quality degradation was heightened. Uncertainties associated with the local nature and extent of urban runoff water quality problems, the effectiveness of possible management and control measures, and their affordability in terms of benefits to be derived mounted as water quality management plans were developed. The unknowns were so great and certain control cost estimates were so high that the Clean Water Act of 1977 (P.L. 95-217) deleted Federal funding for the treatment of separate stormwater discharges. The Congress stated that there was simply not enough known about urban runoff loads, impacts, and controls to warrant making major investments in physical control systems.

"In 1978, EPA Headquarters reviewed the results of work on urban runoff by the technical community and the various 208 Areawide Agencies and determined that additional, consistent data were needed. The NURP program was implemented to build upon pertinent prior work and to provide practical information and insights to guide the planning process, including policy and program development and implementation. The NURP program included 28 projects, conducted separately at the local level, but centrally reviewed, coordinated, and guided. While these projects were separate and distinct, most share certain commonalities. All were involved with one or more of the following elements: characterizing pollutant types, loads, and effects on receiving water quality; determining the the need for control; and evaluating various alternatives for the control of stormwater pollution. Their emphasis was on answering the basic questions underlying the NURP program and providing practical information needed for planning."

This is a very comprehensive report, the scope of which can be seen from the subjects dealt with in the several chapters: Urban Runoff Perspective; Stormwater Management; Methods of Analysis; Characterization of Urban Runoff; Receiving Water Quality; Effects on Urban Runoff; Urban Runoff Controls.

Conclusions of NURP Report

Chapter 9 of the Report states the several conclusions of the Report. The Introduction to the Conclusion states:

The Nationwide Urban Runoff Program has addressed such issues as quantifying the characteristic of urban runoff, assessing the water quality effects on receiving water bodies attributable to urban runoff discharges, and examining the effectiveness of control practices in

removing the pollutants found in urban runoff. This chapter summarizes NURP's conclusion relating to these issues and is based on the results presented in Chapter 6, 7, and 8 of this report. Conclusions reached by the individual NURP projects are also presented to further support the results of the national level analysis.

Major subjects dealt with are:

Grant Programs

The Water Quality Act contains new provisions for financial assistance for NPS control. The grant requirements for this assistance are discussed in Part III of EPA Nonpoint Source Guidance (Exhibit 3), as indicated below:

"Federal financial support is authorized from six new sections established by the WQA to support activities related to NPS control. While each of these funding sources is discussed separately below, and will generally require a separate grant application, states are encouraged to develop coordinated work programs using these various funding sources. Grant funding under each of these sections is subject to the availability of appropriations."

"A. Section 205(j)(5)

This section of the Act provides a set-aside of up to 1% of each State's construction grant allotment or a minimum of $100,000 to be used for developing a State's NPS Assessment Report and Management Program (program development) and for implementing an approved Management Program (implementation)."

The details of application requirements for such assistance is set out in detail on pages 25-28 of the Guidance.

"B. Section 319(h)

Grants under section 319(h) are to be used to implement State NPS Management Programs. A discussion of eligible implementation activities is provided under the previous section of the guidance addressing 205(j)(5) grants.

Section 319(h)(2) provides that grant applications for section 319(h) funds should include:

- an identification and description of the best management practices and measures which the State proposes to assist, encourage, or require in such year with the Federal assistance to be provided under the grant. (emphasis added)"

For details information as to these grants, see pages 28-31 of the Guidance.

"C. **Section 319(i)**

Grants under section 319(i) are for the purposes of carrying out groundwater quality protection activities which EPA determines will advance the State toward implementation of a comprehensive NPS pollution control program."

"D. **Section 201(g)(1)**

This section, as amended, allows NPS control efforts to be financed through the Governor's 20% discretionary set-aside of construction grants funds. These are Title II funds that may be made available for any purpose for which a grant may be made under sections 319(h) and (i). NPS activities funded under this section must meet the requirements for section 319, particularly 319(h) and (i)."

"E. **Section 603(c)(2)**

The WQA adds a new Title VI providing for Federal capitalization grants to States for State revolving funds to be used for loans, primarily for municipal waste treatment. However, these loans may also be made for the implementation of a NPS Management Program established under section 319 and developed and implementation of a conservation and management plan (for bays or estuaries) under section 320, if certain requirements are met under section 603 and Office of Municipal Pollution Control guidance."

"F. **Section 604(b)**

Beginning in FY 1989, States must reserve each year 1% of their Title VI allotments or $100,000, whichever is greater, to carry out planning under 205 (j) and 303 (e). Since NPS planning activities are eligible for funding under 205 (j), the 604 (b) reserve is an additional source of funding for NPS activity."

Further information as to these grants may be found on pages 32-33 of the Guidance.

EPA Report to Congress: Nonpoint Source Pollution in the United States, EPA January 1984 (Exhibit 7).

This report was prepared in response to the request in House Report No. 98-223 that EPA:

> "analyze the extensive body of past research in nonpoint source problems to identify and rank the highest payoff problem areas and submit a report by January 1, 1984 outlining specific strategies and approaches recommended for addressing nonpoint sources in a cost-effective manner."

The report:

- Describes what is known (and not known) about the nature and extent of water quality problems caused by nonpoint source pollution and some available best management practices to address these problems (Chapters 1 and 2);
- Compares point and nonpoint source pollutant loadings nationally (Chapter 1);
- Identifies an approach for targeting high-payoff problem areas (Chapter 2);
- Examines the technical, institutional, and economic factors and data gaps that affect the successful control of nonpoint source pollution (Chapters 1, 2, and 3);
- Identifies current Federal, State, and local programs that address the problem (Chapter 3);
- Highlights successful strategies for controlling nonpoint source pollution and identifies some innovative approaches (Chapters 2 and 3); and
- Outlines the key components of State strategies to prevent and control nonpoint source pollution (Chapter 4).

(See page ix of the Report, Exhibit 7).

For a discussion of urban nonpoint source pollution see pp. 2-32 -- 2-36 and pp. 3-14 -- 3.20; also table 2-4 (pp. 2-34), table A-5 (Appendix A-9); Figure 208 (pg. 2-33) and Figure A.1 (Appendix A-10).

There is, of course, much other material dealing with construction, development, etc., that will be of interest in relation to stormwater management.

National Water Quality Inventory 1986 Report to Congress, EPA, Office of Water.

This is the sixth in a series of reports published since 1975, which summarizes the water quality reports submitted pursuant to section 305 (b) of the Clean Water Act by the states and other jurisdictions in 1986.

The overall report will be of interest, and special attention is called to those parts, as indicated in the table of contents, dealing with the nonpoint source pollution problems, which are of increasing concern.

DELAWARE'S STORMWATER MANAGEMENT NEEDS

The goal of Task C for the Stormwater Management Planning Project is to "determine Delaware's Stormwater Management needs." In order to accomplish this, the following three interrelated assessments were completed:

Ongoing Regulatory Programs

An important task (TASK A) for the Delaware Stormwater Management Planning project was the development of a comprehensive listing of the features and characteristics of those regulatory programs in Delaware that, in some way, address stormwater management. A separately developed Task A report presents a summary of the regulatory features of the various Federal, state and local programs that enforce and monitor stormwater management regulations at the present time.

Existing Stormwater Related Problems in Delaware

Storm runoff flooding is a chronic problem in many areas of Delaware. Storm flooding conditions typically are found downstream of urban and urbanizing areas. Numerous references are available which fully identify storm runoff characteristics, and the impacts on the hydrologic response of a watershed as a result of urbanization. Therefore, it is clearly documented, generally and specifically for Delaware, that waterway flooding is an adverse impact from the development (i.e., urbanization) of an area.

In addition to the identification of storm runoff quantity problems, the Delaware Stormwater Management Planning project also addressed the issue of stormwater runoff pollution and quality. The mechanism that was used to do this involved the coordination with the State's Stream Quality Assessment Reporting project, i.e., the bi-annual 305(b) reporting program for EPA.

The 305(b) report for Delaware is a comprehensive gathering of stream quality data that allows for an identification to be made of those stream segments that are currently not meeting their required quality limits and, therefore, their beneficial uses. The Delaware 305(b) report also, where possible, identifies the potential causes for streams not meeting their designated uses. This information was used for the stormwater management planning project to assess the types of land use activities which have been documented as potential contributors to the State's water quality problems.

Stormwater Management Programs in Other States

An important task for the Stormwater Management Planning project (Task B), was the analysis of stormwater management programs in other states. This analysis included the identification of the guidance and regulations that comprise the state program. The

objective of this development effort was to determine a "recommended" set of new program characteristics, based on those from states where stormwater management programs are currently in place -- and are being successfully implemented.

The objective of the comparative evaluation of was to logically and systematically arrive at a set of recommended stormwater management program "components" for Delaware that have the following characteristics:

1. Provide consistency with existing/ongoing programs in Delaware, so as to involve the least amount of disruption to current functioning programs. This consideration is not only important from a functional standpoint (i.e., disruptions will involve various costs), but also from a political/public recognition and support standpoint.

2. Fully address Delaware's short and long term needs. The goal of the State's Stormwater Management Planning project was to develop a flexible program, but one that is responsive to Delaware's existing and future needs.

3. Incorporate the most current (or "State of the Art") provisions for managing storm runoff. The field of stormwater management planning and implementation is growing considerably at the present time. Many new state programs are being developed and implemented around the country. In addition, several important "lead" states have had statewide programs for several years. Therefore, another goal of the Delaware Stormwater Management Planning project was to evaluate (and utilize as appropriate) the advantages, disadvantages, successes, and also the failures of the ongoing state programs.

The evaluation for Task C involved a considerable amount of information. Given this, and in order to not only effectively assess the information, but also to effectively present the information and results, a "matrix-type" evaluation process was of a computerized database for each of the three information items presented above. A database spread sheet was developed to store and manage the actual data for each matrix. In this way, the information is not only available for short and long term use, but also can be easily updated with any changes as they occur.

Tables 1 through 3 (attached) present these matrices. The following sections present a summary description of each of the individual matrices, followed by a summary of the comparative evaluation of the three matrices. This summary is presented within the context of the goals and objectives of this stormwater management planning project.

Matrix No. 1 - Existing Regulatory Programs

An evaluation of Matrix No. 1 illustrates an important point; numerous existing state programs already address stormwater management issues. However, most of the current programs specifically address erosion/sedimentation and agricultural considerations for stormwater runoff. Most urban area regulations do not effectively extend the erosion and sediment control regulatory process, with its technical requirements, forward to the "post development" condition with long term stormwater management. This shortcoming of the current regulatory program in Delaware is an important one and is one that is a key consideration for the development of a new state-wide stormwater management program.

The erosion and sediment control program in Delaware is currently being successfully implemented. This is due partly to effective legislation, but is also due to the education/training, permit review, and compliance monitoring efforts of the State's Conservation Districts. Matrix No. 1 illustrates the various functions and roles that the Conservation Districts play for numerous programs affecting stormwater runoff in Delaware. Therefore, an important summary observation from Matrix No. 1 is that the State's Conservation Districts are now in position to help implement a new state-wide stormwater management program.

Matrix No. 2 - Stormwater Related Problems

The information presented in Matrix No. 2 illustrates several important points:

1. Agricultural sources are identified as the most significant contributor to water quality problems in Delaware.

2. Construction activities are a contributor of primarily sediment pollution to waterways.

3. Urban runoff is highlighted as being an important source of toxic and potential pathogen pollution to Delaware waterways. Therefore, urban runoff is a source of pollution that must be addressed under the State's new stormwater management program.

Matrix No. 3 - Other State Programs

Matrix No. 3 illustrates the important characteristics of other state programs that are widely recognized as being successful examples of "state of the art" stormwater management planning programs. Summary considerations from Matrix No. 3 are as follows:

1. Each of the successful state programs has legislation at the state level which defines the roles, responsibilities (as well as the goals/objectives) for each of the agency

participants in the program.

2. Several of the progressive states now implementing a state-wide stormwater management program utilized the state's Conservation Districts as the implementing agency.

3. Each of the states utilizes a permit system (with permit review/processing fees) for the state program.

4. A key neighboring state (i.e., Maryland) exempts agricultural activities from the state's stormwater management program. However, Maryland (as with Delaware) has other ongoing agricultural conservation programs that address stormwater runoff. Because of the extent of agricultural storm runoff problems (see Matrix 2) a successful stormwater management program for Delaware must include an emphasis on rigorous enforcement of these existing conservation and erosion control programs.

5. Each of the states that are currently implementing a stormwater management program have identified an existing environmental regulatory agency in the state as the lead agency with responsibility for the stormwater management program.

6. The state agency responsibilities for the state programs typically include the development of program guidelines and model regulations. In addition, state agency responsibilities typically include program coordination and the review/approval of local compliance plans. State agency responsibilities also typically include providing assistance, i.e., technical and financial. In some instances, state agency responsibilities also include enforcement.

7. Local agencies are typically responsible for developing and implementing programs that are in compliance with state guidelines. These programs typically involve some type of municipal ordinance with provisions that are consistent with state-level guidance.

8. Local governments are typically involved in advisory committees to help establish and monitor the performance of these state regulatory programs.

Summary

Program development considerations should address the basic stormwater runoff quantity and quality issues, as well as how to best incorporate new regulations into the existing political structure. Stormwater flooding resulting from urbanization has been identified as a chronic problem in many areas of Delaware,

therefore, runoff regulations will benefit areas of future development. However, the existing (and ongoing) impacts on Delaware waterways must also be addressed on a comprehensive (watershed level) basis for any type of management program to be successful. Stormwater related problems currently result from agricultural activity. In addition, pollution by toxics and pathogens are primarily the result of urban runoff and land disposal practices. Therefore, stormwater management regulations should provide for implementation of techniques to mitigate stormwater runoff impacts for new development, agricultural areas and ultimately existing urban areas.

Numerous existing state programs already address stormwater management issues, however, most focus on erosion/sedimentation issues and do not extend to urban stormwater management. In Delaware, the Conservation Districts are currently functioning in an educational/training, permit review and compliance monitoring capacity; and are in a good position for active involvement in implementation of a state-wide stormwater management program.

The water quality problems identified in Matrix 2, along with the documented urban flooding and erosion and sedimentation problems, identify the need for a comprehensive state-wide stormwater management program in Delaware. Each of the successful state programs studied in this report have legislation at the state level which defines the roles and responsibilities for each of the agency participants in the program. Under state guidelines, local agencies are typically responsible for developing and implementing programs. Local governments are typically involved in advisory committees to contribute to policy making and monitor the performance of the state regulatory program.

Table - 1

MATRIX NUMBER 1
Existing Regulatory Programs

GOVERNMENT LEVEL	PROGRAM	ADMINISTERING AGENCIES	AUTHORITY: LEGISLATIVE	AUTHORITY: REGULATORY	AUTHORITY: LEGAL	AUTHORITY: FUNDING	AUTHORITY: TRAINING & ASSISTANCE	AUTHORITY: INCENTIVES	AUTHORITY: TAXING POWERS	ENFORCEMENT/REVIEW & APPROVAL: (VOL)	ENFORCEMENT/REVIEW & APPROVAL: (MAN)	PERMITS	INSPECTION	ACTIVITIES: URBAN	ACTIVITIES: AGRICULTURE	ACTIVITIES: WASTE DISP	ACTIVITIES: FORESTRY	INVOLVED AGENCIES: CONSERV. DISTRICTS	INVOLVED AGENCIES: TAX DITCH GROUPS	INVOLVED AGENCIES: PUB WORKS & ENG DEPTS	INVOLVED AGENCIES: DNREC
FEDERAL	Soil Conservation Service	Conservation Districts					X			X				X	X		X	P		S	
	FEMA - Floodplain Program	FEMA & Local Govts.	X	X						X				X						P	
STATE	Soil Conservation Commission (DE Code, Ch 39, Title 7)	Conservation Districts				X	X				X		X	X	X			P		S	
	Tax Ditch Program (DE Code, Ch 41, Title 7)	Tax Ditch Organizations	X		X	X			X		X		X	X	X				P	S	
	Erosion & Sediment (DE Code, Ch 40)	Conservation Districts	X	X							X	X	X	X	X		X	P		S	S
	Conservation Program (DE Code, Ch 39, Title 7)	Conservation Districts				X	X	X					X	X	X	X	X	P			
	Floodplain Program																				
	Delaware Extension Service															X					
LOCAL	Stormwater Management Programs	City/County Public Works & Engineering Departments	X	X	X						X	X	X	X				S		P	

Table - 2

MATRIX NUMBER 2
Stormwater Related Problems

STORMWATER (OR NON-POINT SOURCE) IMPACTS ON STATE SURFACE WATERS (Rivers in miles)

NONPOINT SOURCE POLLUTANT	INTENSITY OF NONPOINT SOURCE IMPACT			POTENTIAL POLLUTION <========== SOURCE CATEGORIES ==========>					
	Severe	Moderate	Threatened	Agri-Cultural	Silvi-Culture	Construction	Urban Runoff	Land Disposal	Other
SEDIMENT/TURBIDITY Rivers	7	50	37	51	0	16	0	27	0
NUTRIENTS/FERTILIZER Rivers	11	37	35	64	0	0	0	19	0
PESTICIDES Rivers	0	21	0	21	0	0	0	0	0
TOXICS Rivers	0	34	8	0	0	0	7	14	21
PATHOGENS Rivers	11	73	38	61	0	0	17	42	0
O2 DEMAND	11	34	0	25	0	0	6	14	0
PHYSICAL HABITAT ALTERATION	0	10	9	0	0	19	0	0	0

Source: Delaware 305(b) Report to US Environmental Protection Agency, April 1988.

Table 3

Matrix 3

SUMMARY OF PRINCIPAL PROVISIONS OF STATE LAWS
PROVIDING FOR STORMWATER MANAGEMENT

	DE	FL	MD	NJ	NC	PA	TX	VT
STATE LAWS								
Stormwater management		x	x	x		x		x
Related state laws:								
Conservation districts			x	x		x		
Flood control			x					
METHOD SYSTEM								
Permit system		x	x			x	x	
Fees		x	x			x	x	
EXEMPTIONS								
Agricultural			x				x	
Small development							x	
Existing developments							x	
Wetlands								x
STATE PROGRAM								
Responsible Agencies								
State legislature						x		x
Natural/Environmental Resource		x				x		x
Environmental Quality Board						x		
Dept. of Community Affairs						x		
Dept. of Health & Mental Hygience								
Water Resources								x
Other		2						
STATE RESPONSIBILITIES								
Publish guidelines and model ordinances			x	x		x		
Issue regulations		x	x	x		x		
Establish minimum requirements/ controls standards			x	x				x
Coordinate program								
Designate watersheds						x		
Review and approve county/ municipal plan						x		
Provide financial assistance			x	x		x		
Provide technical assistance			x			x		
Conduct studies and research			x			x		
Enforcement			x			x		x
Periodic review								
LOCAL PROGRAM								
Responsible Agencies:								
Counties								
Adopt stormwater plan		1				x		
Adopt joint county plan						x		
Adopt ordinances		1	x			x		
Establish advisory committee						x		
Review watershed plans of planning agencies						x		
Conduct public hearing						x		
Enforcement				x				
Approve plans/ordinances				x				

Table - 3 (continued)
Matrix 3.

	DE	FL	MD	NJ	NC	PA	TX	VT
Coordinate plans with other entities				x				
Periodic review						x		
Municipalities								
Adopt plans		1		x				
Adopt and implement ordinances		1	x	x		x		
Enforcement						x		
Coordinate plans/ordinances with other entities				x				
Conservation Districts								
Review/approve plans			x					
LANDOWNER/DEVELOPER RESPONSIBILITIES								
Obtain permit								
Comply with permit requirements								
TECHNICAL MANUALS AND HANDBOOKS								
State		x		x		x		x
Local								
MODEL ORDINANCES								
State agency				x		x		
County			x					
Municipality								
FUNDING								
State								
State to provide percentage				90%		75%		
Grants				x		x		
Matching						x		
Fees								
Local								
County								
Municipality								
Fees								
TECHNICAL ASSISTANCE								
State						x		
Local								
County		x						
Municipality								
District								

1 When delegated by the Department
2 Fla. Agriculture and Consumer Affairs

STORMWATER MANAGEMENT RESPONSIBILITY SCENARIOS AND PREFERRED APPROACH

Structure	State	County/Municipality/Other
a.	Establish statewide policy, pledge technical assistance to local units.	Adopt ordinance, Rules & Regulations to implement ordinance criteria to meet rules and regulations, complete plan review/approval Inspection, enforcement, and maintenance reviews Issue permits, holds performance bonds
b.	Adopt state statute, regulations, rules, criteria to meet regulations, provide technical training, research coordination assistance to local governments.	Conducts inspections, does plan review, approval, enforcement, Adopts ordinance consistent with state statute, Issue permits, hold performance bond
c.	Handle entire program	No actual involvement
d.	Same as A, plus approve county/district program, provide training, research and coordination	County/district develop Stormwater program, adopt ordinance, rules and regulations to implement ordinance, criteria to meet rules and regulations, completes plan review/approval, inspection, enforcement, and maintenance. Issues permits, holds performance bonds

1. For structures a, b. and c above identify how various agencies identified in Task A would function.

   a) **Conservation Districts**. Would be responsible for developing local stormwater management program in cooperation with county, municipalities, developers, and contractors. Approve plans, inspect plan implementation. Generally, same approach as Erosion and Sediment Control Program.

   b) **County Government**. Issue permits, hold performance bond.

   c) **Tax Ditch Program**. Where stormwater management plans can, on a practical basis, be developed by watersheds, the tax ditch procedures for organization, approval, taxation and maintenance will be used.

d) **Erosion and Sediment Control Program**. The stormwater management program will be closely coordinated with the Erosion and Sediment Control program and erosion and sediment plans. The same personnel at the district, county, and state would handle both E&S and Stormwater Management. The goal would be to have:

- one plan for stormwater management and erosion and sediment control.
- one review process
- one permit

e) **Soil Conservation Service**. Provide technical assistance to district and county, review plans for technical accuracy as needed.

f) **Stormwater Management, New Castle County**. Operate essentially as presently organized. Update to conform to state law and regulations.

g) **Stormwater Management, City of Newark**. Operate essentially as presently organized. Update to conform to revised county ordinances.

h) **Floodplain Management**. Stormwater management plans will be consistent with floodplain ordinances of counties and municipalities.

i) **Department of Transportation**. Responsible for stormwater management in highway systems. Cooperate with state, counties, and conservation districts.

2. Identify the preferred program structure.

Item d above, a combination of a and b is the preferred structure.

- provides a statewide policy, and
- pledges technical assistance and training,
- carries out needed research, and
- exercises coordination of state and local programs, especially where watersheds cross political boundaries
- conservation districts approve plans, provide technical assistance through SCS, and conducts inspections
- county adopts ordinances, reviews plans, issues permits when plan approved by district, holds performance bond.

Statewide budgetary needs determined and funding sought for staffing, office, space, transportation, etc.

3. Identify responsibilities of each agency in the selected program structure.

The Department of Natural Resources and Environmental Control (DNREC) would have over all responsibility for the statewide stormwater management control with the divisions of Soil and Water Conservation (SWC) and Water Resources (WR) having specific program and functional responsibilities.

SWC and WR would have joint responsibility for preparing proposed legislation, regulations, program criteria and practice manuals. They would share activities on training, research, obtaining funding, local program review and approval, and monitoring performance of local programs.

WR has responsibility for water quality standards and administering the National Pollution Discharge Elimination System (NPDES) as it pertains to stormwater management. Stormwater management system outfalls might possibly be permitted under NPDES or other general "permit by rule" program. This process would be addressed in a positive or "proactive" manner including monitoring of selected outfalls for stormwater quality to evaluate on-site stormwater management systems to control nonpoint source pollution control within the site area or watershed.

SWC and the three conservation districts have designated as the management agencies for non-point source control in Delaware. This includes providing technical assistance, including the Soil Conservation Service for the establishment of Resource Management Systems within stormwater management site or watershed plans including grassed swales, waterways, filter strips, sediment traps and basins, retention, detention, and infiltration practices as well as all erosion and sediment control practices.

WR would have responsibility for standards and technical assistance on control of heavy metals, hydrocarbons, and other non-agricultural pollutants.

The conservation districts would be responsible for local program development, and plan approval; counties and municipalities for local stormwater management ordinances and plan review, issuing permits; performance bonds and plan review fees.

4. Determine how best to establish a regulatory mechanism for the stormwater management program.

The Erosion and Sediment Control Law has been in effect since 1981. The Erosion and Sediment Program has been effective with its system of plan review, plan approval, and permits, although the enforcement provisions were not specifically used. In 1988, the law was amended to provide for simple procedures on minor infractions and a $50 fine by the local magistrates court. Serious and intentional infractions still copy a fine of $500 for each infraction with each day of non-compliance constituting a separate infraction.

It is believed that a similar enforcement mechanism for

stormwater management should be used. People are already aware of the requirement and the same agencies and people would be involved. After 2-3 years experience, enforcement procedures could be fine-tuned if necessary.

STORMWATER MANAGEMENT FUNCTIONS AND RESPONSIBLE AGENCIES

Functions	Responsible Agencies
State Law	State Legislature, DNREC
Local Program Dev.	Cons. Districts, County, Private
Local Program Approval	DNREC, Div. of Soil & Water Div. of Water Resources
Local Ordinance	Counties, municipalities
Plan Review	County, SCS, Districts
Plan Approval	Conservation District
Performance Bond	County, municipalities, private
Permits	County, municipalities
Inspection	Conservation Districts
Enforcement	SWC, WR, and Attorney General
Technical Assistance	DNREC, SWC, Water Resources, SCS
Research	DNREC
Training	DNREC, S&W Conservation, Water Resources, SCS
Information	DNREC, Conservation Districts, Counties, municipalities,
Budget	DNREC, S&W Conservation, Water Resources, Conservation Districts
State Local Private (Fee?)	Private (Fee system for plan review and approval)

5. Using the preferred program structure, identify and discuss how the plans and permitting system should be established and operated.

   a. plans - review, approval, need of performance bonds.

   Plans for stormwater management could fall into two types:

   1) Site plans for individual subdivisions, commercial, or industrial developments.
   In such cases plans would be developed by the developer after necessary consultation with the Delaware Advisory Service (DAS), the conservation district, and SCS. Plans would be reviewed by the County and SCS and approved by the District. Performance bonds could be required prior to issuance of permits by

the county or municipality to insure proper plan implementation.

2) Watershed stormwater management plans for complete drainage basins or small watersheds. Where opportunities exist to develop watershed stormwater management plans and programs, procedures for organization, planning, operation, maintenance and taxation used in the Tax Ditch Program should be employed. Such a procedure would provide for an orderly planning process, funding, and maintenance after completion. This alternative would provide the most optimum approach for reaching stormwater management objectives. This would be applicable to new projects or retrofit of old projects.

b. Permits - types of permits needed, permitting authority, inspection, enforcement, maintenance permits, bond money, and liability insurance needs.

An overall permit for the development or the watershed would be required, as well as permits for individual residences, buildings, etc. After a general permit was issued, individual permits could be withheld pending satisfactory installation of the stormwater management plan.

Counties and municipalities have permitting authority which could be exercised when a stormwater management program is developed and necessary ordinances passed. Inspection and enforcement would follow the same pattern as the Erosion and Sediment Control Program.

Maintenance agreements, specifying responsibility of the developer, homeowners association, or watershed organization should be part of the approved plan on which permits are based.

Performance bonds, at a level of or % of the stormwater management plan costs would be desirable. Liability insurance probably is already covered by the developers and tort claims provisions of laws pertaining to state, county or local agencies and personnel.

c. Waivers - types of exemptions, and need of grandfather clauses.

6. Goals and objectives of State stormwater management policy, water quantity and quality, protect public health and safety.

- prevent flooding damages and dangers to property and people.

- protect water quality from sediment, turbidity, sediment borne pollutants (phosphorus, organics, pathogens),

hydrocarbons, heavy metals, etc. to insure public safety and health.

- provide statewide backing to county and local jurisdictions for developing ordinances to meet local needs.

- establish uniform general standards and technical expectation for developers, engineers, and agency personnel.

- develop needed information for public information and training of involved personnel.

- make technical assistance for program development and implementation available to local agencies.

- coordinate programs of local jurisdictions where basins or watersheds cross political boundaries, and

- establish a uniform system of program development, plan review, inspection, enforcement and budget development.

STORMWATER MANAGEMENT PRACTICE MANUAL

Introduction

The Stormwater Management Planning Project had as a task the development of a "Practice Manual" to help support the emerging Stormwater Management Program. While this task is certainly an important one (particularly for a new and emerging program such as this one for Delaware), it need not be an exercise in "reinventing the wheel". That is, many excellent texts and other reference materials are available concerning the various necessary aspects of Stormwater Management. Many of these texts are, in fact, already extensively used by Delaware Municipal governments and land development professionals. Therefore they are reasonably well understood by practicing professionals. Given this, there is certainly no practical need to again present the full text materials from these available references in this "Practice Manual".

A truly responsive Practice Manual for this Stormwater Management Program is one that allows those that must comply with the program to have the necessary technical documents readily available for their use. The developers of a program such as this for Delaware must also help ensure consistency in technical evaluations, so that both the compliance with the regulatory program as well as the necessary municipal reviews of site stormwater management plans can be completed in an orderly and cost-effective fashion. Therefore, an ancillary use of a "Practice Manual" is to identify preferred, or even recommended, technical procedures for compliance with the specific requirements of the program.

Despite the obvious need for consistency, however, stormwater management approaches and procedures must be sensitive to the specific characteristics and needs of a particular project. Therefore, it is unwise to specify exact techniques or approaches to be used for stormwater management. Numerous techniques and procedures are generally used (even by the same stormwater management professional) based on the design conditions for a project. In fact, some techniques are preferred for certain conditions (for example, small drainage areas) that would not be appropriate for different conditions.

Given these considerations, the strategy for completing Task E of the DNREC Stormwater Management Planning Project involves the development of a comprehensive listing of available and recommended manuals, techniques, procedures, etc. that can be used by both regulatory agencies and the private development industry in support of the new Delaware Stormwater Management Program. This task product contains this listing of reference materials which is then essentially the "Practice Manual" for the new State program.

Stormwater Management Reference "Manual"

The reference materials contained in this section are identified for numerous technical considerations that are required in order to comply with the Delaware Stormwater Management Program (for example, stormwater control designs, maintenance, etc.). Therefore, the user of the practice manual can select appropriate technical procedures from the available references for each factor or consideration necessary in developing a "typical" site stormwater management plan. Similarly, regulatory review agencies can also utilize the references to gather information concerning technical procedures that is important in the review site stormwater management plans.

The stormwater management topic areas have been selected to be both comprehensive and distinct with an attempt to avoid as much duplication as possible. The following stormwater management topics have been selected for the Practice Manual:

- DESIGN OF STORMWATER CONTROL SYSTEMS
- METHODS FOR MAINTENANCE OF STORMWATER CONTROLS
- SITE PLANNING FOR STORMWATER MANAGEMENT
- STORM POLLUTION AND BEST MANAGEMENT PRACTICES
- STATE STORMWATER GUIDELINES

The following sections of this Practice Manual identify the references that are being recommended (although the list is by no means exclusive) for the Stormwater Management topic areas listed above. In addition, to the references brief descriptions of the contents for each reference are provided. This will enable the Practice Manual user to generally identify the contents for each reference, in order that only appropriate technical reference materials are gathered for particular stormwater management applications.

Representative Reference Materials

The following references are recommended sources of information for different categories of stormwater management problems. Many of these references address more than one stormwater management topic. A few of the most comprehensive references have been listed under Comprehensive Stormwater References as they contain material pertinent to most or all of the other categories listed below.

I. Comprehensive Stormwater References

Several references are available that are extremely comprehensive and provide both analysis and detailed design information concerning the individual technical calculations and evaluations

that need to be completed in order to prepare a site stormwater management plan. These "handbook" type documents are extremely important sources of broad information on procedures that can be used to address broad and varying design considerations.

* A STATISTICAL METHOD FOR ASSESSMENT OF URBAN RUNOFF, U.S. EPA Water Planning Division, Non-point Sources Branch, Washington, DC 20460 Report No. EPA 440/ 3-79-023, May 1979.

* HANDBOOK OF APPLIED HYDROLOGY, McGraw-Hill, 1221 Avenue of the Americas, New York, NY 10020, Chow, Ven T., 1964.

II. Computational Methods For Determining Runoff

The most often used methods for estimating stormwater runoff include the Rational Method, SCS TR-55, SCS TR-20, The Penn State Runoff Model (PSRM) and the Army Corps of Engineers HEC-1 Runoff Hydrograph Package. The Rational Method is most commonly recommended and should only be applied to small drainage areas. The literature cited below recommend upper limits of drainage area size between about 0.5 to 1.5 square miles. Larger drainage areas should be evaluated by a method of hydrograph analysis such as SCS-TR20 or HEC-1. These methods, along with some other, less frequently used techniques are described in detail in the following references:

* HYDROLOGY, U.S. Department of Transportation; Federal Highway Administration publication FHWA-IP-84-15, August 1985.

* DESIGN AND CONSTRUCTION OF SANITARY SEWERS, WPCF Manual of Practice No. 9, ASCS Manual of Practices No. 37, 1969.

* RECOMMENDED HYDROLOGIC PROCEDURES FOR COMPUTING RUNOFF FROM SMALL WATERSHEDS IN PENNSYLVANIA, Pennsylvania Department of Environmental Resources Bureau of Dams and Waterway Management and Penn State University, May 1983.

* TECHNICAL RELEASE 55, URBAN HYDROLOGY FOR SMALL WATERSHEDS, 2nd Edition; U.S. Soil Conservation Service, June 1986.

* TECHNICAL RELEASE 20 PROJECT FORMULATIONS - HYDROLOGY (1982 VERSION), U.S. Soil Conservation Service, May 1982.

* HEC-1 FLOOD HYDROGRAPH PACKAGE USERS MANUAL, U.S. Army Corps of Engineers, January 1985.

* URBAN STORM DRAINAGE - VOLUME I, (Proceedings of the

Second International Conference on Urban Storm Drainage), University of Illinois at Urbana-Champaign, June 1981.

* A GUIDE TO HYDROLOGIC ANALYSIS USING SCS METHODS, Prentice-Hall Inc., Englewood Cliffs, NJ 07362, MkKeun, Richard H., 1982.

* PENN STATE RUNOFF MODEL - USERS MANUAL, Institute for Research on Land and Water Resources, The Pennsylvania State University, University Park, PA, Lakatos, David F. (Roy F. Weston, Inc.) and Aron, Gert (The Pennsylvania State University, most recent version).

III. Design of Stormwater Control Systems

Each design of a stormwater control system is unique, however, common to all is the necessity for ability to control runoff to predevelopment levels and protect health and property from possible injury. Many texts and design manuals are available to focus on the specific design requirements of a particular project. Many of the references listed below contain reference sections of materials used in their preparation, which can provide a good sources of further information.

1. Drainage Design

   a) Design Storms/Volume

   * TECHNIQUE FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS IN DELAWARE, U.S. Geological Survey, Water-Resources Investigations 78-93, Open File Report, Simons, R. H., and Carpenter, D. H., 1978.

   * RAINFALL FREQUENCY ATLAS OF THE UNITED STATES FOR DURATIONS FROM 30 MINUTES TO 24 HOURS AND RETURN PERIODS FROM 1 TO 100 YEARS, U.S. Department of Commerce, Weather Bureau Technical Paper No. 40 (TP-40), Washington, D.C., Hershfield, D. M., 1961.

   * NEW CASTLE COUNTY STORMWATER MANAGEMENT ORDINANCE NO. 77-116, June 1977.

   * INTRODUCTION TO HYDROLOGY, Harper and Row, Publishers, 10 East 53rd St., New York, NY 10022, Clark, Viessman, Knapp, Lewis and Harbaugh, 1977.

2. Detention Design

a) Coastal

* LOW COST SHORE PROTECTION, U.S. Army Corps of Engineers, Report Produced under contract #DACW 61-81-D-0012, 1981.

* SHORELINE EROSION CONTROL, Philadelphia District, U.S. Army Corps of Engineers NAPEN-P (SE CDP), Custom House, Second and Chestnut Streets, Philadelphia, PA 19106

* COASTAL CONSTRUCTION MANUAL, Federal Emergency Management Agency FEMA-55, February 1986.

* GUIDELINES FOR CONSTRUCTION WETLAND STORMWATER BASINS, Maryland Department of Natural Resources, Sediment and Stormwater Division, Water Resources Authority, March 1987.

b) Non-Coastal

* PRACTICES IN DETENTION OF URBAN STORMWATER RUNOFF, American Public Works Association Special Report #43, June 1974.

* METHODOLOGY FOR ANALYSIS OF DETENTION BASINS FOR CONTROL OF URBAN RUNOFF QUALITY, U.S. Environmental Protection Agency, Publication USEPA 440/5-87-81, September 1986.

* SURFACE WATER IMPOUNDMENTS - VOLUME II, (Proceedings of the Symposium on) ASCE, 1981, Edited by H. G. Stefan

c) Enbankment Design

* STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENTATION CONTROL IN DEVELOPED AREAS, U.S. Soil Conservation Service, July 1975.

* DESIGN OF SMALL DAMS, United States Department of the Interior, Bureau of Reclamation, Denver Federal Center, Denver, CO 80225, Attention: D-822A.

d) Emergency Spillways

* Morris, Henry M. and Wiggert, James M., APPLIED HYDRAULICS IN ENGINEERING 2ND ED., John Wiley & Sons, 1963.

* HYDRAULIC DESIGN OF SPILLWAYS, U.S. Army Corps of Engineers Publication Number EM 1110-2-1603, March 1965.

* HYDRAULIC DESIGN OF SPILLWAYS AND OUTLET WORKS, U.S. Army Corps of Engineers Publication Number EM 1110-2-2400, November 1964.

e) Energy Dissipaters

* HYDRAULIC DESIGN OF RESERVOIR OUTLET WORKS, U.S. Army Corps of Engineers Publication Number EM 1110-2-1602, October 1980.

3. Construction Inspection of Stormwater Management Systems

* INSPECTOR'S GUIDELINES FOR STORMWATER MANAGEMENT INFILTRATION PRACTICES, Maryland Department of Natural Resources, Water Resources Administration, Annapolis, MD, 1985.

IV. Methods For Maintenance of Stormwater Controls

The maintenance issue for stormwater management systems is possibly the most critical one for its success. Design engineers certainly have sufficient technical support materials to design practical and cost-effective stormwater management systems. However, very few manuals or other similar materials exist concerning the issue of maintenance of stormwater management systems. Some existing manuals, such as the APWA manual listed below, provide insight and information on maintenance procedures or provisions for stormwater management systems. However, the issue is more an institutional one then a technical one. That is, maintenance of stormwater management systems is essentially the process of "good housekeeping" and basic repairs, for example, to corrugated metal outlet structures is technically relatively straightforward, the primary reason for a significant lack of maintenance (to the point where it can essentially cause a stormwater management program to be viewed as ineffective) is that "provisions" (for example, ordinance components) are not provided to ensure that effective maintenance occurs. The State of New Jersey has recently completed a research program aimed specifically at the stormwater management issue. The report listed below is a summary of the findings and conclusions of that research program. As such, it includes insight and perspective for this important stormwater management issue.

* RESEARCH REPORT ON STORMWATER MANAGEMENT MAINTENANCE, New Jersey Department of Environmental Protection, Trenton, NJ, 1988.

* URBAN STORMWATER MANAGEMENT, American Public Works Association, Special Report No. 49, (Poertner, Herbert C., principal investigator) Chicago, IL, 1981.

V. Site Planning For Stormwater Management

Stormwater management systems need not be a costly burden for land development projects. Many innovative land developers are in fact using stormwater management systems as site amenities. For example, a properly located and designed "wet Pond" stormwater management devise can significantly enhance a section of a land development project, and particularly the individual lots that surround the stormwater management "lake". The basic procedure to achieve this level of practical and cost-effective stormwater management system design involves the application of individual creativity to "basic" stormwater management system design. Therefore, many of the manuals listed above provide information on basic techniques that can be used with creative engineering, to develop stormwater management systems that are truly site amenities. In addition, several newer approaches for stormwater management, and particularly as they relate to stormwater quality management, have been identified and are listed below. The use of wetlands and stormwater infiltration systems are now being more widely used for both quantity and quality control of stormwater runoff. Being a new technical area, few descriptive manuals exist. However, several of the more widely used manuals are listed below.

1. Stormwater and Wetlands

* WETLAND BASINS FOR STORMWATER TREATMENT: DISCUSSION AND BACKGROUND, Maryland Department of Natural Resources, Water Resources Administration, Sediment and Stormwater Division, December 1987.

* Gomez, Michele L., THE ROLE OF WETLAND VEGETATION IN MAINTAINING OR IMPROVING WATER QUALITY, Maryland Department of Health and Mental Hygiene, Office of Environmental Programs, May 1987.

* THE USE OF WETLANDS FOR STORMWATER MANAGEMENT AND NON-POINT POLLUTION CONTROL: A REVIEW OF THE LITERATURE, State of Washington, Department of Ecology Report 87-7A, October 22, 1986.

* VIABILITY OF FRESHWATER WETLANDS FOR URBAN STORMWATER MANAGEMENT AND NON-POINT POLLUTION CONTROL: AN ANNOTATED BIBLIOGRAPHY, State of Washington, Department of Ecology Report 87-7B, July 1, 1986.

* FEASIBILITY AND DESIGN OF WET PONDS TO ACHIEVE WATER QUALITY CONTROL, Harrington, Bruce W., Maryland Department of Natural Resources, Water Resources Administration Sediment and Stormwater Division.

* GUIDELINES FOR OBTAINING A PROTECTIVE SURFACE WATER CLASSIFICATION, North Carolina Department of Natural Resources and Community Development Report No. 87-05 and 87-05A, December 1987.

* WETLANDS AND STORMWATER POLLUTION MANAGEMENT, Presented at the National Symposium on Wetland Hydrology, Chicago, IL, Lakatos, David F., and McNemar, L. J., September 1987.

2. Stormwater Infiltration

* UNDERGROUND DISPOSAL OF STORMWATER RUNOFF - DESIGN GUIDELINES MANUAL, U.S. Department of Transportation, Federal Highway Administration Report No. FHWA-TS-80-218, February 1980.

* MODELING INFILTRATION PRACTICES USING THE TR-20 HYDROLOGIC PROGRAM, Maryland Department of Natural Resources, Water Resources Administration, Sediment and Stormwater Division, Harrington, Bruce W., October 1983.

* STANDARDS AND SPECIFICATIONS FOR INFILTRATION PRACTICES, Maryland Department of Natural Resources, Water Resources Administration, Sediment and Stormwater Division, February 1984.

VI. Storm Pollution and Best Management Practices

The newest topic of concern for stormwater management design in many states and local areas is stormwater pollution control. The emphasis on stormwater quality management also will now increase as a result of the new federal requirements under the Water Quality Act of 1987. The section 319 provisions of the Federal Water Quality Act of 1987 require states to develop and implement statewide stormwater quality (or non-point source) management programs. Delaware is a national leader in Section 319 planning, and has developed a comprehensive state 319 non-point source pollution management plan (preliminary) which has been submitted to the U.S. Environmental Protection Agency. This new Delaware program will be an important source of technical guidance materials concerning storm pollution and best management practices. However, in addition to the Delaware guidance materials numerous other widely used technical references are available concerning stormwater pollution control and Best Management Practices (BMPs).

* CONTROLLING URBAN RUNOFF: A PRACTICAL MANUAL FOR PLANNING AND DESIGNING URBAN BMP's, Thomas R. Schueler, Department of Environmental Programs, Metropolitan Washington Council of Governments, July 1987.

* NON-POINT SOURCE POLLUTION MANAGEMENT PROGRAM, Public review draft, State of Delaware, Department of Natural Resources and Environmental Control, June 21, 1988.

* RESULTS OF THE NATIONWIDE URBAN RUNOFF PROGRAM (VOLUME I, FINAL REPORT AND VOLUME II, APPENDICES), Water Planning Division, U.S. EPA, Washington, D.C. 20460, December 1983, NTIS Accession Number PB84-185552.

* GUIDEBOOK FOR SCREENING URBAN NON-POINT POLLUTION MANAGEMENT STRATEGIES, Prepared by the Northern Virginia Planning District Commission, 7309 Arlington Boulevard, Falls Church, Virginia 22042, (703) 573-2210, November 1979.

* ESTIMATION OF URBAN STORM-RUNOFF QUALITY AND QUANTITY DATA IN METROPOLITAN AREAS THROUGHOUT THE UNITED STATES, N.E. Driver and G.D. Tasker, USGS Books and Open File Reports Section, Federal Center, Box 25046, Denver, CO 80225.

VII. State Stormwater Guidelines

Numerous states, like Delaware, have developed statewide stormwater management programs. As a part of these other state programs, as with Delaware, reference manuals and guidelines have been developed for use by both local governments and the land development industry. Numerous guideline and reference manual documents of these states are listed below. These references provide important sources of not only technical material and procedures, but also references for a wider range of technical documents that can be of use to Delaware Stormwater Management professionals.

* RECOMMENDED HYDROLOGIC PROCEDURES FOR COMPUTING RUNOFF FROM SMALL WATERSHEDS IN PENNSYLVANIA, Pennsylvania Department of Environmental Resources Bureau of Dams and Waterway Management and Penn State University, May 1983.

* A GUIDE TO STORMWATER MANAGEMENT PRACTICES IN NEW JERSEY, State of New Jersey Department of Environmental Protection/Division of Water Resources, March 1986.

* STORMWATER MANAGEMENT DESIGN - A MANUAL OF PROCEDURES AND GUIDELINES, prepared by Roy F. Weston, Inc. for Maryland Department of Natural Resources, April 1976.

* STORMWATER MANAGEMENT MANUAL, State of Florida Department of Environmental Regulation, Wanielista, M. P., Yousef, Y. A., Golding, B. L., Cassagnol, C. L., University of Central Florida Department of Civil Engineering, Orlando, FL 32816, November 1981.

RESOURCE NEEDS

Determine the resource needs for start-up of the program for all agencies involved, as well as projected annual operating costs. Include cost considerations for both personnel and field and office equipment. Also, present an itemization of all costs. Present a schedule for phase-in of entire program.

	Budget Item	SWC	WR	CD	County
1.	State Program Leader 1/2 man year	20,000			
	1/2 man year		20,000		
	Fringe, office ins., pension, etc.	5,000	5,000		
	Transportation, equipment	5,000	5,000		
2.	District Program Leader 1/2 man year/ 3 dist. @ 30,000 (plan review)			45,000	45,000
	Fringe, office			15,000	15,000
	Insurance, pension, etc.				15,000
	Transportation, equip.			15,000	
3.	District Program Inspectors - 1 per district @ $20,000/ 3 districts			60,000	
	Fringe, office, Insurance, pension @ 5,000/3 dist.			15,000	
	Transportation, equip. @ 5,000/3 dist.			15,000	
Subtotals		30,000	30,000	165,000	75,000

Grand Total = $295,000/yr.

Schedule for Phase-in of Programs

1 - April 1, 1989	Act to amend Chapter 40, Title 7, Delaware Code to expand erosion and sediment program to include stormwater management passed by Legislation. Provide funding for program development.
2 - October 1, 1989	Department of Natural Resources and Environmental Control (DNREC) develop and adopt regulations for implementation of a statewide stormwater management program.
3 - October 1, 1990	Each conservation district adopt and submit to DNREC for approval a stormwater management program for the area within the district to implement Phase I in cooperation with the counties, municipalities, tax ditch organizations or other governmental subdivisions within the district.
4 - April 1, 1991	Counties and or municipalities adopt ordinances to regulate stormwater management.
5 - October 1, 1991	Districts submit a Phase II stormwater management program (designated watersheds) to DNREC for approval.

DNREC will assist districts with information and education materials and activities throughout the start-up period.

Districts, counties and municipalities should carry on stormwater management efforts under current programs and ordinances until the new program is enacted and implemented.

Staffing needs for the erosion and sediment control and stormwater management program should be fulfilled as turnover in current personnel occurs, through training of qualified staff members, and recruitment of new staff members with education and experience qualifications.

ATTACHMENT 1

A MODEL STORMWATER MANAGEMENT ORDINANCE FOR DELAWARE MUNICIPALITIES

Attachment 1

A Draft Stormwater Management Ordinance for Counties or Municipalities

Department of Natural Resources and Enviromental Control

Division of Soil and Water Conservation

This ordinance has been prepared by the Delaware Department of Natural Resources and Environmental Control as a guide for participants in the State's Stormwater Management Program.

The comprehensive single purpose ordinance is designed to regulate the rate and quality of stormwater leaving a parcel of land, to control accelerated soil erosion and sedimentation resulting from stormwater runoff, to provide for review of stormwater management plans, the issuance of land disturbance permits and the collection of fees, and to insure the maintenance of permanent stormwater management structures.

This model ordinance is designed to be adopted by municipalities or counties as an independent ordinance, rather than as an amendment to an existing ordinance. However, it can also be enacted as part of an ordinance package, with sections adopted by reference as amendments to other ordinances.

This model ordinance is designed for general application, and may be modified. Prior to adoption, however, any modified ordinance must be reviewed and approved by the Department. Information and advise is set out in a "NOTE" preceding the text of each section.

STORMWATER MANAGEMENT ORDINANCE

(NOTE: In drafting an ordinance it is necessary to include an opening section which states the purpose and applicability of the ordinance.)

Section 1. Statement of Findings.

(NOTE: This is a statement similar to findings in the Stormwater Management Act.)

The governing body of the (municipality/county)* finds that accelerated stormwater runoff increases flood flows and velocities, contributes to erosion, sedimentation, and degradation of water quality, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undermines flood plain management and flood control efforts in downstream communities, reduces ground-water recharge, and threatens public health and safety; and, further, that a comprehensive program of stormwater management including reasonable regulation of development and activities causing accelerated erosion, is fundamental to the public health, safety and welfare and the protection of the people of the (municipality/county) and all the people of the State, their resources and environment.

Section 2. Statement of Purpose.

(NOTE: This section states what is to be accomplished by the ordinance.)

The purpose of this Ordinance is to promote the public health, safety and welfare by minimizing the damages described in Section 1 of this Ordinance by provisions designed to:

a. Control accelerated runoff, erosion and sedimentation and water quality problems at their source by regulating activities which cause such problems.

b. Maintain the existing flows and quality of streams and water courses in the (municipality/county) and the State.

c. Preserve and restore the flood carrying capacity of streams.

d. Provide for proper maintenance of all permanent stormwater management structures which are constructed in the (municipality/county).

Section 3. Statutory Authority.

(NOTE: This section states the authority to regulate stormwater management activities. The municipality or county attorney should be consulted for appropriate citations.)

* Insert appropriate governmental entity wherever necessary throughout the ordinance.

This Ordinance is issued pursuant to the authority contained in the Stormwater Management Act of and the (appropriate municipal or county code).

Section 4. Definitions.

(NOTE: Terms in the ordinance which need definitions are contained in this Section. In order to avoid problems, terms which may be unclear or subject to interpretation should be defined.)

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

"Conservation District" - The _____ Conservation District.

"Developer" - A person or persons, partnership, association, corporation or other entity, or any responsible person therein or agent thereof, that undertakes the activities covered by this Ordinance.

"District Stormwater Management Plan" or "Stormwater Management Plan" - The plan for managing stormwater runoff adopted by _____ District as required by the Stormwater Management Act of _____.

"Impervious Surface" - A surface which prevents the penetration of water into the ground.

"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, leasehold, condominiums, building groups or other features; (ii) a subdivision of land.

"Land Development Plan" - Engineering drawings and calculations describing the proposed land development.

"Land Disturbance" or "Land Disturbing Activity" - Any activity involving tilling, clearing, grading, excavating, transporting and filling of land, or any other activity which causes land to be exposed to the danger of erosion.

"Runoff" - That part of precipitation which flows over the land.

"Sediment" - Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by water.

"Subdivision" - The division or redivision 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 purposes; provided, however that the division of land for agricultural purposes into parcels of more than ten acres, not involving any new street

or easement of access, shall be exempt.

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

Section 5. Applicability.

(NOTE: This section states the land disturbance activities which are to be regulated by the ordinance. It is very important to clearly specify these activities so as to avoid confusion. The conservation district stormwater management program will be the guide in determining which activities to include, and the example listing should be changed appropriately.)

The following activities are included under the provisions of this Ordinance.

a. Land development.

b. Subdivision

c. Earthmoving involving _____ or more acres.

d. Agricultural operations except as exempted.

e. Construction of new or additional impervious or semi-pervious surfaces (driveways, parking lots, etc.).

f. Construction of new buildings or additions to existing buildings.

g. Forest management operations except as exempted.

h. Nursery operations.

i. Diversion or piping of any natural or man-made stream channel.

j. Installation of stormwater systems or appurtenances thereto.

k. Mining operations.

Section 6. Compatibility with Other Permit and Ordinance Requirements.

(NOTE: This section is included to reinforce the fact that this ordinance does not relieve the applicant of the responsibility to meet the requirements of other applicable laws, regulations or ordinances.)

Permits and 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 law, regulation, rule or ordinance. If more stringent requirements concerning regulation of stormwater or erosion and sedimentation control are contained in the other law, regulation, rule or ordinance, the more stringent requirements shall apply. It is the intent of this Ordinance that the stormwater management requirements be coordinated with and integrated into the erosion and sedimentation control program so as to require, to the extent possible, inclusion in one application and one permit in connection with proposed

activities that involve land disturbing activities.

Section 7. Stormwater Management Requirements.

(NOTE: This section contains the actual stormwater management criteria. The example shown is the least restrictive condition. If more stringent controls are required by the conservation district stormwater management program, this section should be changed accordingly.)

The following requirements apply to all activities regulated by this Ordinance:

a. Stormwater runoff - Assurance that the maximum rate of stormwater runoff is no greater after development than prior to development activities, and that the quantity, velocity and direction of resulting stormwater runoff will be managed in a manner which adequately protects health and property from possible injury.

b. Erosion and sedimentation - Measures to prevent accelerated erosion and resulting sedimentation must at a minimum meet the standards of the Conservation District.

Section 8. Plan Requirements.

(NOTE: This section contains the requirements for a land development stormwater management plan. The example exemption list, as well as the plan content must be changed to fit the needs and the requirements of the (municipal/county) plan. Even though an activity is exempted from the preparation of plans, it must still meet the requirements contained in Section 7.)

a. Prior to the commencement of any activity regulated by this Ordinance, the owner, subdivider, developer, his agent, or other responsible party must have a stormwater management plan approved by the (municipality/county).

b. The following activities are specifically exempt from these planning provisions:

1. Land disturbances associated with existing dwellings as long as there is no change in the runoff characteristics.

2. Subdivisions of fewer than _____ single family homes.

3. All land disturbing activities resulting in less than a total of 5,000 square feet of new impervious surface.

4. Agriculture when operating in accordance with a conservation plan approved by the Conservation District.

5. Forest management operations which are being carried out under an erosion and sedimentation control plan approved by the Conservation District.

c. The plan must include the following:

1. All existing and proposed structures, land disturbances and impervious surfaces.

2. All temporary and permanent stormwater management controls.

3. All erosion and sedimentation controls.

4. Maintenance responsibilities of permanent stormwater management control facilities.

5. All streams or other bodies of water, swales, and drainageways.

d. Completed plans, accompanied by the requisite fees, are to be submitted to the approving agency as designated in the district program. The approving agency shall notify the applicant within thirty (30) calendar days of its decision. A disapproval of an applicant's plan shall contain the reasons for the disapproval.

Section 9. Inspections.

(NOTE: Some activities under this ordinance, such as the installation of stormwater management control devices, need to be inspected. Inspection schedules must be tailored to needs and manpower resources. Fees generated under Section 10 of this model ordinance can also be used to cover these costs.)

a. The permittee must notify the (municipality/county) five (5) days prior to the commencement of any identified phase of development activity covered by this Ordinance and at least _____ hours in advance of completion of such phase of development so that appropriate inspections to insure compliance with this Ordinance can be made. Such inspections shall be completed within five (5) working days.

b. No work shall begin on a subsequent phase of development until the preceding phase has been inspected and approved.

c. If at any stage of the work, the inspection discloses that the soil or other conditions are not as stated or shown in the approved application, approval of further work may be refused and existing permits may be revoked until a revised plan is submitted and approved.

Section 10. Fees

(NOTE: This section gives the (municipal/county) governing body the authority to set fees by resolution in order to cover the cost of enforcing the ordinance. Fee schedule must be reasonable.)

Land disturbance permit fees covering costs to the (municipality/county) for plan reviews, permit issuance and inspections shall be established by resolution of the governing body of the

(municipality/county). No permit to begin any work on the project shall be issued until the requisite fees have been paid.

Section 11. Financial Guarantees.

(NOTE: In order to insure that any required stormwater management controls are properly installed and maintained, there should be required a financial guarantee of a type acceptable to the (municipality or county). However, financial guarantees will require the services of appropriate legal counsel.

Section 12. Enforcement and Penalties.

(NOTE: This section includes penalties for violations of the Ordinance. In addition to fines, consideration might be given to other remedies such as injunctive or mandamus provisons.)

a. Duly authorized representatives of the municipality have the right to enter private property at reasonable times to investigate any condition associated with this Ordinance.

b. Anyone violating the provisions of this Ordinance shall be guilty of a misdemeanor, and upon conviction shall be subject to a fine of not more than $_____ for each violation, recoverable with costs, or imprisonment of not more than _____ days, or both. Each day that the violation continues shall be a separate offense.

c. In addition, the municipality may institute injunctive, mandamus or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus, or other appropriate forms of remedy or relief.

Section 13. Appeals.

(NOTE: In order to provide an aggrieved party with the due process of law which they are entitled to, an appeal procedure is included.)

a. Any person aggrieved by any action of the (municipality/county) or its agent may appeal to the governing body of the (municipality/county) within _____ days of that action.

b. Any person aggrieved by any decision of the governing body of the (municipality/county) may appeal to the _____ Court within _____ days of that decision.