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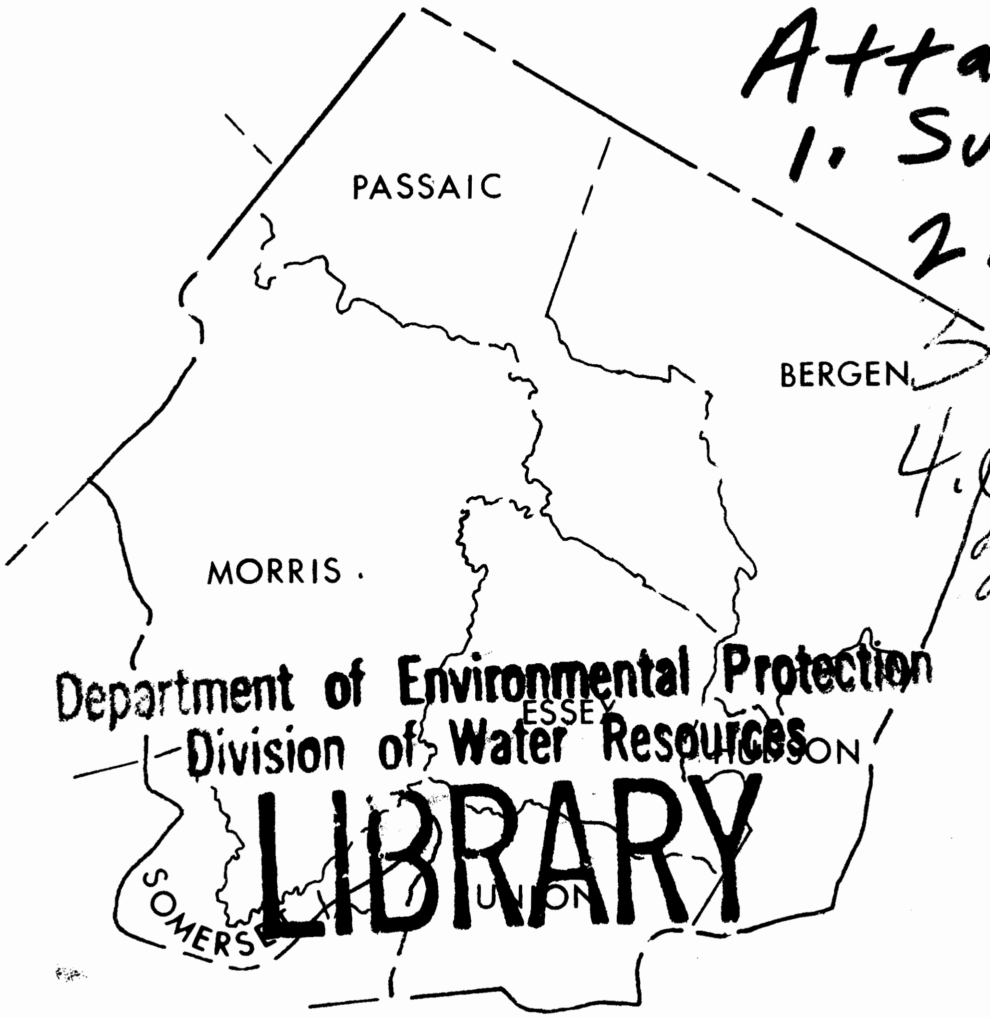
NORTHEAST NEW JERSEY
WATER QUALITY MANAGEMENT PLAN



Attached:
1. Summary
2. Supplement
3. Addendum
4. Inventory of Dischargers

DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATE OF NEW JERSEY

BRENDAN BYRNE Governor
DANIEL J. O'HERN Commissioner
DIRK HOFMAN Acting Director
Division of Water Resources

APRIL 1979

ACKNOWLEDGEMENTS

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Many individuals in the Division of Water Resources, as well as many organizations outside DEP, also contributed to the development of the Plan. Special acknowledgements are given to the Executive Policy Advisory Committee, its various subcommittees, and the other government agencies who have participated in this effort.

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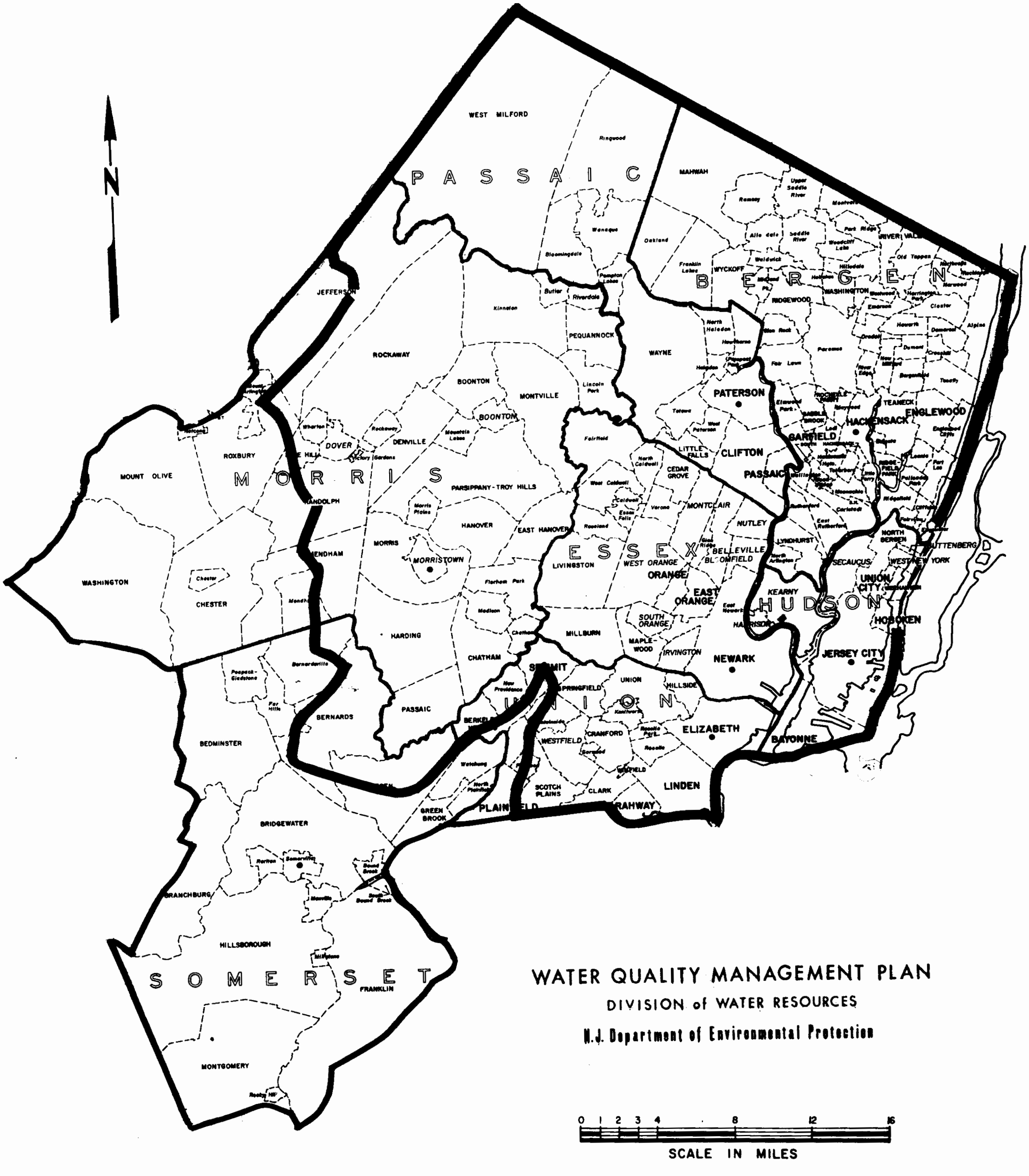

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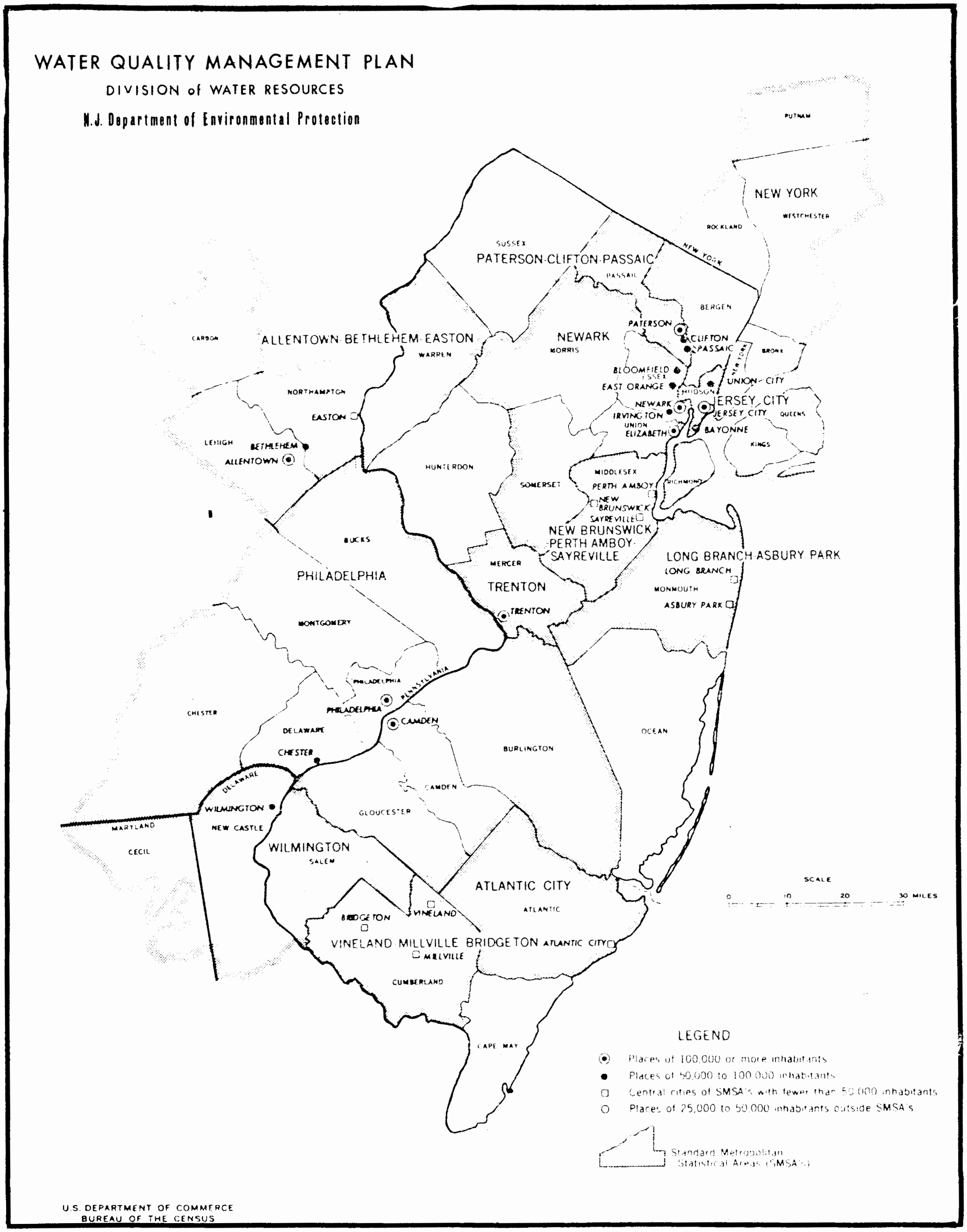
N.J. Department of Environmental Protection

Figure I-3

STANDARD METROPOLITAN STATISTICAL AREAS



Growth and development patterns in the Northeast have primarily been the result of an expansion outward from New York City. The planning area is characteristically urban/industrial in the eastern portion adjacent to the New York City urban core. Proceeding concentrically to the west, the urban/industrial character gives way to a suburban setting of predominantly single-family homes with pockets of garden apartments and industrial park developments. Beyond the suburban area to the west, the overall character of the land is rural except along major highway arteries where suburban and commercial strip development occurs.

Two major river systems drain most of the study area; the Passaic River and the Hackensack River. Both river systems drain portions of New York State.

Terminating at Newark Bay, the Passaic River basin has an area of 935 square miles of which 84 percent is in New Jersey, and can be divided into eight subbasins:

Upper Passaic River
 (above Little Falls)
Whippany River
Rockaway River
Pequannock River
Wanaque River
Ramapo River
Saddle River
Lower Passaic River
 (below Little Falls)

The Hackensack River also terminates at Newark Bay and has a total drainage area of 202 square miles. The Hackensack can be divided into three subbasins:

Upper Hackensack River (above Oradell Dam)
Pascack Brook
Lower Hackensack River (below Oradell Dam, Tidal Portion)

The balance of the planning area is drained by the Elizabeth, Rahway, and Lower Hudson Rivers. The Elizabeth and Rahway Rivers are the two major freshwater tributaries to Arthur Kill, an estuarine waterbody which, along with Newark Bay and Kill Van Kull, is a component of the New York Harbor Complex.

The Elizabeth and Rahway Rivers have drainage areas of 35 and 100 square miles, respectively. The Lower Hudson River terminates at Upper New York Bay. Although relatively little water drains to the Lower Hudson from New Jersey, a large amount of wastewater is discharged into this tidal segment by both New York and New Jersey. Figure I-4 illustrates the location of each river in the study area.

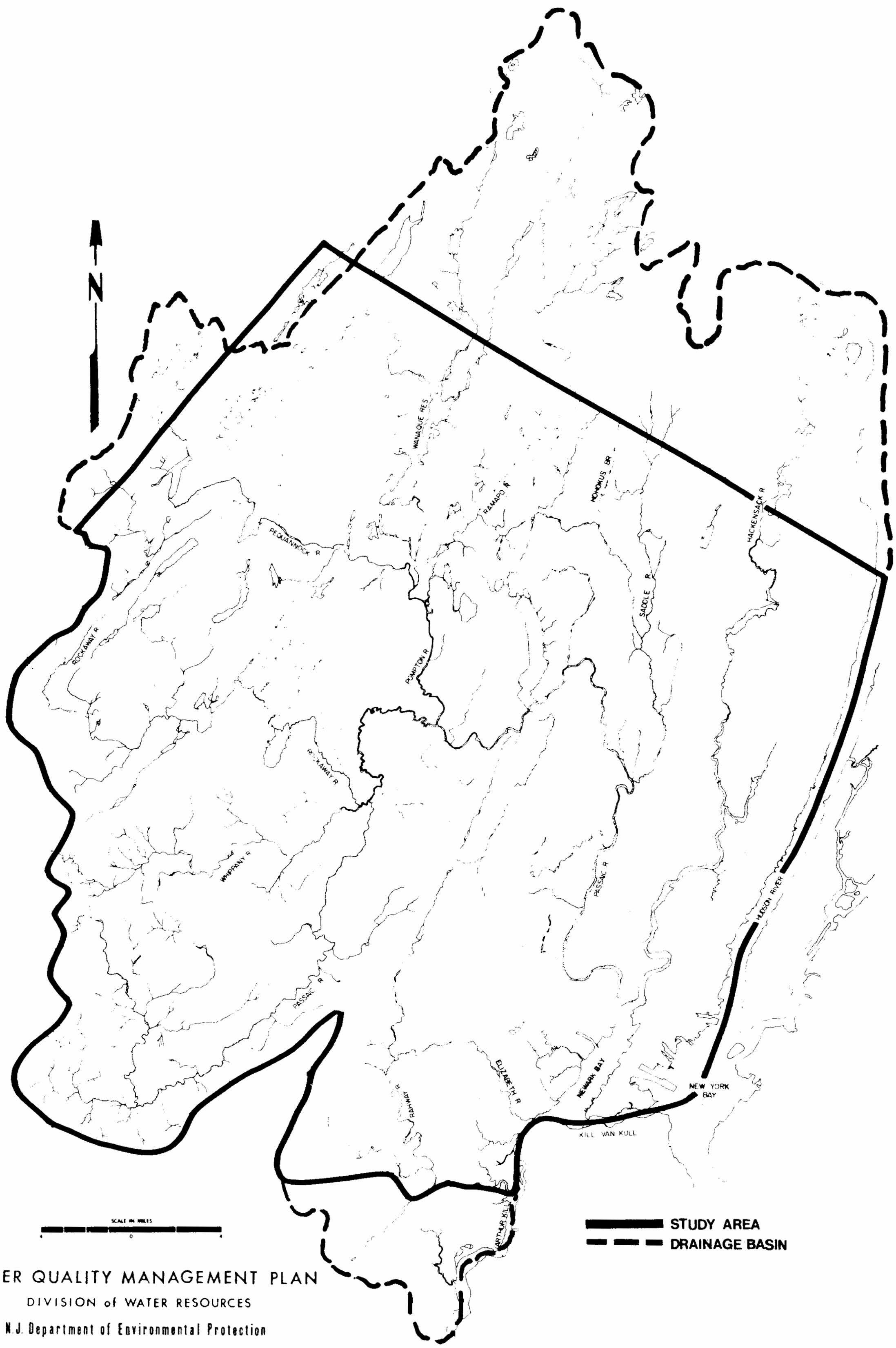
Surface and ground water resources in the Northeast are extensively developed as sources of potable water supply to meet the heavy demands of the study area. Approximately 357 million gallons of water are withdrawn daily, of which approximately 80 percent is diverted from surface sources and 20 percent is pumped from ground sources. About 85 percent of the total water withdrawn from surface and ground sources is conveyed to the urbanized area for consumption.

Quality of surface waters in the study area is generally poor, except in the relatively underdeveloped areas where water quality is good. The Passaic River, for instance, has been characterized as one of the ten most polluted rivers in the Nation. However, in its upper reaches the same river is capable of maintaining a viable population of trout. The poor surface water quality can be primarily attributed to the multitude of municipal and industrial wastewater discharges and to runoff from developed areas. Pollutants associated with these sources include oxygen-demanding material, nutrients, bacteria, and toxic and hazardous substances. Estuaries in the urbanized area are used principally for transportation and commerce, while fishing and swimming occur upstream in higher quality waterways where access is available.

I.C. Scope

This section explains the extent to which this Plan meets the requirements for a comprehensive Water Quality Management Plan. The legislative concept of a comprehensive water quality plan is presented, followed by a description of the steps taken by DEP to develop the Plan, and an analysis of the extent to which this Plan conforms to the concept.

Figure I-4
RIVERS IN THE NORTHEAST STUDY AREA



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I.C.1 Legislative Concept of Water Quality Planning

The combination of three sections of the Act, Sections 201, 208, and 303(e), leads to a comprehensive approach to water quality planning.

Section 201 facilities plans are developed for municipal or regional sewage treatment works. These plans are required prior to construction of wastewater treatment plants with federal funding. Municipalities and regional sewerage authorities that wish to utilize federal sewerage funds follow a three step process of planning, design, and construction. In the planning phase, various alternatives are considered to determine the most cost-effective means of handling sewage.

In contrast to facilities planning, the 208 program develops a comprehensive strategy for all the water quality problems of a particular geographic area. It examines all potential sources and types of water pollution, including those related to land use, rather than being limited strictly to domestic sewage in the case of 201 planning. All areas of the Nation must have 208 plans. One aspect of 208 planning is to determine how sewerage facilities fit into the total water quality scheme. These 208 plans are to be developed by either regional agencies or the State.

Section 303(e) requires a basin plan, to coordinate the State's enforcement, discharge permit, and 201 construction grants programs, and incorporates aspects of 208 planning. The plans, to be developed by the State, quantify the amount of pollutants from point sources that can be acceptably discharged to a stream consistent with maintaining water quality.

In November 1975, USEPA combined the provisions of Sections 208 and 303(e), and labelled those combined plans "Water Quality Management (WQM) Plans."[1] Water quality management planning applies to all areas and waterways (streams and lakes, as well as ground water) in the Nation. It must include solutions for all potential sources and types of pollution, both point and nonpoint sources. This requires consideration of land use or land management activities as they relate to water quality. This Plan combines the work the State has previously undertaken to meet the requirements for Section 303(e) basin planning[2] (primarily directed at point sources) with the requirements of Section 208, which covers all other pollution sources.

Footnotes

1) The requirements of these plans are specified in detail in the federal regulations CFR Part 131.11(a)(p), which are cross referenced in Appendix I-4.
2) DEP completed a draft 303(e) Basin Plan for the Northeast Area in December 1976. The information and analyses contained in that document has been used to develop this Plan.

What forms of pollution are dealt with in a WQM Plan?

Pollutant Types Diverse substances contaminate our waterways. They range from bacteria, viruses, and toxics, which render water unsafe to drink, to nutrients such as phosphate and nitrate that feed algae growth, to organic matter that depletes the dissolved oxygen making the water unsuitable for fish. A complete plan for water quality management should cover all pollutants of possible concern to an area. The Glossary, Appendix I-1, includes explanations of the parameters and their water quality impact. Appendix I-2 shows the relationship between various parameters, pollution sources and abatement measures.

Sources of Pollution Most of the pollutants in our waterways can be traced to several types of sources. For example, the presence of organic matter may be attributable to discharge by municipal or industrial treatment plants, or may be due to nonpoint pollution such as runoff from urban areas. Thus, in managing water quality, it is necessary to consider all possible sources of pollution, both point and nonpoint. These include, but are not limited to:

Point Sources

- Municipal Sewage Discharges
- Industrial Discharges to Municipal Sewage Plants
- Industrial Discharges to Streams

Nonpoint Sources

- Agriculture
- Silviculture
- Mining
- Construction
- Landfills
- Hydrologic modifications (including ground water pumping and stream channel modification)
- Residual wastes
- Urban and industrial stormwater
- Septic systems

In addition to point and nonpoint sources, certain types of land are considered sensitive for water quality management. These include:

Flood Hazard Areas
Wetlands
Land adjacent to water bodies
Headwater areas
Woodlands
Steep slopes
Prime aquifer recharge zones
Highly erodible soils
Soils with seasonal high water tables
Wildlife habitats
Land draining to trout waters

What are the ingredients of a WQM Plan?

1. Pollution clean-up programs A WQM Plan should include a series of programs to solve the various water quality problems of an area. In order to develop a program to resolve a particular problem, the plan must do the following:

- identify the problem Document the actual existence or potential future development of each water quality problem. The plan should indicate the nature and extent of problems, and identify the contributing sources of water pollution where they are known.

- develop technical solutions After investigating alternative structural and nonstructural means of abating the sources of pollution, the plan should select the measures most appropriate for each of the problems of the area.

- develop a regulatory program Alternatives other than regulation should be considered, such as voluntary compliance or pricing measures. One of the alternative programs for addressing the problem must be selected; the legal steps necessary to implement the program should be clearly spelled out.

- recommend a management agency Agencies must have adequate legal, financial and technical capabilities, to carry out the proposed program.

2. Planning Information In addition to recommendations for programs to solve water quality problems, plan development necessitates certain background information. For example, a plan should include projections of population and land use. A plan should also include an assessment of the long and short term impacts its implementation will have on the environment and economy of the area. Planning information also includes planning boundaries, a classification of waters according to pollution control needs, and an identification of water quality standards for the waters.

In order to develop this Plan, detailed information and analyses of many water quality issues have been presented in a series of separate documents called working papers. (See Appendix I-3 for a list of those papers).

Technical references are cited in the text by author(s) or agency and date. A list of references is contained at the end of each Chapter.

3. Program Coordination and Public involvement Active involvement of State, County and municipal officials, as well as a broad base of interested citizens, is essential to the development of an implementable Water Quality Management Plan. Public participation and agency coordination is mandated by law and has been supported by the State and Federal governments.

Most WQM Programs have a Policy Advisory Committee (PAC), consisting of representatives of a diverse cross section of public interests. The PAC and public participation for this study area are described in Chapter II.

Coordination between the WQM Program and other relevant programs is necessary to ensure consistent approaches to planning and implementation, and to prevent duplication of efforts. Through exchanges of information and data with other agencies, water quality management planners can obtain the most benefit from limited resources, achieving uniformity of policies and objectives, and identifying gaps between programs.

Many agencies at the Federal, State, regional and local level are relevant to water quality management planning. Agencies which have been involved in coordination efforts with the WQM Program include:

FEDERAL

U.S. Department of Agriculture
Agricultural Stabilization and Conservation Service
Soil Conservation Service

U.S. Department of Defense
Army Corps of Engineers

STATE

N.J. Department of Agriculture
N.J. Department of Community Affairs
N.J. Department of Environmental Protection
Facilities Planning (201)
Water Supply Master Plan
NPDES Permit Program (402)
Solid Waste Administration
Division of Marine Services
Bureau of Air Pollution
Division of Fish, Game and Shellfisheries

REGIONAL

Other 208 Agencies

Tri-State Regional Planning Commission
Interstate Sanitation Commission

Techniques used for coordination are dependent on arrangements between agencies and the approach and timing of each WQM Program. The specific methods can range from joint efforts, subcontracts or consultation, to review of program outputs, to participation in advisory committee activities. USEPA and DEP are responsible for reviewing WQM Plans and coordinating New Jersey's WQM Programs. The coordination in developing this WQM Plan will be documented in a separate working paper.

Discussion Various pollutants, their potential sources, and the aspects of a WQM Plan described above are tied closely together. For any water quality goal (such as preserving high quality water, or ensuring fishable and swimmable waterways), potential pollution sources must be identified and water quality samples must be analyzed for various parameters. To properly identify a type of pollution source such as mining or municipal sewage treatment, a plan should confirm that the source is a problem, determine technical and regulatory solutions and designate a management agency to carry out the solutions. The diagrams in Figure I-5 illustrate this relationship.

I.C.2 Priorities for Initial Planning

In order to develop detailed strategies and programs in the first two years of water quality management planning, the WQM Program, with assistance from the public, identified four major water quality issues upon which to focus planning efforts. Each of the issues was subsequently assigned a priority.

Priority 1 - Protection of sources of potable water supply.
Priority 2 - Control of toxic and hazardous substances.
Priority 3 - Control of nonpoint sources of pollution.
Priority 4 - Protection of environmentally sensitive areas.

Specific water quality planning objectives to be attained in pursuing the priority issues were then established, including:

- Preservation of high water quality waters

- Assessment of water quality impacts resulting from nonpoint and intermittent point sources of pollution and the development of abatement measures to prevent such pollution

- Evaluation of State water quality standards as they relate to the water bodies in the Northeast, and the revision of these standards, where appropriate, to better reflect the real beneficial uses of each waterway

- Study of key surface water impoundments to assess the potential for eutrophication to define the necessary point and nonpoint source control measures

- Identification of the locations, supply capacities, and recharge zones of the area's major aquifers and the development of a management program to protect the ground water resources of the Northeast

Figure I-5
How WQM Plans Develop Solutions To Water Quality Problems

STEP 1-SET PRIORITY GOALS

Goals: / Pollutant Types:	Nutrients	Suspended Solids	Bacteria	
Potable Supply				
Fish&Wildlife	✓	✓		
Swimming				
Preserving Existing Quality				

While all goals at the left must be met, within a limited planning period it is necessary to focus on priority goals and determine what forms of pollution have the greatest impact on attaining or preserving desired water quality.

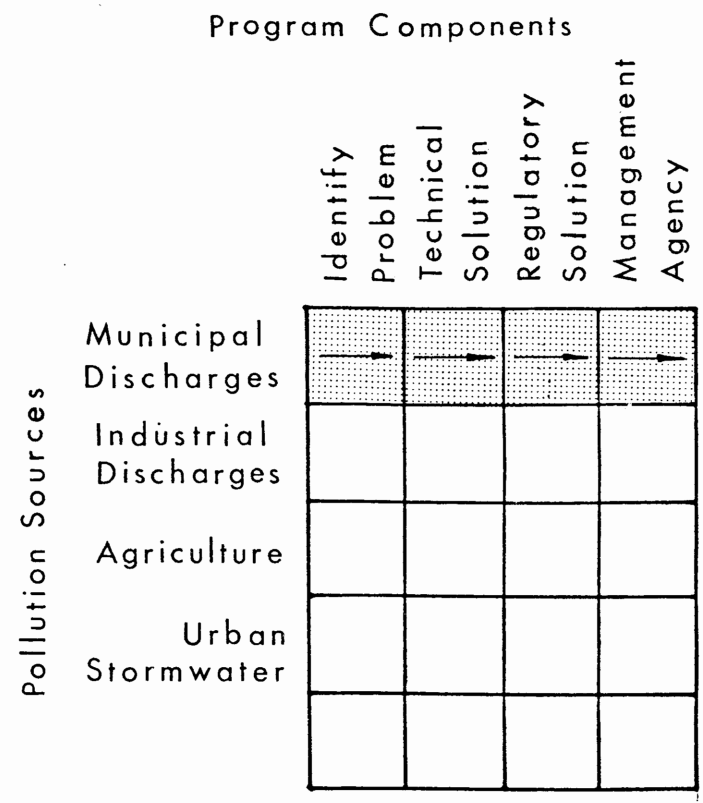
STEP 2-DETERMINE SOURCES OF POLLUTION

Pollutant Types: / Pollution Sources:	Municipal Discharges	Industrial Discharges	Agriculture	Urban Stormwater	
Nutrients	✓			✓	
Supended Solids		✓			
Bacteria					

Pollutants originate from diverse sources. For example, in a given waterway, nutrients may emanate from municipal or industrial treatment plans, from streets or farmland, or from other sources. If nutrients were a priority problem in an areas, it would be necessary to determine their probable sources.

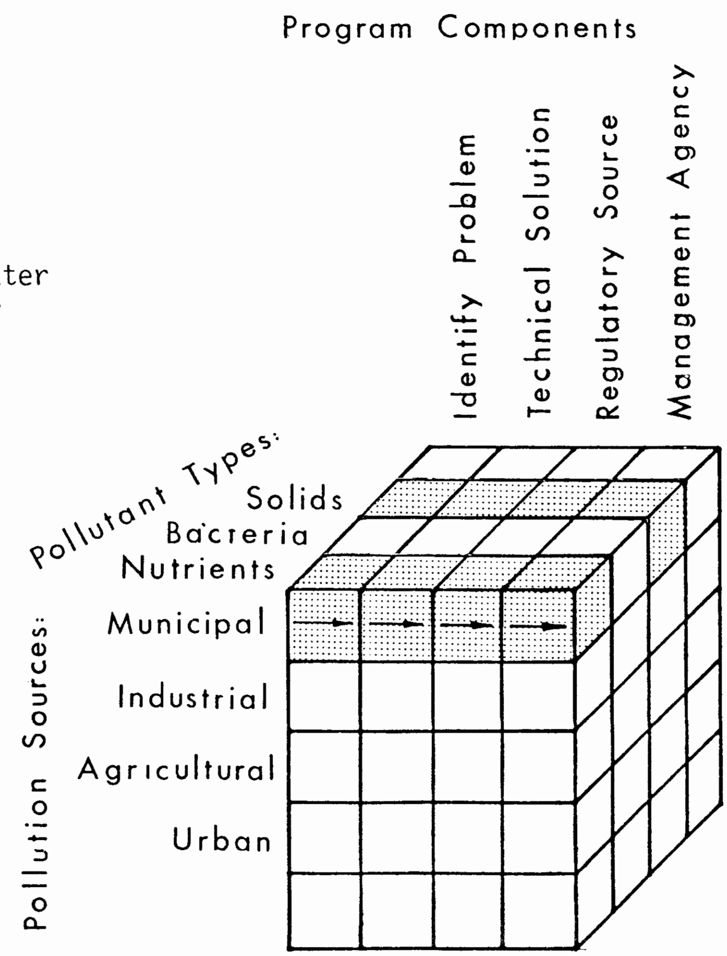
STEP 3-DEVELOP CLEAN-UP PROGRAM

To develop a complete program to solve pollution from a particular type of source, such as municipal sewage treatment, a WQM plan must fully identify the problem as well as technical and regulatory solutions and a management agency.



SUMMARY OF PLANNING PROCESS

The WQM plan begins by setting water quality goals (e.g. potable water protection), then determines what pollutant types and sources are obstacles to meeting these goals. The planning process develops a strategy for each source which involves all four strategy components. (The relationship of the ingredients of plans discussed above to federal regulations is outlined in a separate document, Policy Memorandum No. 3.01, Policy and Procedures for Review of Water Quality Management Plans, Division of Water Resources, May, 1978.)



- Development of a comprehensive water quality data file and establishment of a long-term monitoring system for the area

- Implementation of effective point source controls to achieve 1983 water quality goals

- Protection of the public from health hazards associated with polluted surface and ground water

- Balancing water quality goals with other community goals

A work plan was then prepared that defined tasks which needed to be undertaken to achieve the planning objectives and solve pollution problems related to the priority water quality issues. The work plan tasks were organized according to specific categories:

water quality analysis; point source controls; nonpoint and intermittent point source controls; ground water quality management; land use, population, and economic considerations; institutional, legal, and financial implementation strategy; plan selection, adoption, and impact assessment; project management; and public involvement. The detail to which these tasks were to be undertaken was outlined in a document developed by DEP and EPA ("State/EPA Agreement," May 1976.)

I.C.3 Plan Format and Level of Detail

a. Plan Format At the outset of planning it was necessary to determine in-stream water quality problems prior to identifying the various categories of sources discussed earlier in this chapter. Thus, this Plan evaluates in-stream water quality problems in Chapter III, and sources of the problems in Chapters V and VI, (point source and nonpoint source control, respectively). Technical and regulatory solutions are also developed in Chapters V and VI. Management agencies are designated in Chapter VII (Legal and Institutional Considerations) and in Appendix VII-2.

b. Statewide Policies Dealt with in the Plan Many of the solutions to pollution problems in an individual study area require changes in State policy. Therefore, a WQM Plan may include recommendations for such statewide changes. This Plan includes many such recommendations, developed by the WQM Program for all five Draft WQM Plans prepared by DEP.

For example, to encourage sound investment of Federal sewerage funds, statewide guidelines are included in the Plan to ensure evaluation of alternatives to regional sewer construction in 201 sewerage facilities plans (Chapter V). Population projections for the entire State are included, to prevent costly oversizing of sewer facilities (Chapter IV). Recommendations for revisions to the State Water Quality Standards are included in Chapter III. A new procedure for setting effluent limitations for industrial and municipal discharges is recommended in the Point Source Control Plan (Chapter V). Definitions of Environmentally Sensitive Areas and guides for selecting nonpoint source management practices, in Chapters IV and VI, respectively, are applicable statewide. Uniform procedures for designation of agencies to carry out management programs recommended in WQM Plans are described in Chapter VII.

The recommended statewide policies are only a portion of the Plan. Other aspects have been developed specific to the area. Area-specific aspects of the plan were developed in detail in working papers which compiled and evaluated data collected in the area for the Plan. Analyses of the data are used in Chapter III of this Plan, the Water Quality Assessment, which assesses the pollution problems of the area. Likely solutions to those problems, including both area-specific and statewide approaches are contained in Chapters III, V, and VI. Along with the background information on land use, economy, and population provided in Chapter IV, and the detailed information in the working papers, these comprise the strategy for solving problems of the area. Thus, the strategy includes both area-specific and statewide aspects.

c. Level of Detail In the initial planning period, complete management programs were developed for some water quality problems. In other cases progress was made but not all components of a management program were developed. Tables I-1 and I-2 illustrate these accomplishments.

Table I-1

Water Quality Management Plans
Level of Detail

	Problem Identification	Technical Solutions	Regulatory Programs	Management Agency
Point Sources				
Municipal Discharges	+	+	+	+
Industrial Discharges to Municipal Facilities	+	+	+	+
Industrial Discharges	+	+	+	+
Non-point Sources				
Agriculture	P	+	*	+
Silviculture	P	+	*	+
Mining	P	+	-	-
Construction	P	+	+	+
Landfills	P	+	+	+
Hydrologic Modifications	-	-	-	-
Residual Wastes	-	-	-	-
Urban Stormwater	-	-	+	-
Septic Systems	P	P	P	P
Sensitive Land Areas				
Flood Hazard Areas	P	-	-	-
Wetlands	P	-	-	-
Lands Adjacent to Waterways	P	-	-	-
Headwaters Areas				
Woodlands	P	-	-	-
Steep Slopes	P	-	-	-
Prime Aquifer Recharge Zones	P	-	-	-
Soils with Seasonal High Water Tables				
Highly Erodible Soils	P	-	-	-
Wildlife Habitats	P	-	-	-
Lands Draining to Trout Waters	P	-	-	-

Key:
+ Sufficient detail to develop complete program
P Partially developed in plan, not in sufficient detail to implement complete program
- Not developed in plan
* Voluntary management program

Table I-2

Water Quality Management Plans
Chapter and Section References

	Problem Identification	Technical Solutions	Regulatory Programs	Management Agency
Point Sources				
Municipal Discharges	III.B.2	V.B.5	VII.	Appendix VII-2B
Industrial Discharges to Municipal Facilities	V.B.6	V.B.6	VII.	Appendix VII-2A
Industrial Discharges	III.B.2, V.B.5.	V.B.4		
Non-point Sources				
Agriculture	VI.A.2, B.2	VI.C	VI.C.	Appendix VII-2A
Silviculture	VI.A.2, B.2	VI.C	VI.C	Appendix VII-2A
Mining	VI.A.2, B.2	VI.C	VI.C	Appendix VII-2A
Construction	VI.A.2, B.2	VI.C	VI.C	Appendix VII-2A
Landfills	VI.A.2, B.2	VI.C		
Hydrologic Modifications	VI.A.2, B.2	VI.C		
Residual Wastes	VI.A.2, B.2	VI.C		
Urban Stormwater	VI.A.2, B.2	VI.C		
Septic Systems	VI.A.2, B.2	VI.C		
Sensitive Land Areas				Appendix VII-2A
Flood Hazard Areas	IV.C.2			
Wetlands	IV.C.2			
Lands Adjacent to Water Bodies	IV.C.2			
Headwaters Areas	IV.C.2			
Woodlands	IV.C.2			
Steep Slopes	IV.C.2			
Prime Aquifer Recharge Zones	IV.C.2			
Soils with Seasonal High Water Tables	IV.C.2			
Highly Erodible Soils	IV.C.2			
Wildlife Habitats	IV.C.2			
Lands Draining to Trout Waters	IV.C.2			

For the problems caused by point sources of pollution, this Plan contains integrated management strategies. The water quality assessment (Chapter III) and the point source inventory (Chapter V) identify water quality problems and their sources. The point source control chapter presents technical solutions such as capacities and treatment levels required for discharges; regulatory solutions including existing permit and enforcement programs; and management agencies such as DEP and facilities planning agencies. A schedule for implementation of the sewerage construction program is given in the priority list, also in Chapter V. Thus, for point sources, the Plan describes problems, technical and regulatory solutions, and a management program.

However, not all water quality problems related to point sources are solved by this Plan. Facilities planning is still needed to devise detailed technical strategies for some sewerage areas. Design capacities and treatment levels described in this Plan may need refinement. Specific effluent limitations are not given for industrial dischargers; however, the procedure DEP will use in establishing effluent limitations is explained.

For nonpoint pollution the Plan does not present a complete program. Instead, as shown in the tables, substantial progress has been made in identifying the problems and in developing technical solutions and management strategies.

For sensitive land areas, a partial identification of the problem has been done. Further work needs to be done in the future, by municipal and county governments and/or in continuing planning.

Some aspects of the various programs are still being developed, and may be completed prior to the publication of the final version of this Plan. Appendix I-4 cross references the various plan requirements with EPA regulatory requirements.

The Plan provides a framework for continuing planning by identifying, 1) where water quality data is lacking, and 2) where management programs are needed. An outline of the future planning program is currently being developed through the State/EPA Agreement (described in greater depth in Chapter VIII), which will determine the direction of New Jersey's water-related programs for the next five years.

II. PUBLIC PARTICIPATION PROGRAM

II.A. Structure

The incorporation of public input into the development and implementation of the State Water Quality Management Plan was a major goal of the program. To meet this goal, affected citizens and government officials were continously involved in the planning process. Active public participation in WQM planning was mandated by law, endorsed by the governmental agencies involved, and is clearly a necessity for effective implementation of the final Plan.

Major decisions made as a result of the WQM Program will be tied to the needs and desires of the people of the Northeast region and the State. It was necessary, therefore, to establish a mechanism whereby information concerning the study could be exchanged between the planning staff and interested participants.

The objectives of public participation were:

- To inform a broad spectrum of affected individuals, groups, and organizations and achieve maximum public input and involvement during the plan development stages in order to gain acceptance of an implementable water quality management plan and program.

- To create a knowledgeable constituency for periodic review, assessment and modification of the implemented program and of the continous planning process after the plan is completed.

Policy Advisory Committee (PAC) - The keystone of the public participation program was the establishment of a Policy Advisory Committee, consisting of representatives from local government, environmental and economic interests, and the general public. The PAC provided a forum for review, negotiation, advice, and assistance with important planning and policy issues.

The policy issues included resource preservation, and the fiscal, environmental, economic and social impacts of the Plan.

The PAC promoted communications and cooperation throughout the planning area and with other planning areas.

It will advise DEP staff on the acceptability of this Plan and implementation program.

The membership of the PAC was required by regulation to include a majority of local elected and appointed officials. As a result of the public meetings the following representation structure was developed for the regional Policy Advisory Committee:

The Northeast Study Area was subdivided into four smaller areas for the purpose of selecting PAC members. Each sub-area selected two persons from the general public, organized public interest groups and economic interests along with six elected or appointed officials to serve on the PAC. The PAC determined that additional representation was needed in certain areas, and selected 19 special invited groups to serve on the PAC (see Appendix). Due to increased interest by the elected officials during the program the PAC increased the number in this category from six to eight representatives for each sub-area. This resulted in the PAC having 14 representatives from each sub-area, which along with the 19 special invited members gave the PAC a total membership of 75 persons.

The PAC established subcommittees to discuss water quality, land use, and public education aspects of the planning process, and to recommend policy for PAC action.

These subcommittees met when necessary, and reported back to the PAC at regular meetings. Sometimes the subcommittees met during the first hour of a regularly scheduled PAC meeting and reported to the remainder of those assembled during a general discussion in the latter half. The expanding subcommittees developed policy recommendations.

The PAC also established a Technical Advisory Committee, to advise the PAC and DEP on some of the more technical aspects of the planning.

In addition, a Chairman's Advisory Council was formed, to serve us a steering committee for the PAC. Membership included the Chairman of the Subcommittees, the Chairman of the PAC, representatives of DEP, and others.

II.B. Evaluation

The PAC and other members of the public were involved actively, early and continously in providing input for the planning process.

The PAC made numerous policy recommendations. Planning staff worked closely with the PAC and its subcommittees on recommendations they developed regarding septic tank management, population forecasting, land use, water quality and public education. They reviewed the various working papers on the point source plan and provided useful comments.

In addition, PAC members sometimes reported specific current pollution problems. When these were point source discharges, the information was conveyed to the Monitoring, Surveillance and Enforcement Element of the Division of Water Resources. References to nonpoint problems such as faulty septic systems, leaching landfills and the impacts of mining operations were noted in nonpoint aspects of the planning process.

The PAC and technical advisors (TAC), in reviewing methodologies (e.g. ground water sampling) helped to point out areas where clarification was necessary. Sometimes, as in the eutrophication studies, they questioned the basic technical assumptions.

Another topic of interest to the PAC was definition of environmentally sensitive areas. Discussion of this topic was rigorous. However, most PAC members agreed that management and protection of environmentally sensitive area's is fundamental to the achievement of water quality goals.

Informing the PAC was a benefit as well as a necessity for the process of public participation. Bringing all PAC members to a common base of expertise was a prerequisite to discussion of the issues. Presentations by the planning staff boosted the PAC's understanding of the issues. PAC members were responsible for reporting progress on the plan to their constituencies.

Aside from regular meetings, two workshops were held to educate and obtain input from the PAC and general public.

A workshop on water conservation dealt with institutional and technical residential water - saving measures. A later workshop on control of nonpoint sources of pollution explained the concept of "Best Management Practices".

A conference for the mayors of Northeast New Jersey, titled, "Dollars and Sense for Water Quality Management" was held on June 10, 1978. Among the speakers were PAC chairman Thomas Cooke, Chief of EPA Water Branch Charles Durfor, and Northeast Basin Manager Steve Nieswand.

Training at a "Synergy" Citizen Involvement Seminar in 1977 helped to better equip the WQM Program staff for public participation. After the seminar, the process became more informal, and generally more agreeable to those involved.

Because of the size of the area, the PAC was necessarily large. The need to break down into smaller working groups eventually became apparent, and subcommittees were formed. Subcommittee meetings, because of their smaller size and narrower focus, proved to be a more viable forum for discussion than general PAC meetings. PAC meetings held after the smaller committee meetings became more productive, because more of those in attendance were capable of discussing the issues in an informed manner.

At the start of the program, several meetings were held when the work plan still had not been fully approved. This delay frustrated many participants, as well as staff.

In order for the limited staff to adequately document specific pollution problems, little time was spent in the early phases of the planning on development of policy recommendations. Much of the PAC's energy was therefore directed towards becoming knowledgeable about the technical aspects of water quality management planning, such as methodologies and technical working papers.

II.C. Public Information

Newsletter

From October 1977 to August 1978, six issues of "208 Water Report" were published. The newsletter contained feature articles on such topics as "Land Use and Water Pollution" and "Mapping the Way to Clean Water," updates on progress in 208 plans throughout the State, and notices of meetings in the five DEP Water Quality Planning Areas. The newsletter was sent to the entire DEP WQM Program mailing list, and distributed to other interested persons.

Press Release

Numerous press releases were issued during the course of the planning process, publicizing meetings and workshops. The Education Subcommittee also prepared press releases on its own for distribution by DEP.

A special letter was sent by the Program Director to environmental reporters, explaining the planning process. Another mailing, to special interest groups with newsletters, asked them to publish articles about the program and subscription forms for the 208 newsletter. One of the many articles resulting from this mailing was in the April 1978 issue of the magazine of the New Jersey League of Municipalities.

Electronic Media

Professionally produced television public service announcements were distributed to New York T.V. stations in coordination with EPA Region II and the New York City 208 program. At the conclusion of the announcement, a number to call for information in New Jersey was to be announced.

Radio public service announcements produced by EPA were sent to radio stations in the area.

A special television announcement was prepared by DEP in coordination with the PAC, and arrangements were made so that the PAC chairman read the message on NBC-TV in New York.

A member of the Upper Delaware PAC, in coordination with DEP, prepared a proposal for a documentary film about WQM planning in New Jersey, and presented it to New Jersey Public Television.

Depositories

Pertinent reports and documents have been deposited in various libraries as part of the public education aspect of the program. These libraries are listed below.

NORTHEAST PUBLIC DEPOSITORIES

BERGEN COUNTY

Johnson Public Library
Technical Service Department
275 Moore Street
Hackensack, New Jersey 07601
Attn: Mr. Geraldi - Reference
(201) 343-4169

Leonia Public Library
227 Fort Lee Road
Leonia, New Jersey
Attn: Harold A. Ficke, Director

ESSEX COUNTY

Montclair Public Library
Reference Division
50 South Fullerton Ave.
Montclair, New Jersey 07042
(201) 744-0500 Mr. Spence

Newark Public Library-Main Branch
c/o New Jersey Reference Division
5 Washington Street
Newark, New Jersey 07101
Attn: Charles Cummings

HUDSON COUNTY

Jersey City Public Library
472 Jersey Avenue (Jersey Room)
Jersey City, New Jersey 07302
Attn: Joan Doherty

MORRIS COUNTY

Morris County Library
Reference Department
30 E. Hanover Drive
Whippany, New Jersey 07981
Attn: (Sylvia Middleman)

Morris County Daily Record Library
800 Jefferson Road
Parsippany, New Jersey

PASSAIC COUNTY

Wayne Public Library
475 Valley Road
Wayne, New Jersey 07470
Attn: Mrs. Punshon

West Milford Public Library
2717 State Highway #23
West Milford, New Jersey
Attn: Mr. Bornardo, Director

Paterson Free Public Library
250 Broadway
Paterson, New Jersey 07501
Attn: Linda Tuttle

SOMERSET COUNTY

Bernards Township Library
32 South Maple Ave.
Basking Ridge, New Jersey 07920
Attn: Ann C. Ryan, Director

UNION COUNTY

Elizabeth Public Library
11 South Broad Street
Elizabeth, New Jersey 07202
Attn: Margaret Volker

Miscellaneous

Brochures were prepared specifically for each area, titled "Citizen Involvement In 208 Water Quality Planning." In addition to these brochures and the newsletter, extensive use was made of other DEP, EPA and Soil Conservation Service brochures.

Working papers prepared throughout the course of the study were distributed at PAC meetings and publicized through minutes and the newsletter.

A slide/sound presentation titled "The Path to Clean Water" was produced, and used to explain DEP's WQM Program to various public groups. Other slide shows, produced by EPA and SCS, were also used to explain aspects of water quality planning.

A WQM simulation game, in which players select roles and participate in issues from WQM planning, was developed and used to explain the program to high school, college and adult audiences. Clean water quiz displays supplied by EPA were publicized in the newsletter, brought to meetings, and loaned to interested organizations and individuals.

II.D. PAC Policy Recommendations

The following section presents the water quality management policy recommendations which have been adopted by the Northeast Policy Advisory Committee (PAC). The PAC recommendations have been organized according to the subcommittee from which they originated, Land Use, Water Resources, Public Education, and Public Participation. WQM Program comments, describing the responses of the WQM Program to the PAC recommendations, are contained in Section II.E following the presentation of recommendations. The WQM Program responded to the PAC recommendations in several ways:

- The recommendation has been factored into the WQM Plan essentially as it was adopted by the PAC.

- The concept of the recommendation has been factored into the Plan.

- The recommendation has not been factored into the Plan but has been referred to the appropriate agency for consideration or will be considered by the WQM Program in the process of setting priorities for continuing planning.

It is important to note that the PAC recommendations, as presented in this section, are not intended to represent official WQM Program recommendations. However, various PAC recommendations have, as indicated above, been factored into the WQM Plan, either conceptually or essentially as adopted by the PAC, and consequently, have become official WQM Program recommendations.

II.D.1. PAC Land Use Committee Recommendations

a. Statement on Committee Goals and Objectives

The 208 Land Use Committee recognizes the role that the areas' water resources perform in shaping the quality of life for the area's 3.8+ million population. Water is our area's most vital resource. To protect the public's health, safety, and welfare, the future of these resources must continue to be safeguarded. The Committee's recommendations to the PAC shall be derived within the context of the general goals established in federal and State water quality legislation and will involve traditional as well as innovative approaches and techniques.

To meet the 1972 federal legislative goal to make waterways "swimmable and fishable, where attainable," the Committee will define objectives and make recommendations to meet these objectives:

1. Protect the quality and supply of surface and ground waters.

2. Protect the quality and quantity of Northeast New Jersey's potable water supplies.

3. Guide development in and redevelopment of areas with existing infrastructure, with priorities to cities and urban centers.

4. Protect critical areas that impact upon water quantity and quality, including:

    a. Flood plains
    b. Wetlands
    c. Sensitive lands adjacent to waterways
    d. Aquifer recharge areas
    e. Steep slopes
    f. Shallow soil to bedrock
    g. Seasonal high water table

5. To encourage land use development standards which mandate specific site improvements to ameliorate the need for further publicly financed structural solutions.

b. Statement on Implementation of Goals and Objectives

A. Recommendations Requiring Funding:

1. For improved water quality through treatment facilities: Priority to cities, urban areas and nodes of development in

rural areas with need for new, upgraded or expanded wastewater treatment facilities. Future construction of new facilities to service unsewered low density areas should be eliminated. The design capacity of new or expanded facilities should be related to the reasonable projected service population. As part of the 208 areawide planning process it shall be required that facility plans (201) currently being prepared or those to be prepared in the future shall include delineation of critical areas, as defined in the 208 Plan. Funding of sewer extensions to serve new development to be built in critical areas is to be prohibited. In cases where the proposed sewer extension may impact on critical areas within the proposed development parcel, there shall be a dedication for conservation purposes of those lands before a sewer extension permit is granted.

2. For improved water quality through land use practices:

a. Establishment of a program to fund, through matching grants, the fee simple acquisition of critical areas and the purchase of development rights of critical areas. Program would include tax relief to owners of property where the development rights have been purchased. Funds could be utilized only by local and county bodies which have undertaken a comprehensive identification of critical areas and have adopted a continuing program for protecting them. Lands acquired consistant with above shall be open to multi-use recreational opportunities where compatible with the critical area designation. Critical area identification to include:

(1) Flood plains - The area adjacent to the channel of any natural stream which is flooded or subject to flooding when the stream overflows its banks; special attention should be given to the flood hazard area, the portion of the flood plain outside the DEP protected floodway.

(2) Wetlands - Lands which are poorly drained, subject to water at the surface much of the year, have poor surface outlets and which serve natural water filtering functions.

(3) Sensitive lands adjacent to waterways - The area adjacent to streams, rivers, lakes and other water bodies which, if disturbed, would contribute to decreased water quality from erosion and other impurities

associated with development. Protection of such by the creation of corridors along streams and rivers and buffer strips adjacent to lakes and other water bodies, such as the following guideline:

- in urban areas, 25 to 50 feet
- in suburban areas, 50 to 100 feet
- in rural areas, 100 to 250 feet
- in all areas adjacent to streams classified FW-1, 500 feet
- in all areas adjacent to streams classified FW-2 or TW-1, 100 to 250 feet.

(4) Aquifer recharge areas - Lands that, from known soil and geological data, may be areas where ground water is replenished via infiltration.

(5) Steep slopes - Lands characterized by slopes in excess of 8% which when considered with soil type, erodibility (K factor), and depth are subject to potential erosion.

(6) Shallow soil to bedrock - Areas where the depth of soil to bedrock is less than 4 feet, where septic systems are proposed.

(7) Seasonal high water table - Areas where the water table is at or within 0 to 4 feet of the surface during several months of the year.

b. Larger grants could be available to communities which have an acquisition and/or purchase of development rights program which is funded annually, is consistent with the community's master plan and which have development ordinances which are aimed at protecting natural water resources such as provision for:

(1) clustering of development

(2) a transfer of development rights from the critical areas to sections within the municipality where the intensity of development can be increased.

(3) impact reducing development measures, such as but not limited to onsite stormwater management with the goal of controlling to

predevelopment levels the volume, the flow rate, and velocity of stormwater runoff from the site; erosion and sediment controls; vegetation retention and/or replacement; and porous surfaces.

(4) Waterfront enhancement programs combined with safeguards for critically sensitive areas in conformity with a comprehensive revitalization program.

B. Policy Recommendations for Governmental Action

Implementation of the following recommendations will require action by a combination of governmental units (federal, state, county and local). Initiation of such action as may be required should be considered an individual responsibility of each of the governmental units as well as the collective responsibility.

1. Support the mandate of the Clean Water Act to plan for multiuse of lands acquired for or related to the development of wastewater treatment facilities through provisions of public access to waterways and use of such lands for recreation, open space and education.

2. Support of EPA proposal for buffer zones along waterways as outlined in "Public Benefits of Cleaned Water: Emerging Greenway Opportunities."

3. Expansion of DEP stream encroachment permit procedure to include analysis and impact of proposed change on water quality with measures to mitigate the impact.

4. Establishment of a storm water management program geared to reducing the volume and velocity of waterflow by means of but not limited to ponding, culvert sizing, retention basins, etc.

5. DEP shall make available to all municipalities, critical area definitions and standards to enable municipalities to use uniform criteria in meeting requirements of the Municipal Land Use Law.

6. Flood control studies include the preparation of contour maps at one or two foot intervals with priority to the freshwater portions of the Northeast planning area.

7. All federally mandated EAS and EIS shall include a delineation of critical areas as defined by the 208 Plan for all alternatives and shall define measures to protect these areas during and after construction.

8. DEP and EPA, in cooperation with citizens, civic organizations, and governmental agencies, shall establish continuing local and regional public information and technical assistance programs for citizens and municipalities throughout the State.

9. The State shall mandate and provide the funds for county governments, in cooperation with Soil Conservation Districts and municipalities, to delineate critical areas, as defined by the 208 Plan, for inclusion in the A-95 review process and all other review processes.

10. Establishment of a New Jersey Freshwater Wetlands Act to identify and conserve freshwater wetlands and the benefits derived therefrom.

11. Pursuant to Section 404 of the Clean Water Act, the State must immediately establish a water quality certification procedure for all projects involving dredging and/or depositing of fill.

C. <u>Areas Requiring Further Study and Analysis by the State</u>

1. An analysis of State laws relating to the property tax structure in order to determine the feasibility of decreasing development pressure on vacant and critical lands through revision of the current taxing of land at its "highest and best" use.

2. Although all available information indicates that surface potable water supplies will be adequately safeguarded by the protection of critical areas (as previously specified) and by the use of reasonable land development standards, the State, in conjunction with federal agencies, should undertake an analysis of: further land use measures necessary to protect surface potable water; special performance standards for development within watersheds used for potable water supply; and taxing policies with regard to watershed holdings and adjacent lands.

3. Research to determine specific quantitative and qualitative impacts on water resources by the development of critical areas.

c. Policy Statement on Environmental Impacts Associated with Construction of Wastewater Treatment Facilities

Construction of wastewater treatment facilities under the federal Clean Water Act (P.L. 95-830) is intended to improve water quality in all waterways. In order to insure that there is not further degradation of rivers, streams, wetlands and harbors as a result of improper construction activities during the installation of wastewater treatment facilities, it is recommended that:

> The U.S. Environmental Protection Agency and the N.J. Department of Environmental Protection jointly establish appropriate standards and procedures, including inspection and review responsibilities and schedules, for all wastewater facility construction, including interceptor sewers. These standards and procedures should be included in contract documents with special consideration to: operations which are in or adjacent to waterways; the authority to suspend construction and impose penalties should violations occur; and establishing of a process through which citizens and local officials can register complaints.

d. Energy Policy

In setting priorities for funding water pollution control projects, the DEP ranking system shall contain a significant negative factor for projects which promote secondary impacts resulting in inefficient use of energy.

The DEP shall develop (with the advice of the New Jersey Department of Energy) guidelines for evaluating the Net Energy Efficiency of a water pollution control project. Furthermore, the DEP shall require that an assessment of Net Energy Efficiency be performed as an integral part of all 201 facilities planning.

Background

"Often new land uses were so spread out that public services became overextended and expensive, especially new sewers, water lines, other public utilities and streets - although much development was dense enough to make such services necessary. This low density style also made public transportation impractical, requiring virtually total dependence on the automobile to serve new growth."

"Operational Inefficiency"
Regional Development Guide 1977-2000
Tri-State Regional Planning Commission
March 1978

e. Statement on the Draft State Development Guide Plan

While there exists the need to shape future development so that the value of public investment is maximized, there has not yet been an opportunity for an adequate airing of the various points of view which are necessary to achieve a concensus on these policies or on the physical configuration of these policies. The Draft Plan must receive further public exposure, such as through a series of meetings in each county, in order to provide the opportunity for subregional areas and localities to indicate specific concerns and to correct inconsistencies or other problems which are most apparent at the local level. This process should allow for revision of the Draft Plan prior to its use to either guide state investment, aim legislative action or influence state, regional, subregional or local development.

From the perspective of water quality, which is the focus of the 208 planning program, the Draft Plan is inadequate, incomplete, and unacceptable as the land use element for 208 water quality planning. Their criteria deliniated in Chapters I through III set forth sound planning objectives. However, these planning objectives are not implemented in the succeeding sections, which contain the Concept Map and Implementation Strategies (Chapters IV and V). Further, these succeeding sections appear to contradict the planning objectives.

While existing infrastructure, particularly vehicular routes, are in reality significant shapers of development opportunity, past development trends themselves should not necessarily be patterns on which to promote future growth. In the NE 208 planning area, the most blatant examples of allowing vehicular routes to shape future development are the recommended focusing of state investment in infrastructure along the recently developed interstate highways - I-78, I-80, and I-287. For the most part the corridors along these highways are devoid of any significant infrastructure development other than the highway. In particular, they lack the water resources to accomodate development. For example intensive development in the Rockaway corridor would actually tend to degrade the existing water supplies upon which millions of people are already dependent.

The Draft Plan has ignored natural and critical features to an extent that further intensification or encouragement of these patterns will create additional and more severe water quality problems.

Critical area designations, as defined in the critical area implementation statement of the Policy Advisory Committee must be included in the planning process. In addition, special attention must be given to the protection and management of ground water resources and all forms of wetlands, such as Great Piece Meadows. Funding by the state to accomplish this identification process at municipal and county levels must commence immediately.

The Draft Plan must place a greater emphasis on the need to identify and locate critical areas within the proposed growth areas, the development of which would impact on the water quality. Conversely, there are areas within other classifications, which because of their natural characteristics are conducive to development provided enlightened environmental design criteria are utilized.

A Guide Draft Plan, as a charter for the future, should reflect economic, environmental and social objectives. Although the Draft Plan does recognize some economic interests, it should be broadened to address the full range of impacts to society as a whole by placing at least an equal value on environmental and social needs. To be acceptable as the land use element for the NE 208 Water Quality Plan, the Draft Plan should be revised to implement the goals and strategies adopted unanimously by the NE Policy Advisory Committee.

f. <u>Statement on S1263--Amendments to Chapter 251, Soil Erosion and Sediment Control Act</u>

The PAC strongly endorsed proposed amendments to the Soil Erosion and Sediment Control Act which expand coverage of the Act to include: demolition; parking lots; and all facilities constructed by public utilities, municipalities, counties, the State or any other such agency or instrumentality.

However, the Act should be amended to provide that certification of public facilities be the responsibility of the appropriate local Soil Conservation District, not local governmental jurisdictions where that jurisdiction is otherwise exempt from Sections 5 through 9 of the Act.

Further, circumvention of the Act through the consideration of new subdivisions as a series of individual single family units should be overcome by amending the Act to provide for inclusion of proposed subdivisions and subdivisions approved after January 1, 1976.

No land disturbance shall occur until the soil erosion and sediment control plan has been certified by the jurisdiction having authority.

g. Critical Areas Policy and Methodology for Determination of Critical Areas

A. Critical Areas Policy

A1. Rational for Critical Areas Mapping

Water is among Northeast New Jersey's most vital resources. The Northeast 208 Policy Advisory Committee has stressed in its recommendations the protection of water quality. It is clearly in the interest of the health and well being of the three million people who live and work in the Northeast area to protect the area's water resources. Future land use decisions must be made within a framework of sufficient knowledge regarding the characteristics of the land so that decisions will not result in adverse impact on the quality of surface or ground water.

A2. Value of Critical Areas Mapping

The use of critical areas mapping, as a significant tool for sound future land use decision-making, is to be encouraged. The Land Use Committee policy statement on Implementation of Goals and Objectives, adopted by the NE 208 PAC on August 10, 1978, provides for implementation techniques.

Critical areas mapping will be of significant assistance to local and county planning agencies in resolving land use conflicts, in directing growth into areas that are environmentally capable of supporting development without adverse impacts on water quality, and in channelling growth away from designated critical resource areas. Generally, a greater intensity of development should occur on lands which have soil, slope, geologic and other characteristics which may absorb high density uses. Conversely, on lands with more sensitive soils, slopes, and geology, development could adversely impact water quality and therefore such lands should be subject to less intense development using stringent development standards. Those lands identified as critical should be subjected to very limited and compatible development or removed from development by conservation easements or other public acquisition.

With the delineation of critical areas, State and local entities will be able to develop anticipatory regulations to protect critical areas and to avert irresversible impairment of water quality. Such regulations would reinforce existing State and Federal water quality standards and 208 planning goals. These goals must include both the definition and identification of critical areas throughout the State of New Jersey.

B. Methodology For Determination of Critical Areas

B1. Background

In order to encourage the development and the promotion of a methodology for the identification and mapping of land and water areas which are critical from water quality standpoint, the Northeast 208 PAC Land Use Committee created a Critical Areas Subcommittee. This Subcommittee developed a model critical areas methodology, incorporating a map for Morris County, using as a basis U.S. Soil Conservation Service Soil Survey data.

B2. Definition and Classifications

In 208 planning, critical areas are sensitive natural lands and waters which when altered would lead to the degradation of water quality. (For the purposes of this mapping, such areas include the following five physiographic classifications):

A. Water bodies and watercourses - These include ponds, lakes, reservoirs, rivers, primary streams, secondary streams, and intermittent streams. This classification is designated by dark blue coloring.*

B. Soils which flood frequently - These include floodplains and wetlands (bogs, marshes, open water swamps). This classification is designated by the light blue coloring.*

C. Soils which retain water - These are soils which are subject to ponding, but seldom flood. They correspond to seasonal high water table areas and sensitive areas adjacent to waterways. This classification is designated by the green coloring.*

D. Potential prime aquifer recharge soils - These are highly permeable soils where ground water is readily replenished through infiltration. They overlie stratified drift deposits of sand, gravel, silt and clay deposited by meltwater streams of glaciers. Site specific information on underlying soil and geologic conditions should be generated in order to determine the existence and extent of recharge. This classification is designated by red coloring. Diagonal black lines indicate areas within the classification where development has taken place.*

*The printing process employed in the reproduction of this report necessitated the modification of the color code to a shading code by the WQM Program. The shading corresponding to each color on the original map is indicated in the legend to the example map.

E. Steep slopes - These include areas with slopes in excess of 25% . They are characterized by excessive stoniness and rock outcropping. This classification is designated by brown coloring.*

B3. Critical Areas Mapping

Critical areas of Morris County, have been delineated with the participation and guidance of Mr. Obie Ashford, District Conservationist of the U.S. Soil Conservation Service and Mr. Robert Glennon, Administrator of the Hudson-Essex-Passaic and Bergen Soil Conservation Districts. A base map of Morris County at a scale of 1:20,000 containing information on soil types was used as the beginning point of ananlysis followed by the identification of soil characteristics that affect water quality. The results of this analysis was the establishment of one water and four soil classifcations for critical areas. Soil types within each of the classifications were then color coded for mapping purposes.* The result is a map delineating critical resource areas within Morris County. In addition, the locations of all known major wells were superimposed on the map. Although the precise relationship between those wells and the recharge potential of the soils and substrata is undetermined, the relationship among wells, well yields and recharge areas may be significant and therefore should be part of future studies.

The classifications, as mapped, may be viewed as a conservative estimate of critical areas. Additional information delineating vegetation, wildlife habitat, geology, and hydrology may further adjust the areas designed as critical.

B4. Soil Survey Information

Table II-1, following, based on the published soil survey of Morris County, indicates that 43.5% of the land area may be considered as critical. Of this area 3.9% has already been subject to development. Approximately 40% is found in areas not yet developed. Totals do not include water bodies in the critical areas classifications. Table II-2, following, lists the soils of Morris County which have been placed into the critical areas classification. Although each soil type has been assinged to one classification, overlap does occur.

*The printing process employed in the reproduction of this report necessitated the modfication of the color code to a shading code by the WQM Program. The shading corresponding to each color on the original map is indicated in the legend to the example map.

TABLE II-1

Critical Areas as a Percentage of Undeveloped & Developed Land in Morris County

Classification	Undeveloped Land %	Developed Land %
Soils which flood frequently	12.0	0.2
Soils which retain water	14.6	0.5
Potential aquifer recharge soils	6.7	3.2
Steep Slopes +25%	6.3	-
	39.6	3.9

TABLE II-2

Soil Classifications in Morris County

Frequently Flooded Soils

Adrian	(Ad)
Alluvial	(Ae, Am)
Biddeford	(Bd)
Carlisle	(Cm)
Muck	(Ms, Mu)
Parsippany	(Ph, Pk)
Preakness	(PvA, Pw)
Urban, Preakness	(Un)

Water Retention Soils

Califon	(CaA,CaB,CcB,CcC, CbB,CdB)
Cokesbury	(CoA,CoB,CsB)
Minoa	(MlA,MlB)
Pompton	(PtA,PtB)
Ridgebury	(RgA,RlB)
Turbotville	(TuA,TuB)
Whippany	(WhA,WhB,WlA,WlB)
Whitman	(Wm)
Urban	(Ub)
Urban, Whippany	(Uw)

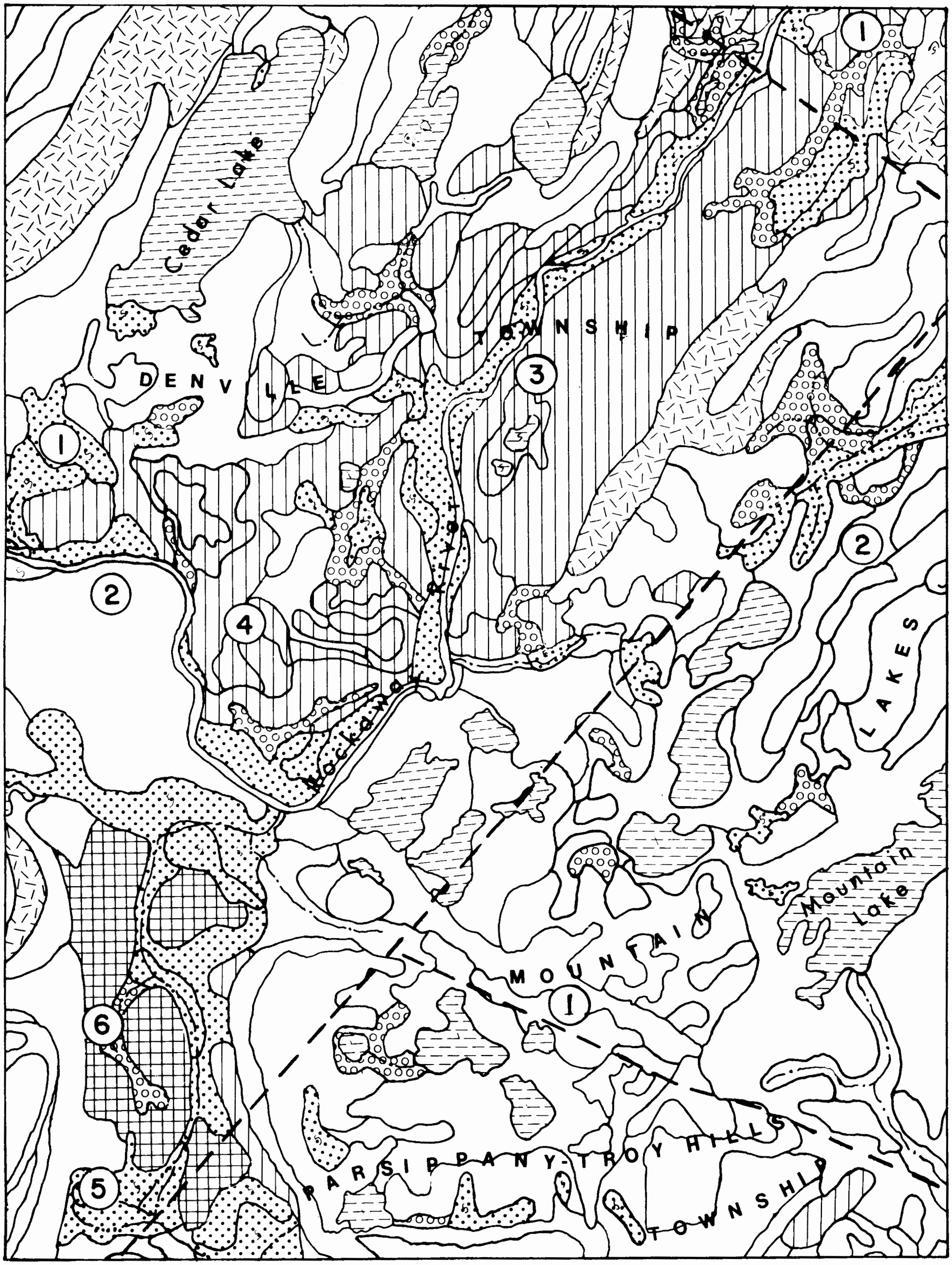
Potential Prime Aquifer Recharge Soils

Otisville	(OtB, OtC)
Netcong	(NtB, NtC)
Riverhead	(RmA, RmB, RmC)
Urban, Riverhead	(Up)

Steep Slope Soils

Holyoke-Rock	(HrE)
Klinesville	(KlE)
Parker-Rock	(PfE)
Rockaway-Rock	(RsE)
Rock Outcrop	(RvF, Rt)

Example of Morris County Critical Areas Map



LEGEND

MORRIS COUNTY CRITICAL AREAS MAP

Water courses, water bodies	Dark Blue *	① ② etc. Municipal wells
Aquifer recharge	Red *	
Developed aquifer recharge	Red with * Diagonal Black lines	
Steep slopes, rocky outcrops	Brown *	
Floods seldom, but ponds	Green *	
Floods frequently	Light Blue *	

* As indicated in Critical Areas Delineation Narrative, Section.D

h. Statement on Population Projections

It is recommended that the range of population projections (Series I through III of the N.J. Department of Labor and Industry) be accepted on an interim basis until they can be evaluated with data on the carrying capacity of the land. The population projections are based on economic, historical and social factors, and we are being asked to adopt a land use policy based on these statistics. This process is the reverse of a rational approach to dealing with land use. The existing land use, together with natural, political, economic, social and legal constraints, should be the basis for population projections. When the Land Use Committee receives the necessary data, it will make its final recommendations concerning population projections for the Northeast area of 208.

II.D.2 PAC Water Resources Committee Recommendations

a. Policy Recommendations Regarding Reduction of Pollution from Dumps, Sanitary Landfills, Etc.

I. Abandoned Dumps:

A.) Potable Water Resources

1. When an abandoned dump of unknown or disputed ownership has been found to be endangering a source of potable water by the discharge of leachate or by other means, the State or other responsible authority shall take appropriate action to cause, without delay, the cessation of the pollution. The State, or other responsible authority, shall thereafter monitor the area as is necessary to assure continuing pollution abatement.
2. Any funds expended by the State, or other responsible authority, on the land upon which a polluting dump is located, in order to cause cessation of the pollution, shall be held as a lien on the land until such time as ownership has been legally established. Thereafter, the legal owner shall repay the State, or other responsible authority, the full amount of the lien.

B.) Other Water Resources

1. When an abandoned dump of unknown or disputed ownership has been found to be polluting a water resource by the discharge of leachate or by other means, the State or other responsible

authority, following a hearing and for cause, shall take appropriate action to cause, without delay, the cessation of pollution. The State, or other responsible authority, shall thereafter monitor the area as is necessary to assure continuing pollution abatement.

II. Existing Sanitary Landfills:

A.) Existing sanitary landfills shall be operated and maintained in a manner consistant with the provisions of appropriate current legislation and resulting regulations.

III. Proposed Sanitary Landfills:

A.) Potable and Non-potable Water Resources

1. New sanitary landfills shall be construed in a manner consistant with the provisions of appropriate current legislation and resulting regulations based on the current state of the act.
2. The water resource user shall have the right to present objections to the State, or other responsible authority, at a public hearing. If such objections are found to have a valid basis, the plans for the proposed landfill shall be modified or abandoned accordingly.

IV. Sewage Sludge

A.) Regional plans should be established for the disposal of sewage sludge.

V. P.L. 95-217, Sect. 67

The Water Resources Subcommittee supports P.L. 95-217, Sect. 67 (Formerly P.L. 92-500, Sect. 404) as originally stated in the act.

b. Policy Recommendations Regarding Septic Tank Management Areas (STMA) Methodology Paper

I. Concept

A. It is important to insure that subsurface sewage disposal systems are properly designed, installed and maintained.
B. Subsurface sewage disposal systems act to maintain water within drainage basins by recharging groundwater aquifers. This is desirable provided that the aquifers are not contaminated by septic tank leachates.

C. The success of this concept is dependent upon comprehensive planning involving expertise and resources at State, regional and local levels.
D. Strict, well structured laws and regulations are required regarding requirements for specification, design, soil testing, installation, inspection and maintenance of septic tank sewage disposal systems.
E. The sale and installation of commercial and residential garbage grinders should be prohibited.
F. Subsurface sewage disposal systems should be installed in headwater areas, where possible, because they are generally less polluting.

II. <u>Regulatory Approach</u>

A. The creation of new independent STMA agency would yield additional bureaucracy which could duplicate the functions of existing State and local jurisdictions.
B. The State should appropriately delegate responsibilities to local jurisdictions in order that standard-setting, administration and enforcement responsibilities for on-site septic tank sewage disposal systems may be shared. Local jurisdictions responsible for the subsurface disposal systems standards and regulations and shall be accountable under law for compliance.
C. Regulations and ordinances should clearly establish and define minimum standards for the design and installation of subsurface sewage disposal systems. These regulations should be sufficiently flexible to allow individual designs that can respond to the hydrogeologic considerations of potentially acceptable sites within the state.
D. The regulatory jurisdictions should be responsible for monitoring the performance and maintenance of both existing and new on-site sewage disposal systems. Also, the specific maintenance services rendered, including those of disposal contractors, should be clearly defined under the jurisdiction of the agencies.
E. Wellwater analyses, both public and private, should be required periodically in areas with existing or potential groundwater pollution problems from subsurface sewage disposal systems.
F. The performance monitoring and maintenance methods must be capable of detecting malfunctioning septic tank sewage disposal systems.

III. New/Alternate Technology

A. Regulations should be prepared to allow for the design and testing - in actual use - of "Alternative" or "Innovative" systems for all areas, including those not suitable for traditional septic tanks and absorption fields. For example, composting toilets may be an alternative means for treating domestic wastes; their suitability should be considered by the regulatory agencies. If these units are found to be acceptable, the regulatory agencies should legalize their use as per appropriate standards.
B. The regulatory agencies should also consider centralized subsurface sewage disposal systems for areas where individual disposal systems are not practical (sites too small) or not effective (hydrologic and geologic considerations).

IV. Impact

A. The owner of the subsurface disposal system must be responsible for the continuous maintenance of and costs associated with the operation of the system in an environmentally acceptable manner.
B. An owner/user education program is a necessary adjunct to the STMA program.

c. Water Supply Conservation Policy Recommendations

General A successful water conservation program will rely on a combination of methods to reduce consumption. Metering, pricing, domestic conservation devices, education and industrial recirculation are all methods by which these objectives can be accomplished. The Policy Advisory Committee therefore recommends that a program be formulated based on the following policy recommendations:

A. Metering should be implemented in any remaining non-metered service areas and nonmetered connections to enable an accounting of water usage and to facilitate leakage detection. Unit metering should be analysed for feasibility and application to new construction and rehabilitation of multi-unit dwellings.
B. The price of water should be considered as a conservation measure and should reflect the costs of development and production.

C. Conservation devices should be required in all new construction and renovations through the New Jersey State Uniform Construction Codes. The Code should prohibit the use of commercial and domestic garbage grinders as they introduce large quantities of solid wastes into the sewage system and require large amounts of water to flush it through the system which is contrary to water conservation policy.

D. Legislation at the State level should be enacted that would require the water supply purveyors to inform all consumers about specific water supply conservation measures that they can take through an education program relating the program to the particular situation of that utility.

E. A drought contingency plan for the state should be prepared to determine where and by what methods water can be conserved with minimum inconvenience to the public and industrial interests.

F. Industrial recirculation, reuse and modification of manufacturing processes should be encouraged to minimize the use of water.

G. Water using appliances should be rated by their water use much the way electrical appliances, particularly air conditioners, are rated for their energy efficiency.

H. Water supply systems should be inspected between the source and distribution points at time intervals sufficient to minimize losses through leakage.

I. The Policy Advisory Committee should coordinate and encourage conservation planning with the New Jersey Water Supply Master Plan Study in the review of Task 6, Conservation Plans.

d. Eutrophication Policy Statement

The State of New Jersey should encourage, support, and initiate research into the causes, prevention, and cures of eutrophication. The TAC should undertake a study of the courses, prevention and cures of eutrophication.

II.D.3 Public Education Committee Recommendations

a. Educational Policy for the Executive Policy Advisory Committee for the Northeast Areawide Water Quality Management Planning (208)

The purpose of the Education Committee is:

1. To inform the leadership of municipalities of 208 planning and its implications and to establish a feed-back loop whereby counties, municipalities and their citizens react and contribute to the planning process and/or provide support for the planning process;
2. To inform the PAC and its various committees (including TAC) with regard to the structure and function of the advisory planning process and the interrelationship of these activities with other agencies involved in the planning process or request of the project staff such information;
3. To identify problems and areas of concern, both within the PAC and its various committees (including TAC) and between the PAC and/or Project Staff and the public and provide appropriate education to meet these needs or assist the project staff and N.J. DEP in this effort.

b. Policy on Dissemination of Policy Statements

All policy statements approved by the Northeast 208 PAC shall be sent to all New Jersey 208 Policy Advisory Committee Chair-men as well as pertinent Regional, State, and/or Federal agencies concerned with the issue.

II.D.4. Ad Hoc Committee On Public Participation Recommendations for Public Participation In The Continuing Planning Process

I. INTRODUCTION

Section 101(e) of the Clean Water Act (92-500) requires the State of New Jersey to provide for, encourage and assist participation by the public in programs established by the Clean Water Act (CWA).

II. DEFINITIONS & ASSUMPTIONS

"The Public" - Any affected or interested entity other than the planning agency including other federal, regional, state, and local government entities and officials; public and private organizations, and individuals.

"Participate" - To take part; to have a role in program deliberations prior to a decision being made.

"Provide for" - To ensure opportunity; prepare for.

"Encourage" - To stimulate.

"Assist" - To help; aid; give support.

"Responsive" - Providing a timely answer or reply; reacting in a receptive manner.

"Public Participation" - Part of the decision-making process that seeks to determine the "public interest" in any given decision.

"Public Interest" - The composite or continuously shifting individual and group values, viewpoints, concerns and interests.

"Division" - Division of Water Resources

"State - State of New Jersey

"DEP" - N.J. Department of Environmental Protection

III. PURPOSE AND SCOPE

(a) Purpose

This part sets forth guidelines for public participation in the processes of development, revision and enforcement under the Federal Water Pollution Control Act, as amended, in accordance with section 101(e) of the CWA. It applies to the State of N.J., interstate and substate entities (i.e., and public, regional, local, county, municipal, or inter-municipal agency) receiving financial assistance under the CWA.

(b) Scope

Public participation includes public meetings, conferences and workshops; development of end distribution of reference materials understandable by the public; the opportunity for public involvement and comment prior to promulgation of regulations and guidelines; and agency response to public concerns. These elements of public participation will be appropriate in varying degrees for each activity under the CWA.

These provisions allow the public the opportunity to influence the social, economic, technical and political changes called for in the CWA.

IV. POLICY AND OBJECTIVES

Participation of the public shall be provided for, encouraged, and assisted to the fullest extent practicable consistent with other requirements of the CWA in State government water pollution control activities. The major objectives of such participation include greater responsiveness of government actions to public concerns and improved popular understanding of official programs and actions. The intent of these policies is to foster a spirit of openness and a sense of mutual trust between the public and the State in efforts to restore and maintain the intergrity of the State's waters.

In order to promote the protection of the public health and environment, the goals of public participation shall be:

(1) To foster a spirit of openness and mutual trust between the public and the State and sub-state entities;

(2) To assure that no significant decision on any plan, program, project or activity is made without public participation in decision-making process.

(3) To promote public knowledge and understanding of agency actions, programs and decisions;

(4) To promote agency understanding and support of public values, needs, concerns, problems and preferences;

(5) To assure responsiveness in program deliberations and decisions to the expressed interests of the public;

(6) To promote public support of strong, balanced environmental laws which affect water quality and are representative of the interests represented by the PAC.

It is the purpose of these policies to assure that all State, local and areawide agencies responsible for programs and activities under N.J. Department of Environmental Protection, Division of Water Resources jurisdiction will:

*keep the general public continuously informed of program progress and developments and proposed changes in decisions;

*seek out the segments of the public relevant to significant program decisions, and

(1) keep them informed of problems and needs, alternatives, costs and benefits and issues relating to decisions;

(2) use all feasible means to furnish opportunities for, stimulate help and give support to their participation in program deliberations and decisions;

(3) consult with interested and affected segments of the public; and

(4) demonstrate that public preferences and viewpoints are considered in all aspects of decision-making.

No significant decision on any plan, program, project, regulation, standard or effluent limitation of activity shall be made without public participation in the decision-making process in accordance with this part. Those responsible for programs and activities must continuously strive to make public participation happen. Particular emphasis should be directed toward encouragement and assistance, which means that agencies must seek to understand why the public cannot or does not participate and explore every possible means for overcoming these obstacles.

Merely conferring with the public after a final agency decision has been made will not meet these objectives.

V. PUBLIC PARTICIPATION REQUIREMENTS

(a) General

State and substate entities shall conduct a continuing program for public information and participation in the development and implementation of activities under the CWA meeting the requirements of this part and shall assure adequate opportunity for participation by the public at large. They shall specifically attempt to involve all parties affected by activities under the CWA including private citizens; representatives of consumer, environmental and minority associations; trade, industrial, and labor organizations; public health, scientific and professional societies; and public officials and governmental and educational associations. Special efforts should be made to ensure that nonprofit organizations and citizens representing themselves have every opportunity to participate. The exact mechanism and extent of activity may vary in relation to public response, and the nature of issues involved.

(b) Informational Requirements

Public information is an essential component of public participation and a necessary prerequiste for meaningful, active public involvement. Informational activities should be designed to facilitate the public's participation where alternative courses of action are deliberated in the course of a decision process.

(b) 1. Development of Informational Materials

Continuing policy, program, and technical information shall be provided at the earliest practicable times and at places easily accessible to interested or affected persons and organizations so that they can make informed and constructive contributions to governmental decision-making. Fact sheets, news releases, newsletters and other publications may be used for this purpose.

Informational materials must be comprehensive and easily understood. Special efforts shall be made to clearly and concisely summarize complex technical materials for public and media uses. Lengthy documents should be summarized (noting where the full document can be obtained).

Information should be timely and relevant to the specific decision process. It is essential that informational materials highlight significant issues that will be the subject of decision-making. Whenever possible, the social, economic, and environmental consequences of proposed decisions should be clearly stated. Agencies should identify publics likely to be affected by agency decisions and target specific informational materials toward these publics (in addition to the specific materials directed toward the general public).

(b) 2. Access to Information

The Division of Water Resources shall provide, either directly or through others, in a convenient location or locations, one or more controlled public, or private collections or depositories of water resources reports and data pertinent to the geographic area concerned. All environmental institutions who maintain a depository with public access should be included. Copying facilities at reasonable cost shall be available. Requests for information directed to the Division shall be promptly handled.

(b) 3. Public Notification

The Division shall develop and maintain a list of persons and organizations who have expressed an interest in or may by the nature of their purposes, activities or members be affected by or have an interest in any plans, programs or activities being conducted. Those on the list shall receive timely and periodic distribution of materials under (b) (1). In addition, the agency shall provide written notification to those on its mailing list and the media at times when major program decisions are being made.

(c) Policy Advisory Committee (PAC) Requirements

(c) 1. General

The Policy Advisory Committee shall be representative of the geographic area designated by the Governor of the State of New Jersey.

(c) 2. Memberships

(a) A majority of the PAC shall be representatives of local government (county and/or municipal).

(b) Private citizens and representatives of public interest groups in the geographic area shall be part of the PAC. "Public interest group" is an organization which represents a general civic, social, environemtal or public health perspective in the community and which does not directly reflect the economic interests of its membership or general economic interests.

(c) Representatives on the PAC shall also include economic interests of the community.

(c) 3. PAC Organization

The PAC shall organize itself and continue to function within a democratic process whereby members apply, and are accepted by a majority vote of the PAC to the PAC. The PAC shall be empowered to select its own chairperson and other appropriate officers, to establish and maintain its own rules of order, and to schedule and conduct its meetings.

(c) 4. PAC Authority

(a) The PAC shall coordinate with the State and the public to assure that the public interest in water resource management is served.

(b) PAC meetings shall be open to the public. At all meetings opportunity for public comment shall be provided.

All PAC meetings should be announced in advance.

(c) PAC shall monitor State progress, review State documenting and become familiar with all issues relevant to State development of water resources policies and projects.

(d) The PAC shall make written policy recommendations directly to the State DEP on major decisions and issues and shall promptly and fully respond to requests from the State for such recommendations.

(e) The PAC shall use its best efforts to represent changing community attitudes and responses to issues as they arise.

As part of this effort, the PAC may (1) establish and maintain a Chairman's Advisory Council, which shall be appointed by the Chairman of the PAC. The CAC acts as an agenda committee for the PAC and TAC. All committee reports must be submitted to and reviewed by the CAC. A representative of the State and the TAC Chairman shall be members of CAC.

(2) Establish and maintain standing committees, such as Land Use, Water Resources, and Education, to formulate and review policy issues. Each of these standing committees shall formulate its goals and objectives to be presented to the PAC for acceptance or rejection.

(3) Establish and maintain a Technical Advisory Committee (TAC) which shall provide scientific, socio-economic, legal and cultural data and interpretation needed by the PAC in the decision-making process. The TAC or special members of TAC shall meet when necessary as determined by the PAC and/or CAC to deliberate on issues of importance. The TAC chairman shall be a member of the CAC.

(4) Establish ad hoc committies to investigate and develop recommendations on particular issues as they arise.

(f) PAC shall assure that the public has access to all formal deliberations of the PAC (including minutes of meetings and recommentations to the State) to be desseminated by the State.

(g) PAC shall follow Roberts Rules of Order, Revised 1915; however, a quorum shall be "those present".

VI N.J. DEP DWR SUPPORT & RESPONSIBILITIES TO 208 PAC

(1) The State shall designate a staff contact who will be responsible for day-to-day coordination between the PAC and the State.

(2) The State shall provide the PAC with needed information concerning water resource management, identify issues for the PAC consideration, consult with PAC, and request PAC recommendations prior to major decisions, and in time to influence actions.

(3) The State shall provide the PAC with an explanation in any instance in which a policy is not carried out in accordance with PAC recommendations. To the maximum extent feasible, the State shall involve the PAC in development of the public participation program and its implementation.

(4) Any public participation program or major revision thereof, prepared by the State shall be submitted promptly to the PAC for its comments and recommendations.

(5) The State shall appropriate funds to the PAC as a Discretionary Chairman's Fund to be used for administrative functions of the PAC, CAC, TAC, and standing and/or ad hoc committees. PAC business may be considered for reimbursement through a system to be approved and monitored by CAC. The CAC shall formulate a budget to be approved by PAC and submitted to the State. Any officer or committee chairman must formulate a budget and obtain approval from PAC to qualify for reimbursement of expenditures. PAC may elect a municipal official to act as a treasurer of the PAC in maintaining a PAC budget and the administration of PAC funds.

(6) The State shall in cooperation with PAC sponser conferences and training sessions, workshops, publish fact sheets, reports, brochures; issue press releases; develop media messages; so that every effort is taken to educate and inform the public with the policy issues being deliberated by PAC.

(7) The State shall provide facilities and equipment for all PAC meetings and shall notify PAC members, and substate government interests as to the time, date, and location of all PAC meetings, and shall issue notices in major newspapers regarding such meetings. The State shall provide sufficient copies of reports, fact sheets, statements, and such other background data as may be required by PAC to function according to Section V(C) (4) PAC Authority.

(8) The State shall coordinate PAC 208 activities with major water resource efforts being undertaken by the State in the region so that policy issues may be reviewed by PAC and recommendations made; and shall provide a forum of all N.J. 208 Leadership.

(9) The State shall furnish the PAC with stationery and supplies necessary to pursue the activities of PAC.

II.E WQM Program Comments on PAC Recommendations

1. PAC Recommendation II.D.1 - Land Use

a. Land Use Committee Goals and Objectives
b. Implementation of Goals and Objectives

WQMP Comment

Many of the PAC recommendations concerning land use goals and objectives and their implementation have been considered by the WQM Program and are reflected in the Plan (see Chapter IV). The remaining PAC recommendations will receive consideration in the assignment of priorities to be addressed in the continuing planning process.

c. Environmental Impacts Associated with Construction of Wastewater Treatment Facilities

WQMP Comment

Essentially all of the elements of this recommendation are in effect.

d. Energy Efficiency

WQMP Comment

Although the existing ranking system does not specifically consider energy inefficiency of secondary impacts resulting from wastewater facilities projects, the system does contain a significant bias in favor of projects in highly populous areas; higher density uses tend to result in greater operational and energy efficiencies. Additionally, in an effort to promote operational efficiencies and mitigate the undersirable secondary impacts of a project, 201 facilities planning agencies must investigate feasible alternatives to regional wastewater systems. As reflected in Chapters IV and V, the WQM Program advocates development which promotes operational efficiencies. The ranking system for establishing funding priorities for water pollution control projects is being evaluated for possible revision. The PAC recommendation on energy will be considered in the evaluation. The development of guidelines for evaluation net energy efficiency and the requirement that 201 facilities plans contain a net energy efficiency assessment will receive appropriate consideration in the assignment of priorities for future planning.

e. Draft State Development Guide Plan

WQMP Comment

The WQM Program recognizes the need for a comprehensive Statewide development policy and feels that the forum provided through the 208 participatory process has served well to identify many of the water quality concerns that a State development policy should reflect. The statement on the draft State Development Guide Plan has therefore been forwarded to the Department of Community Affairs, Division of State and Regional Planning for consideration in future revisions to the Guide Plan.

f. S1263-Amendments to Chapter 251, Soil Erosion and Sediment Control Act

WQMP Comment

The WQM Program supports the PAC recommendation on Amendments to Chapter 251.

g. Critical Areas Policy and Methodology for Determination of Critical Areas

WQMP Comment

The WQM Program recognizes the value of critical areas mapping in water quality management. The concept of environmental inventory, analysis, and synthesis as a basis for local land use decision-making has been incorporated into the management strategy for environmentally sensitive areas (Chapter IV). In that section, the Land Use Committee critical areas delineation for Morris County is cited as an example of what local jurisdictions can do to manage environmentally sensitive areas.

h. Statement on Population Projections

WQMP Comment

The WQM Program population projections for the Northeast area are contained in Chapter IV. For an explanation of DEP policy on population projections, refer to Sections A.1 and A.3 of Chapter IV, and Appendix IV-1, "Policy and Procedures for the Development and Review of Population Projections for Water Quality Management Planning."

2. PAC Recommendation II.D.2 - Water Resources

a. Reduction of Pollution from Dumps, Sanitary Landfills, Etc.

WQMP Comment

The WQM Program has forwarded the PAC recommendation on dumps and landfills to the appropriate offices of the Solid Waste Administration of DEP for consideration.

b. Septic Tank Management Area (STMA) Methodology Paper

WQMP Comment

As discussed in Chapter V, the concept of STMA's will be further analyzed in the continuing planning process, during which time the PAC recommendation on this topic will receive further consideration.

c. Water Supply Conservation

WQMP Comment

The PAC recommendation on water supply conservation has been referred to the Water Supply Master Plan offices for appropriate consideration. The issue of water supply conservation will be considered in the assignment of priorities for continuing planning.

d. Eutrophication

WQMP Comment

The Division of Water Resources conducts a Lakes Management program to determine the status of eutrophication in New Jersey lakes and investigate the causes, prevention, and cures of eutrophication in those lakes.

3. PAC Recommendation II.D.3 - Public Education

a. Educational Policy for the Executive PAC for the NE Areawide WQMP

WQMP Comment

The WQM Program supports the PAC recommendation on education.

b. Dissemination of Policy Statements

WQMP Comment

The WQM Program encourages dialogue between the New Jersey 208 PAC's and between PAC's and other governmental agencies. In order to facilitate this dialogue, policy statements approved by the Northeast 208 PAC will be disseminated to the other New Jersey 208 PAC chairmen. PAC policy statements will continue to be referred to the appropriate governmental agencies concerned with the issue.

4. PAC Recommendation II.D.4 - Public Participation in the Continuing Planning Process

WQMP Comment

The PAC recommendation on future public participation has been taken into consideration by the WQM Program and is reflected in the section on public participation in the continuing planning process (see Chapter II.F).

II.F. Recommendations for Public Participation in Continuing Planning

II.F.1. Background

To ensure that WQM Plans meet the needs and desires of each area's residents, an unprecedented program of intensive public participation was mandated by regulation and law. Public involvement will be a necessity to ensure implementation of the WQM Plans, as well as provide input for future planning efforts.

Public participation in future WQM planning should be viewed in perspective with other environmental programs and participation in them. Several current activities will affect future public participation.

The U.S. Environmental Protection Agency is in the process of revising regulations on public participation, so that there will be broader requirements, especially for 201 sewerage facilities planning.

U.S.E.P.A. and the New Jersey Department of Environmental Protection are working on an interagency agreement designed to draw a clear concept of what activities DEP will undertake relating to water resources over the next five years. This State/EPA Agreement will provide concepts rather than work plans, and will include direction on the nature of public participation.

DEP is also examining its public participation program. A Departmental task force on public participation has prepared a draft policy on public participation which will clarify responsibilities and requirements for individual programs. The task force also proposes a DEP Office of Public Participation to provide public participation support for the entire Department.

II.F.2. General

In the future, public participation in WQM planning will be part of a Division-wide involvement program incorporating Sewerage Facilities Planning, Monitoring, Surveillance and Enforcement, Potable Water, the Water Supply Master Plan, and other elements of the Division of Water Resources.

A periodic Division-wide publication, discussing the various aspects of the water resources programs, might be published. This would include a special insert or outer page which would describe WQM planning activities specific to the region to which it is being sent. In other words, each time the Division's publication would be printed there would be five of these supplements, one for each of the five DEP-208 areas. The supplement would address issues and events regarding WQM planning which are of regional concern.

A minimum of one staff person per two DEP planning areas, charged exclusively with public participation responsibilities, would be needed to conduct the citizen involvement program at the level described in this section. These individuals will provide assistance to the existing Policy Advisory Committee, which would be sustained, with changes as noted below.

Staff for public participation will be responsible for planning meetings and workshops, issuing press releases and newsletters, producing audio-visual material, giving talks on WQM planning and helping to answer routine public inquiries. Their chief responsibility will be to plan meetings for the PAC where policy, rather than technical issues, will be discussed. For these meetings, they will do some of the research and present basic information for the PAC.

Whenever possible, issues, particularly those of a technical nature, will be discussed by small groups or subcommittees prior to introduction for general discussion at larger meetings. PAC meetings will be held as needed, not necessarily as frequently as the monthly meetings which were held during the initial planning.

The possibility of using advertising through newspapers or other media will be investigated. The advertisements would be designed to educate the public on water quality issues of broad general interest, and may include questionnaires to obtain input on specific issues.

The possibility of increased public participation activities by County Planning Boards or other local agencies will be examined. Established regional agencies such as these might assume more of the responsibilities for public participation, such as developing and conducting public information programs and meetings, providing mailing and other distribution services, and receiving local input on water quality management endeavors. DEP, as the lead planning agency, would continue to attend meetings, prepare presentations, and provide certain supporting materials. The DEP would still maintain direct contact with the public, but with some assistance by these local agencies.

II.F.3. Policy Advisory Committee Authority and Responsibilities

The Policy Advisory Committee (PAC) and its subcommittees, will continue under the same general structure as it did during the initial planning program, unless they opt to make changes. The PAC will be responsible for advising the Division of Water Resources on policy issues involved in the planning through written recommendations, and will respond to requests from the State for such recommendations. They will also keep the DWR informed of relevant water quality issues and problems in their municipalities.

The PAC may form ad hoc subcommittees as it sees fit. The list of technical advisors will be maintained, with those persons serving in an advisory capacity to the PAC.

Members of the PAC will be expected to keep their constituencies informed of relevant developments of the planning program. For example, those individuals representing municipalities will be expected to report back to municipal officials as relevant issues arise.

County Planning Board representatives will have a special responsibility - to ensure that all municipalities in their counties are kept aware of developments in the program. The possibility of having the Planning Boards sponsor periodic County-wide meetings for municipalities will be investigated and pursued if found feasible.

II.F.4. Division of Water Resources PAC Support Responsibilities

DWR will provide the PAC with needed information concerning water resource management, and develop policy issues for discussion at PAC meetings. For purposes of day to day coordination, one member of the Basin staff will be designated as the chief public contact.

Staff attendance at PAC and subcommittee meetings will be arranged so that staff time spent on those activities does not become overextended at the expense of other planning responsibilities.

DWR will furnish the PAC with stationery and supplies as needed to pursue PAC activities. An attempt will be made to develop means for reimbursement of authorized PAC business expenses, such as telephone, postage and travel on special PAC business. This may take the form of a contractual arrangement with the PAC, with discretionary funds to be available after approval by the Chairman's Advisory Council and the Chairman.

III WATER QUALITY ANALYSIS

III. WATER QUALITY ANALYSIS

Overview

This chapter describes the existing uses and quality of the surface and ground waters in the basin. The descriptions of water quality are based on historical information as well as data collected as part of the WQM Program. Because it is usually withdrawn in a fairly pure form, ground water is often used for drinking without treatment. Thus, in assessing ground water quality, this chapter uses drinking water criteria for comparison.

In contrast to ground water, surface water is usually treated prior to consumption. Conventional water treatment, which includes disinfection and filtration, is aimed at removal of moderate levels of suspended solids, bacteria, and other traditional pollutants. More advanced treatment, as has recently been recommended by USEPA, is needed to remove higher levels of contaminants and complex pollutants such as organic chemicals. In-stream water quality criteria, which consider waterway uses such as fishing and swimming as well as potable supply, are used in this chapter to assess surface water quality.

This information provides a basis for the development of a water quality management plan to solve current water quality problems and provide for future wastewater management needs.

III.A. Surface and Ground Water Hydrology

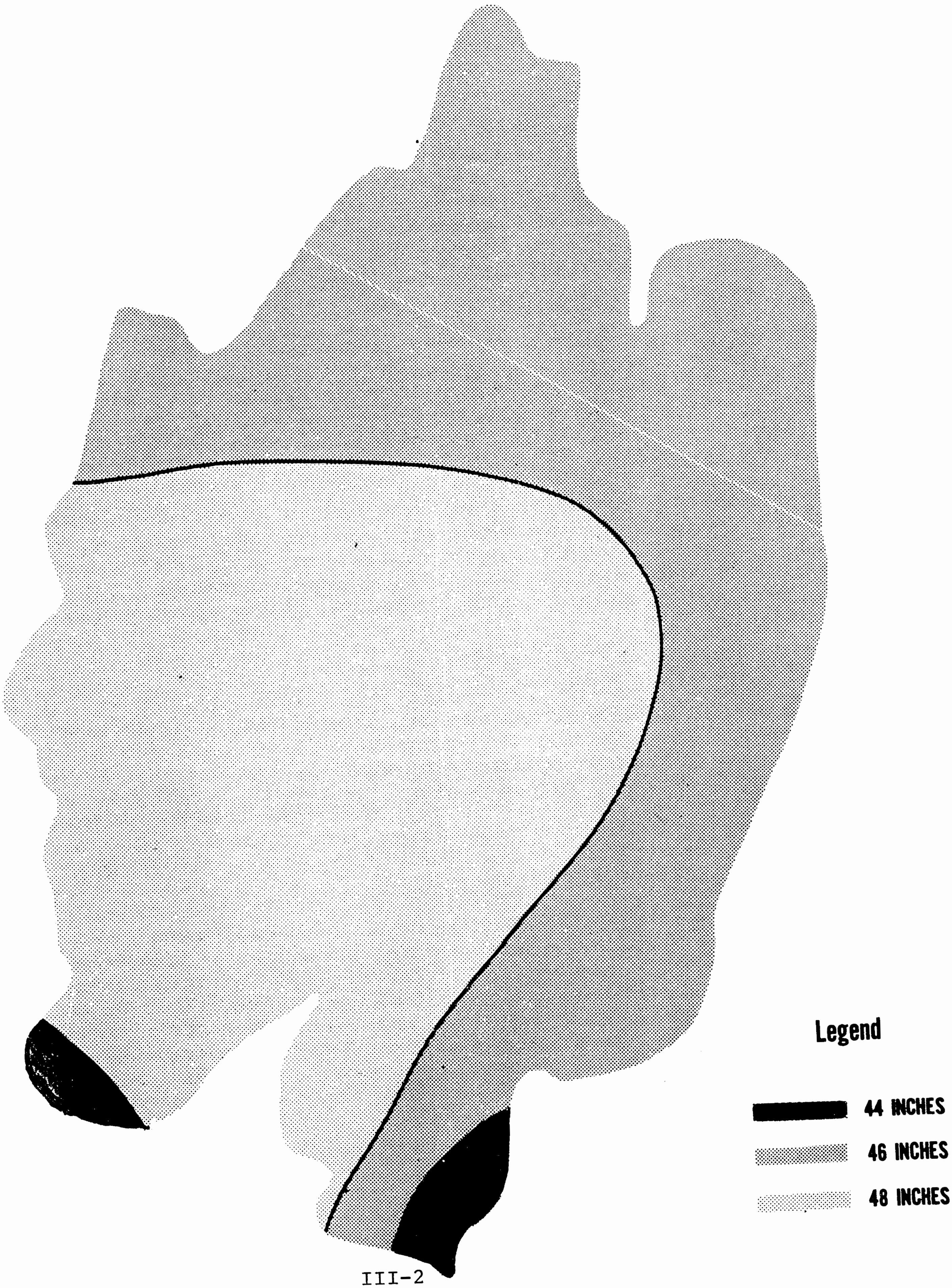
An understanding of surface and ground water quality is essential to a water quality management study; the importance of water quantity may not be as apparent. Determination of the source, extent and reliability of supply, and character of water on which an assessment of control and use is to be based, are the objectives of a hydrologic appraisal. This will involve collection and utilization of data of many factors, including precipitation and runoff, streamflow, and an inventory of water resource development.

III.A.1 Precipitation and Runoff

The average yearly rainfall in the study area is approximately 47 inches. Mean annual precipitation for the years 1931 to 1955 is shown in Figure III-1. Generally, most precipitation either runs off to the nearest waterway or is lost to the atmosphere via evapotranspiration. Runoff consists of surface runoff, which appears in surface streams of either the perennial or intermittent type via overland flow; interflow, which infiltrates the surface soil and moves laterally through the upper soil horizons toward the stream; and ground water runoff, which is that portion of runoff due to deep percolation of infiltrated water which passes to the main ground water level, to be later discharged into streams.

FIGURE III-1

MEAN ANNUAL PRECIPITATION, IN INCHES, 1931 -55



Evapotranspiration rates range from about 25 inches per year in the southern portion of the study area to about 20 inches in the elevated northwestern portion. The long-term average annual surface runoff is illustrated in Figure III-2. A discussion of the effects of land use on runoff is presented in Chapter VI.

III.A.2 Streamflow

Stream flow patterns can allow insight into factors such as low flow response ground water recharge, and travel time.

Flow patterns are of particular interest in water quality planning when determining the assimilative capacities of a particular stream. The greatest factor controlling the overall waste-assimilative capacity of surface water is the amount of dilution provided. Providing all other factors are equal, a stream with a higher flow will be able to accept greater amounts of waste without creating objectionable conditions than a stream with a lower flow. It must be recognized, however, that the assimilation capacity during high flow may be affected by non-point contributions, such as urban runoff, bank erosion and benthic scouring.

Although ground and surface waters are discussed separately in this report, it is important to recognize the interrelationship between the two. Since stream flow is made up almost entirely of groundwater contributions during low flow, groundwater storage is an important determination of flow maintenance.

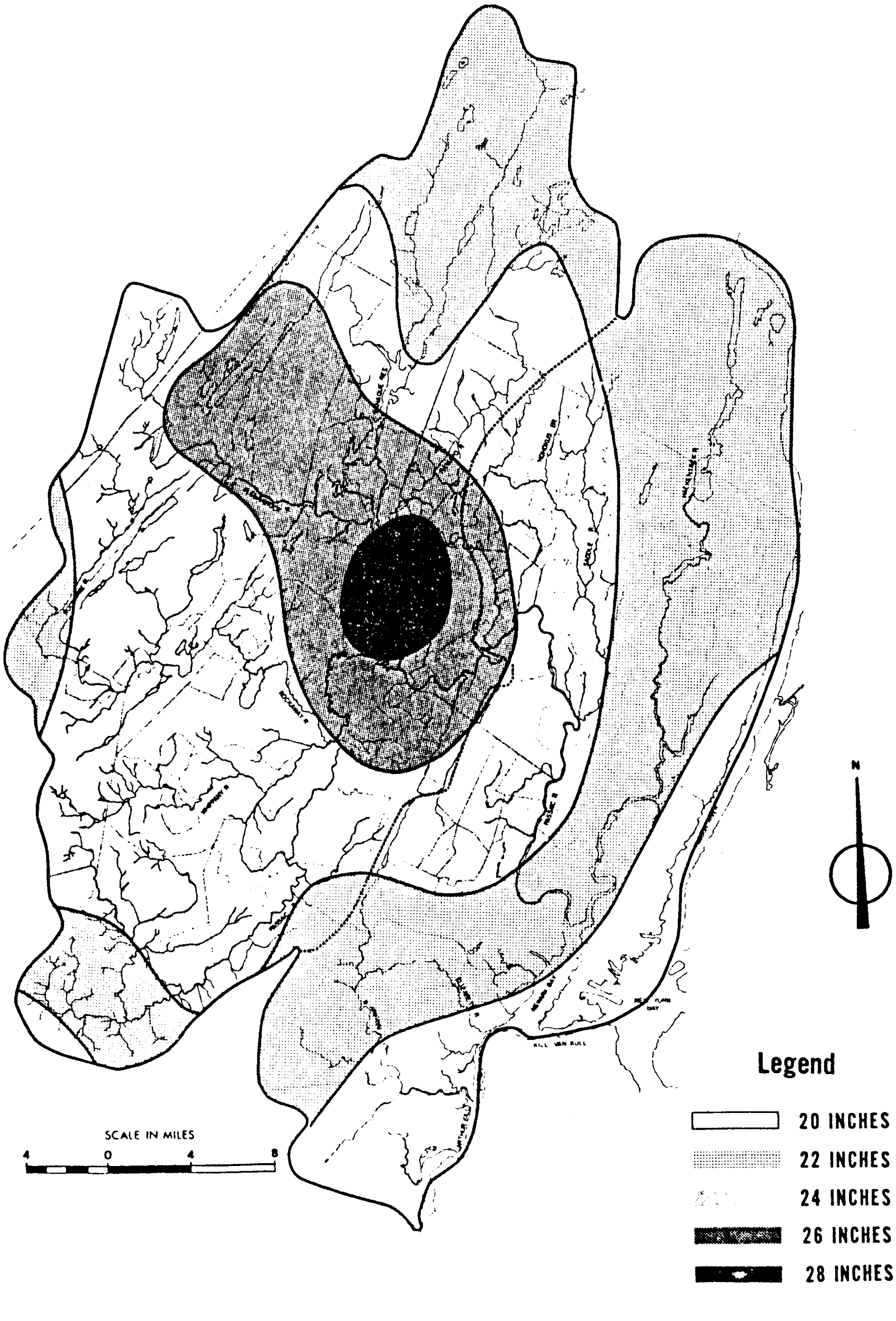
The low flow of most interest in water quality is the minimum average seven consecutive day low flow which occurs once every ten years (MA7CD10). Table III-1 presents a summary of MA7CD10 values, flow per unit area, and drainage area for various sampling stations in the study area. Figure III-3 pictorially summarizes low flow data.

III.A.3 Inventory of Water Resource Developments

Existing water resource developments and their associated environmental impacts on a regional water quality basis, especially surface and ground water development are discussed below. Table III-2 and Figure IV-4 list and illustrate the major surface water impoundments in the study area. The total storage capacity of these impoundments is approximately 70 billion gallons. The ground water section presents the geohydrologic information of the Northeast aquifers. The major water purveyors and water supply information is presented in Table III-3, while primary water use is summarized in Table III-4.

Figure III-2

AVERAGE ANNUAL RUNOFF, IN INCHES. 1931-60



Source: USGS 1972

TABLE III-1

STREAM FLOW SUMMARIES

River/Location	Drainage Area Sq. Mi.	Flow cfs	
		Flow/Unit Area (cfs/sq.mi.)	10-Year 7-Day Low Flow
Passaic River, Little Falls (0.6 mi. below Beatties Dam)	762	0.30	23.1
Saddle River at Ridgewood (Highway 17)	21.6	0.11	2.31
Ho-Ho-Kus Brook, Ho-Ho-Kus, N.J. (Maple Ave. Bridge)	16.4	0.20	3.26
Saddle River at Lodi (Outwater Lane Bridge)	54.6	0.23	12.6
Hackensack River at Riverdale (Westwood Ave.)	58.0	0.14	8.03
Pascack Brook at Westwood (Harrington Ave.)	29.6	0.27	7.9
Hackensack River at Milford (Below Oradell Dam)	120	0.042	5
Elizabeth River at Elizabeth	20.2	0.25	4.95
Rahway River at Rahway	40.9	0.11	4.46
Passaic River near Millington	55.4	0.026	1.4
Passaic River near Chatham	100.	0.031	3.1
Passaic River at Little Falls above dam [3]	762.	0.13	102.6
Passaic River at Little Falls below dam [3]	762.	0.030	23.1

Notes supplied with original table:

1. P indicates Partial Record Stations.
2. Data were compiled from statistical summaries of New Jersey Stream Flow Records and communication with USGS.
3. Flows indicate affect of PVWC withdrawal.

TABLE III-1 (Continued)

STREAM FLOW SUMMARIES

River/Location	Drainage Area Sq. Mi.	Flow/Unit Area (cfs/sq.mi.)	10-Year 7-Day Low Flow
Passaic River at Hanover (P)	128.	0.037	4.7
Passaic River at Dundee Dam (P)	806.	0.034	27.6
Dead River near Millington (P)	20.8	0.058	1.2
Whippany River at Morristown	29.4	0.26	7.6
Whippany River near Whippany (P)	48.5	0.27	13.1
Whippany River near Pine Brook (P)	68.5	0.25	17.
Black Brook at Mouth (P)	10.4	0.24	2.5
Troy Brook at Troy Hills (P)	10.1	0.26	2.6
Rockaway River above Boonton Reservoir	116.	0.12	14.4
Crooked Brook near Boonton (P)	7.9	0.23	1.8
Singac Brook at Singac (P)	11.1	0.40	4.4
Peckman River at West Paterson (P)	10.1	0.59	6.
Pompton River at Mouth (P)	372.	0.10	39.
Pompton River at Pompton Plains (P)	355.	0.10	36.

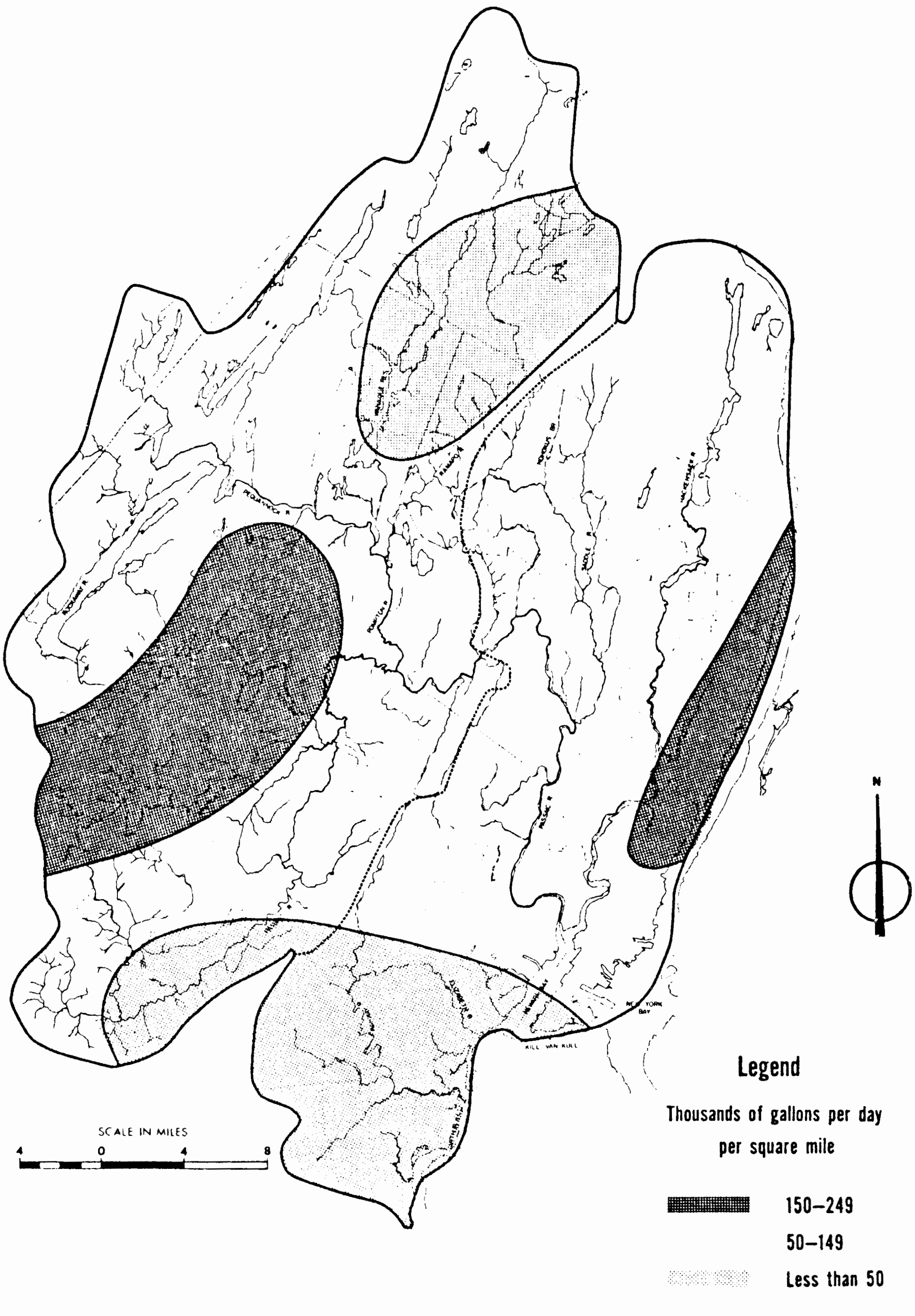
Notes supplied with original table:

1. P indicates Partial Record Stations.

2. Data were compiled from statistical summaries of New Jersey Stream Flow Records and communication with USGS.

Figure III-3

MINIMUM STREAMFLOW CONDITIONS



Minimum flow equal to or less than that shown occurs 5 percent of the time.

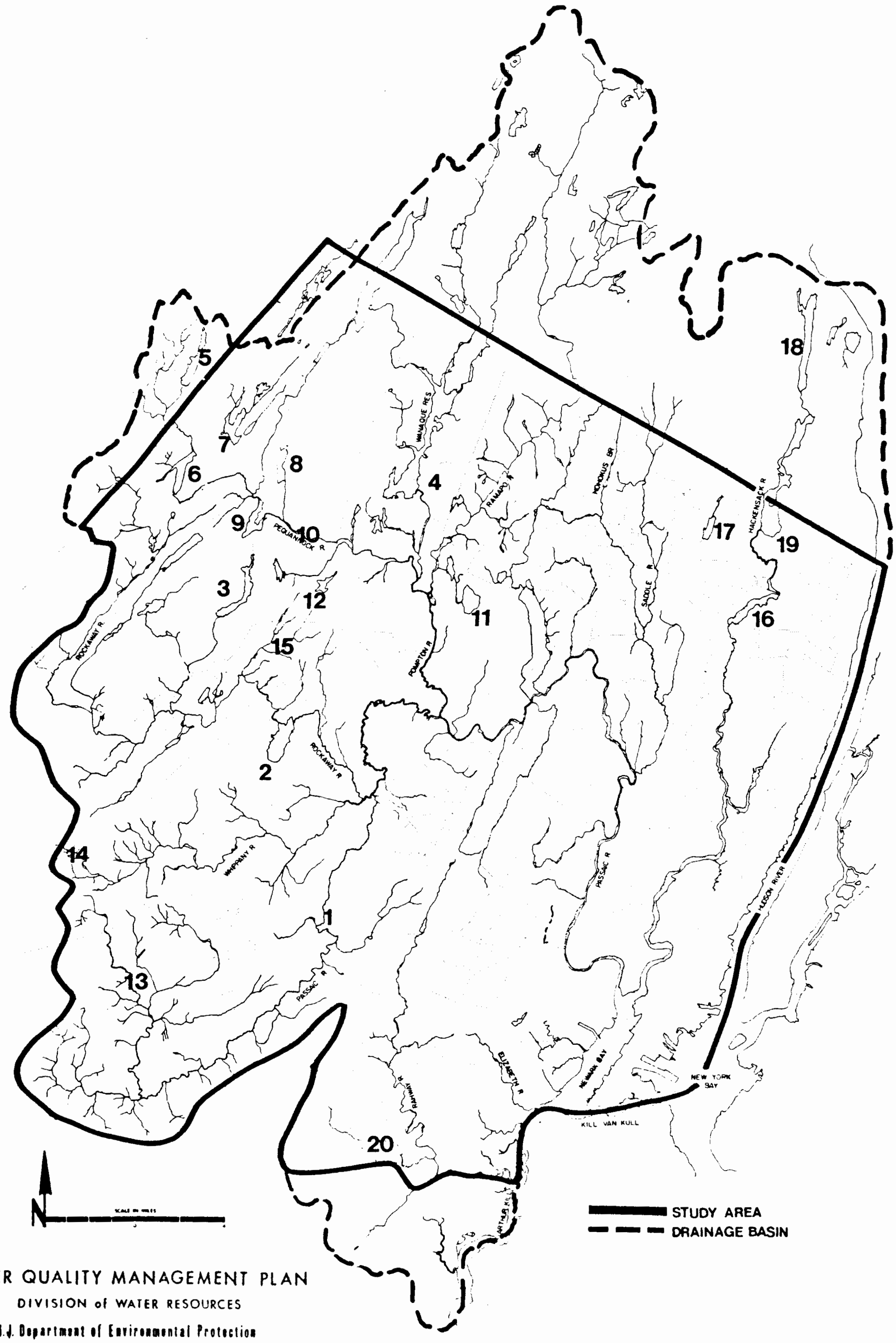
Source: USGS 1972

TABLE III-2

RESERVOIRS AND IMPOUNDMENTS

No.	Reservoir	River Basin	Capacity (bil.gal.)	Drainage (Sg. mi.)
1.	Canoe Brook	Canoe Brook	2.8	60
2.	Boonton	Rockaway	7.6	91
3.	Split Rock	Rockaway	3.3	5
4.	Wanaque	Wanaque	29.5	90
5.	Cannistear	Pequannock	2.4	6
6.	Oak Ridge	Pequannock	3.9	22
7.	Clinton	Pequannock	3.5	11
8.	Echo Lake	Pequannock	2.0	4
9.	Charlottesburg	Pequannock	3.0	18
10.	Macopin (Intake)	Pequannock	-	3
11.	Point View	Pompton	3.0	122
12.	Kikeout	Pequannock	0.9	5
13.	Osborn Pond	Passaic	0.01	10
14.	Clyde Potts	Whippany	0.4	2
15.	Taylortown	Rockaway	0.1	3
16.	Oradell	Hackensack	2.9	46
17.	Woodcliff Lake	Hackensack	0.9	20
18.	De Forest (NY)	Hackensack	5.6	27
19.	Lake Tappan	Hackensack	3.5	23
20.	Robinsons Branch	Rahway	0.3	22

Figure III-4 Reservoirs and Impoundments



WATER QUALITY MANAGEMENT PLAN

DIVISION of WATER RESOURCES

N.J. Department of Environmental Protection

Table III-3

MAJOR WATER PURVEYORS

Purveyor	Ownership	Counties Served	Population Served	Water Supply Source	Diversion & Purchase (1974 in MGD)	Rights
Commonwealth Water Company [1]	Private	Essex, Morris, Passaic Somerset, Union	277,300	Canoe Brook	1.263	10.5
				Passaic River	6.723	
				Wells	12.480	13.5
				Total Diverted	20.466	24.0
				Total Purchased	8.608	
				Total Demand	29.074	
Elizabethtown [1] Water Company	Private	Middlesex, Somerset, Union	524,600	Raritan River	71.623	78.0
				D&R Canal	20.567	29.0
				Wells	28.118	21.0
				Total Diverted	120.308	128.0
				Total Purchased	0.260	
				Total Demand	120.568	
Hackensack Water Company	Private	Bergen, Hudson	767,000	Hackensack River	83.204	82.0
				Saddle River	3.665	
				Hirschfeld Brook	0.342	
				Sparkill Creek	-	
				Wells	1.336	4.0
				Total Diverted	88.547	86.0
				Total Purchased	5.404	
				Total Demand	93.951	
Jersey City Water Department	Municipal	Bergen, Essex, Hudson	260,545	Rockaway Basin	64.526	65.0
Middlesex Water Company	Private	Middlesex, Union	175,000	Raritan River	-	10.0
				D&R Canal	19.925	10.0
				Robinsons Branch	-	4.0
				Wells	3.944	19.0
				Total Diverted	23.869	43.0
				Total Purchased	4.006	
				Total Demand	27.875	
Newark Water [1] Department	Municipal	Essex, Morris, Passaic, Union	603,200	Pequannock	74.219	50.0
				Wanaque Reservoir	30.695[2]	38.1[2]
				Total Diverted	104.914	88.1
				Total Purchased	9.471	
				Total Demand	114.385	
North Jersey District Water Supply Commission	See Note 3			Wanaque Reservoir	96.381	94.0
Passaic Valley Water Commission	Cities of Paterson, Passaic and Clifton	Bergen, Essex, Hudson Passaic	600,000	Passaic River	50.330	75.0
				Wanaque Reservoir	34.798[4]	35.5[4]
				Total Diverted	85.128	110.5

Notes: (1) Commonwealth, Elizabethtown, and Newark also supply water to the Freshwater Area

(2) The Wanaque Reservoir diversion and safe yield listed for Newark are also included in the figures given for the North Jersey District Water Supply Commission

(3) The North Jersey District Water Supply Commission operates the Wanaque Reservoir which is owned by the five (5) Municipalities listed below and the Passaic Valley Water Commission. Bayonne contracts for Wanaque water but is not an owner

Owner	% Ownership	Rights (MGD)	1974 Diversions (MGD)
Newark	40.50	38.07	30.7
PVWC	37.75	35.49	34.8
Kearny	12.00	11.28	10.7
Montclair	5.00	4.70	4.9
Bloomfield	4.00	3.76	4.2
Glen Ridge	0.75	0.70	0.7
Bayonne	-	-	10.4
		94.0	96.4

(4) The Wanaque Reservoir diversion and safe yield shown with PVWC is also included with the figures listed for the North Jersey District Water Supply Commission

Sources:

1) Quarterly Reports, Bureau of Water Resources, N.J.D.E.P.
2) Hordon, 1975
3) Country Water Supply Studies

TABLE III-4

SUMMARY OF WATER USE BY SEGMENT

		MGD Wells	MGD Surface
Mid Passaic (above Little Falls)			
Public		0.610	0.0
Private Registered		0.0	0.0
Industrial		0.0	0.0
	Subtotal	0.610	0.0
Pompton			
Public		10.075	198.955
Private Registered		0.011	0.0
Industrial		0.332	0.0
	Subtotal	10.418	198.955
Upper Passaic			
Public		30.800	33.155
Private Registered		0.384	0.0
Industrial		1.053	0.0
	Subtotal	32.237	33.155
Whippany/Rockaway			
Public		18.403	64.530
Private Registered		1.076	0.0
Industrial		1.541	1.630
	Subtotal	21.020	66.160
Hackensack			
Public		2.760	87.210
Private Registered		0.286	0.0
Industrial		0.170	1,958.790
	Subtotal	3.216	2,046.000
Hudson/New York Bay			
Public		0.0	0.0
Private Registered		0.0	0.0
Industrial		0.0	15.763
	Subtotal	0.0	15.763

TABLE III-4 (continued)

SUMMARY OF WATER USE BY SEGMENT

		MGD Wells	MGD Surface
Newark Bay			
Public		28.771	4.200
Private Registered		1.772	0.0
Industrial		2.700	1,612.991
	Subtotal	33.243	1,617.191
Mid-Passaic (below Little Falls)			
Public		9.335	1.410
Private Registered		0.308	0.0
Industrial		2.057	12.047
	Subtotal	11.700	13.457
Saddle River/Hohokus Brook			
Public		7.090	0.0
Private Registered		0.949	0.0
Industrial		0.220	0.0
	Subtotal	8.259	0.0
Lower Passaic			
Public		6.770	0.0
Private Registered		0.511	0.0
Industrial		10.498	108.611
	Subtotal	17.779	108.611
Total Study Area			
Public		114.614	389.46
Privated Registered		5.297	0.0
Industrial		18.571	3,709.832
	Total	138.482	4,099.292

This last table indicates the degree in which the waters upstream of Little Falls are utilized for potable supplies, while the downstream waters are mostly used for industrial water supply. The Hackensack River basin is the only major potable source downstream of Little Falls. The approximate amounts of potable water produced and transferred from one basin to another are presented in Table III-5.

All of the potable water which is imported to the urban centers is transferred via pipeline rather than stream channel. This has resulted in reduced stream flow. As indicated in III.A.2, this reduces stream assimilation capacity for natural and man-induced pollutants. Additionally, since the urban centers are located in the tidal portion of the study area the water is utilized and disposed of in these brackish or saline waters. At this point it is not practical to treat and reuse the water as a potable source. Therefore, a large portion of the water collected upstream of Little Falls is used only as a potable supply one time.

III.B. Surface Water

The surface waters of the study area are a vital resource for the residents and industries in the area. Their value for water supply, fishing, and recreation could conflict with their use as receiving bodies for industrial and sewage treatment plant effluents. It is therefore essential that due emphasis be placed on the protection of these waters.

III.B.1 Water Use Classifications and Criteria

In order to set quantifiable surface water quality goals, DEP developed the New Jersey Water Quality Standards in 1971. The standards classify the surface waters of New Jersey according to desired uses such as potable supply, shellfish harvesting, and propagation of fish. Table III-6 (Figure III-5) indicates the waterway classifications and designated uses associated with each. For example, a waterway classified FW-2, is a fresh water body with goals of potable supply, propagation of fish, and swimming. A waterway classified TW-3, is a tidal water body where the goal is maintenance of fish and biota, and use for boating ("Secondary Contact Recreation").

Fresh waters are also classified according to their ability to support trout. They may be classed either Trout Production, Trout Maintenance or Non-Trout waterways.

TABLE III-5

UPPER PASSAIC[1] POTABLE WATER DIVERSIONS AND TRANSFERS

	Well		Surface		Total	
	MGD	%	MGD	%	MGD	%
Amount transferred out of Upper Passaic	15	25	283	95	298	84
Amount remaining in Upper Passaic	45	75	14	5	59	16
Total transferred in Upper Passaic	60	100	297	100	357	100

[1]Upper Passaic refers to Passaic Basin upstream of Little Falls

Table III-6

N.J. DEP Surface Water Classifications

NJDEP Designated Water Use	FW-1[1]	FW-2	FW-3	FW-PB[2]	LMW-PB[3]	TW-1	TW-2	TW-3	TW-4
A. Major Freshwater Water Supply		X		X	X	X	X		
B. Shellfish Harvesting						X			
C. Propagation of Fish and Biota		X	X	X	X	X	X		
D. Maintenance of Fish and Biota		X	X	X	X	X	X	X	
E. Primary Contact Recreation		X	X	X	X	X			
F. Water Supply (other than A)		X	X	X	X	X			
G. Secondary Contact Recreation		X	X	X	X	X	X	X	
H. Industrial Use									X

1. These water shall be maintained as to quality in their natural state and shall not be subject to any man-made wastewater discharge.

2. Class FW-Central Pine Barrens.

3. Class Lower Mullica and Wading Rivers - Central Pine Barrens.

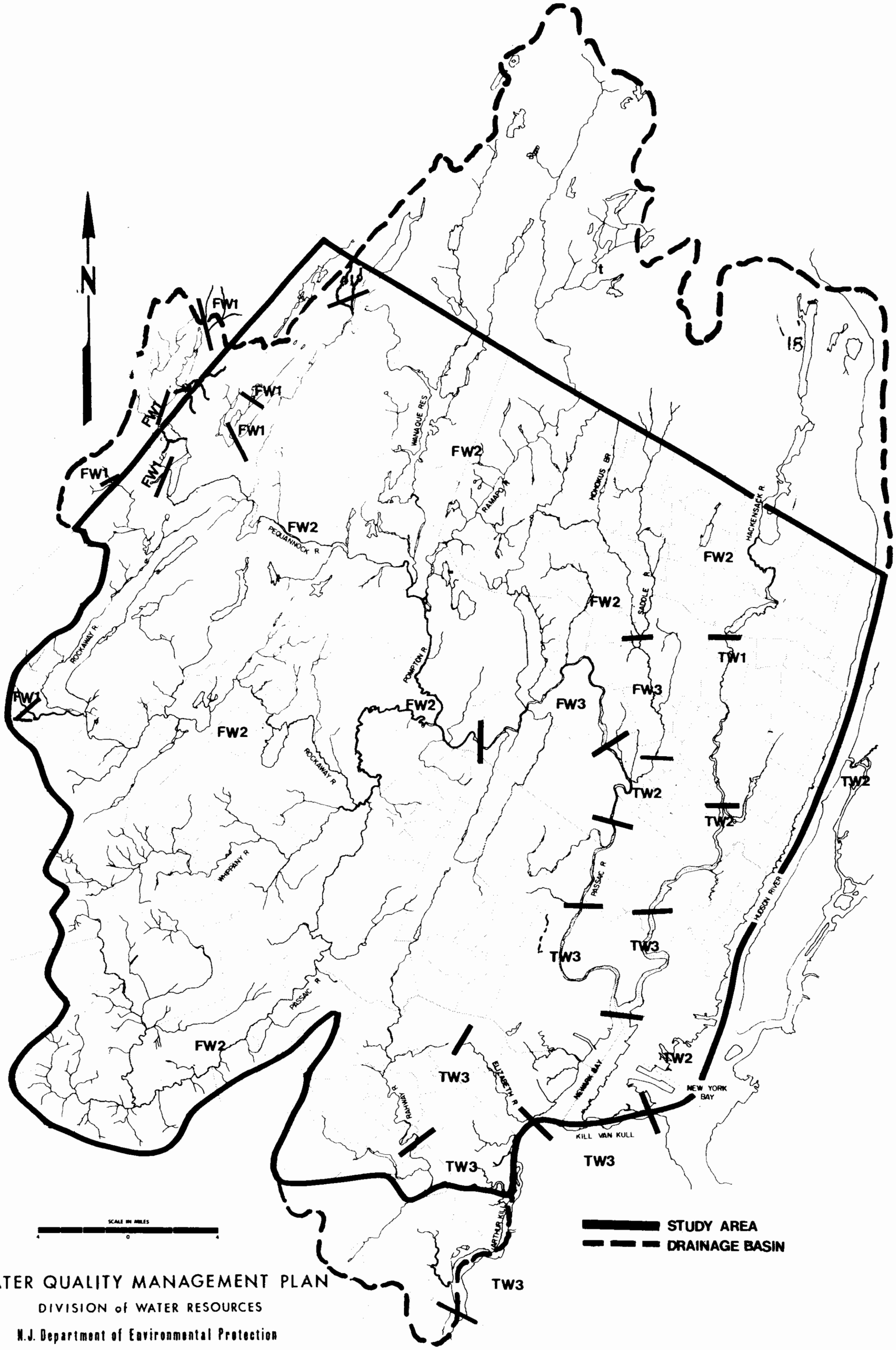
FW = Fresh Waters

TW = Tidal Waters

CW = Coastal Waters

Figure III-5

STREAM CLASSIFICATIONS



WATER QUALITY MANAGEMENT PLAN

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For each waterway classification, there are numerical water quality criteria, for quantifiable measures of water purity. The criteria are summarized in Table III-7. For example, for FW-2 waters the pH should range between 6.5 and 8.5, and turbidity (a measure of suspended solids) should not exceed 110 Jackson Turbidity Units. Fresh water criteria for temperature and dissolved oxygen vary according to trout classifications.

The criteria do not necessarily describe existing conditions in water bodies; they represent objectives for cleanliness to be achieved through administrative and enforcement mechanisms. In addition to the numerical criteria, there are stated standards for the additional parameters of radioactivity, taste and odor producing substances, toxic substances, and floating, suspended and colloidal solids.

USEPA has published criteria for a number of pollutants. In the absence of applicable State criteria, the federal criteria are used as guidelines by the State in assessing water quality.

The standards include an antidegradation policy, aimed at preserving existing water quality, particularly in high quality waterways. All waterways in the State are to be protected from degradation, unless degradation can be justified on the basis of economic or social needs.

The water quality standards are periodically revised. Revisions currently being developed are aimed at more nearly reflecting the goal of fishable and swimmable waters. Revisions will be made on the antidegradation and disinfection policies, and on certain criteria and stream classifications. These revisions are described in Section III.B.5.

Tables III-8 to III-10 specify the water quality classifications for the streams of the study area. A map of the area showing the water quality classifications is included as Figure III-5.

In the Northeast Study Area, only streams in the Passaic River Basin have been found suited for trout production or maintenance. The streams are listed in Table III-11 (Trout Production) and Table III-12 (Trout Maintenance). Streams not listed in either of these tables are considered unsuitable to support trout, but may be suited to supporting a wide variety of other fish species.

<u>Table III-7. New Jersey Surface Water Quality Criteria</u>
<u>Surface Water Quality Classification</u>

Parameter	FW2.P	FW2.M	FW2.N	FW3.P	FW3.M	FW3.N	FW-PB.N	LMW-PB.N	TW1.M	TW1.N	TW2	TW3	TW4	CW1	CW2
Dissolved Oxygen 24-hr. avg. mg/l minimum	--- 7.0	6.0 5.0	5.0 4.0	--- 7.0	6.0 5.0	5.0 4.0	85%[1]	85%[1]	6.0 5.0	5.0 4.0	--- 4.0	--- 3.0	--- 3.0	--- 5.0	--- 5.0
Turbidity 30-day avg. maximum J.T.U.	20 110	20 110	20 110	20 110	20 110	20 110	20	20	25 130	25 130	25 130	50 150	50 150	--- 10	--- 10
pH range, S.U. (except natural)	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	3.5 - 5.5	4.5 - 6.0	6.5 - 8.5	6.5 - 8.5	6.5 8.5	6.5 8.5	6.5 8.5	---	---
Fecal Coliform (log mean) MPN	200	200	200	200	200	200	200	200	200[2]	200[2]	770	1500	1500	50[2]	200[2]
Total Phosphorus as P, mg/l[3]	.05	.05	.05	.05	.05	.05	.23[4]	.23[4]							
Temperature change °F(°C)	1 (.6)	2 (1.1)	5 (2.8)	1 (.6)	2 (1.1)	5 (2.8)			2 (1.1)	1.5 (.8)[7]	1.5 (.8)[7]	1.5 (.8)[7]	1.5 (.8)[7]	1.5 (.8)[7]	1.5 (.8)
from ambient maximum °F(°C)		68 (20)	82 (27.8)[5]		68 (20)	82 (27.8)[5]			68 (20)	82 (27.8)[5]	82 (27.8)[5]	82 (27.8)[5]		80 (26.7)	80 (26.7)
Total Dissolved Solids	Not to exceed 500 mg/l or 133% of background			Not to exceed 133% of background			100	100	Not to exceed 500 mg/l for waters approved as sources of public water supply. Not to exceed 133% of background.						

P - Trout Production M - Trout Maintenance N - Non-Trout Waters

1. Percent (%) saturation of dissolved oxygen
2. Where harvesting of shellfish is permitted, requirements established by the National Shellfish Sanitation Program as set forth in its current manual of operations shall apply.
3. In impoundments or in a tributary at the point where it enters such bodies of water.
4. All surface waters
5. For small mouth bass or yellow perch waters.
6. For other nontrout waters.
7. June through August, during September through May-4°F (2.2°C)

Adapted from <u>N.J. DEP, 1974, Surface Water Quality Standards, amended, 1978</u>.

Table III-8

Water Use Classifications - Hackensack River Basin

<u>Class FW-1</u>

None

<u>Class FW-2</u>

Hackensack River Basin above Oradell Dam.

<u>Class FW-3</u>

Overpeck Creek and tributaries to tide dam and nontidal portions of tributaries to Hackensack River downstream from Oradell Dam.

<u>Class TW-1</u>

Hackensack River and all tidal portions of tributaries from Oradell Dam to confluence with Overpeck Creek.

<u>Class TW-2</u>

i. Overpeck Creek and tidal tributaries from tide dam to confluence with Hackensack River.

ii. Berry's Creek and all tidal tributaries to Hackensack River below its confluence with Overpeck Creek.

iii. Hackensack River main stem from Overpeck Creek to the confluence with Berry's Creek.

<u>Class TW-3</u>

Hackensack River main stem downstream of Berry's Creek.

Table III-9

Water Use Classifications - Hudson River, Kill Van Kull, Arthur Kill Basin

Class FW-1

None

Class FW-2

i. Rahway River and tributaries above Rahway Water Department intake downstream from the Rahway-Clark municipal boundaries.

ii. Robinson's Branch and tributaries above Middlesex Water Company intake at the reservoir dam.

Class FW-3

i. Elizabeth River and triburaries above Broad Street Bridge, Elizabeth.

ii. Nontidal tributaries to Morses Creek.

iii. Nontidal tributaries to Piles Creek.

iv. Rahway River below Rahway Water Department intake to head of tide (West Grand Avenue, Rahway).

v. South Branch Rahway River to head of tide (Hazelwood Avenue, Rahway).

vi. Robinson's Branch below Middlesex Water Company intake to head of tide (Hamilton Street, Rahway).

vii. Nontidal tributaries to Smith Creek.

viii. Nontidal tributaries to Woodbridge Creek.

ix. All other fresh, nontidal waters not mentioned herein.

Class TW-1

None

Class TW-2

i. Hudson River and its New Jersey tidal tributaries from a north-south line connecting Constable Hook (Bayonne, New Jersey) to St. George (Staten Island, New York) to the Bergen County (New Jersey) - Rockland County (New York) line.

ii. Arthur Kill and its New Jersey tidal tributaries between Outerbridge Crossing and a line connecting Ferry Point (Perth Amboy, New Jersey) to Wards Point (Staten Island, New York).

Table III-10

Water Use Classifications - Passaic River Basin Including Newark Bay

Class FW-1

Wanaque Watershed

i. A.S. Hewitt State Forest

(1) Cooley Brook, tributaries and Surprise Lake stituated wholly within the Hewitt State Forest boundaries.

(2) Green Brook, tributaries and West Pond situated wholly within the Hewitt State Forest boundaries.

Pequannock Watershed

ii. City of Newark Holdings

(1) Tributary to Pequannock River at Green Pond Junction.

(2) Cedar Pond, Hanks Pond and all tributaries thereto.

(3) Tributary to the Pequannock River joining the main stem 3500' $\pm$ southeast of the Sussex-Passaic County line, in the vicinity of Jefferson.

(4) Pascack Brook and tributaries thereto north of Canister Reservoir situated wholly within the boundaries of Newark Watershed.

(5) Cherry Ridge Brook and tributaries thereto north of Canistear Reservoir situated wholly within Wawayanda State Park and Newark Watershed boundaries.

(6) The southern branch of the easterly tributary to Canistear Reservoir.

(7) Pequannock River and tributaries thereto upstream from the confluence with Pascack Brook.

(8) Northwestern tributary to Oak Ridge Reservoir.

(9) Westerly tributary to lake Stockholm Brook situated wholly within the Newark Watershed boundaries.

(10) Lud-Day Brook downstream to its confluence with a tributary from Camp Garfield.

(11) Brook between Hamburg Turnpike and Williamsville-Stockholm Road, downstream to its confluence with Lake Stockholm Brook, north of Route 23.

<u>Rockaway Watershed</u>

iii.	<u>Berkshire Valley Fish & Game Tract</u>	Stephens Brook north of the Berkshire Valley Tract boundaries

<u>Class FW-2</u>

i. Main stream and all tributaries to the Passaic River above Passaic Valley Water Commission intake at Little Falls, except those waters designated as FW-1.

ii. Saddle River and tributaries and Ho-Hok-Kus Brook and tributaries upstream from the confluence of Saddle River and Ho-Ho-Kus Brook in the vicinity of the intake of the Hackensack Water Company.

iii. Haledon Reservoir and tributaries thereto.

<u>Class FW-3</u>

i. Saddle River and tributaries upstream from head of tide to its confluence with Ho-Ho-Kus Brook.

ii. Main stem and tributaries of Passaic River between Dundee Lake Dam and Passaic Valley Water Commission intake at the Little Falls.

iii. Nontidal tributaries to the Passaic River, below Dundee Lake Dam.

iv. Bound Creek upstream from head of tide and nontidal tributaries.

<u>Class TW-1</u>

None

<u>Class TW-2</u>

i. Passaic River upstream from confluence with Second River to head of tide at Dundee Dam.

ii. Tidal portion of Saddle River and all other tidal portions of tributaries to the Passaic River.

iii. Tidal portion of Bound Creek.

iv. All other tidal waters not mentioned herein.

Class TW-3

i. Newark Bay north of Central R.R. bridge crossing up to the mouth of the Passaic River and up to the mouth of the Hackensack River.

ii. Main stem of Passaic River from its mouth to point of entry of the Second River.

TABLE III-11

Trout Production Waters In The Northeast Study Area

Trout Production Waters - Waters that are used by Trout for spawning and/or nursery purposes during their first summer or which are considered to have high potential for such pending the correction of short term environmental alterations.

	Distance	Approx. Drainage Area. (Sq. mi.)
Pequannock River		
Clinton Brook (New Foundland)	Clinton Reservoir to Pequannock River	7.9
Cooley Brook (West Milford)	Entire length	2.0
Green Brook (West Milford)	Entire Length	1.3
Hewitt Brook (West Milford)	Entire Length	1.7
Kenouse Brook (New Foundland)	Entire Length	3.9
Pequannock River (Trib) (Jefferson)	Entire Length	2.3
Pequannock River (Vernon)	Source to confluence with Pascak Brook	
West Brook (West Milford)	Entire Length	1.9
	total	20.1
Ramapo River		
Bear Swamp Brook (Mahwah)	Entire Length	2.6
Clove Brook (Mahwah)	Entire Length	1.2
	total	3.8

	Distance	Approx. Drainage Area. (Sq. mi.)
Rockaway River		
Jackson Brook (Mine Hill)	Entire Length	5.3
Saddle River		
Saddle River (Upper Saddle River)	State line downstream to Bergen County Rt. 2 Bridge	11.3
Whippany River		
Harmony Brook (Brookside)	Entire length	2.6
Whippany River (Brookside)	Source downstream to Whitehead Rd. Bridge	3.5
Whippany River (trib.) (Brookside)	Entire Length	1.9
Whippany River (trib.) (Randolph)	Entire length	1.3
	total	9.3

Table III-12

Trout Maintenance Waters In The Northeast Study Area

Trout Maintenance Waters - Waters that in fact support trout throughout the year or which have high potential for such pending the correction of short term environmental alterations.

	Distance	Approximately Drainage Area (Sq. Mi.)
Passaic River		
Indian Grove Brook (Somerset in)	Entire Length	2.5
Passaic River	source downstream to Van Doren's Mill Pond	8.9
Primross Brook (Harding)	source downstream to Rt. 20 Bridge	2.0
	total	13.4
Pequannock River		
Canister Reservoir (Vernon)		
Charlottesburg Reservoir		56.2
Clinton Reservoir (West Milford)		
Macopin Brook (New Foundland)	Entire Length	.8
Pequannock River	confluence with Pascak Brook to Hamburg turnpike in Bloomingdale	81.3
Post Brook (Bloomingdale)	source downstream to Wanaque Reservoir	2.3
Oak Ridge Reservoir (Oak Ridge)		3.9
Rockaway River		
Green Pond (Rockaway Twp.)		
Jersey City Reservoir (Boonton)		

	Distance	Approximately Drainage Area (Sq. Mi.)
Hibernia Brook (Hibernia)	Entire Length	4.5
Russia Brook (Milton)	Lake Hartong dam downstream to lake Swannonoa	
Split Rock Reservoir (Rockaway Twp.)		
Saddle River		
Saddle River	Bergen County Rt. 2 Bridge downstream to Allendale Rd. Bridge	
Wanaque River		
Greenwood Lake		27.1
Ringwood Brook (Ringwood)	Entire Length	
Sheppard Cake		
Wanaque Reservoir		
Wanaque River	Greenwood Lake to Monk's Pond	

III.B.2 Surface Water Quality Assessment

This section highlights the surface water quality assessment of the Northeast Planning Area. Passaic river tributaries within Somerset, Morris, Passaic, Bergen, Essex, Union, and Hudson counties were studied, including: Whippany River, Rockaway River, Pequannock River, Wanaque River, Ramapo River and Pompton River.

The Hackensack River, Newark Bay, New York Bay, Kill Van Kull, Arthur Kill and their tributaries were also included in this assessment. Within the study area there are over 100 major lakes and ponds. It was found that the surface waters of the fresh water portion of the study area, based on the parameters examined, are generally of sufficient quality to be used as a source of potable water. Criteria for fishing and swimming are met only in a few locations, mostly in areas, isolated from the effects of development. The remainder of the study area, including the tidal portion, appears to have water quality below the standards for fishing and swimming.

a. Sources of Water Pollution There are two general categories of pollution sources: point and non-point. Generally, any wastewater discharge which is conveyed by some kind of watercourse (pipe, drainage ditch, channel) directly to a waterway can be considered to be a point source. Point sources include effluent emanating from municipal or industrial wastewater operations. While point sources are usually continuous (e.g. wasteflow discharges from a treatment plant), they can also be intermittent (e.g. storm sewer overflows, drainage ditch overflows and illegal connections to sewer systems.)

Non-point pollution sources cannot be as easily identified. They may be generated by diffuse runoff, seepage, percolation or even by disruption of pollutants already accumulated in a waterway. The Environmental Protection Agency (EPA) has delineated eight categories of nonpoint sources. They are: agricultural, silvicultural, construction and mining activities, urban runoff, sources affecting ground water, residual wastes disposal and hydrologic modifications.

Non-point source pollutants are generally delivered to the stream by either wind or water movement. Wind transports gaseous and particulate matter, releasing them both over land and water. During precipitation, atmospheric washout occurs, purging gases and particulates from the air and concentrating them in the rainfall. Rainwater falling upon the land also picks up the pollutants accumulated during the "dry" periods. Moreover, elements or compounds deposited in the sediment at the bottom of a waterway may be reintroduced through dredging or through disruptive natural physical and/or geological processes.

The water quality response of the water body to the combined impacts of both point and nonpoint sources is determined by its "assimilative capacity." This is the ability of the water body to reduce the pollutional constituents through physical, chemical or biological means. Each water body has a specific capacity to mitigate the effects of each pollutant, whether organic matter, nutrients, bacteria or toxics.

b. Watershed Characteristics The size of the drainage area is important in the analysis of pollutant loadings in a watershed. With all other conditions held equal, the quantity of runoff would be greater for watersheds with steeper slopes and greater drainage areas.

Flow rate is another factor which is critical to sediment transport and pollution assimilation. It depends upon a number of factors, such as the nature of precipitation, infiltration, antecedent moisture conditions, and physical characteristics of the watershed, including topography and shape of the drainage area. The low flow conditions of a watershed provide information for estimation of the assimilative capacity for the critical periods in a stream.

Land use patterns also play an important role in water quality, therefore, the land use characteristics of a watershed must be evaluated to relate size of drainage area and maximum and minimum flow, to the pollutant loads.

c. Typical Water Pollutants The most common water pollutants include organic matter, nutrients, toxics (including heavy metals) and bacteria. Decomposition of organic matter causes biochemical oxygen demand (B.O.D.), contributing to the depletion of dissolved oxygen (D.O.) in streams.

Dissolved oxygen is necessary to support aquatic life. BOD is present in all waters; in typical clean waters BOD levels are found below 5.0 mg/l. BOD may be higher without harm, provided that D.O. content is high enough to offset the depletion of oxygen. A typical clean stream should have a D.O. concentration of approximately 7.0 mg/l in the summer and about 12.0 mg/l in the winter. The oxygen holding capacity (saturation level) of water is dependent upon temperature. The ability of oxygen to be dissolved in water is reduced as temperature increases.

Nitrate, nitrites, and phosphorus are nutrients which, in high concentrations, can promote excessive growth of algae and other aquatic plants. Nitrates are found in relatively clean or undisturbed waters in concentrations of approximately 1.0 mg/l. Nitrite values are substantially less than those of the Nitrates, usually below 0.1 mg/l in uncontaminated waterways. Nitrites are produced as ammonia decomposes. Phosphorus concentrations, are extremely important, as they are generally the factor which limits growth of algal in fresh waters. Small amounts of phosphorus pollution tend to be used by plants as it is available, resulting in rapid algae and plant growth. In clean water phosphorus concentrations are generally below .05 mg/l.

Ammonia poses complex problems to aquatic biota because its toxicity depends on both temperature and/or pH. As temperature or pH rises the toxicity increases. Natural ammonia concentrations are usually below .1 mg/l, unless a marsh or swamp is present. Ammonia levels in those areas increase as rates of decomposition increase. Special analyses must be done to relate ammonia to these other factores in order to assess the importance of ammonia in a stream.

Other toxic materials include heavy metals which, although found in low concentrations in the water column, can build up in bottom deposits. Heavy metals can assumulate in tissues and organs of animals, where over long periods of time they can reach toxic levels. Other toxins include the chlorinated hydrocarbon complexes found in insecticides, pesticides and herbicides, which can be extremely harmful in even low concentrations. The heavy metals and toxic compounds are not components of natural waters and should not be present in any amounts.

Bacteriologic pollutants, as indicated by fecal coliforms, may pose serious health problems. Fecal coliform are however found naturally as a result of animals in their natural environment. A ratio of fecal coliform to fecal streptococci (fecal/strep) is used to indicate the origin of the fecal matter. It is suggested that a fecal/strep ratio below .7 is considered from a non-human warm blooded mammal source and if the ratio is above 4.0 a human source is indicated. If a value between these numbers is found it is undetermined as to the origin.

d. <u>Identification of Pollution Sources</u> It is a goal of a water quality management plan to identify all significant pollution sources, consider their potential for generating and delivering pollutants to the water bodies in the study area, and assess their impacts by comparing water quality data with the physical, chemical and/or biological limits in the State's water quality standards. The identification of pollution sources was accomplished by preparing inventories of both point sources (see Chapter V) and nonpoint sources (see Chapter VI). The information in the Point Source Inventory was extracted from a detailed computerized EPA file (STORET), as well as DEP files. The nonpoint source information was gathered from various agencies (N.E. Water Quality Management Study, 201 Facilities Plans, DEP Solid Waste Administration) (see Chapter VI-Nonpoint Source Control Plan).

e. Surface Water Sampling To assess surface water quality in the northeast area, data was obtained from many sources, ranging from governmental agencies (EPA, DEP, U.S.G.S.) to private water purveyors. An attempt was made to compare historical data with present conditions so that trends could be observed. Comparisons of segments of waterways were also attempted where data permitted. Most historical comparisons were preformed using past intensive surveys, which were normally performed during the summer months when the flow is at its minimum. Intensive survey data was not available for present conditions, therefore comparisons were made using similar monthly data. Data is collected by various agencies with varying frequencies of sampling. The United States Geological Survey (U.S.G.S.) samples monthly, taking between three and eleven samples each year (some months are sampled twice and sampling during the summer months occassionally is missing). Their sampling network consists of approximately one site per tributary of the mainstem of a river (see Figure III-6 for sampling site locations). The Passaic Valley Water Commission (P.V.W.C.) samples monthly on a regular basis, with major sites (intake and major tributaries) sampled daily. The Interstate Sanitation Commission (I.S.C.) and DEP data was based on intensive sampling performed in 1970 and 1973 for the upper and mid Passaic River (Weekly sampling for the months of July and August). Hackensack Water Company (H.W.C.) and Bergen County Utilities Authority (BCUA) both sample weekly with daily samples at major sites. Rutgers data was from sampling in 1977 (under a grant from the WQM Program) during the summer. One grab sample was taken from each site (see figure III-7) for sample site locations). A comparison of parameters tested for each data source is given in Table III-13. Additional compounds tested during the Rutger University toxic sampling program are listed below.

LAS	Dibromochloromethane	Lindane
Fluorides	Trifluoromethane	Aldrin
Cyanides	Carbon tetrachloride	Dieldrin
Dissolved Solids	1,2, dibromoethane	Heptachlor
Beryllium	1,2, Dichloroethane	Heptachlor Epoxide
Sodium	1,1,1, Trichloroethane	Toxaphene
Methylene Chloride	Vinyl Chloride	O,P'-DDE
Methyl Chloride	1,1,2,2, Tetrachloroethylene	P,P'-DDT
Methyl Bromide	O,M,P - Dichloro Benzene	P,P'-DDT
Bromoform	Diiodomethane	Methyoxchlor
Bromodicloromethane + 1,1,2 - Trichloroethylene	Polychlorinated Biphenyl	Mirex
1,1,2,2 - Tetrachloroethane	BHC - (alpha)	Endrin
1,1,2-Trichloroethane	BHC-B C-(beta)	Chlordane

The results of the toxic sampling program follow the surface water quality assessment.

TABLE III-13

WATER QUALITY PARAMETERS

	Sampling Agency					
Sampling Data	USGS	PVWC	ISC & DEP	HWC	BCSA	Rutgers
Parameter						
pH	X	X	X	X	X	X
Temperature	X	X	X	X	X	X
D.O.	X	X	X	X	X	X
B.O.D. (5 day)	X	X	X	X	X	X
C.O.D.	X[6]				X	
TKN	X		X			
Total Nitrogen	X					
Organic Nitrogen	X					X
Nitrate	X	X	X	X	X	X
Nitrite	X	X	X	X		X
Ammonia (total)	X	X	X		X	X
Phosphorus	X			X[9]		X
Ortho Phosphate	X[7]		X			
Total Phosphate	X			X[9]		
Total Organic Carbon	X		X			
Iron	X[7]			X[7]		X
Manganese	X[7]			X[7]		X
Chlorides	X	X		X	X	X
MBAS				X[7]		

TABLE III-13 (continued)

Sampling Data	USGS	PVWC	ISC & DEP	HWC	BCSA	Rutgers
Color		X		X	X	
Total coliform		X		X		
Fecal Coliform	X				X	X
Fecal Streptococci	X					
Turbidity	X	X			X	
CO_2	X	X				
Copper	X[7]			X[7]		X
Odor		X		X[7]		
Alkalinity	X	X		X	X	X
Hardness	X[7]					
Dissolved Solids	X					
Arsemic	X					X
Berellium						
Chrominum	X					X
Cadmium	X					X
Mercury	X					X
Nickle						X
Lead	X					X
Zinc	X					X
Silver						X
Selenium						X
Conductivity			X			
Time of Sample	X		X	X		
Flow	X	X[2]	X	X		
Suspended Solids	X[7]			X		
Sulfate						X

Key

1. USGS - United States Geological Survey

2. PVWC - Passaic Valley Water Company

3. ISC - DEP - Interstate Sanitation Commission and NJ Dept. of Environmental Protection Intensive Survey - (Summer 1973).

4. HWC - Hackensack Water Company

5. BCSA - Bergen County Sewage Authority

6. COD used when B.O.D. not given

7. Not tested regularly

8. At Little Falls

9. Dependent upon year sampled after Jan. 1977 recorded as phosphorus (as P).

f. Biomonitoring In addition to data available for pollutants, some of the results of the DEP biomonitoring program were used. The biota present in a water body are an important indicator of water quality conditions. The presence of a significant number of pollution tolerant species would indicate polluted conditions. Conversely, the dominance of species unable to tolerate pollution would indicate good water quality.

Thirty stations in New Jersey have been selected by DEP to be part of a network designed to evaluate the biological integrity of the Nation's waters. Six stations were selected in the Northeast Study Area. Periphyton, phytoplankton and macroinvertebrates were sampled in this program.

g. Methodology for Surface Water Quality Assessment Data on the major parameters was compiled to prepare a water quality assessment. The following parameters were used: Dissolved oxygen (D.O.), Biological Oxygen Demand (B.O.D.), Nutrients (Phosphorus (as P), Nitrate, and Nitrites), Ammonia (un-ionized), and Fecal Coliform. A present day profile of water quality was attemped with available data (1976, 1977) for each sampling site. The data was also evaluated to assess trends within river segments, as well as water quality changes which have occurred over approximately the last 10 years.

The format utilized in the following surface water quality description consist of:

- i. Description of each watershed
- ii. Water quality findings (chemical, bacteriological, biological).
- iii. Summary

Figure III-6 Surface Water Sampling Sites

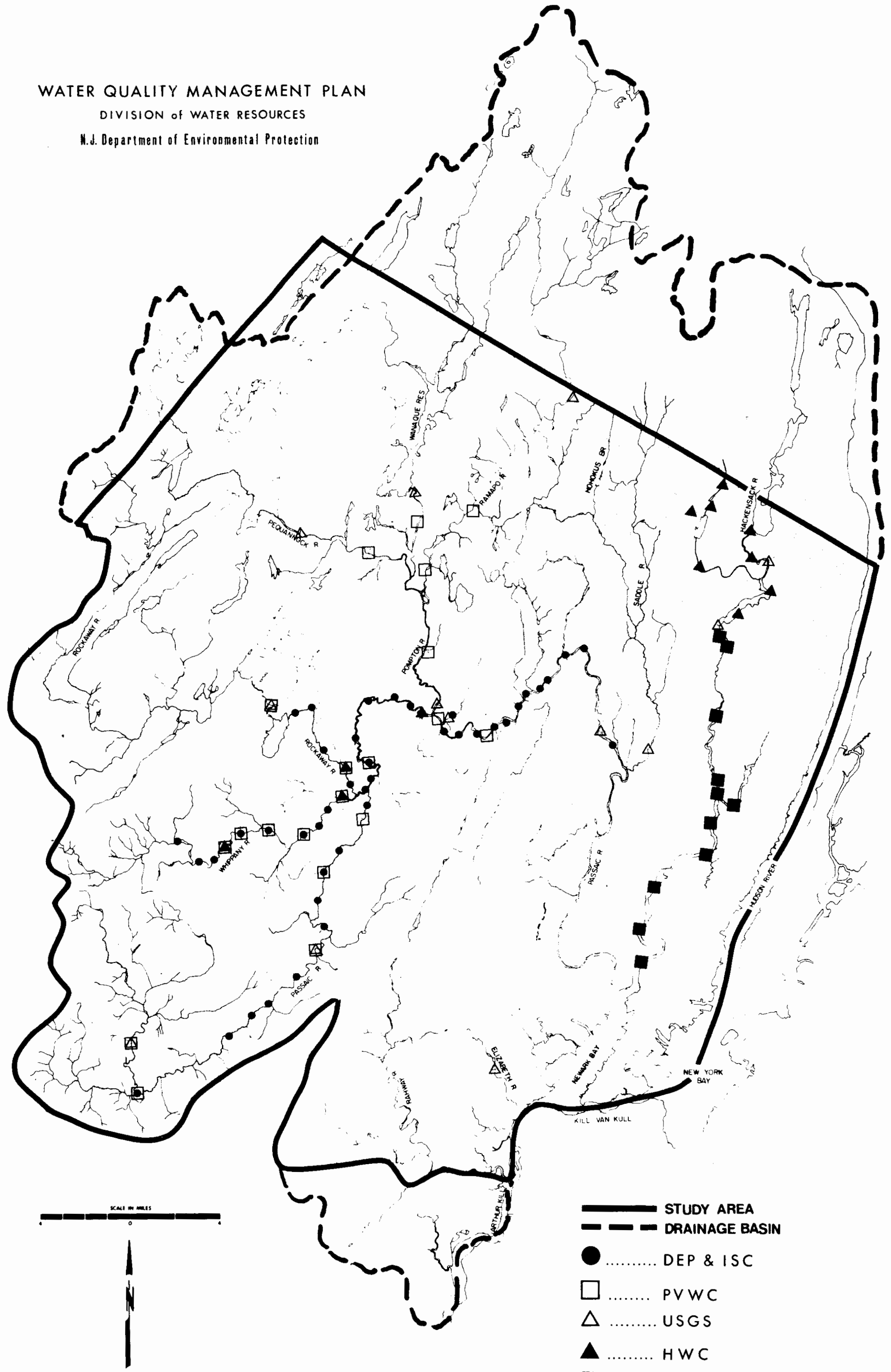
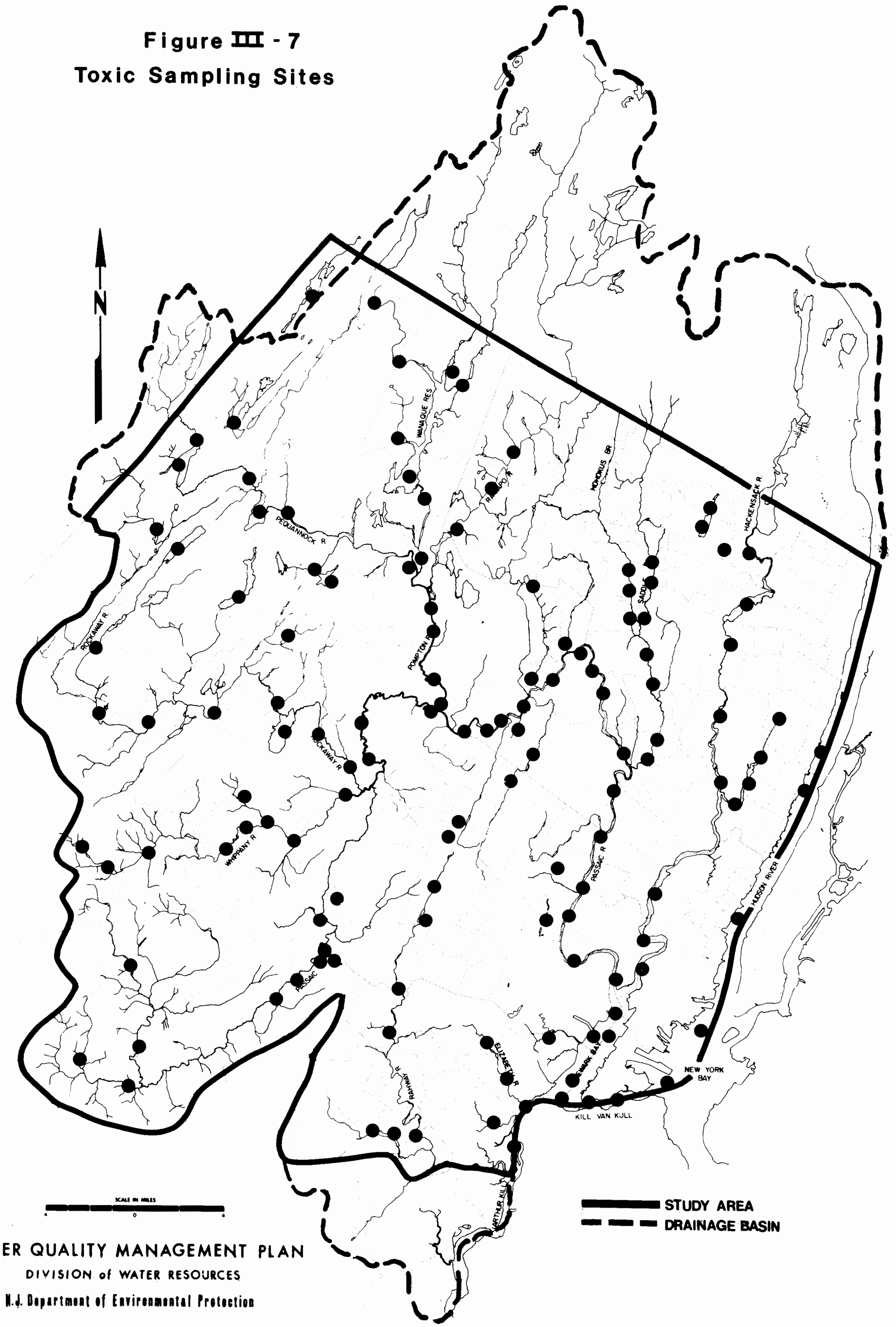


Figure III - 7
Toxic Sampling Sites



WATER QUALITY MANAGEMENT PLAN

DIVISION of WATER RESOURCES

N.J. Department of Environmental Protection

h. Segment Water Quality Assessment

Upper Passaic

Description The headwaters of the Upper Passaic originate near Washington Corner and Morristown National Historical Park and flow south through the Great Swamp east of Basking Ridge. Most of the headwaters area is undeveloped with pockets of development around Basking Ridge and Millington. After the confluence with the Dead River, the river bends northeast toward Chatham dividing a low density suburban area. The river borders the Town of Chatham then meanders north through marsh areas until it joins the Whippany/Rockaway Rivers at Hatfield Swamp. The total drainage for the Upper Passaic area, source to the confluence of the Whippany, is approximately 135 square miles. Over 40 point sources discharging 19.1 MGD are located in this segment. Some of the major discharges are Bernards, Madison-Chatham, Livingston and Florham Park. Potable water supply is the highest priority for water usage. Other benefits include canoeing, fishing, and the potential for swimming.

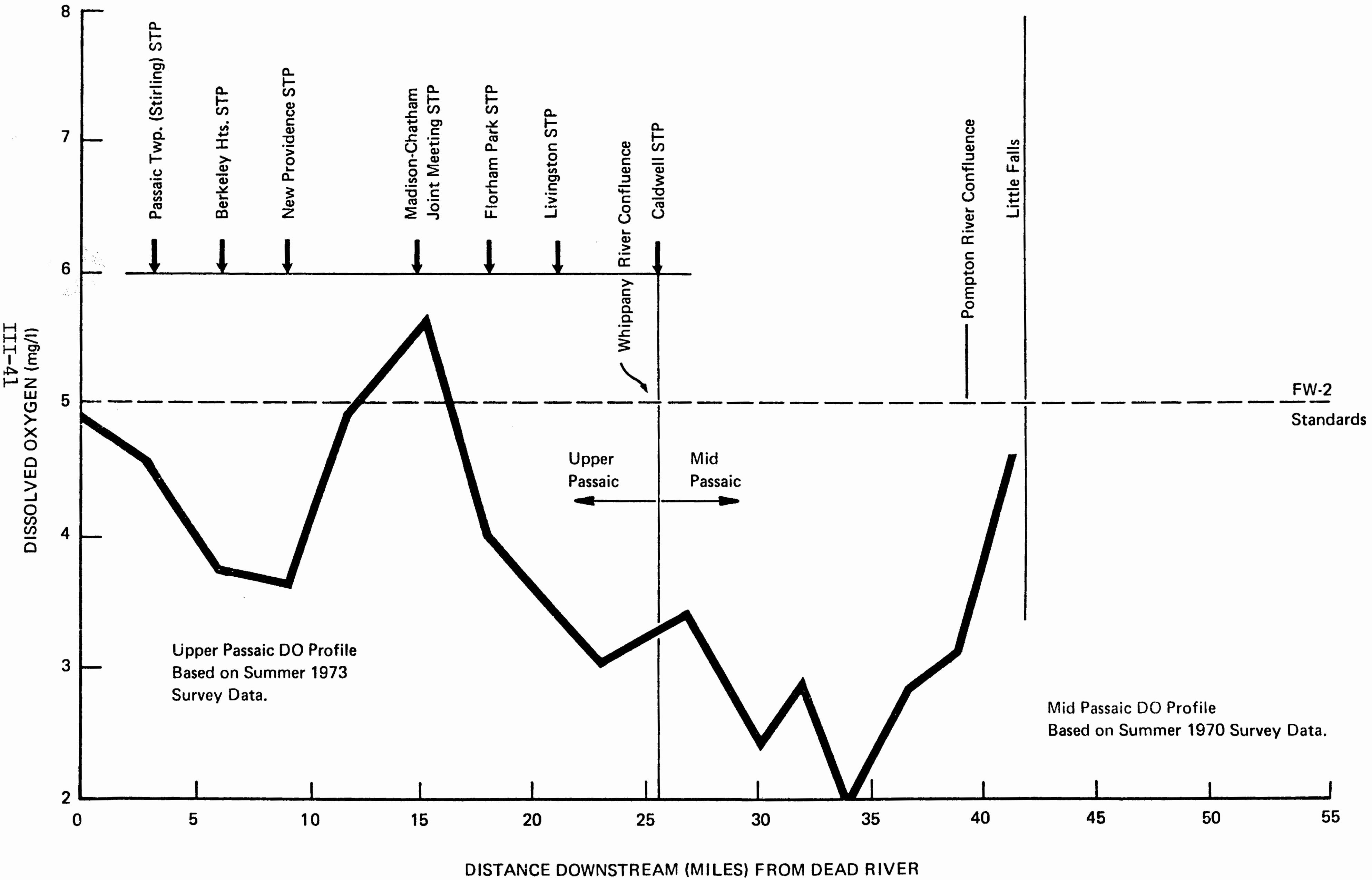
The entire length is classified as FW-2 with parts of the headwater as trout maintenance (see water use classifications and criteria). Near the headwaters Commonwealth Water Company withdraws from Osborn Pond in Bernards. The company also maintains three off-channel reservoirs at Millburn, Canoe Brook, and Livingston. The main stream is also used by Passaic Valley Water Company at Little Falls.

Dissolved Oxygen - An intensive survey conducted by DEP in 1973 (Figure III-8) indicated Dissolved Oxygen (D.O.) levels near or below state standards (range, 1.8 mg/l-6.20 mg/l). More recent data, though not based on intensive sampling, do suggest an improvement. Data taken during the summer period (1976-77) still show low D.O. concentrations but not as many violations. Yearly ranges for recent years (1976-77) are 2.4 mg/l to 12.1 mg/l.

Biochemical Oxygen Demand - The 1973 intensive survey data shows BOD_5 ranging from 1.0 mg/l to 9.0 mg/l. The most recent 5 years of data suggest an improvement in water quality, similar to the D.O. analysis. USGS data shows a relationship between flow (cfs) and BOD (conc.). As flow increases BOD rises, which seems to indicate the likelihood of significant non-point sources.

Figure III-8

DO PROFILE FOR FRESHWATER PASSAIC RIVER



Nutrients - The 1973 intensive survey indicate phosphorus concentration of .1 mg/l, equalling the Federal recommendations for free flowing streams or rivers. More recent data sources indicate an increase in the concentration of phosphorus with values of .25 mg/l toward the confluence of the Rockaway River. Both intensive (1973) and recent data sources confirm nitrate levels of below 1.0 mg/l, well within the potable water standards.

Ammonia - The 1973 intensive survey found all ammonia (un-ionized) values to be in compliance with EPA recommended levels. However recent data sources indicate violations of these EPA limits (.02 mg/l un-ionized ammonia). These high concentrations are mostly due to point source contributions with minor loads from biological decompostiion. In addition to toxic effects on aquatic organisms, these high concentrations contribute to the oxygen demanding materials lowering the D.O.

Fecal Coliform - Limited data was available for fecal coliform. All stations exceed State criteria with the exception of the Dead River, where PVWC data was in compliance with State standards. The two sample sites on the main stem suggest a trend, with Fecal Coliform levels increasing downstream. Fecal coliform to Fecal streptococci ratios (less than .7) from USGS stations (Millington and Chatham) indicate non-human sources as the major contributor for the fecal loadings.

Summary - The Upper Passaic waters generally are of poor water quality with exception of the headwater which appear to have substantially better water quality. However, data for the headwaters section was extremely sparse and judgements are based partially upon trout water classifications. Low D.O., high ammonia, phosphorous and fecal coliform prevent most of the waters from meeting Federal fishable and swimmable goals. Domestic point source loadings are the major causes of D.O. consumption and ammonia. However, non-point source BOD loadings, during rainfall also are heavy contributors while non-point sources of suspended solids and nutrients are secondary compared to point sources (see Chapter VI).

Whippany River

Description - The Whippany River, located entirely within Morris County, has a drainage area of 72 square miles. The headwater reaches of the river consist of rapidly moving stretches with small pools and eddies. The Whippany widens downstream forming a slow meandering river. The river is interrupted just above Morristown by two small lakes, Speedwell and Pocahantas. Marshland, including Troy Meadows and Black Meadow, border the lower reaches in the vicinity of Hanover, East Hanover and Parsippany-Troy Hills.

The various land uses in the basin add to the water quality problems of the area. The headwater areas of the Whippany are rural, with water quality exceeding minimum state water quality standards. The Clyde Potts Reservoir, which serves Morristown is located on the headwaters of the Whippany River. Urban and heavily suburbanized areas, such as Morristown and Parsippany-Troy Hills, are located further downstream. The more intensively developed areas are associated with services and utilities needed to support this development including sewerage systems, land fills, commercial centers and industry. There are five major wastewater treatment facilities in the area; Morris-Butterworth, Morristown, Hanover, Parsippany-Troy Hills and Whippany Paperboard, discharging approximately 26 MGD. Sharkey's landfill encroaches on the banks of the river at the confluence of the Whippany and Rockaway Rivers. The combination of these land uses and point source discharges has resulted in water quality degradation below State standard for a number of parameters below Morristown.

The Whippany River is classified as an FW-2 stream which includes such uses as swimming, fishing, boating and potable water supply. The water quality degradation has severly limited the intended uses in the lower reaches of the River.

Dissolved Oxygen - The 1973 intensive sampling program by DEP established the D.O. profile in Figure III-9 from Speedwell Lake to the confluence with the Passaic River. The profile shows a decline in D.O from the Morristown sewage treatment facility to the confluence with the Rockaway River with standards being contravened approximately four miles below Morristown.

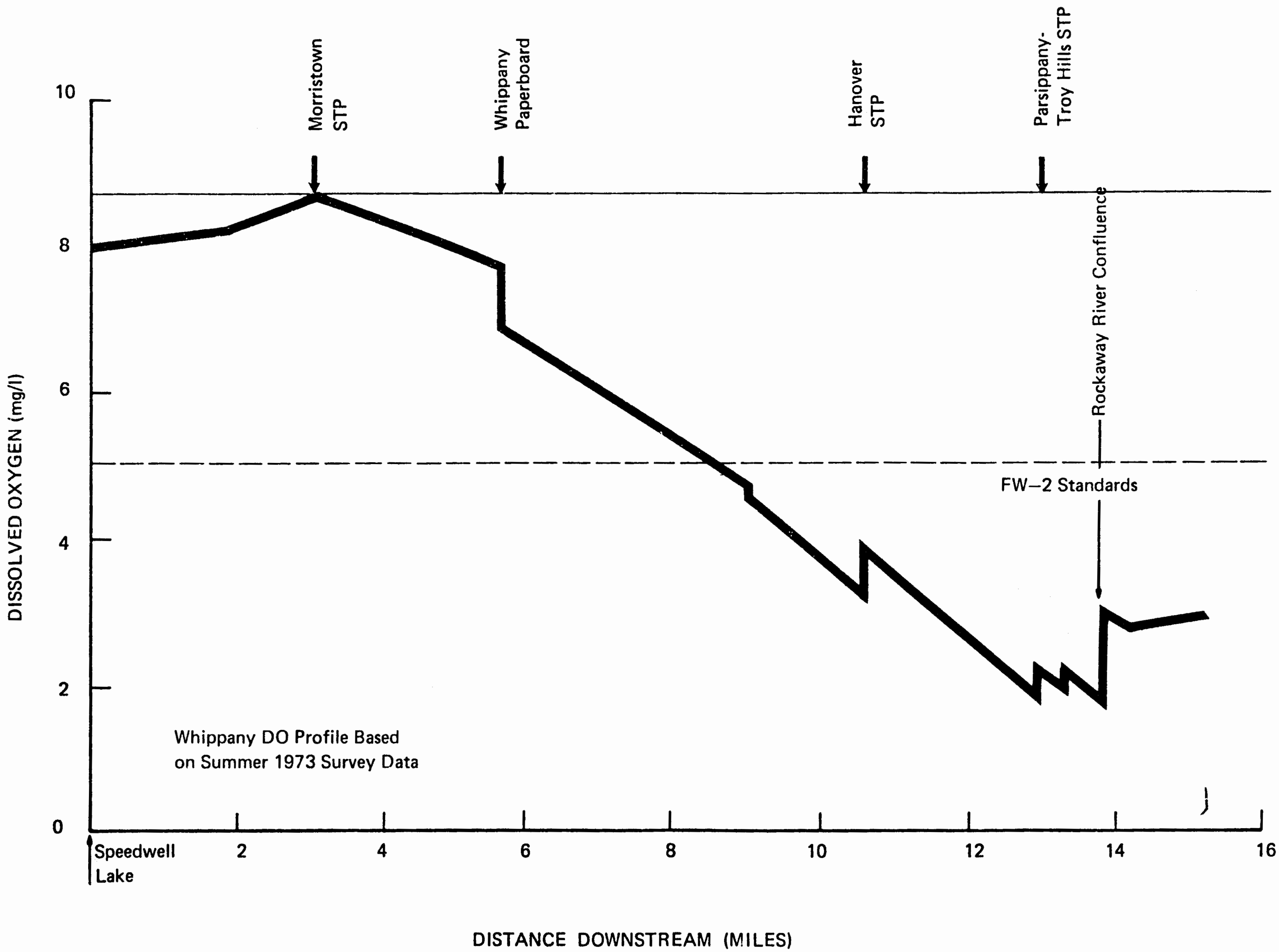
Recent grab samples, confirms these results for the river segment below Speedwell Lake. The data does suggest some improvement of D.O. near the confluence with the Rockaway River; however standards were still being violated. Both historic records and the recent sampling program indicates that the river segment above Speedwell Lake has D.O. levels well above standards, ranging from 6.0 mg/l to 9.0 mg/l during summer months.

Biochemical Oxygen Demand - The 1973 intensive survey data indicates that the BOD_5 below Speedwell Lake, ranging from 1 mg/l to 18 mg/l, is above that which would be considered an appropriate level for a relatively unpolluted stream. The headwaters of the Whippany have BOD_5 levels that are generally below 5 mg/l indicating a relatively unpolluted condition.

Historical data from PVWC collected for the years 1963 to 1977 show an improvement of the yearly average BOD_5 values, from 30 mg/l to 6.0 mg/l respectively. This data, though

Figure III-9

DO PROFILE FOR WHIPPANY RIVER



encouraging, must be analyzed with some consideration of when the data was taken. During the mid 1960's a severe drought affected the Northeast, practically drying up the Whippany and therefore greatly increasing pollutant concentraton. In addition, Whippany Paper Board has greatly increased the treatment of wastewater since 1963.

Nutrients - The 1973 data indicated that total phosphorus coming out of Speedwell Lake averaged .06 mg/l and above the state standard of .05 mg/l for the inlet of a lake. Data collected by DEP in 1977 and 1978 for intensive lake studies show levels of phosphorus of .47 mg/l coming into Speedwell Lake and concluded that the lake was eutrophic. Below Speedwell lake, the results of other sampling programs show total phosphorus level ranging from .05 mg/l to 1.0 mg/l which are above the EPA recommended limits for a free flowing stream.

Nitrate levels were found to range from approximatley .5 mg/l to 3.0 mg/l which are within water quality standard for potable water.

Ammonia - The 1973 intensive survey did not show levels of ammonia to be toxic in the Whippany. Data collected during 1976 and 1977 did however show a number of violations of EPA recommended toxic limits of .02 mg/l of un-ionized ammonia.

Fecal Coliform - The 1973 data indicated that the lower reaches of the Whippany River violated fecal coliform standards, the averages of more recent data indicate no improvement in this situation. The fecal coliform to fecal streptococci ratios indicate that the source of pollution is most probably human.

Summary

The water quality for the Whippany River is good for the upper segment above Morristown and fair to poor for the lower portion. The upper segment appears to meet federal fishable and swimmable goals, while the lower segment has been greatly degraded. Low D.O. and high BOD, ammonia, phosphorus and fecal coliform result in failure to meet Federal water quality goals.

The analysis comparing point source loadings to non-point source loadings suggest that point sources are the major cause of the water quality problems in the segment.

Rockaway River

Description - The headwaters of the Rockaway River are located in the Bear Fort and Green Pond Mountains. After flowing south through Jefferson Township the Rockaway turns east and continues on to its confluence with the Whippany

River. The drainage area of the Rockaway River is 133 square miles. The basin contain numerous natural and man made lakes. There are also several reservoirs in the basin of which the Jersey City Reservoir is the largest.

Above the Jersey City Reservoir the basin is mostly suburban with some areas, such as, Boonton Town and Dover being more densely developed. Below the Reservoir Parsippany-Troy Hills has been developing numerous office and industrial parks along with its residential areas. There are approximately 35 municipal and industrial dischargers in the basin. The major dischargers include High Ridge Sewage, Picatinny Arsenal, Rockaway Valley Regional S.A. (RVRSA) and Howmet Corporation. The total wastewater discharged into the Rockaway River is 9.3 MGD, with 6.6 MGD being discharged by RVRSA below the Jersey City Reservoir. The water quality above the Reservoir is of fairly high quality while below the Reservoir and RVRSA outfall the water quality declines.

Almost the entire length of the Rockaway River is classified as FW-2 (Jackson Brook being trout production), except Steven Brook which is classified as FW-1 (see water use classifications and criteria). These waters are utilized for swimming, fishing, boating, and potable water supply. There have been some instances of beach closing on the Upper Rockaway due to high bacteria levels.

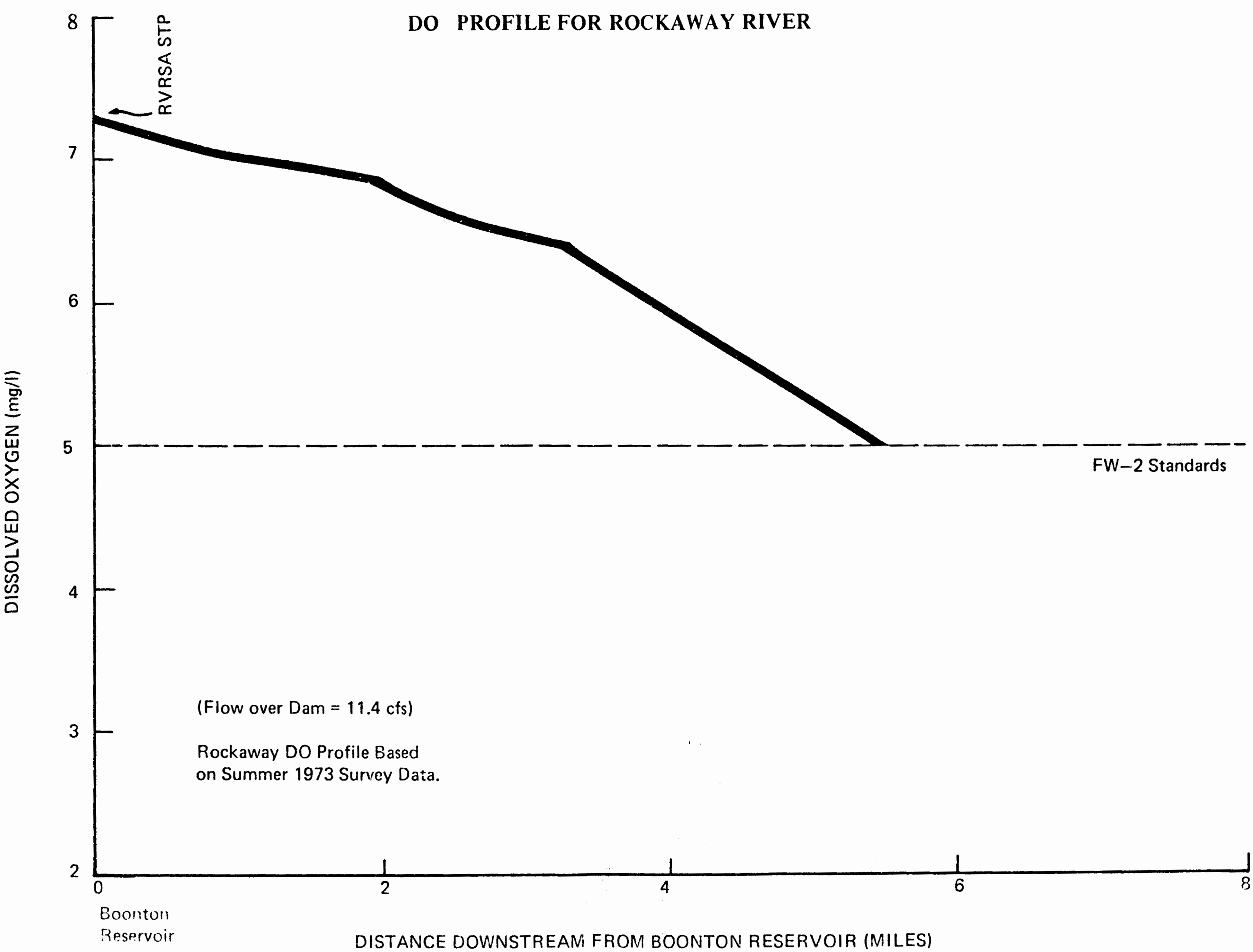
Dissolved Oxygen - Most of the data available for the upper reaches of the Rockaway River above Boonton Reservoir is from a one event sampling program in August 1977. Dissolved Oxygen (D.O.) for this area ranged from 7.0 to 15.8. Historical and recent data from the headwaters of the Boonton Reservoir reveal that the D.O. concentrations have not changed significantly.

The 1973 intensive survey for the lower Rockaway River shows a constant decline of D.O. from the Rockaway Valley Sewage Authority to the confluence of the Whippany River. As presented by Figure III-10, the average D.O. level near the confluence of the Whippany approached the water quality standards. Individual samples taken in 1973 and historic and recent data taken during the summer months, indicate D.O. ranging from 3.84 mg/l to 7.98 mg/l.

Biochemical Oxygen Demand - Above the Boonton Reservoir, B.O.D. levels range from .8 mg/l to 4.3 mg/l, with agreement between historic and recent data sources. Below the reservoir, the 1973 intensive survey found BOD to range from 1.0 mg/l to 9.0 mg/l. Recent data sources indicate slightly higher levels of B.O.D. than in the past. Average values in the Boonton Reservoir outlet are 1 mg/l. BOD concentrations rise sharply after the RVSA discharge.

Figure III-10

DO PROFILE FOR ROCKAWAY RIVER



Nutrients - Phosphorus (as P) levels above the Boonton Reservoir from 1977 DEP sampling program range from .01 mg/l to .09 mg/l with 25% (eight stations total) exceeding State standards for inlets to lakes. Historical data was not available for these sites. Beyond the reservoir, concentrations increase significantly, rising 210%. Historic data show concentrations in this segment ranging from .155 mg/l to 2.86 mg/l. The average from recent data is .69 mg/l (range .08 - 2.4). Both sampling sequences (past and present) reflect phosphorus levels well over EPA recommended criteria for free flowing streams.

Nitrate levels were found to range from approximately .2 mg/l to 3.7 mg/l with the higher values found below Boonton Reservoir. These values are within water quality standards for potable water.

Ammonia - Data for the Rockaway River above Boonton Reservoir indicates that there is no violation of the EPA recommended toxic limits of .02 mg/l of un-ionized ammonia. Below the Reservoir, historic and recent sampling programs indicate levels of un-ionized ammonia approaching the EPA recommended limit (0.019 mg/l).

Fecal Coliform - The geometric mean for fecal coliform levels above the reservoir for 1977 and 1976 are 125 MPN and 402 MPN respectively. The 1977 data meets the state criteria (200 MPN) while the 1976 data did not. Sources of contamination are uncertain as the fecal strep ratio proved inconclusive. Below the reservoir as was previously found, 1977 levels met state standards where 1976 failed to comply. Fecal streptococci ratios also proved uncertain as to its source. Historical data was not available.

Biological Monitoring - Biological monitoring (1977) was conducted on the Rockaway River only at one site, Morris Ave, which is located above the Reservoir. It was presumed that this segment was in a relatively healthy state after an analysis of the predominant organisms found.

Summary

The water quality of the Rockaway River is generally good for the upper segment above the Boonton Reservoir. The segment below the reservoir is moderately polluted. The upper segment, although limited data exists, appears to meet federal fishable and swimmable goals. The lower segment however, fails to comply with these federal goals having low D.O., high ammonia, BOD, fecal coliform and phosphorus. The Rockaway Valley Regional Sewage Treatment Plant and industries on the rivers tributaries (Crooked Brook) account for the degraded conditions.

Pequannock River

Description - The Pequannock River originates in Sussex County and flows east forming the boundaries of Morris and Passaic counties, then meanders south to its confluence with the Wanaque River. The Pequannock continues its southerly course until it joins the Ramapo, forming the Pompton River. The drainage area of the basin is approximately 90 square miles.

The headwaters of the Pequannock watershed has numerous lakes, ponds and reservoirs. The City of Newark owns 63.7 square miles of the watershed and has four reservoirs that are utilized for the city's water supply. As would be expected the water quality in this mostly undeveloped area exceeds the state water quality standards.

The major developed areas within the basin begin around Butler and Bloomingdale and continue down to Pompton Lakes. The water quality in this area is adversely affected by this development and the discharges from the municipal and industrial facilities. The Butler-Bloomingdale wastewater treatment facility is the largest plant in the watershed discharging over 2 MGD of sewage.

The majority of the rivers waters are classified as FW-2 with a few sections being FW-1. Segments of the river are classified as trout production and trout maintenance (see water use classifications and criteria). These waters are utilized mainly for fishing and potable water supply.

Dissolved Oxygen - Historical data for the lower segments of the river indicate dissolved oxygen concentrations from 1963 to 1977 having a range of its means between 10.0 mg/l to 11.1 mg/l. Although limited for the headwaters region, recent data confirm high quality water with no violations of the D.O. criteria.

BOD - Historical BOD_5 means range from 3.2 mg/l to 4.6 mg/l, with no data available for the headwaters region. Recent data is consistant with past water quality records. The Bloomingdale-Butler sewage treatment plant, located downstream from the sampling site has BOD_5 loading from its effluent exceeding 25 mg/l 80% of the time. Specific water quaity impacts from this plant are uncertain due to the limited sampling data for this area.

Nutrients - Recent data show phosphorus(as P) levels generally exceeding EPA recommended levels of .05 mg/l for water entering impounded area. The range of concentrations found are zero to .20 mg/l with the minimum values reflecting the quality of the Macopin intake dam. The remaining stations both upstream and below the dam have values closer to the upper range. Other DEP lake surveys indicate levels of phosphorous are closer to the lower range of 0. Recent data indicates nitrate levels within the potable water standards range from .03 mg/l to 1.5 mg/l. The nitrate levels (annual means) appear to be increasing slightly from past records.

Ammonia - Present data indicates the river having un-ionized ammonia values within EPA recommended levels, however substantial increases in ammonia concentrations appear after the Butler-Bloomingdale STP. The Butler-Bloomingdale STP effluent shows a high ammonia concentration ranging from 13 mg/l to 30 mg/l. This should dramatically reduced after the plants scheduled upgrading.

Fecal Coliform - Recent data, although limited, suggest fecal coliform levels within the limits of the state standards. Samples taken below the Butler-Bloomingdale STP, have had levels in contravention of state criteria.

Biological Assessment - Water quality is apparently sufficient to support a healthy community. Low flow conditions probably limits the diversity to some degree.

Summary

The Pequannock River's water quality is among the best within the study area. The lower segment is affected by the effluent of the Butler-Bloomdale STP, lowering D.O. levels and raising BOD and ammonia concentrations. The river appears to meet Federal fishable and swimmable goals with the possible exception of the waters directly downstream from the sewage treatment plant.

Wanaque River

Description - The headwaters of the Wanaque River are located in New York and are for the most part wet-weather brooks which are steeply sloped and contribute flows only during periods of heavy rainfall or during the spring. These brooks flow into Greenwood Lake, which is split between the two states. From Greenwood Lake the Wanaque River flows south-west until it enters the Wanaque Reservoir. After leaving the reservoir the Wanaque River flows south through Lake Inez and on to its confluence with the Pequannock River. The Wanaque watershed has a drainge area of 108 square miles.

The Wanaque Basin can be described as a region consisting of a number of hills with brooks and lakes located in the valleys. For the most part, the basin is sparsely developed with pockets of concentrated population located around the numerous lakes. The Borough of Wanaque is well developed and has the largest (.3 MGD) of eight municipal and industrial wastewater treatment facilities in the basin. The total discharge of these point sources is 0.6 MGD. The water quality in the Wanaque River is for the most part above State standards, due to the limited development and small point source contribution.

The Wanaque River is mostly classified as FW-2 with a few brooks classified as FW-1. The Wanaque Reservoir and its tributaries have a trout maintenance classification (see water use classifications and criteria). The waters in the basin are utilized for swimming, fishing, boating and potable water supply.

Dissolved Oxygen - Dissolved oxygen (D.O.) levels, from limited data sources (recent data only), indicate a generally good oxygen content in the water. With few exceptions the D.O. concentration range from 5.9 mg/l to 13.6 mg/l. Summer averages ranged from 7.13 mg/l to 9.53 mg/l. The only deviation from the overall profile was exhibited by the one-event sample done in August 1977 in the Wanaque Reservoir. This low reading, 4.8 mg/l, is most likely spurious when investigated further. A report titled "U.S. E.P.A. National Eutrophication Survey", list data that substantiates higher D.O. levels (ranges: April-(11.8-12.4), July-(8.4-12.6), Oct.-7.8-8.4).

B.O.D. - The B.O.D. data for the Wanaque was extremely limited. Sources indicate (recent only) BOD levels denoting good water quality. Levels of concentration ranged from .2 mg/l to 6.0 mg/l (5 day BOD, 1975-1977).

Nutrients

Phosphorus (as P) levels, for the most part, are at or within the tolerance of the State standards of .05 mg/l. The levels of phosphorous (as P) range from .01 mg/l to .14 mg/l. The latter value does not represent the majority of samples. For the most part concentrations remain at approximately .05 mg/l. Present data sources confirm nitrate levels of approximately .1 mg/l (average) with a maximum concentration of .44 mg/l. These are all within potable water standards.

Ammonia - Present total ammonia concentrations (range .021 mg/l to .13 mg/l) conform with EPA recommended levels. As with the nitrates, this data indicates good water quality.

Fecal Coliform - Current data sources indicate levels (geometric means) of Fecal Coliform meeting state standards for the segments from the source to the sampling station after the Raymond Dam (Wanaque Reservoir). Fecal Strep ratios for USGS data proved inconclusive with only 2 sets (33.3%) of data suggesting a non-human source from a six set total.

Summary

The Wanaque River, although limited data exists for its upper waters, has high quality water. The river appears to meet federal fishable and swimmable goals. Phosphorous seems to be the only parameter of great concern with levels near the EPA recommended limits. The nonpoint source analysis and the National Eutrophication Study indicate that high phosphorus levels are due to point sources.

Ramapo River

Description - The Ramapo River has its headwaters in the Ramapo Mountains of New York State. The river has a drainage area of 160 square miles, 110 square of which are in New York. Most of the development in New York State is rural and suburban until the Suffern area where more urbanized land uses predominate. The upper waters of the Ramapo have been degraded below our state standards by the development and discharges in New York and New Jersey.

The New Jersey portion of the basin has a mixture of suburban and undeveloped land uses. The western portion of the watershed is basicly undeveloped in Mahwah and Oakland, due to the Ramapo Mountains. Most of the suburban areas currently utilize on-site disposal with some areas being serviced by packaged plants. There are also two major industrial dischargers. Abex Corporation and Ford Motor Company, which discharge 1.3 MGD of wastewater. The water quality in the Bergen County portion of the watershed improves some what from that entering from New York. However, as the river enters Passaic County and Pompton Lakes there are still sufficient pollutants to cause euthrophication problems in the lake. After Pompton Lakes, the Ramapo flows south for about one mile where it joins the Pequannock River to form the Pompton River.

The Ramapo is classified as FW-2, with two small tributaries classified as trout production waters (see water use classifications and criteria). These waters are utilized for fishing, boating and potable water supply. Pompton Lakes had been used for swimming but has been closed due to high bacteria levels.

Dissolved Oxygen - Recent data, although limited, indicate some D.O. problems for the upper segment near Mahwah. D.O. concentrations contravene state standards during the late summer period. The remainder of the river shows D.O. levels within state standards ranging from 5.3 mg/l to 14.0 mg/l.

Biochemical Oxygen Demand - Recent BOD_5 data also suggest water quality problems for the upper segment of the river. The late summer (August) samples have concentrations above 7.0 mg/l. The lower segments of the river generally have BOD_5 values below 5.0 mg/l.

Nutrients - Present data sources indicate the upper segments of the Ramapo River (West Mahwah) having excessive amounts of phosphorous. The data reveals levels of approximately .30 mg/l of phosphorous (as P) or about six times the EPA recommended level for a stream or river flowing into an impoundment. The EPA National Eutrophication survey found the Pompton Lakes to be phosphorous limiting. The phosphorous concentration is above EPA recommended levels.

Nitrate levels range from .15 mg/l to 1.90 mg/l with a mean concentration of approximately .75 mg/l. These are within potable water standards.

Ammonia Recent sampling data indicate levels of ammonia (un-ionized) above the EPA recommended level. Most of the violations occured in the upper segment during the late summer, yet a violation was noted on the lower segment near the confluence with the Pompton River.

Fecal Coliform - Recent data sources, although limited, indicate fecal coliform levels conforming to the state standards with a geometric mean well below 100 MPN/100 ml for the upper waters. Recent data also indicates the lower waters near Pompton Lakes have high fecal coliform counts.

Summary

The water quality is generally fair for the upper waters to good for the lower segment. The upper waters fail to meet Federal fishable and swimmable goals with low D.O. and high ammonia values. High fecal coliform and ammonia values prevent the lower segment from attaining these goals. High phosphorus concentrations are also a problem causing the Pompton Lakes to be in a eutrophic state.

Pompton River

Description - The Pompton basin has a drainage area of 24 square miles from its confluence with the Pequannock and Ramapo Rivers, to the Passaic River. The Pompton River flows through a relatively flat and suburban area.

There are currently two municipal wastewater facilities, Pompton Lakes and Sheffield Hills, discharging 2.0 MGD into the Pompton River. A new 7.5 MGD facility will be in operation shortly at Lincoln Park while the Sheffield Hills plant will be discontinued. The Pompton River is able to assimilate these discharges with its waters generally being above state standards. The waters of the Pompton are considerably cleaner than the Passaic at the confluence of the two rivers.

The Pompton River is classified as FW-2 which includes such uses as fishing, boating and potable water supply.

Dissolved Oxygen - The 1970 intensive survey conducted by DEP found D.O. values to be superior to State standards for the majority of the Pompton River. (See Figure III-11) However D.O. levels decline toward the lower portion falling below 5.0 mg/l and recovering before the confluence of the Passaic River. Present data sources, although not intensive, confirm the results of the intensive survey.

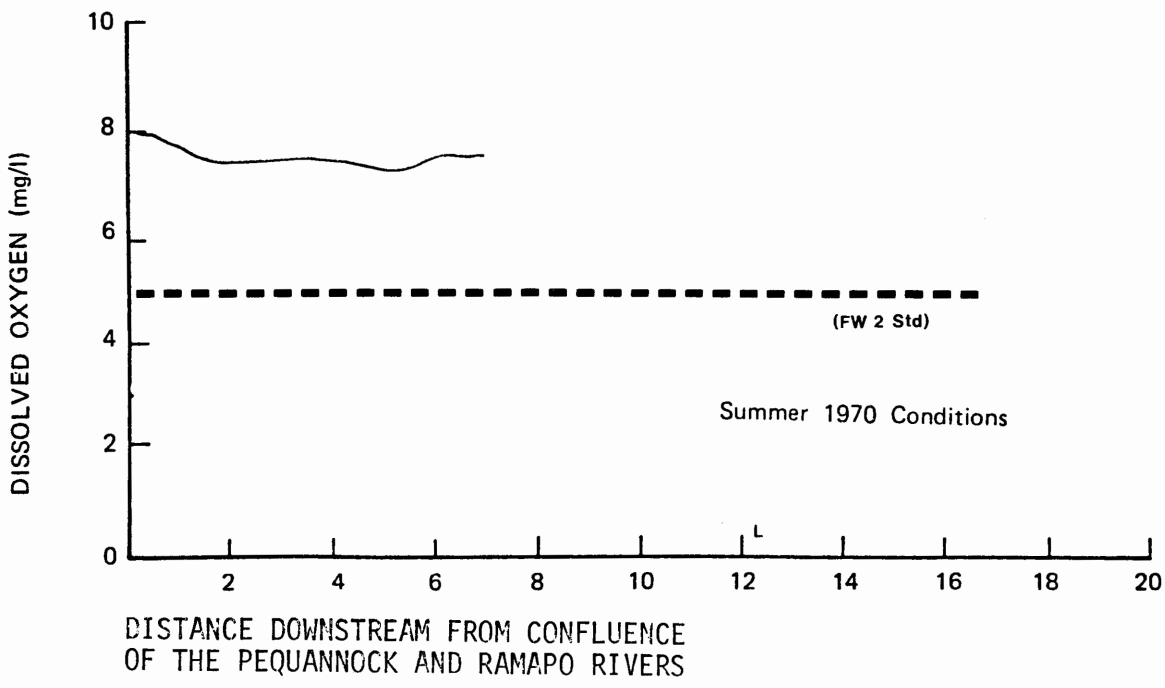
Biochemical Oxygen Demand - The 1970 intensive survey indicated average BOD_5 concentrations on the main stem at the river below 4.0 mg/l. Some of the tributaries however, show higher average BOD_5 values (between 5.1 mg/l and 6.1). Recent sampling data confirms the intensive survey results for the mainstem with average values below 4.0 mg/l. No samples were taken on the tributaries to verify intensive sampling results.

Nutrients - Recent data, with limited sampling, was available for phosphorous values. These samples indicated phosphorous levels above the State standards for free flowing rivers or streams and almost all samples exceeded .05 mg/l with a mean concentration of .25 mg/l. The intensive survey data for 1970 indicate high nitrate concentrations with average values between 2.0 mg/l and 3.0 mg/l. More recent data however, suggest a substantial decline lowering average nitrate values to about 1.0 mg/l or below. All samples, intensive and present, conform to state potable water standards.

Ammonia - The intensive survey results indicate no violations of EPA recommended limits. The present data sources confirm these results, but some samples taken are approaching toxic levels.

Fecal Coliform - Present sampling for fecal coliform, although sampling was infrequent, indicates bacteria levels slightly within State standards with a geometric mean of 196 MPN/100 ml. Data for 1976 contravene State standards with a geometric mean for fecal coliform of 696 MPN/100 ml.

Figure III-11
DISSOLVED OXYGEN CONDITIONS
Pompton River



Summary

The water quality for the Pompton River is fair to good. The waters just meet Federal fishable and swimmable goals. In some areas in the mid river segment these goals may not be met due to low D.O. Fecal coliform and ammonia are near state and EPA recommended limits. Phosphorous concentrations are higher than EPA recommended concentrations for a free flowing river or stream. Point source discharges are the probable cause of these elevated levels.

Mid-Passaic River

Description - The Mid-Passaic River begins at the confluence of Whippany/Rockaway rivers and flows north to Lincoln Park and then east to Little Falls. The drainage area of this river segment is 90 square miles.

The Mid-Passaic basin is relatively flat and contains numerous marshes and swamps, of which Great Piece Meadow is the largest. There is also substantial suburban and industrial development located in the Caldwells and Fairfield. The major discharger in the segment is the Caldwell municipal facility which discharges 3.8 MGD of the 5.6 MGD discharged to the river. The water quality at the beginning of the Mid-Passaic river is poor due to upstream degradation and the impacts of the dischargers in the Mid-Passaic.

The entire Mid-Passaic river is classified as FW-2. The river is utilized primarily as a potable water supply but could also be used for boating, fishing and swimming if the water quality improves.

Dissolved Oxygen - The 1970 intensive survey indicates poor water quality for the Mid-Passaic segment. D.O. values are below the state standards for FW-2 class waters (Figure III-8). According to the intensive survey data, D.O. concentrations improve after the confluence of the Pompton River. Recent data sources confirm low D.O. before the Pompton. D.O. concentrations then degrade approaching Little Falls, with an increasing amount of violations. Point source contributions from Deepavaal Brook and Signac Brook may explain further degradation of the lower segment.

Biochemical Oxygen Demand - Intensive survey data for 1970 and present data sources indicate high B.O.D. levels after the confluence with the Rockaway-Whippany Rivers (average 6.5 mg/l). B.O.D. concentration decline before the confluence with the Pompton River (average 4.3 mg/l). The final segment near Little Falls shows a slight increase which probably represents loadings from the tributaries mentioned previously.

Nutrients - Recent data sources, although limited, indicate phosphorous concentrations consistantly higher than EPA recommended levels. Its values range from .02 mg/l to 1.0 mg/l with a majority of the samples reflecting the upper values of the range. Historic data from the 1970 intensive survey indicate nitrates ranging from nondetectable to 5.0 mg/l, which is within potable water standards. Other historical data sources suggest a substantial increase (3 times greater than those of the 1960's) when yearly averages are compared over the last 15 years. This is probably the combined affect of increased runoff (drought conditions existed in the 1960's and new developments) and an increase in sewage flow due to an expanding population.

Ammonia - Intensive survey data (1970) and recent sampling indicate a substantial number of samples with concentrations exceeding EPA recommended limits for un-ionized ammonia. These levels occur during the summer months when the rise in water temperature also increases the toxic effect of total ammonia.

Fecal Coliform - Limited recent sampling indicates fecal coliform levels (MPN) over the state standards for FW-2 class waters (200 MPN/100 ml).

Summary - The general water quality for the Mid-Passaic is poor. The Federal fishable and swimmable goals are not met due to low D.O. and high B.O.D., nutrients, ammonia, and fecal coliform. The relatively good water of the Pompton River improves the water quality of the main stem but the lower segment is quickly degraded by point sources on the river and its tributaries.

Saddle River and Ho-Ho-Kus Brook

Description - The headwaters of the Saddle River are located in New York State while the Ho-Ho-Kus Brook originates in the Ramsey area. The Saddle flows in a southerly direction from New York while the Ho-Ho-Kus follows a south-easterly course. The Ho-Ho-Kus joins the Saddle River near Ridgewood and the Saddle continues flowing south until it enters the Passaic River at Garfield. The total drainage area of the Saddle and Ho-Ho-Kus is 55 square miles.

The upper portions of the Saddle and Ho-Ho-Kus basins have been developed mostly as suburban areas. Farther downstream, around Lodi and Garfield, the development is more urbanized with some industrialization. The major discharges in the basins are the Northwest Bergen County Utilities Authority, which discharges to the Ho-Ho-Kus, and Ridgewood and Fair Lawn, which discharge to the Saddle after its confluence with the Ho-Ho-Kus. The total flow from these facilities and some minor dischargers is 10 MGD. The Saddle River above its confluence with the Ho-Ho-Kus and the Brook are classified as FW-2. Portions of this area are trout maintenance (see water use classifications and criteria). The Saddle River is classified as FW-3 from its confluence with the Ho-Ho-Kus downstream to Outwater Lane in Lodi. From the dam in Lodi to its confluence with the Passaic the Saddle is classified as TW-2.

Dissolved Oxygen - According to the 1971 intensive survey and recent data sources, the dissolved oxygen (D.O.) levels in the Saddle River and Ho-Ho-Kus Brook are mostly within the standards with a few exceptions (see Figure III-12). Summertime concentrations range between 2.5 mg/l and 9.5 mg/l with the majority of values close to the standards. Municipal point sources have a considerable influence of the D.O. concentration.

B.O.D. - The intensive survey (1971) and recent data indicate BOD_5 concentrations ranging from 1.4 mg/l to 18.0 mg/l. The upper limit probably reflects point source imputs.

Nutrients - Recent data indicate phosphorus (as P) levels higher than state standards (.05 mg/l, for a river which flows into an impoundment) above the tidal dam. These concentrations range between .29 mg/l and 2.9 mg/l. Municipal treatment facilities are probably the major cause with minor input from non-point sources. Nitrate levels are extremely high as was the case of phosphorus, but concentrations remain below EPA recommended levels. The range for nitrates is between 1.3 mg/l and 4.4 mg/l.

Ammonia - Historical and recent data indicate ammonia values are approaching EPA recommended levels (.02 mg/l unionized ammonia). Municipal point source loadings are probably the primary sources of this pollutant.

Fecal Coliform - Recent data indicates fecal coliform exceeding State standards for FW-3 waters with its geometric mean, which ranges from 976 MPN/100 ml to 6977 MPN/100 ml. Fecal strep ratios were inconclusive due to the paucity of data.

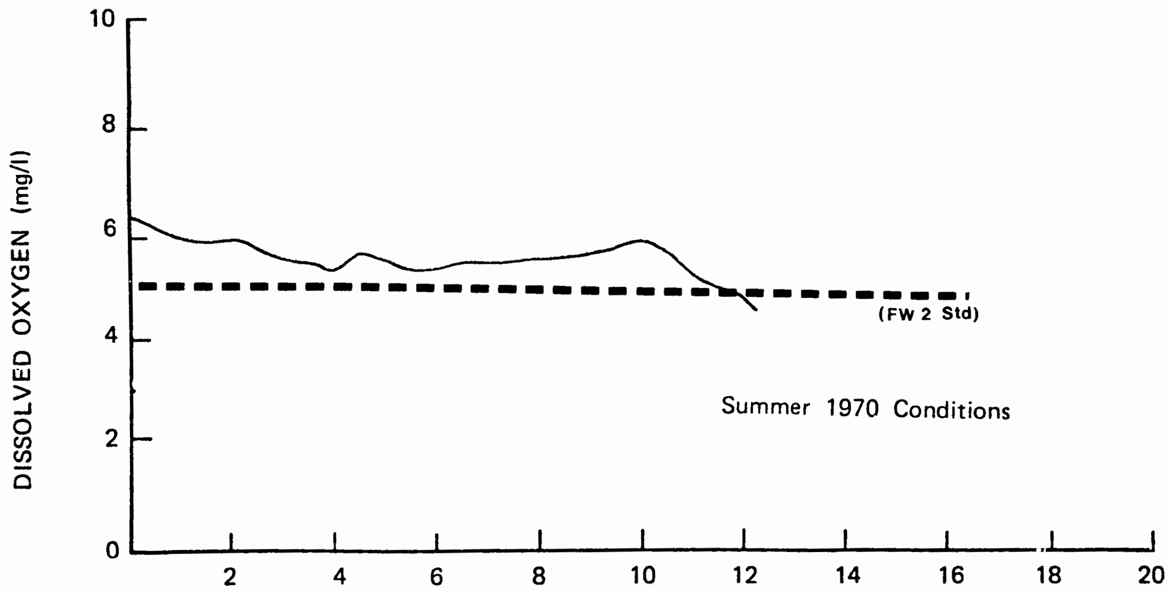
Summary

Water quality for the Saddle River and Ho-Ho-Kus Brook is good for the headwater regions then gradually degrades. Data was extremely limited for the upper region but it is classified as trout maintenance, indicating high quality waters. The lower portion of the river probably fails to meet Federal goals for fishable and swimmable waters having low D.O. and high levels of BOD, fecal coliform, phosphorus and ammonia. Point source contributions seem to be the major cause of degradation. However, due to the residential nature of the segment, non-point BOD loadings may be significant during periods of rainfall.

Figure III-12

DISSOLVED OXYGEN CONDITIONS

Hohokus - Saddle Rivers (low flow)



DISTANCE DOWNSTREAM STARTING UPSTREAM
OF N.W. BERGEN COUNTY UTILITIES AUTHORITY

Lower Passaic River

Description - The lower Passaic basin emcompasses the drainage area (133 square miles) of the Passaic River from the Little Falls dam to its mouth at Newark Bay. From Little Falls down to Dundee Dam the river is freshwater while after the dam it is tidal. The freshwater area includes the Great Falls Park located in Paterson.

The Lower Passaic basin is highly urbanized with large scale industrial development. These land uses in association with the 12.6 MGD of domestic and process water discharged by the 20 wastewater treatment facilities and the poor upstream water quality results in very poor water in the lower Passaic River. Water related uses of the River are supposed to include industrial water supply, fishing, boating and secondary contact recreation. Many of these uses are currently hindered by the poor water quality in the lower Passaic.

The Passaic River is classified as FW-3 from Little Falls downstream to Dundee Dam. The tidal portion of the river is classified as TW-2 from Dundee Dam to the confluence of the Second River where it becomes TW-3 to its mouth at Newark Bay.

Fresh Water

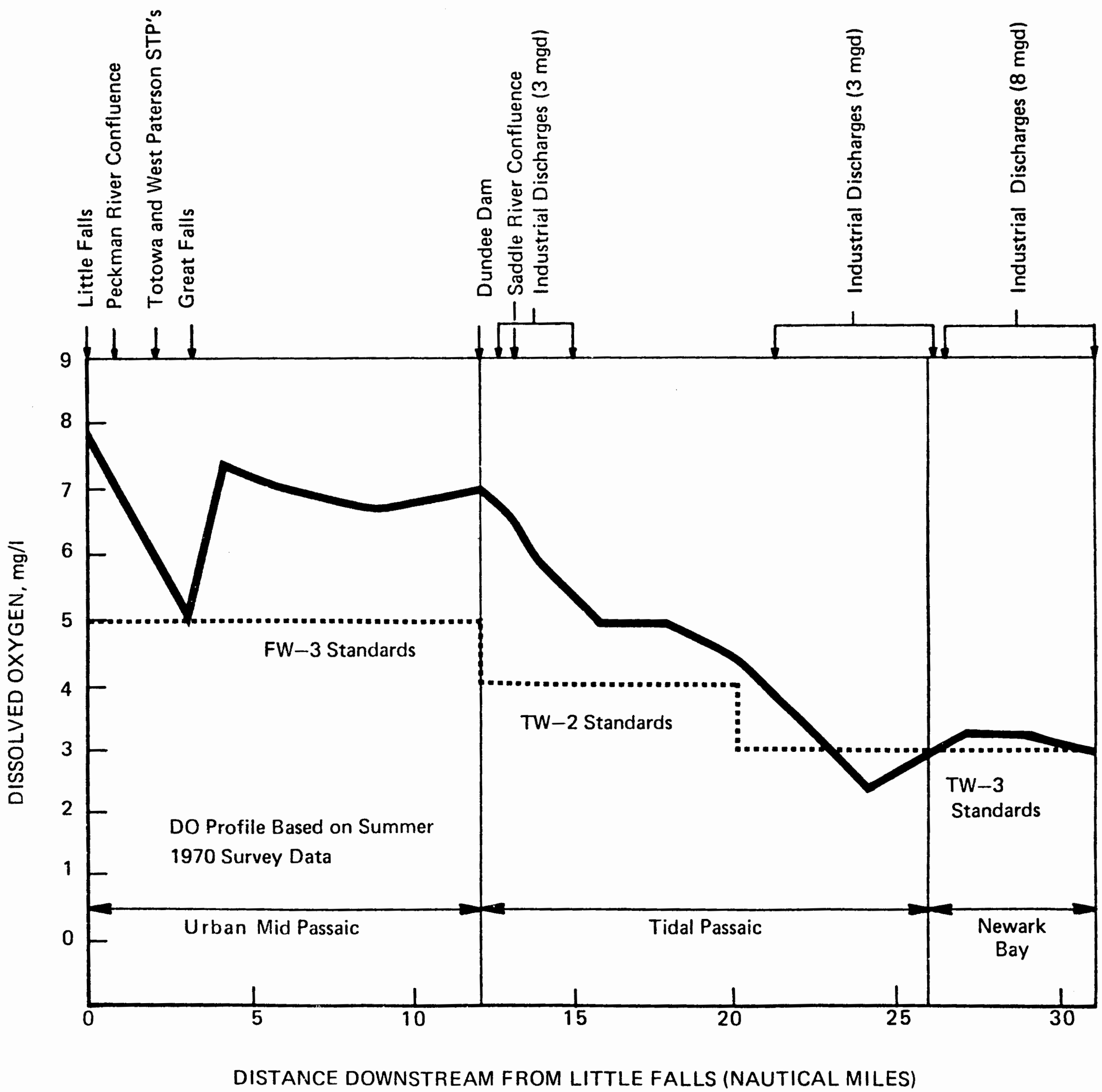
Dissolved Oxygen - Intensive sampling for the Lower Passaic in 1970 (Figure III-13) indicated a wide range of D.O. concentrations with average values ranging from approximately 4.0 mg/l (before the Great Falls) to approximately 8.0 mg/l (after the Great Falls). D.O. concentration are first raised by Little Falls and Great Falls aeration and then D.O. levels decay immediately after each to the lower values of the range. Limited recent sampling data confirms the intensive survey results.

Biochemical Oxygen Demand - BOD_5 average concentrations from the 1973 intensive survey range from 4.0 mg/l to approximately 6.0 mg/l. The increased BOD_5 values in the range occur downsteram from the Totowa and West Paterson STP's. Only chemical oxygen demand data was available for recent data.

Nutrients - Recent data sources indicate phosphorous concentrations ranging from .04 mg/l to .93 mg/l. These values greatly exceed State standards for a river or stream which flows into an impoundment. The intensive survey conducted in 1970 indicate nitrate levels ranging from less than 1.0 mg/l to 5.0 mg/l. Recent data suggest an improvement as reported concentrations for nitrate and nitrite (reported together) ranged between .46 mg/l and 2.7 mg/l.

Figure III-13

DISSOLVED OXYGEN PROFILE FOR PASSAIC RIVER–NEWARK BAY (1970)



Ammonia - The 1973 intensive survey data indicate high ammonia concentrations. Levels of un-ionized ammonia were consistantly higher than .02 mg/l, the EPA recommended limit. Recent data, although limited for the summer sampling period, confirmed high ammonia concentrations.

Fecal Coliform - Recent data sources indicate fecal coliform values above the state standards of 200 MPN/100 ml. Fecal coliform level of 900 MPN/100 are present.

Summary - The freshwater Lower Passaic has generally poor water quality. It fails to meet Federal fishable and swimmable goals due to low D.O. and high nutrients, ammonia, and fecal coliform. These conditions are the result of numerous point source dischargers and run-off from the urban areas during rainfalls.

Tidal Waters

Dissolved Oxygen - Intensive survey data from 1970 indicate D.O. concentrations in violation of State standards for TW-2 and TW-3 water. D.O. values after the Dundee Dam are approximately 7.0 mg/l. This water with its high D.O. levels reflecting the aeration from the Dundee Dam, degrades rapidly from contributions of industrial point sources to a final concentration of 2.0 mg/l at the confluence at Newark Bay.

Nutrients - The 1970 intensive survey data indicates phosphorus levels ranging from .9 mg/l at the Dundee Dam to .4 mg/l at the confluence with the Newark Bay.

Ammonia - The 1970 intensive survey indicates total ammonia values of 1.0 mg/l increasing to 2.0 mg/l at the confluence of the Newark Bay.

Fecal Coliform - State standards for fecal coliform, according to the 1970 intensive survey, are not met for the TW-2 segment of the river. Fecal coliform values over 1000 MPN/100 ml were indicated. The TW-3 segment has fecal coliform levels below 1000 MPN/100 ml which is within state standards for its class waters.

Summary - The Lower Passaic (tidal) generally has poor water quality. The Federal fishable and swimmable goals are not met due to low D.O. and high nutrients, ammonia, and fecal coliform. The major cause of degradation is from the industrial and domestic point sources and poor water quality in the freshwater and estuary segments.

Hackensack River

Description The Hackensack River originates in New York State and flows through Lake De Forest and Lake Tappan into New Jersey. From Lake Tappan the Hackensack flows south to the Oradell Reservoir. Below the reservoir the river is tidal and follows a southerly course to its mouth at Newark Bay. The drainage area of the entire basin is 202 square miles with 113 square miles being above Oradell Reservoir.

The upper Hackensack basin has been developed as a suburban area with portions of undeveloped land near the Oradell Reservoir. Below the reservoir higher residential density development exists along with numerous commercial and industrial establishments. There are approximately 35 facilities discharging 85.6 MGD of domestic or industrial wastewater in the basin. The largest discharger is the Bergen County Utilities Authority which discharges about 63 MGD from its facility at Little Ferry.

From Little Ferry south to approximately 2 miles north of Newark Bay the Hackensack basin was designated as the Hackensack Meadowlands District by the N.J. Legislature in 1969. The Hackensack Meadowlands Development Commission has jurisdiction over this area and has initiated the development of residential, industrial and recreational establishments while preserving part of the District as open space areas.

The Hackensack River above Oradell Reservoir is classified as FW-2 and is utilized for potable water supply. The length from the Oradell dam to the confluence with Overpeck Creek is classified as TW-1, from Overpeck Creek to Berry's Creek is TW-2, and from Berry's Creek to Newark Bay is TW-3. The lower portion of the river is utilized for industrial cooling or process water along with boating, fishing and some secondary contact recreation.

Freshwater

Dissolved Oxygen - Historical data sources indicate the fresh water segment of the Hackensack River having D.O. concentrations superior to the state criterion. Current data concurs with a range of 4.4 mg/l to 16.7 mg/l and a majority of samples reflecting the upper segment of the range.

Biochemical Oxygen Demand - Historical data indicate B.O.D. concentrations generally below 6.0 mg/l with occasional samples slightly higher. Recent data sources confirm these values.

Nutrients - Historical data, which was confirmed by recent data sources, indicate phosphorus concentrations generally ranging from non-detectable to .444 mg/l with most samples approaching the higher figure, and few exceeding that figure. These levels are above the EPA, recommended levels of phosphorus entering into an impoundment. Since no recorded point sources exist above the Oradell Reservoir, it may be assumed that these elevated values of phosphorus are the result of non-point sources (run-off, septic tank malfunctions, etc.) or unrecorded point sources. Historical data indicate exceedingly high nitrate values, but within potable water standards. Present data sources agree that nitrate levels, ranging from .40 mg/l to 6.75 mg/l, are above expected values for unpolluted waters.

Ammonia - Both historical and recent data sources indicate ammonia (un-ionized) concentrations lower than the recommended limits by EPA of .02 mg/l (un-ionized).

Fecal Coliform - Recent data sources indicate fecal coliform levels within state standards, although sampling sites were sparse and data limited.

Biological Assessment - Recent biological sampling indicate a low diversity of macro invertebrates (i.e. mostly caddis fly recovered) and limited algal production. Apparently there is a substance exerting a direct or indirect toxic effect on the biota. Inasmuch as the outflow from the reservoir is chlorinated, it is the prime suspect causing such apparent alteration and degradation of this stream segment. Since the potable water intake is approximately 0.7 miles downstream from the prechlorination site at the reservoir, it is difficult to discern the beneficial effects of such chlorination in view of its carcinogenic potential, detriment to the aquatic ecosystem and cost of chlorination.

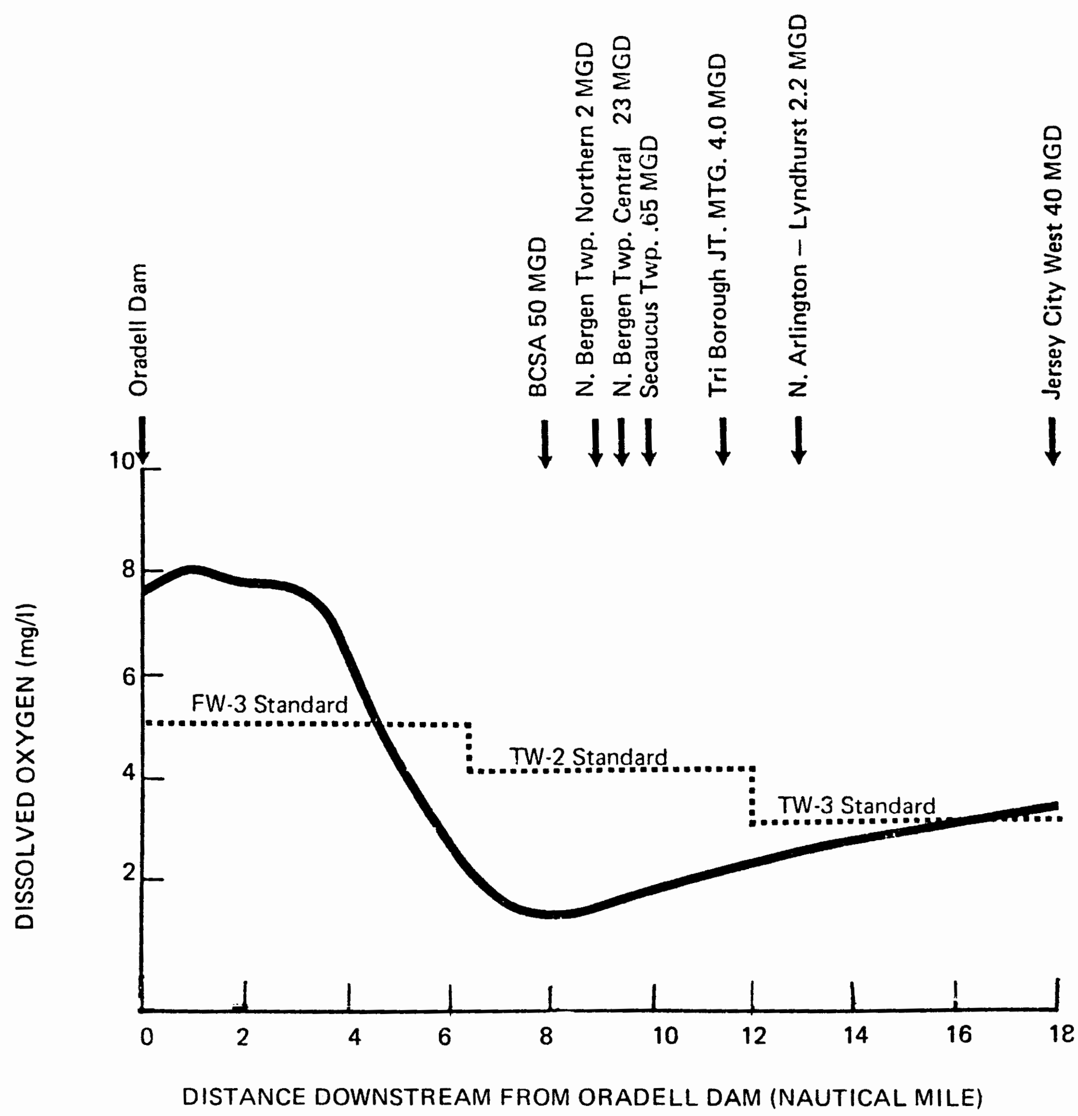
Summary - The water quality for the freshwater Hackensack is good. It meets federal fishable and swimmable goals. High concentrations of phosphorous are present. Since there are no point source dischargers (known), the cause of contamination is probably due to faulty septic systems, runoff from residential land use, or unknown point source dischargers.

Tidal Waters

Dissolved Oxygen - Intensive survey data conducted by the DEP in 1970 (summer) indicate D.O. concentrations in violation of State standards for both TW-2 and TW-3 waters (see Figure III-14). Initially water quality standards are met below the Oradell dam. Approximately 2 miles below the dam degradation occurs until the tidal flushing affect becomes more effective. A major cause of D.O. depletion is the Bergen County U.A. with a synergistic effect from PSE&G cooling waters. D.O. concentrations just meet TW-3 at the confluence with the Newark Bay. Present data sources indicate a slight improvement, but D.O. values still violate state standards.

Figure III-14

1970 DISSOLVED OXYGEN CONDITIONS HACKENSACK RIVER



Source: Teledyne 1973

Summer 1970 Conditions

Biochemical Oxygen Demand - Historical data from the intensive survey indicate BOD_5 values ranging from approximately 1.0 mg/l to 8.0 mg/l. Recent data confirm these results.

Nutrients - Historical data from the intensive survey indicates high levels of phosphorous ranging from approximately 1.0 mg/l to 5.0 mg/l. Nitrate levels generally range between .004 mg/l and 2.3 mg/l.

Ammonia - Recent data indicate un-ionized ammonia levels frequently exceed EPA recommended levels of .02 mg/l for fresh water. No toxic levels have been determined for an estuary environment.

Fecal Coliform - Both historical and recent data sources indicate fecal coliform concentrations in violation of State standards for TW-1 and TW-2 waters, but meet TW-3 classified waters.

Summary - The tidal Hackensack River has generally poor water quality. Low D.O. and high BOD, nutrient, ammonia, and fecal coliform prevent Federal fishable and swimmable goals to be met. Large point source loadings degrade the water quality which are accentuated by poor flushing of the waters by tidal actions.

Rahway and Elizabeth Rivers

Description - The Rahway and Elizabeth Rivers are both tributaries of the Arthur Kill. The rivers drain portions of Essex and Union Counties and have drainage areas of 20.2 (Elizabeth) and 40.9 (Rahway) square miles. Both rivers include freshwater and tidal sections.

The headwaters of the rivers are generally suburban areas while further downstream more intense development exists. The cities of Rahway and Elizabeth are located along the tidal portion of the rivers. Most of the wastewater from the Rahway and Elizabeth drainage basins is discharged to the Arthur Kill. There are only about seven facilities discharging 4.3 MGD of domestic and industrial wastes.

Portions of the freshwater Rahway River are classified as FW-2 and are utilized as a potable water supply. The remainder of the freshwater Rahway and the entire freshwater Elizabeth are classified as FW-3. The tidal sections of both rivers are classified as TW-2 and TW-3. On the Rahway River the TW-3 classification begins at the Route 1-9 crossing while on the Elizabeth River this classification starts at the Broad Street Bridge in Elizabeth.

Dissolved Oxygen - The dissolved oxygen (D.O.) data for both rivers was extremely sparse. Recent data for the Elizabeth River indicates average summer D.O. concentrations were approximately 4.7 mg/l and the Rahway River had a summer average value of about 8.4 mg/l. Summarized historical data indicate D.O. for the Elizabeth River decreasing, most likely due to point source contributions. This historical data also suggests an increase in D.O. concentrations for the Rahway River, possibly a result of eutrophic activities supersaturating the waters.

BOD - The limited historical and recent data sources show the Elizabeth River having a BOD concentration about 8.5 mg/l while the Rahway River BOD concentrations are about 3.8 mg/l. These results are possibly explained by the point source BOD loadings, which are about 7 times less in the Rahway River than those in the Elizabeth River.

Nutrients - Historical and recent data sources indicate both rivers having phosphorus levels well above the suggested EPA recommended values. The increased levels of phosphorous (over six times the EPA recommended concentration) seem to be from non-point sources since there are no municipal discharges above the sampling points.

Ammonia - The limited historical and recent data sources suggest levels of total ammonia not presenting a problem with values at or below 1.0 mg/l.

Fecal Coliform - The geometric mean for both river is at or about the State requirements for FW-2 and FW-3 waters.

Summary

The water quality for the Elizabeth and Rahway Rivers is fair to poor. The Rahway River appears to have a slightly higher quality but this may be due to increased algal growth promoting supersaturated levels of D.O. during sampling. For both rivers the Federal fishable and swimmable goals are not fully met due to the levels of fecal coliform, phosphorous, and low D.O. Both rivers have minor industrial point sources and high urban runoff (see Chapter VI).

Newark Bay, Arthur Kill, Kill Van Kull, New York Bay and Hudson River

Description - These estuarine water bodies are components of the New York Harbor complex and separate New Jersey from Staten Island and New York City. The Passaic and Hackensack River both empty into the northern part of Newark Bay which at the southern end is connected to the Arthur Kill and Kill Van Kull. The Arthur Kill is connected to Raritan Bay while the Kill Van Kull is connected to the Upper New York Bay. The Hudson River also empties into Upper New York Bay which is connected to Lower New York Bay through the narrows. All of these waters are tidal.

Extensive residential and industrial development has taken place in the areas that drain to the New York Harbor Complex. The cities of Newark, Hoboken and Jersey City are located partially or entirely within this area. Numerous wastewater treatment facilities discharge their wastes into the estuary. The total wastewater discharged by these facilities is 483 MGD of which 258 MGD is discharged by the Passaic Valley Sewerage Commissioners.

The Hudson River is classified as TW-2, while Newark Bay, Kill Van Kull and the portion of the Arthur Kill in the study area are classified as TW-3. These waters are primarily utilized for transport with the ports of Newark and Elizabeth being located on Newark Bay. Boating and limited fishing also takes place in some areas.

<u>Dissolved Oxygen</u> - The dissolved oxygen (D.O.) concentrations for the Newark Bay and Kill Van Kull (see Figure III-13, III-15) are at or near the state criteria for TW-3 waters (3.0 mg/l) according to the 1970 intensive sampling. The Arthur Kill D.O. is only above standards (TW-3) during the colder periods (see Figure III-16). The upper Hudson starting at Hasting-on-the Hudson has D.O. values above the State criteria for TW-2 waters but gradually degrades below these standards in the New York Bay (see Figure III-17). Numerous point and non-point sources are responsible for the low D.O.

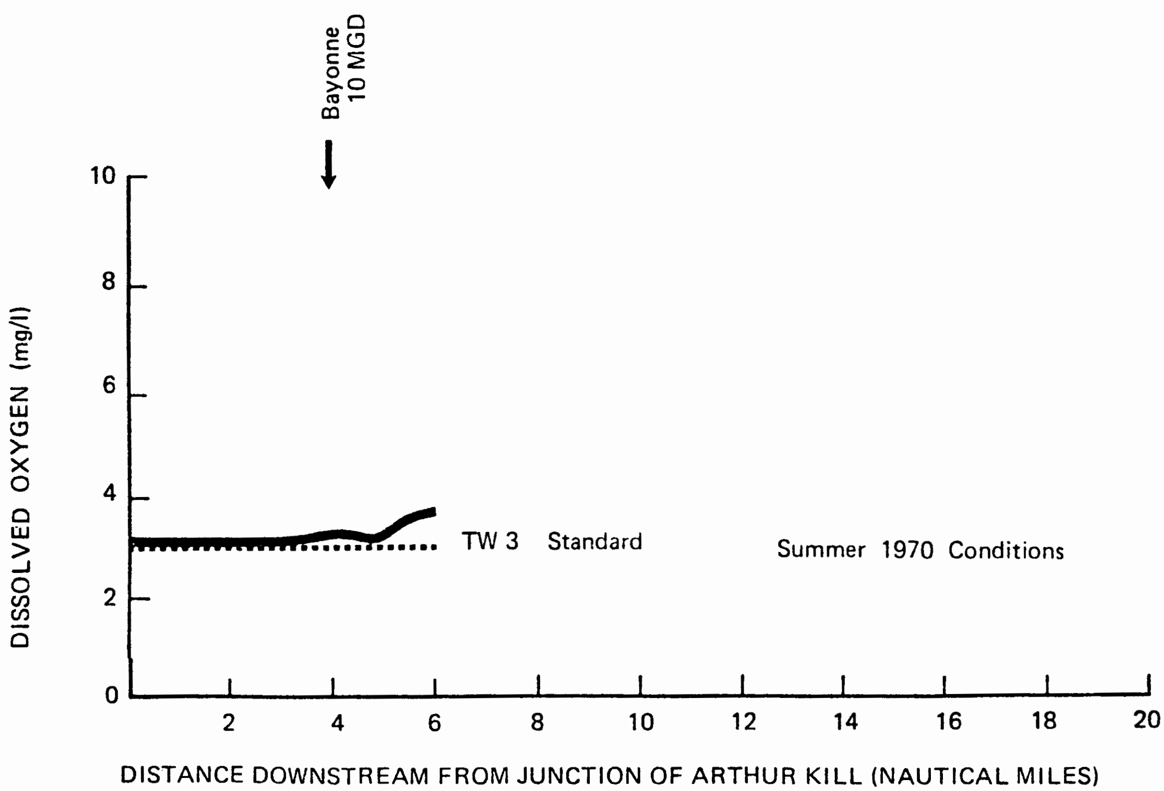
<u>Nutrients</u> - The intensive survey indicated phosphorus levels for the Hudson River, Newark Bay, New York Bay, Arthur Kill, and Kill Van Kull ranged between .33 mg/l and .82 mg/l. These levels exceed EPA recommended levels for unimpounded fresh waters of .1 mg/l but as of the time of this report there are no recommended levels for phosphorus in an estuary. Nitrates and nitrites concentrations from the freshwater areas decrease in concentration as flowing toward the ocean due to diluting effect of the Bays.

<u>Ammonia</u> - Intensive survey values for total ammonia for all segments are near or exceed 1.0 mg/l. The exception is the Kill Van Kull which has high values initially (approximately 2.0 mg/l) and then drop to levels about 1.0 mg/l at New York Bay.

<u>Fecal Coliform</u> - Data from the 1970 intensive survey indicates that all segments, with the exception of Kill Van Kull, exceed State standards for fecal coliform. The Kill Van Kull has only a portion, approximately 2 miles, meeting the state criteria for TW-3 classified waters.

Figure III-15

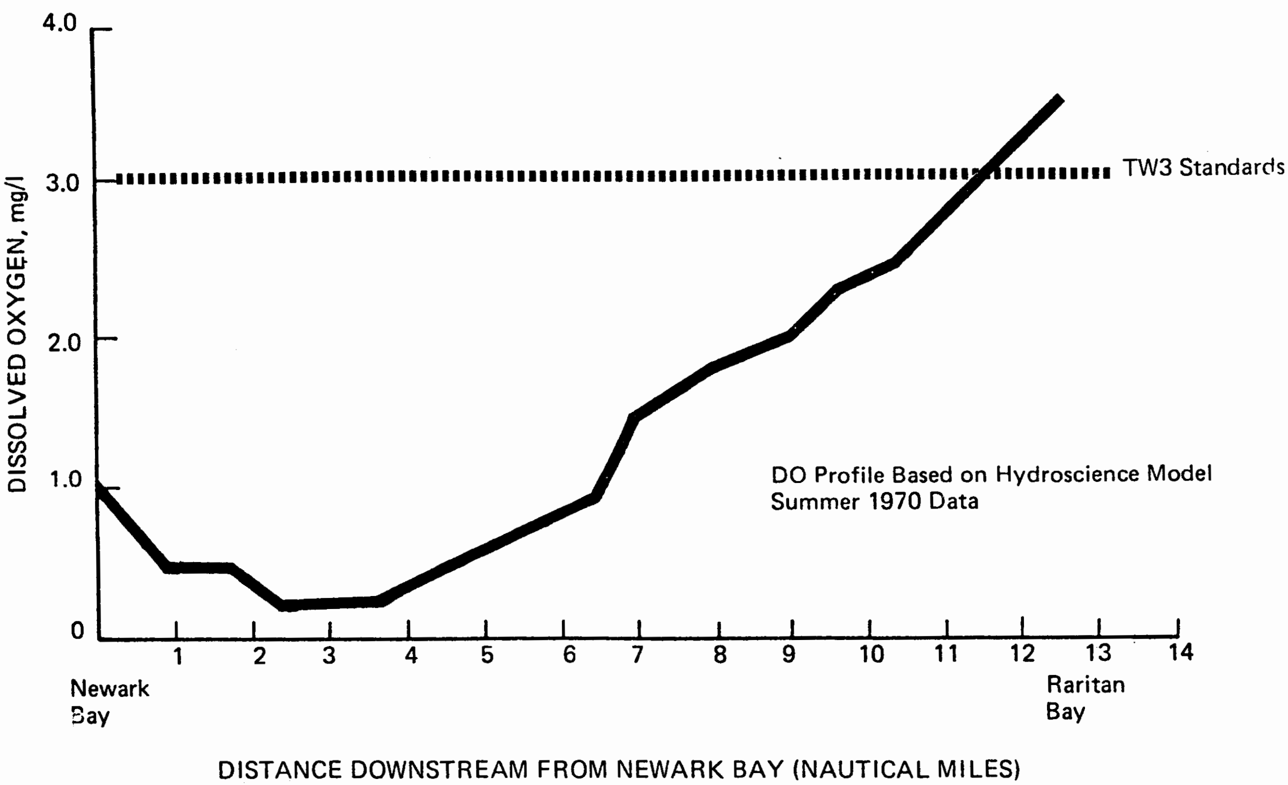
1970 DISSOLVED OXYGEN CONDITIONS KILL VAN KULL



Source: Teledyne, 1973

Figure III-16

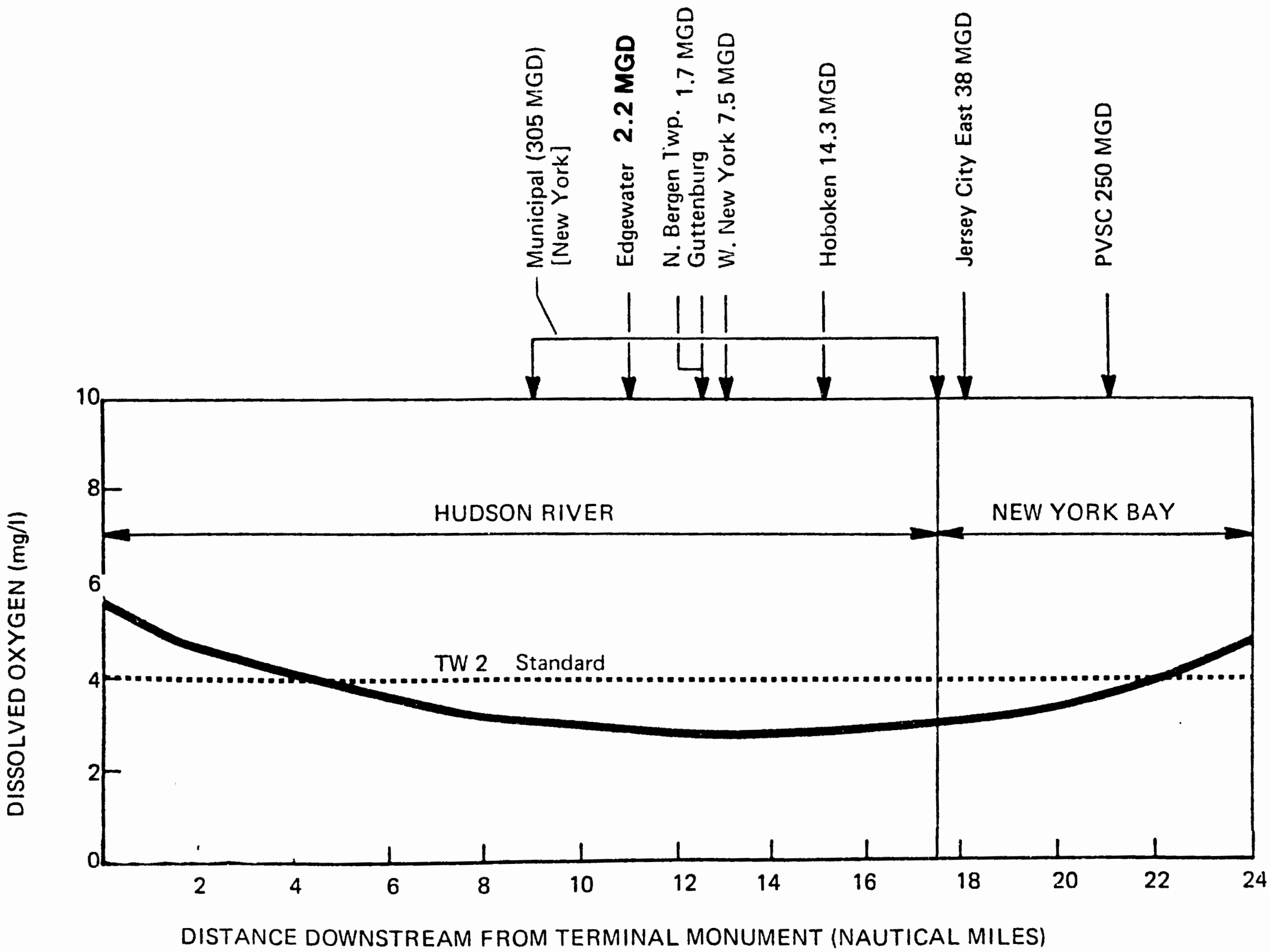
DISSOLVED OXYGEN PROFILE, ARTHUR KILL (1970)



Source: Hydroscience, 1975

Figure III-17

1970 DISSOLVED OXYGEN CONDITIONS
HUDSON RIVER/NEW YORK BAY



Source: Teledyne, 1973

Summary

The water quality for these segments is poor. Federal fishable and swimmable goals are not met with the exception of limited fishing on the Hudson River. The waters have low D.O., high ammonia, nutrients, and fecal coliform. Large point source and non-point source loadings account for the degraded waters.

i. Toxic and Carcinogenic Substance Monitoring Program

A study to identify toxic and carcinogenic substances within the surface waters of the Northeast WQM planning area was implemented by the Water Quality Management Planning Program. The purpose of this sampling program, the first of its kind for this area of New Jersey, was to take one time grab samples throughout the study area to provide a foundation for future toxic sampling programs. With the knowledge and questions raised by this effort, more comprehensive and intensive studies can be developed. The description and methodology for this study is detailed in working paper M-3.2 (see Monmouth County WQM Plan).

The analytical instrumentation employed, e.g. gas chromatography with electron capture detector, has the capability of measuring contamination as low as ten parts per trillion (10 nanograms per liter), however, as the sensitivity of the analytical techniques increases, so does the probability of error. When analyses are being conducted in the parts-per-trillion range, there is increased possibility of sample contamination, as well as instrument and observer variability. The testing procedures, as they require analysis of many complex compounds, are still in the early stages of development and should be treated as such. Since a one time grab sample was employed; this single sample value may not represent the true ambient quality.

(A) Volatile Organic Compounds

Organic compounds were found throughout the study area in various concentrations (mostly in parts per trillion levels). The parameters observed most frequently included: chloroform, bromodichloromethane, bromoform, and dibromochloromethane. EPA research has concluded that these and other similar organics are formed through the process of chlorination. Since wastewater facilities are present throughout the 208 area, they are probably a prime source of these toxics.

Organic compounds which are associated with the commercial and industrial sectors were generally found throughout the study area in parts per trillion quantities. These parameters and some of their applications for commercial and industrial use are methylene chloride (paint stripper, soluent, cleaner); 1,1,1 trichloroethylene, 1,1,2,2 tetrachlorethane (metal degreaser, dry cleaner); carbon tetrochloride (refrigerant, propellant, dry cleaner); 1,1,1 trichloroethane (cold cleaning solvent for machinery, batch cleaning); 1,1,2,2 tetrachloroethylene (dry cleaner).

Table III-14 summarizes the sampling results for volatile organic compounds, polynuclear aromatic hydrocarbons, PCB's and insecticides, and metals. Since one time sampling was employed, results for the tributaries and sections of the rivers main stems were aggregated for analysis.

The table lists the percentage of samples in which each parameter was found, and the total number of samples taken, for each segment. The percentages listed are for any detectable (machine measurable) concentration, therefore they indicate compounds present, but are not quantitative measures. There are no federal or state standards for volatile organic compounds, with the exception of the trihalomethanes (denoted by an asterisk on Table III-14). The trihalomethanes which has an EPA recommended limit of 100 parts per billion of the sample. The results of this sampling program indicate that there were no violations of these procedures for the recommended limits.

(B) Aromatic Hydrocarbon

These compounds (o,m,p diclorobenzene and trichlorobenzene) were found only in the urban portions of the study area (tidal waters). The Arthur Kill, Newark Bay and the Hudson River all showed evidence of these compounds. No Federal or State standards exist for these parameters. These materials are used as metal cleaners, solvents, dielectric fluids, lubrication and other industrial and commercial purposes. See working paper, Organic Compounds and Their Uses.

(C) PCB (Polychlorinated biphenyls) and Pesticides

PCB's were found throughout the study area, with concentrations in the parts per trillion range. Although the concentrations found for PCB's are in violation of EPA recommended levels for aquatic organics (one part per trillion), they conform to the requirements for finished potable water (one part per billion). Further study is suggested to identify the probable sources of PCB's. Additional verification, through intensive survey, would be required to confirm quantitative values. PCB's are used in the manufacturing process as a medium in electric transformers and as a solvent for plastics paints, licquers, lubricants and waxes.

Pesticides were found sporadically in the urban industrial areas (Kill Van Kull, Hudson River, Hackensack River, Newark Bay, and Arthur Kill). Pesticides were found in the Pompton River and Upper Passaic less frequently. As mentioned with the PCB's, the levels recommended by the EPA are exceeded

TABLE III-14

Frequency (Percent) of Toxic Substances Detected

Example: (# of Cases Sampled) % Detected

Parameters / Segment	Upper Passaic	Whippany	Rockaway	Mid Passaic	Pequannock	Wanaque	Ramapo	Pompton	Lower Passaic	Peckman	Saddle River	Ho-Ho-Kus Brook	Rahway	Arthur Kill	Newark Bay	Kill Van Kull	Upper New York Bay	Hudson	Hackensack
Silver	(10) 0	(6) 0	(10) 0	(5) 0	(8) 0	(5) 0	(4) 0	(4) 0	(18) 0	(5) 0	(7) 0	(3) 0	(7) 14	(3) 0	(4) 0	(2) 0	(2) 0	(3) 0	(12) 8
Arsenic	(10) 60	(6) 50	(10) 20	(5) 40	(8) 13	(5) 0	(4) 0	(4) 0	(18) 94	(5) 40	(7) 57	(3) 100	(7) 100	(3) 100	(4) 100	(2) 100	(2) 100	(3) 100	(12) 92
Beryllium	(10) 0	(6) 0	(10) 0	(5) 0	(8) 0	(5) 0	(4) 0	(4) 0	(18) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 33	(4) 0	(2) 0	(2) 50	(3) 0	(12) 0
Cadmium	(10) 0	(6) 0	(10) 10	(5) 0	(8) 0	(5) 0	(4) 0	(4) 0	(18) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 50	(2) 50	(2) 100	(3) 0	(12) 0
Copper	(10) 70	(6) 100	(10) 80	(5) 100	(8) 75	(5) 40	(4) 75	(4) 100	(18) 94	(5) 100	(7) 85	(3) 100	(7) 0	(3) 100	(4) 100	(2) 100	(2) 100	(3) 100	(12) 100
Chromium	(10) 70	(6) 33	(10) 50	(5) 100	(8) 0	(5) 0	(4) 50	(4) 0	(18) 89	(5) 60	(7) 71	(3) 100	(7) 86	(3) 100	(4) 100	(2) 100	(2) 100	(3) 100	(12) 83
Iron	(10) 100	(6) 100	(10) 100	(5) 100	(8) 100	(5) 100	(4) 100	(4) 100	(18) 100	(5) 100	(7) 100	(3) 100	(7) 100	(3) 100	(4) 100	(2) 100	(2) 100	(3) 100	(12) 100
Mercury	(10) 20	(6) 17	(10) 10	(5) 20	(8) 0	(5) 0	(4) 0	(4) 0	(18) 56	(5) 2	(7) 14	(3) 0	(7) 0	(3) 66	(4) 50	(2) 50	(2) 100	(3) 67	(12) 83
Manganese	(10) 100	(6) 100	(10) 90	(5) 100	(8) 100	(5) 100	(4) 100	(4) 100	(18) 56	(5) 100	(7) 100	(3) 100	(7) 0	(3) 100	(4) 100	(2) 100	(2) 100	(3) 100	(12) 100
Sodium	(10) 100	(6) 100	(10) 100	(5) 100	(8) 100	(5) 100	(4) 100	(4) 100	(18) 100	(5) 100	(7) 100	(3) 100	(7) 100	(3) 100	(4) 100	(2) 100	(2) 100	(3) 100	(12) 100
Nickle	(10) 20	(6) 100	(10) 20	(5) 80	(8) 0	(5) 60	(4) 75	(4) 25	(18) 22	(5) 60	(7) 28	(3) 67	(7) 100	(3) 100	(4) 75	(2) 100	(2) 100	(3) 100	(12) 75
Lead	(10) 90	(6) 100	(10) 80	(5) 100	(8) 50	(5) 80	(4) 100	(4) 100	(18) 89	(5) 100	(7) 100	(3) 100	(7) 100	(3) 100	(4) 100	(2) 100	(2) 100	(3) 100	(12) 92
Selenium	(10) 50	(6) 0	(10) 0	(5) 0	(8) 13	(5) 20	(4) 0	(4) 0	(18) 0	(5) 0	(7) 0	(3) 0	(7) 100	(3) 67	(4) 75	(2) 100	(2) 100	(3) 100	(12) 17
Zinc	(10) 70	(6) 83	(10) 50	(5) 80	(8) 50	(5) 0	(4) 25	(4) 0	(18) 94	(5) 80	(7) 28	(3) 67	(7) 100	(3) 100	(4) 100	(2) 100	(2) 100	(3) 100	(12) 83

TABLE III-14 (continued)

Frequency (Percent) of Toxic Substances Detected

Example: (# of Cases Sampled) / % Detected

Parameters \ Segment	Upper Passaic	Whippany	Rockaway	Mid Passaic	Pequannock	Wanaque	Ramapo	Pompton	Lower Passaic	Peckman	Saddle River	Ho-Ho-Kus Brook	Rahway	Arthur Kill	Newark Bay	Kill Van Kull	Upper New York Bay	Hudson	Hackensack
Diiodomethane	(13 0	(8) 0	(10 0	(5) 0	(8) 0	(5) 0	(4) 0	(4) 0	(17) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 67	(4) 50	(2) 50	(2) 50	(3) 33	(11) 0
Polychlorinated Biphenyl (PCBS)	(13) 54	(8) 88	(10) 90	(4) 75	(8) 88	(5) 100	(4) 75	(3) 67	(16) 88	(5) 80	(7) 100	(3) 100	(7) 100	(3) 33	(4) 25	(2) 0	(2) 50	(3) 33	(10) 80
BHC ∝	(13 0	(8) 13	(10 0	(4) 0	(8) 0	(5) 0	(4) 0	(3) 0	(16 13	(5) 0	(7) 0	(3) 0	(7) 0	(3) 33	(4) 25	(2) 0	(2) 0	(3) 0	(11) 0
BHC B	(13) 54	(8) 25	(10) 10	(4) 75	(8) 0	(5) 0	(4) 25	(3) 33	(16) 25	(5) 0	(7) 0	(3) 0	(7) 14	(3) 67	(4) 25	(2) 100	(2) 0	(3) 33	(11) 36
Lindane	(13) 8	(8) 0	(10) 0	(4) 50	(8) 0	(5) 0	(4) 0	(3) 33	(16) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 0	(2) 0	(2) 0	(3) 0	(11) 9
Aldrin	(13) 0	(8) 13	(10) 0	(4) 0	(8) 0	(5) 0	(4) 0	(3) 0	(16) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 0	(2) 0	(2) 50	(3) 33	(11) 9
Dieldrin	(13) 15	(8) 25	(10) 10	(4) 0	(8) 0	(5) 0	(4) 0	(3) 33	(16) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 0	(2) 0	(2) 0	(3) 0	(11) 9
Heptachlor	(13) 0	(8) 13	(10) 0	(4) 0	(8) 13	(5) 0	(4) 0	(3) 67	(16) 0	(5) 20	(7) 0	(3) 0	(7) 14	(3) 67	(4) 50	(2) 100	(2) 0	(3) 67	(11) 9
Toxaphene	(13) 0	(8) 0	(10) 0	(4) 0	(8) 0	(5) 0	(4) 0	(0) 0	(16) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 0	(2) 0	(2) 0	(3) 0	(11) 0
O,P'-DDE	(13) 15	(8) 13	(10) 0	(4) 0	(8) 0	(5) 0	(4) 0	(3) 67	(16) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 25	(2) 0	(2) 0	(3) 0	(11) 18
O,P'-DDT	(13) 8	(8) 13	(10) 0	(4) 0	(8) 0	(5) 0	(4) 0	(3) 0	(16) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 0	(2) 50	(2) 0	(3) 33	(11) 9
P,P'-DDD	(13) 8	(8) 0	(10) 0	(4) 0	(8) 0	(5) 0	(4) 0	(3) 0	(16) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 0	(2) 50	(2) 0	(3) 67	(11) 9
P,P'-DDT	(13) 8	(8) 0	(10) 0	(4) 0	(8) 0	(5) 0	(4) 0	(3) 0	(16) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 0	(2) 50	(2) 0	(3) 33	(11) 9
Methyoxychlor	(13) C	(8) 0	(10) 0	(4) 0	(8) 0	(5) 0	(4) 0	(3) 0	(16) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 0	(2) 0	(2) 0	(3) 0	(11) 0
Mirex	(13) 0	(8) 0	(10) 0	(4) 0	(8) 0	(5) 0	(4) 0	(3) 0	(16) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 0	(2) 50	(2) 0	(3) 33	(11) 0
Endrin	(13) 8	(8) 0	(10) 0	(4) 0	(8) 0	(5) 0	(4) 0	(3) 33	(16) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 25	(2) 50	(2) 0	(3) 0	(11) 9
γ Chloradane	(13) 31	(8) 13	(10) 0	(4) 25	(8) 0	(5) 0	(4) 0	(3) 67	(16) 6	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 25	(2) 50	(2) 0	(3) 0	(11) 9
Heptachlor Epoxide	(13) 8	(8) 25	(10) 20	(4) 75	(8) 0	(5) 0	(4) 25	(3) 33	(16) 6	(5) 0	(7) 0	(3) 0	(7) 14	(3) 33	(4) 25	(2) 0	(2) 0	(3) 0	(11) 9

TABLE III-14 (continued)
Frequency (Percent) of Toxic Substances Detected

Example: (# of Cases Sampled) % Detected

Parameters \ Segment	Upper Passaic	Whippany	Rockaway	Mid Passaic	Pequannock	Wanaque	Ramapo	Pompton	Lower Passaic	Peckman	Saddle River	Ho-Ho-Kus Brook	Rahway	Arthur Kill	Newark Bay	Kill Van Kull	Upper New York Bay	Hudson	Hackensack
Methylene Chloride	(13) 0	(8) 0	(10) 0	(5) 0	(8) 0	(5) 0	(4) 0	(4) 0	(19) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 25	(2) 0	(2) 50	(3) 67	(11) 0
Methyl Chloride	(13) 0	(8) 0	(10) 0	(5) 0	(8) 0	(5) 0	(4) 0	(4) 0	(19) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 0	(2) 0	(2) 0	(3) 0	(11) 0
Methyl Bromide	(13) 0	(8) 0	(10) 0	(5) 0	(8) 0	(5) 0	(4) 0	(4) 0	(19) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 0	(2) 0	(2) 0	(3) 0	(11) 0
Chloroform*	(13) 39	(8) 88	(10) 60	(5) 100	(8) 63	(5) 0	(4) 50	(4) 0	(19) 90	(5) 100	(7) 100	(3) 100	(7) 100	(3) 100	(4) 100	(2) 100	(2) 100	(3) 100	(11) 91
Bromoform*	(13) 8	(8) 0	(10) 0	(5) 0	(8) 25	(5) 20	(4) 25	(4) 25	(19) 11	(4) 50	(7) 86	(3) 0	(7) 14	(3) 67	(4) 100	(2) 100	(2) 100	(3) 100	(11) 27
Bromodichloromethane*+ 1,1,2-Trichlorethylene	(13) 85	(8) 100	(10) 60	(5) 100	(8) 63	(5) 100	(4) 100	(4) 100	(19) 84	(5) 80	(7) 86	(3) 100	(7) 71	(3) 100	(4) 100	(2) 100	(2) 100	(3) 67	(11) 91
1,1,2,2 Tetrachloroethane	(13) 15	(8) 13	(10) 0	(5) 10	(8) 25	(5) 60	(4) 25	(4) 75	(19) 37	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 0	(2) 0	(2) 0	(3) 0	(11) 0
1,1,2 Trichloroethane	(13) 15	(8) 0	(6) 17	(5) 60	(8) 13	(5) 0	(4) 25	(4) 25	(19) 32	(5) 20	(7) 0	(3) 33	(7) 14	(3) 0	(4) 0	(2) 0	(2) 50	(3) 33	(11) 0
Dibromochloromethane*	(13) 46	(8) 13	(10) 20	(5) 100	(8) 13	(5) 20	(4) 100	(4) 75	(19) 68	(5) 60	(7) 42	(3) 0	(7) 14	(3) 100	(4) 75	(2) 100	(2) 100	(3) 67	(11) 55
Trifluromethane*	(13) 0	(8) 0	(10) 0	(5) 0	(8) 0	(5) 0	(4) 0	(4) 0	(19) 0	(5) 20	(7) 0	(3) 0	(7) 0	(3) 0	(4) 75	(2) 100	(2) 50	(3) 67	(11) 0
Carbon Tetrachloride*	(13) 77	(8) 88	(10) 80	(5) 80	(8) 75	(5) 100	(4) 100	(4) 100	(19) 100	(5) 80	(7) 86	(3) 67	(7) 86	(3) 100	(4) 100	(2) 100	(2) 100	(3) 67	(11) 100
1,2 dibromoethane	(13) 0	(8) 13	(10) 0	(5) 0	(8) 0	(5) 20	(4) 25	(4) 0	(19) 16	(5) 0	(7) 0	(3) 0	(7) 100	(3) 67	(4) 0	(2) 0	(2) 0	(3) 0	(11) 0
1,2 dichloroethane	(13) 0	(8) 0	(10) 0	(5) 0	(8) 0	(5) 0	(4) 0	(4) 0	(19) 0	(5) 0	(7) 0	(3) 0	(7) 100	(3) 67	(4) 25	(2) 50	(2) 0	(3) 0	(11) 0
1,1,1 Trichloroethane	(13) 69	(8) 100	(10) 100	(5) 100	(8) 75	(5) 100	(4) 100	(4) 100	(19) 100	(5) 80	(7) 100	(3) 100	(7) 100	(3) 100	(4) 100	(2) 100	(2) 100	(3) 67	(11) 100
Vinyl chloride	(13) 0	(8) 0	(10) 0	(5) 100	(8) 0	(5) 0	(4) 0	(4) 0	(19) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 0	(4) 0	(2) 0	(2) 0	(3) 0	(11) 0
1,1,2,2 Tetrachloroethylene	(13) 85	(8) 75	(10) 70	(5) 100	(8) 100	(5) 100	(4) 100	(4) 100	(19) 100	(5) 80	(7) 100	(3) 100	(7) 100	(3) 100	(4) 100	(2) 100	(2) 100	(3) 100	(11) 100
o,m,p dichlorobenzene	(13) 0	(8) 0	(10) 0	(5) 0	(8) 0	(5) 0	(4) 0	(4) 0	(19) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 33	(4) 50	(2) 0	(2) 0	(3) 33	(11) 0
Trichloro Benzene	(13) 0	(8) 0	(10) 0	(5) 0	(8) 0	(5) 0	(4) 0	(4) 0	(19) 0	(5) 0	(7) 0	(3) 0	(7) 0	(3) 33	(4) 0	(2) 0	(2) 0	(3) 0	(11) 0

for aquatic organisms yet remain within potable water standards for compounds which limits have been established (Endrin, Lindane). The only pesticides which were not found in any area were toxaphene and methyoxychlor.

(D) Metals

The metals found with the greatest frequency are copper, iron, manganese, and sodium. These are commonly found and are generally considered to be naturally occurring throughout the area. Other parameters detected, such as arsenic, chromium, mercury, nickel, selenium, lead, and zinc were found in urban or developed areas. These compounds are considered to be components of urban runoff and industrial point sources. There were two violations of State standards for lead, one in the tidal Passaic River (tidal) and one in the tidal portion of the Hackensack River. Both areas where violations occurred are outside of the potable water areas. Chromium was also detected at one site on the tidal portion of the Hackensack River at levels above EPA recommended concentrations. There were no other violations recorded for the remaining parameters where state or federal criteria exist.

(E) Effluent Sampling

The Water Quality Management Program designed and implemented a 24 hour composite sampling (5 samples per facility) of 12 wastewater facilities. (All discharge to non-potable waters, since water purveyors have similar programs in progress or planned for potable waters). Those toxic and carcinogenic compounds previously analyzed in the surface water sampling program, were analyzed for the effluent samples. As was anticipated, the data confirmed that treatment plants with greater industrial flows have larger concentrations of organic compounds in their effluents. However, this was not true for all compounds. Some organic compounds (dichlorobenzene), BHC (beta), and heptachlor were also detected in high quantities in the effluent of facilities that treat a high proportion of domestic wastes. The presence of organics, and the possible presence of other substances not tested, reinforces the need for an accurate inventory of industrial wastes discharged to municipal treatment plant. (The Office of Sludge Management and Industrial Pretreatment is preparing such an inventory). Further research may be needed to determine components of commercial and domestic wastes (cleaners, both home and office; paints and thinners, etc.) so that their contribution to the total flow of organic compounds can be identified. The Riverview sewage treatment plant, which treats almost exclusively domestic wastes, contained organic compounds in its effluents which normally are not associated with residential usage (see working paper, Organic Compounds and Their Uses). After all the data is reviewed, it may be necessary to implement industrial pretreatment and/or domestic restrictions on the use of hazardous compounds. The organic compounds were detected in parts per billion values, which are much higher than those found in ambient water samples. The concentration of the effluent is greatly reduced by dilution in the rivers but may still present threats to aquatic organisms. Only further research and continued monitoring can resolve questions of their short term and long term effects.

Conclusion

The surface waters of the Northeast Study Area, both potable and tidal, show evidence of low levels of contamination with suspected toxics and carcinogens. The effects of the low concentrations upon the biota or human consumption are not fully understood. Specific sources of these chemicals have not been identified.

The detection of toxic and suspected carcinogenic in the surface waters is in its infancy, and the determination of acceptable levels of these substances is even more difficult to resolve. EPA is currently developing numerical criteria for some organic compounds. These standards require extensive research and testing which are very time consuming and will probably delay results until verification of testing is completed.

A combined effort by the State and Federal agenices, both giving high priority to potable waters, should help insure the safety of present and future water supplies. The following programs are currently being undertaken, to provide information, control and prevention of toxic and suspected carcinogens in surface and drinking waters:

1. The DEP Program on Environmental Cancer and Toxic Substances plans to sample intensively for toxics and carcinogens, in the Northeast study area. This effort should help establish more statistically accurate results.

2. The DEP Office of Sludge Management and Industrial Pretreatment is preparing a survey to identify sources of toxic wastes within municipal wastewater systems. After a source has been located, pretreatment by the producer may be required.

3. The National Pollutant Discharge Elimination System (NPDES) requires dischargers of waste (point sources) to apply for a permit to discharge. The ultimate goal is to eliminate all discharges of pollution by 1985.

4. EPA is proposing regulations concerning organic compounds in drinking water, which may require utilities serving 75,000 or more people to provide treatment with granular activated carbon to remove organic contaminants.

j. Nitrification Study

The "Analysis of Nitrification in the Passaic Basin" was prepared by Rutgers University, Department of Chemical and Biochemical Engineering, for the WQM Plan. The purpose of the study was to verify the DEP computer analysis and the recommendations of the 303(e) Water Quality Management Basin Plan that nitrification (the process in which ammonia is converted into nitrates through bacterial action and the use of available dissolved oxygen) may be a significant cause of oxygen depletion in the freshwater Passaic River. The 303(e) Basin Plan also reported that sewage treatment plants supply the majority of ammonia which feeds the nitrification process and, in some river segments, present ammonia toxicity problems. Based upon these hypotheses, formulated from previous studies, a program to determine whether nitrogen removal is necessary for specific treatment plants to meet water quality objectives on the Passaic River was implemented with the following objectives:

1) to determine the effect of nitrification on the present water quality of the Passaic River.

2) to determine the potential for nitrification in the future as sewage treatment plants are upgraded and expanded.

The following conclusions are based upon a review of the data collected at the time of publication. Further analysis of the data will be continued to verify the following:

1. Nitrifier activity is prevalent throughout the Upper and Middle Basins of the Passaic River, i.e. above Little Falls. Most Probable Number (MPN) bacterial enumerations on benthic mud samples are uniformly significant at all sites sampled. This is the case for both Nitrosomonas Sp. and Nitrobacter Sp. Population densities do not vary with water temperature or time of year. Nitrite-nitrogen is found generally and is specific to microbial oxidation of ammonia. Relatively high concentrations of this metabolite are found wherever ammonia levels are substantial.

2. Ammonia-nitrogen concentrations are high, at times exceeding 2 mg/l, and represent a large energy resource for nitrifying organisms. Ammonia and soluble organic nitrogen loads are substantial in the Upper Passaic River, the Whippany River, the Rockaway River below Boonton Reservoir, and at several sites in the Middle Basin.

3. Mass balances (a weighted average of stream and discharge concentrations) were calculated using treated wastewater discharges and in-stream nitrogen loads. An estimated 50% of low flow nitrogen species loading is attributable to sewage treatment plant effluents. 303(e) Basin Plan estimates of average nitrogen loads, reported as nitrogenous oxygen demand (NOD), may be conservative; if so, the relative low flow contribution of point sources is even greater. Large increases in nitrate-nitrogen loads, in the reaches cited in Paragraph 2, reflect in-stream nitrification. It is likely that nitrogen conversion exerts a sizable oxygen demand and contributes to violations of stream (DO) standards.

4. At elevated stream flows, nitrogen loads are of predominantly non-point origin. Runoff from heavy rainfall and/or snowmelt is associated with large background loads of organic nitrogen and nitrate-nitrogen, probably arising from detrital decay and nitrification in marshes and undeveloped drainage areas. The role of urban runoff and sewer overflows is not clear.

5. Observed combinations of ammonia concentration, temperature and pH are marginal with respect to reported toxicity limits for aquatic species, i.e. 0.1-0.2 mg/l free ammonia. These conditions are peculiar to high temperature and low flow regimes, at a small number of sampled locations. Water column concentrations of several heavy metals are questionable on the basis of the Interim Primary Drinking Water Standards.

6. It appears that there are no toxic effects upon the nitrifying organisms within the water column, which would lead to the inhibition of nitrification. This is based upon limited data which is being verified.

7. Temporal sampling sequences, carried out at Berkeley Heights and Little Falls, give evidence for major variations in nitrogen species concentrations and loads. Intensive sampling within a 24 hr. period is required to detect these changes.

Based upon the preceeding conclusions it is necessary to control the high ammonia levels found within the Freshwater Passaic River. These elevated ammonia levels have a major effect upon dissolved oxygen depletion via nitrification. In addition, the ammonia values are above recommended toxic levels for freshwater organisms and will continue to increase if future expansion of treatment facilities do not include advance treatment to reduce the ammonia concentrations. The nitrification study supports previous conclusions of the DEP computer analysis and the recommendations of the 303(e) Basin Plan that sewage treatment facilities in the Passaic Basin upgrade their treatment to lower ammonia concentrations in the river.

k. Benthic Study

The study, "The Characterization of Benthal Deposits of the Upper Passaic River", was prepared by Rutgers University, Department of Environmental Science, for the WQM Plan. The main objectives of the study was to remedy data deficiencies; to provide data suitable for use in our water quality modelling efforts; to provide data on which to base in part a non-point source control plan; and to provide data to be used in the determination of effluent limitations. Data gather for this report indicated the following:

1) The Great Piece Meadow acts as a "sink" for nitrogen and trace metals. Total nitrogen is reduced by half by the time the sediments reach the sampling site after the meadows. Metals, when compared before and after the meadow, show significant reductions. Lead, for example, ranged from 18 ppm to 1645 ppm before the swamps and 3 ppm to 710 ppm after accumulating in the marsh areas.

2) The levels of metals do increase with increasing urbanization of the drainage basin. For example, the lead concentration in the rural area's ranged from 30 ppm to 80 ppm, where the suburban and urban regions had values ranging from 37 ppm to 125 ppm and 78 ppm to 764 ppm, respectively.

3) The land uses close to the banks of the river appear to have the greatest effect upon the pollutant loads.

This study was site specific for benthic loads as it was a preliminary identification of problems. Future investigations are required to determine the areal extent of the benthic problems in the basin as well as determining the specific causes. The report recommends further investigation of the Dead River and a detailed study of the constituents existing in the Great Piece Meadows.

III.B.3. Lake Quality

The USEPA, as part of the National Eutrophication Survey, sampled the following lakes in the Northeast Study Area: Greenwood Lake, Pompton Lake, Pinecliff Lake, Oradell Reservoir, and Wanaque Reservoir. The samples were taken starting July 1973 and were completed in June 1974. Table III-15 summarizes the results of the sampling. All the lakes, with the exception of the Wanaque Reservoir, (which is mesotrophic) are eutrophic or boarding on eutrophic conditions. Generally the lakes experience low dissolved oxygen, high phosphorus and excessive vegetation. The factors promoting growth increase the turbidity (% light transmittence) hence the low secchi disk readings. All the lakes, except Pinecliff Lake, are phosphorus limiting. Rapid growth from the addition of phosphorus will result from these conditions. Pinecliff Lake is nitrogen limiting (inorganic nitrogen), therefore addition of this species of nitrogen will increase growth similar to the phosphorus limiting lakes. Pinecliff Lake differs from the other lakes in the study area as it is the only lake with a larger percentage of point source then non point sources contributors. This condition may be the reason for it being the only nitrogen limiting lake in the study area, as a result of the higher proportion of phosphorus to nitrogen in wastewater (point sources). According to the EPA's National Eutrophication Survey, controlling point source discharges would: change Pinecliff Lake from nitrogen limiting to phosphorus limiting, which is more easily controlled; gradually improve water quality in Greenwood Lake; and improve water quality if non-point controls are implemented for the Pompton Lakes.

There are no point sources in or above the Oradell Reservoir to control. The Wanaque Reservoir is significantly better than the other lakes studied, but an unknown nutrient source is believed present, warranting further investigation. Non-point source contributions are the largest percentage of the phosphorus loadings for the Wanaque Reservoir and the other lakes. Further research is required to determine the true impact and a methodology of identification of non-point sources and their controls.

III.B.4. Identification and Classification of Segments

The purpose of this section is to present a description of the process to identify, classify and rank segments. The identification of segments allows the large basin to be divided into small manageable areas for the purpose of investigating alternative pollution abatement strategies. This segmentation is directed at identifying areas with similar characteristics that relate to water quality management. The criteria used by the N.J. DEP in segmentation are listed as follows:

- Each segment should generally contain similar physical characteristics.

Table III-15

LAKE STUDY WATER QUALITY SUMMARY
(National Eutrophication Survey)

Water Quality Factors / Lakes	Oligotrophic	Mesotrophic	Early Eutrophic	Eutrophic	Low Summer D.O.	High Total Phosphorus	Vegetative Problems			Secchi Disk Transmittance			Limiting Factors: algae assay			Limiting Factors: N/P*		
							Emergent	Submerged	Agal Blooms	Low	Medium	High	Phosphorus	Nitrogen	Phosphorus & Nitrogen	Phosphorus	Nitrogen	Phosphorus & Nitrogen
Greenwood Lake			X		X	X	X	X			X		X			X		X
Pompton Lakes				X	X	X		X		X			X			X		
Pinecliff Lake				X		X	X		X	X				X			X	
Oradell Reservoir				X	X	X			X	X								
Wanaque Reservoir		X										X	X					

*N/P - Total Inorganic Nitrogen to mean orthophosphorus ratio.

- Similar technical approaches should be applicable for managing water quality within a segment.

- Common needs for preservation of high quality water should exist within a segment.

Figure III-18 presents the segments identified in the Northeast Study Area. These segments were then ranked by DEP on the basis of population affected, the degree of need for preservation of high quality waters, and the severity of pollution problems within a segment (State Program Grant Application Plan, 1974). The segments were also classified as "water quality limited" (WQ) or "effluent limited" (EL). This classification is particularly important because it determines the level of detail necessary for pollution abatement strategy investigations. WQ segments require a greater effort in this regard. The WQ and EL classifications are defined as follows:

Effluent Limited (EL)

Any segment where water quality meets applicable standards or is expected to meet applicable standards after application of best practicable treatment (BPT) to point source effluents within the segment. BPT is defined as secondary treatment for municipal systems.

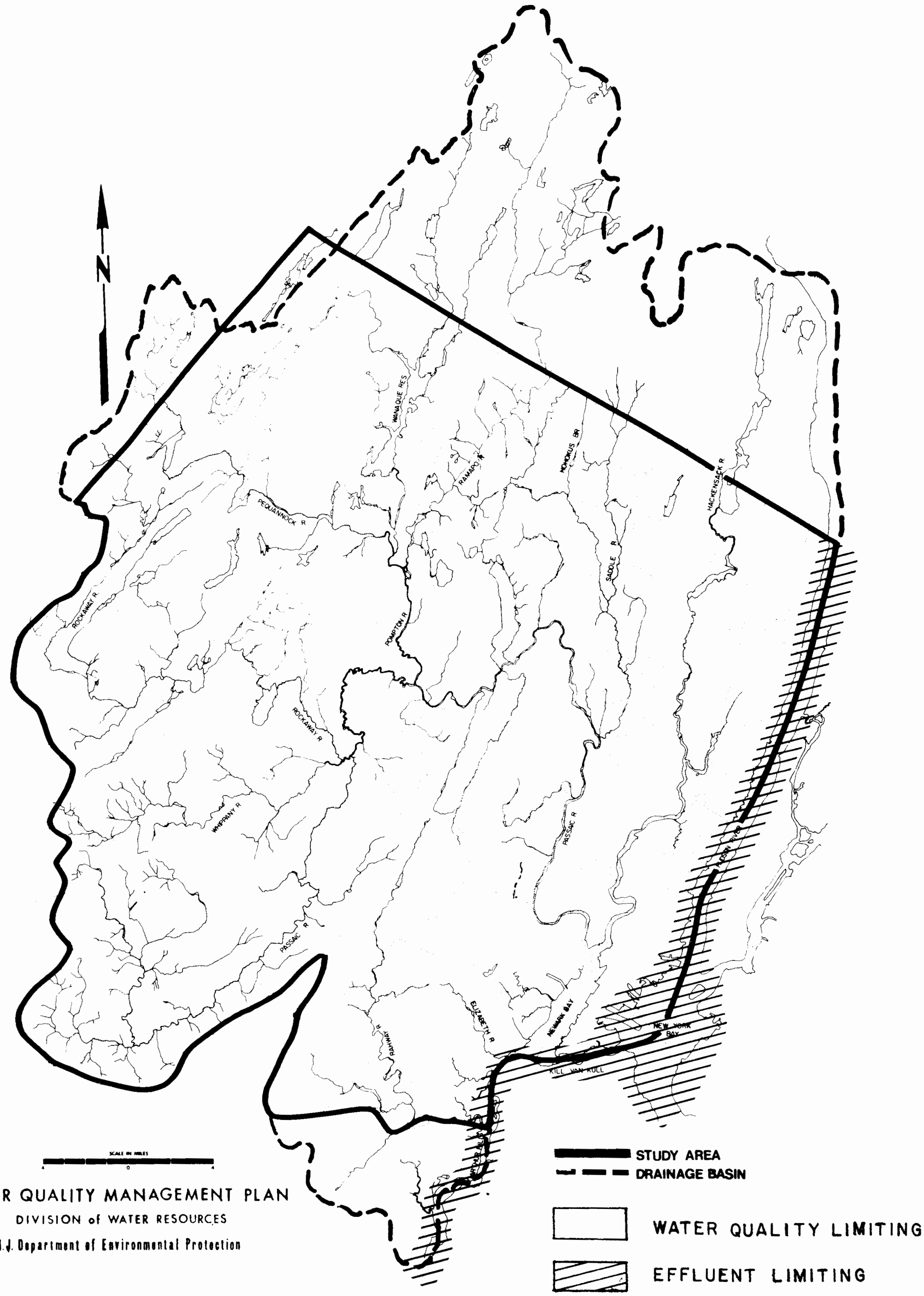
Water Quality Limited (WQL)

Any segment where water quality does not meet applicable standards and is not expected to meet applicable standards even after application of BPT to point source effluents within the segment.

Table III16 presents the segmentation and classification by WQ and EL, accompanied by a brief description of each segment.

Figure III- 18

SEGMENT CLASSIFICATIONS



WATER QUALITY MANAGEMENT PLAN
DIVISION of WATER RESOURCES
N.J. Department of Environmental Protection

Table-III-16

WATER QUALITY SEGMENTATION AND CLASSIFICATION

Segment	Classification
Arthur Kill Estuary	EL
Arthur Kill Tributaries, Rahway River	WQ
Arthur Kill Tributaries, Elizabeth River	WQ
Newark Bay	WQ
Passaic River, downstream of Little Falls and tributary Saddle River	WQ
Hackensack River	WQ
Kill Van Kull Estuary	EL
Upper New York Bay	EL
Hudson River to Bear Mountain Bridge	EL
Mid-Passaic, confluence of Whippany River to Little Falls	WQ
Upper Passaic, headwaters to confluence with Whippany River	WQ
Whippany, headwaters to confluence with Passaic River	WQ
Rockaway River, headwaters to confluence with Whippany River	WQ
Pompton River, including the Pequannock, Ramapo and Wanaque Rivers, headwaters to confluence with the Passaic River	WQ

III.B.5. Recommended Water Quality Standards Revision

The State of New Jersey is required by Federal regulations (40 CFR Parts 130 and 131) to revise its water quality standards to more nearly reflect the Act's 1983 water quality goals calling for fishable and swimmable waters where attainable. Exceptions to the 1983 goal may be allowed based on: 1) natural background, 2) irreversible man-induced conditions, or 3) widespread adverse economic and social impact of requiring pollution controls to meet the 1983 goals. The regulations also require that standards be such as to protect existing stream uses and provide a mechanism to prevent deterioration of existing uses.

Water quality management planning provides the technical basis for making policy decisions regarding standards. The two key planning objectives are (1) the maintenance (non-degradation) of existing water quality for those waters that are of higher quality than that required to meet the present minimal water quality standards and (2) the upgrading of water quality to meet standards for those waters in violation of the standards. An outline of the State procedure for water quality standards revision is presented in Table III-17.

New Jersey water quality standards provide for the classification of all surface waters according to beneficial uses. Present water classifications--except those classified as TW-2, TW-3, TW-4 and CW-2--conform to the 1983 interim goal of fishable, swimmable waters. Where present use classifications do not properly reflect existing in-stream uses, or do not differentiate among uses that vary in their tolerance of pollution, a determination must be made of the need to revise the use classification. This may require a redefinition of uses, resulting in more specific classifications.

Existing State water use classifications which provide for maintenance and protection of fish must be examined to determine the extent to which indigenous species are protected. In streams where man's activity has resulted in a shift from sensitive species to pollution-tolerant species, the classification should reflect those uses that the stream could support if available water quality control measures were implemented.

The criteria presently assigned for use classification may not be sufficiently specific or stringent to prevent degradation. The most current scientific information, such as the Federal Section 304(a) Quality Criteria for Water publication, should provide the basic reference point for

Table III-17 Water Quality Standards Development Procedure

Standards Revision Process

A. Development of State standards policy to retain existing designated beneficial uses and protect existing instream beneficial uses at 1983 goal levels consistent with 40 CFRI 130.17.	B. Development of State Standards Policy to upgrade existing use classifications to levels consistent with 40 CFRI 130.17.
1. Determine whether present use classifications are appropriate to retain existing designated beneficial uses (including policies of antidegradation).	1. Propose upgraded uses that will result in achievement of 1983 goal levels wherever attainable.
2. Determine (on a preliminary basis) the criteria needed to protect existing designated and instream benefical uses. (EPA's Quality Criteria for Water is a basic reference).	2. Determine (on a preliminary basis) the criteria needed to protect proposed upgraded uses.
3. Develop a standards revision policy for existing designated and instream beneficial uses.	3. Develop a standards revision policy for upgrading uses.

Source: Adapted from EPA Draft Guidelines for State and Areawide Water Quality Management Program Development, Table 2.2, Page 2-40, February 1976.

establishing numerical criteria for many pollutants. Other sources, such as existing instream water quality data, for streams having a quality exceeding existing standards, can be used to establish a definitive baseline of stream quality for the purposes of carrying out an antidegradation policy. Definition of the critical stream-flow conditions under which the antidegradation policy applies, and of a reasonable data collection period and number of sampling stations to define existing conditions, would be necessary to establish a representative baseline quality.

Recommended revisions to the New Jersey Water Quality Standards include changes to the anti-degradation policy, disinfection policy, stream classifications and toxic substances.

a. Recommended Revisions to Antidegradation Policy - In accordance with Section 130.17(e) New Jersey's Antidegradation Policy would be revised to contain the following components:

i. Statement of Policy

- In all situations where a lower classification of water may impinge upon a higher classification of water, the Department in implementing these standards, shall ensure the quality and uses of the higher classification are protected.

- It is the objective of the Department to restore tidal waters which are now at levels of quality below acceptable limits of quality for shellfish harvesting.

- Existing instream water uses shall be maintained and protected. In no event, may degradation of water quality interfere with or become injurious to, existing instream water uses.

- Existing high quality waters which exceed those levels necessary to support propagation of fish, shellfish, and wildlife in and on the water shall be maintained and protected. No water quality degradation which would interfere with or become injurious to existing instream water uses is allowable. However, the State may allow some degradation provided that the applicant can demonstrate to the Department, in a public hearing requested by the applicant, that there is no reasonable relationship between the economic and social costs and benefits of achieving the effluent limitations that are developed pursuant to this antidegradation policy.

If, following the hearing process and USEPA review, the applicant has met these requirements, a modified NPDES or NJPDES permit, or conceptual approval of treatment works (N.J.A.C. 7:14-2.16 et seq.) will be issued. The amended permit will, in every case, contain technically based effluent limitations reflecting the highest level of technology available in order to support propagation of fish, shellfish, and other aquatic life and support wildlife and recreation in and on the water.

- The Department may also choose, upon its own initiative, and after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, to allow lower water quality as a result of necessary and justifiable economic or social development. However, in no event, may degradation of water quality interfere with or become injurious to the designated uses.

- Non-degradation of Central Pine Barrens Water Quality Note: (not included here because of irrelevance to study area).

ii. Statement of Implementation

Note: This section will reference the process by which effluent limitations would be developed for waters in an antidegradation classification. This is contained in Chapter V of this document.

b. Recommended Revisions to Disinfection Policy - The principal components of the disinfection policy revisions would include:

i. A description of those areas for which discharges may be permitted to practice seasonal disinfection. The term of the season will also be defined.

ii. For those areas where chlorination will continue to be practiced, the policy will provide for reduced application rates while maintaining the effectiveness of the process. This will reduce the overall consumption of chlorine as well as minimize the occurence of harmful water-borne by-products.

iii. A statement of policy on alternative methods of disinfection, other than chlorination.

c. Recommended Revisions to the Stream Classifications - Revisions to the stream classifications would be as follows:

i. Class FW-3 would be upgraded to FW-2. This means that all fresh surface waters will have potable water as a designated use.

ii. Class FW-2 stream classifications would be described in greater detail so as to identify trout production, trout maintenance and non-trout segments.

iii. Certain TW waters would be re-classified to FW-2, which is more representative of their designated uses.

d. Statement on Toxic Substances - It is recommended that "Quality Criteria for Water" (EPA, 1976), "Water Quality Criteria 1972" (National Academy of Sciences, National Academy of Engineering, March 1973, EPA-R3-73-033), other water quality criteria information published pursuant to Section 304(a) of the Clean Water Act of 1977, or other scientific information, should be used for developing toxicity levels of pollutants which may affect designated uses.

e. Other Recommendations - In addition to the above water quality standards revisions recommended by the Department, the following recommendations for revisions to current standards are being made as a result of the WQM Program, as possible topics for continuing planning:

i. All narrative criteria contained within the current standards should be converted to numerical criteria in order to facilitate water quality assessment, e.g. floating, colloidal and settleable solids, oil, grease, color, taste and odor producing substances.

ii. Guidelines contained within the present standards should be given the status of standard criteria in order to facilitate both water quality assessment and enforcement, e.g. guidelines for delineation of a heat dissipation area.

iii. The thrust of standards revisions should be to reduce the number of classifications and to unify criteria, where possible and practicable. For example, as tidal waters improve in quality, and uses are restored to the goals of fishable and swimmable, the classifications should be upgraded to reflect these improvements.

iv. Where numerical criteria are somewhat ambiguous (or stated as goals) they should be made more specific. For example, the numerical criterion for petroleum hydrocarbons is stated as a goal until adequate information is gathered regarding the occurrence of this substance in New Jersey's surface waters. When such information is fully developed it is recommended that the numerical criterion for this substance be made more specific.

III.B.6. Water Quality Data Needs

The objective of water quality monitoring is to better understand causes of pollution, measure levels and trends and provide a data base to guide formulation and implementation of water quality management policies and actions. An effective monitoring program should be able to determine compliance with standards and policies, identify existing water quality problems, anticipate potential problems and disseminate information in an efficient fashion to prevent or minimize the associated problems.

Cooperative agreements exist between the New Jersey Department of Environmental Protection (NJDEP) and the New Jersey office of the U.S. Geological Survey (USGS) to collect and analyze water qualty data. There are approximately 200 surface water stations Statewide that are sampled under these agreements, of which 17 are in the Northeast study area. The data from these surveys is used to prepare an annual report (required under Section 305(b) of PL 92-500) to Congress on the existing water quality nationwide.

While the sampling program is adequate for making an inventory or a "rough" water quality assessment, it is not adequate for determination of specific water quality problems associated with nonpoint sources, toxic substances, photosynthetic activity, and biological and benthic deposits. In order to develop sound water quality management plans, and in order to meet the national goal of swimmable and fishable waters, the sampling stations, and types of sampling parameters should be revised.

The Water Quality Standards as set by either the EPA or State of New Jersey, establish a relative concentration for which a pollutant may be found without endangering people or aquatic organisms. It is important to have a specific value and detailed conditions set for the use of these criteria. Furthermore the conditions set (time of sample, frequency, etc) should be realistic with respect to the abilities of most laboratories to process a limited amount of samples. For example, 5 fecal coliform samples per month may be difficult to acquire. In general, the most frequent sampling done by agencies is on a weekly basis; and in most cases, monthly sampling is used. As discussed in this chapter, limited water quality criteria are available for the present state standard, and an anti-degradation policy will be proposed to protect streams that meet the state standards from increased pollution. This will require sampling to identify specific ambient water quality conditions on which to base anti-degradation policies.

The following changes in data collection and use are recommended:

a. Modification and Amplification of the Existing Program Shortcomings in sampling, (frequency increased) and data gaps, (headwater areas are not sampled) should be systematically identified. To begin with, extensive coordination among the agencies (water purveyor and other data collection agencies collecting water data for independent uses) should be established. These agencies should be encouraged to participate in a cooperative monitoring system in which they may have access to all other data.

In all cases, water quality sampling should be integrated with streamflow gaging, ground water studies and local weather records. This information should be available in a data management system (EPA-Storet), convenient for all personel involved with water quality analysis or related fields. For example, all parameters should be easily correlated to weather so that a possible relationship may be evaluated. Furthermore, additional pollutants other than the traditional parameters should be selected for analysis in stream reaches that might have specific problems, such as benthic oxygen uptake, pesticides, toxic organics and heavy metals, etc. Diurnal variations of dissolved oxygen present an analytical problem in various sections of the area. Therefore, it is recommended that diurnal dissolved oxygen measurements for some identified key stations and regular chlorophyll "a" data for all stations should be included in the sampling program.

Increasing the number of sampling stations in the long term monitoring program should be considered, at least on a seasonal basis, if resources will permit it.

b. Intensive Sampling Program From the sampling analysis, water quality "trouble spots" or high priority waters should be identified for intensive surveys. Most importantly, intensive samping should be used as a mechanism for integrating monitoring components to improve resource management (i.e., intensive surveys to support planning, modelling, and permit revision, etc.). As part of this program, fecal coliform/fecal strep. ratios should be determined to evaluate whether the source is human or livestock.

Pollution also results from landfills, unlined lagoons, septic tank areas, and similar sources. It is recommended that intensive surveys be conducted for these potential nonpoint sources, along with the point sources, so that a better understanding of the nonpoint impacts can be established.

Since potable water and non-degradation of high quality waters are a high priority for the Northeast Study Area it is recommended that the Upper Passaic headwaters be one of the first areas to be sampled intensively in order to provide a data base for the natural (background) levels of parameters. Such a study would also incorporate an analysis of different land uses downstream from the headwaters area, to provide specific non-point source information to compare to the contributions of the limited point sources in that area.

c. Quality Control Program Sampling techniques, laboratory procedures and reporting formats that are acceptable by EPA and DEP should be implemented by agencies that do water quality sampling. Additional quality assurance should be performed at least biannually to confirm the consistency of data collection and reporting.

d. Intra-Departmental Coordination Many of the data collection and analysis tasks performed by offices within DEP are relevant to tasks performed by other offices. Duplication of efforts may be reduced by better communications between the Department's Divisions, and by standardizing geographic study and reporting areas wherever possible. For example, in the Division of Water Resources, the basins studied by the Monitoring, Surveillance and Enforcement Element and the Water Quality Management Program are delineated differently. Making these delineations uniform would simplify the exchange of data between these offices. Similarly, the Bureau of Fisheries in the Division of Fish, Game and Shellfisheries currently records fish kills in chronological order. Listing of the fish kills by river basins would make this data easier for the Division of Water Resources to utilize.

III.C. Ground Water Quality

Approximately 25% of all potable water in the Northeast Study Area comes from ground water. Water is collected below the surface in an underground reservoir of gaps between rocks, termed an aquifer. Ground water is known for its purity because it is usually filtered by the ground enroute to the aquifer. However, any contamination of ground water is a very serious problem due to its long duration and uncertainty of human health risks. In recent years, the Northeast region of New Jersey has experienced several recorded incidents of ground water contamination. For example, in August 1978, approximately 7000 gallons of gasoline were lost by a refinery in Leonia; since then, gas has periodically appeared in storm and sanitary sewers in that area, indicating the likelihood of ground water contamination. In October 1977, 3000 to 6000 gallons of gasoline leaked from a gas station in Harding Township, contaminating four domestic wells. In 1977 South Orange closed eight wells after the odor of gasoline was detected at the town's ground water pumping station. 600 parts per million were recorded in one of the wells; a leak in an underground gas station tank was the suspected source. South Orange has had to find its water elsewhere; the cost so far has exceeded 500,000 dollars. Records of ground water contamination reveal many such accidents, occurring from a variety of sources. Sometimes the sources of pollution can be difficult to locate and control. By the time ground water pollution is discovered it usually is too late to reverse the damage.

The pollution sources that are expected to pose the greatest threat to ground water quality in the Northeast Study Area are stormwater runoff, landfills, chemical spills from industry, and waste disposal lagoons. Other ways ground water may be contaminated are faulty septic systems, highway deicers, and agricultural practices. Chapter VI discusses these pollution sources in detail.

Areawide water quality management programs to implement abatement measures for all pollution sources, including ground water, are required for all areas of the state. The New Jersey Division of Water Resources is expected to initiate a program in the near future to assess the effects of industrial impoundments on ground water. In order to evaluate the region's ground water quality, the Northeast WQM Program undertook a short-term ground water sampling program to begin to fill data gaps and to help in assessing future regulations and controls.

Early in the planning process the WQM Program, in coordination with the DEP Program on Environmental Carcinogens and Toxic Substances (PECTS), entered into a contract with Rutgers University for ground water sampling at approximately 80 sites for a wide range of parameters. The purpose of the project was to obtain an assessment of the degree of contamination of ground water supplies by selected toxic and carcinogenic compounds. Fifteen standard parameters were also included in the study. All laboratory work was performed by the Department of Environmental Sciences of Rutgers University.

Tests were conducted to detect quantities of the substances listed in Table III-18, and locations of wells sampled are shown in figures III-19 and III-20.

III.C.1 Areawide Ground Water Management Program

Development of an areawide ground water management program requires a thorough understanding of the surficial and subsurface geohydrology. This is necessary because the water supply potential and water quality characteristics of ground water are a function of the geology and hydrology of the various types of formations, whether they be rock or unconsolidated sediments.

In the Northeast Study Area the principal geologic formations consist of consolidated shales, sandstones, granites, gneisses and traprock. These are overlain in part by unconsolidated sedimentary and/or glacial deposits of clay, silt, sand, and gravel. The differences in the water bearing properties of rock formations and unconsolidated materials are explained below.

a. Surficial Deposits Surficial deposits consist principally of unconsolidated glacial deposits formed and left by the last glacial advance and retreat. These deposits consist of both stratified and unstratified materials depending on the glacial and/or glacial melt mechanism involved in their formation. More recent river deposits border the major streams in the northeast area. The distribution of surficial deposits is shown in Figure III-21.

Table III-18

PARAMETERS SELECTED FOR GROUND WATER MONITORING PROGRAM

Standard Parameters

C^o Temperature
pH
Ammonia-N
Organic-N
Nitrate-N
Nitrite-N
Phosphorous
Sulphate
Alkalinity
Chloride
Flouride
Cyanide
LAS
Dissolved Solids
Fecal Coliform

Light Organic Compounds

methylene chloride
methyl chloride
methyl bromide
chloroform
bromoform
bromodichloromethane
dibromodichloromethane
trifluoromethane
carbon tetrachloride
1,2 - dibromoethane
1,2 - dichloroethane
1,1 - trichloroethane
vinyl chloride
1,1 1,2 - dichloroethylene
1,1,2 - trichloroethylene
o,m,p - dichlorobenzene
trichlorobenzene
tetrachloroethylene

Heavy Metals

arsenic and compounds
beryllium and compounds
cadmium and compounds
chromium and compounds
copper and compounds
nickel and compounds
lead and compounds
zinc and compounds
selenium and compounds

Pesticides and PCB

Polychlorinated Biphenyls (PCB)
BHC
lindane
aldrin
dieldrin
endrin
heptachlor
heptachlor epoxide
toxaphene
DDT and associated compounds

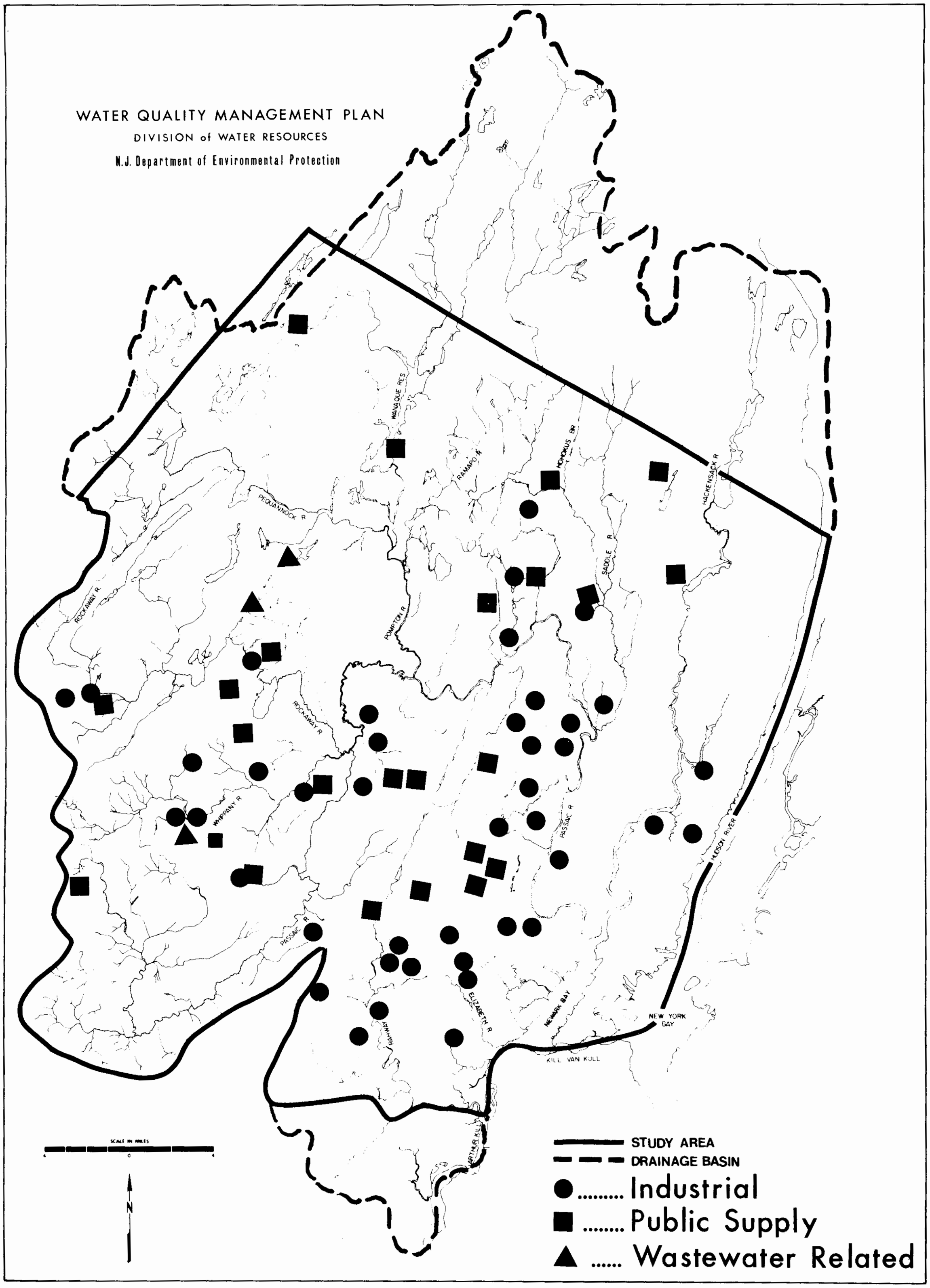


Figure III–19 –Ground Water Sampling Sites.

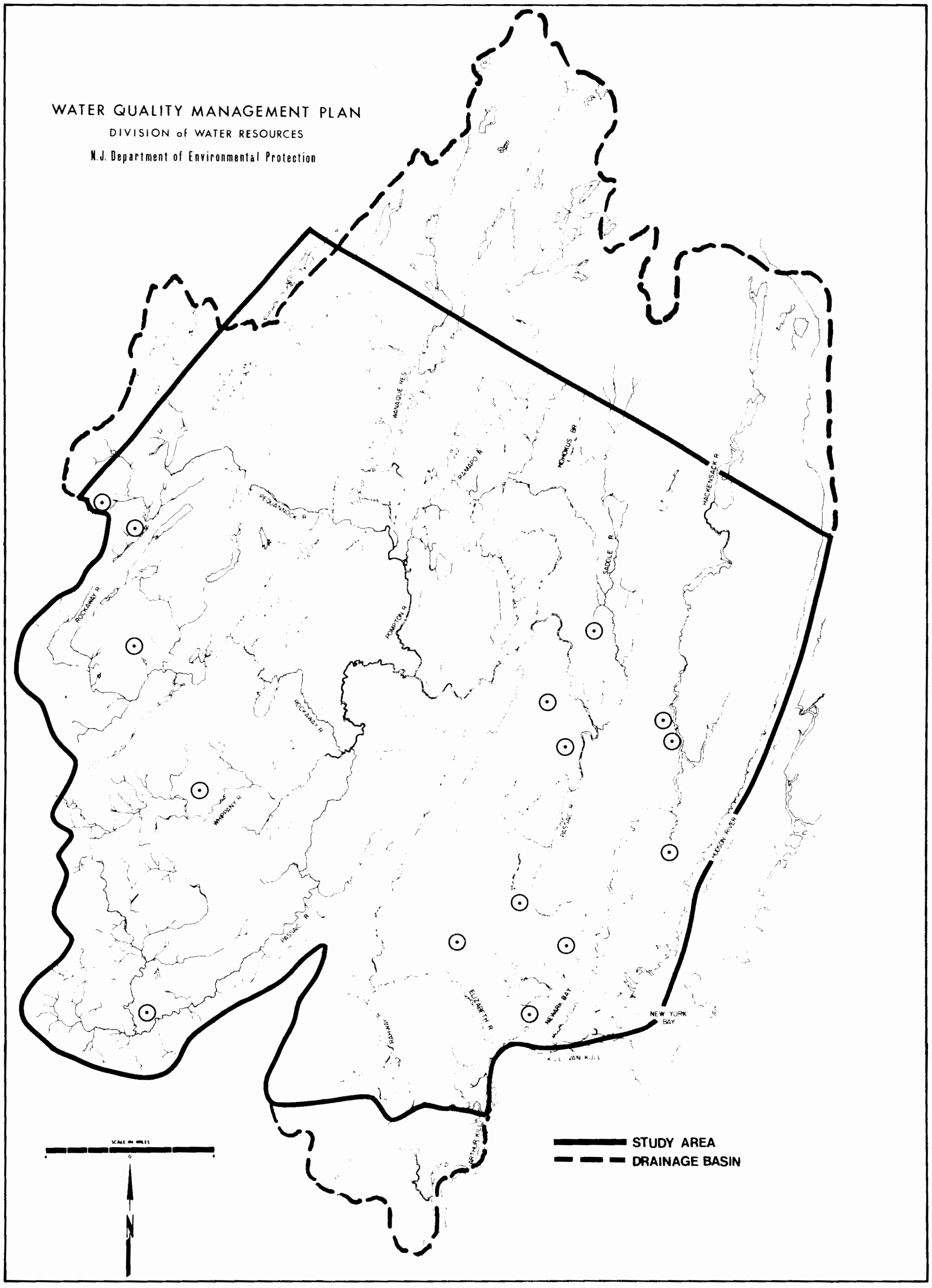


Figure III-20 – Second Round Ground Water Sampling Sites.

Figure III-21
SURFICIAL GEOLOGY IN THE
NORTHEAST NEW JERSEY STUDY AREA

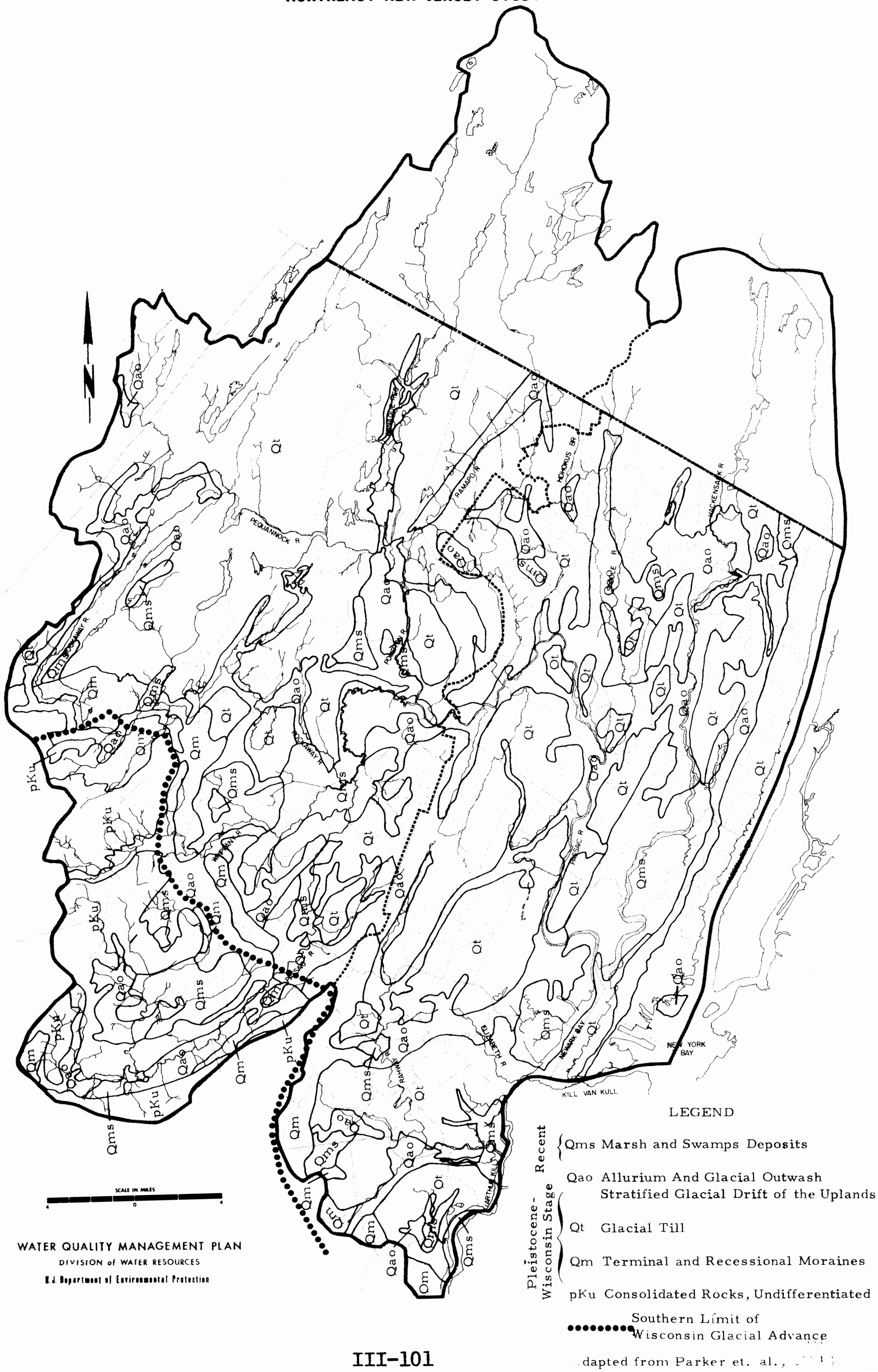


Table III-19 reveals that stratified glacial deposits are the most productive surficial aquifers in the Northeast Study Area. Ground water in the stratified deposits occurs under confined and unconfined conditions. Unconfined (water table) ground water occurs where the porous sediments are not covered by an impervious layer of silt or clay and the migration of ground water is generally free from the surface down. These deposits generally do not yield large quantities of ground water in the Northeast since they are commonly less than 30 feet thick. The water potential varies with local conditions. Confined (artesian) and semi-confined aquifers contain less porous clay or silt units which confine water, permitting withdrawal under pressure.

In the Northeast Study Area the most productive aquifers are the buried confined valley fill deposits located in Morris & Essex Counties. Reported yields from large diameter wells range from 20 to 2,200 gallons per minute with an average of 502 gallons per minute in Morris County (Gill and Vecchioli 1965, p.26) and from 410 to 1,593 gallons per minute with an average of 908 gallons per minute in Essex County (Nicholos, 1968 p.25).

The amount of water available on a continuing basis from the valley fill aquifer was determined from a simulation model of 61 hypothetical wells using the criterion that water levels would not decline below 30 ft. above the base of the aquifer. The estimated yields available from the buried valley deposits and a comparison with the withdrawal rates in 1972-73 are given in Table III-20.

Table III-20 indicates that additional quantities of water can be pumped from the East Hanover and Chatham Valley aquifer system. Additional supplies of ground water may also be available from the valley fill deposits in the Whippany, Parsippany-Troy Hills area located north and northwest of the northern part of the East Hanover valley.

Much of Morris and Passaic counties is underlain by Precambrian granites and gneisses. These Precambrian rocks yield ground water with a wide range of iron concentrations because of the iron-bearing minerals in the formation. The pH of the ground water is typically low with minimal concentrations of hardness. Local thin permeable soil conditions over bedrock permits the area to be susceptible to pollution.

b. Productive Bedrock Aquifers - The Brunswick formation, a bedrock aquifer, covers the major portion of the Northeast Study Area. It is the major source of potable water for the southeastern third of Morris County and the western portion of Essex, Union and Bergen counties. Table III-21 outlines bedrock geology for the Northeast Study Area. Figure III-22 reveals the locations of bedrock aquifers in the study area.

Table III-19

NORTHEAST SURFICIAL STRATIGRAPHIC COLUMN

Era	Period	Epoch	Number of Million Years Ago	Symbol	Formation	Lithology	Hydrologic Characteristics	Thickness (approx. in ft.)	Aerial Extent
Cenozoic	Quaternary	Holocene	0-1	Qms	Marsh and swamp deposits	Peat, silt, clay, sand, and root mat.	Relatively impermeable. Wells tap ground water from underlying formations	0-50	Small
		Pleistocene (Wisconsin Stage)	0-1	Qao	Stratified glacial deposits	Generally composed of sand and gravel, but may contain some silt and clay. Deposited by glacial meltwaters.	Material is usually clean and displays good sorting. The most productive confined and semi-confined aquifers occur in stream valleys. Permeability may be reduced by silt and clay.	0-450	Moderate
		Pleistocene (Wisconsin Stage)	0-1	Qt	Unstratified glacial till	Deposits consisting of rock fragments from clay size to boulders which were deposited directly by the glacier.	Generally a poor aquifer as a result of poor sorting.	0-200	Moderate
		Pleistocene (Wisconsin Stage)	0-1	Qm	Unstratified terminal and recessional morraines.	Heterogeneous deposits ranging from clay size to large rock fragments deposited directly at the glacier front.	A poor aquifer due to low permeability.	0-400	Small
		Pleistocene (Wisconsin Stage)	0-1	pKu	Early glacial drift.	Extensively weathered material deposited during early glacial periods.	A very poor aquifer as a result of limited thickness and poor permeability.	0-30	Very small

Table III-20

Ground Water Resources in the Morris County Area

	Water Available	Water Pumped 1972-73
East Hanover Valley;	20 CFS (13 MGD, 0.6 m^3/s)	7.15 CFS 0.20 m^3/s)
Northern Millburn Valley	1 CFS (0.7 MGD, 0.03 m^3/s)	2.89 CFS (1.87 MGD, 0.08 m^3/s)
Chatham Valley;	19 CFS (12 MGD, 0.5 m^3/s)	5.09 CFS (3.29 MGD, 0.14 m^3/s)
Southern Millburn Valley;	21 CFS (14 MGD, 0.6 m^3/s)	23.21 CFS (15.0 MGD, 0.66 m^3/s)
Slough Brook Valley	0.1 CFS (0.06 MGD, 0.003 m^3/s)	0.60 CFS (0.39 MGD, 0.02 m^3/s)
Canoe Brook Valley	2 CFS (1.3 MGD, 0.06 m^3/s)	4.08 CFS (2.64 MGD, 0.12 m^3/s)
Total	63 CFS (41 MGD, 1.8 m^3/s)	43.02 CFS (27.81 MGD, 1.22 m^3/s)

Table III-21

NORTHEAST BEDROCK STRATIGRAPHIC COLUMN

Era	Period	Number of Million Years Ago	Symbol	Formation		Lithology	Hydrologic Characteristics	Thickness	Aerial Extent
MESOZOIC	Cretaceous	70-135	Kmr	Magothy-Raritan		Alternating beds of sands and clays.	A very good aquifer. However, salt water intrusion reduces potential yields in Study area.	0-30	Small
	Triassic	135-225	Trd	Newark Group	Diabase	Medium to coarse-grained igneous rock forming the Palisades.	Formation has a very low primary permeability. Water is found only in fractures. Useful only for domestic supplies.	1000	Large
		135-225	Trbs		Basalt	Fine-grained, dark-gray extrusive igneous rock forming the Watchungs.	Very low primary permeability. Well yields are low to moderate.	300-800	Moderate
		135-225	Trc		Border Conglomerate	Well-rounded quartzite, gneiss, granite and sandstone pebbles within a sand and shaley matrix.	Variable water-bearing characteristics. Well yields range from low to moderate. Cross-bedding and abrupt texture variations are typical.	Variable along bedding planes and joints	Small
		135-225	Trb		Brunswick	Interbedded shale and sandstone.	Ground water found primarily in fractures and cracks. Most important aquifer in Study Area.	6000-8000	Very large
		135-225	Trl		Lockatong	Mostly argillite with some minor sandstone and limestone	Unit is found in West New York. A very minor aquifer.	Very thin	Very small
		135-225	Trs		Stockton	Arkosic sandstone shale and conglomerate.	Formation has very good primary permeability and is a very good aquifer. Water is stored and transported along extensive networks of fractures and cracks.	2300-3000	Moderate

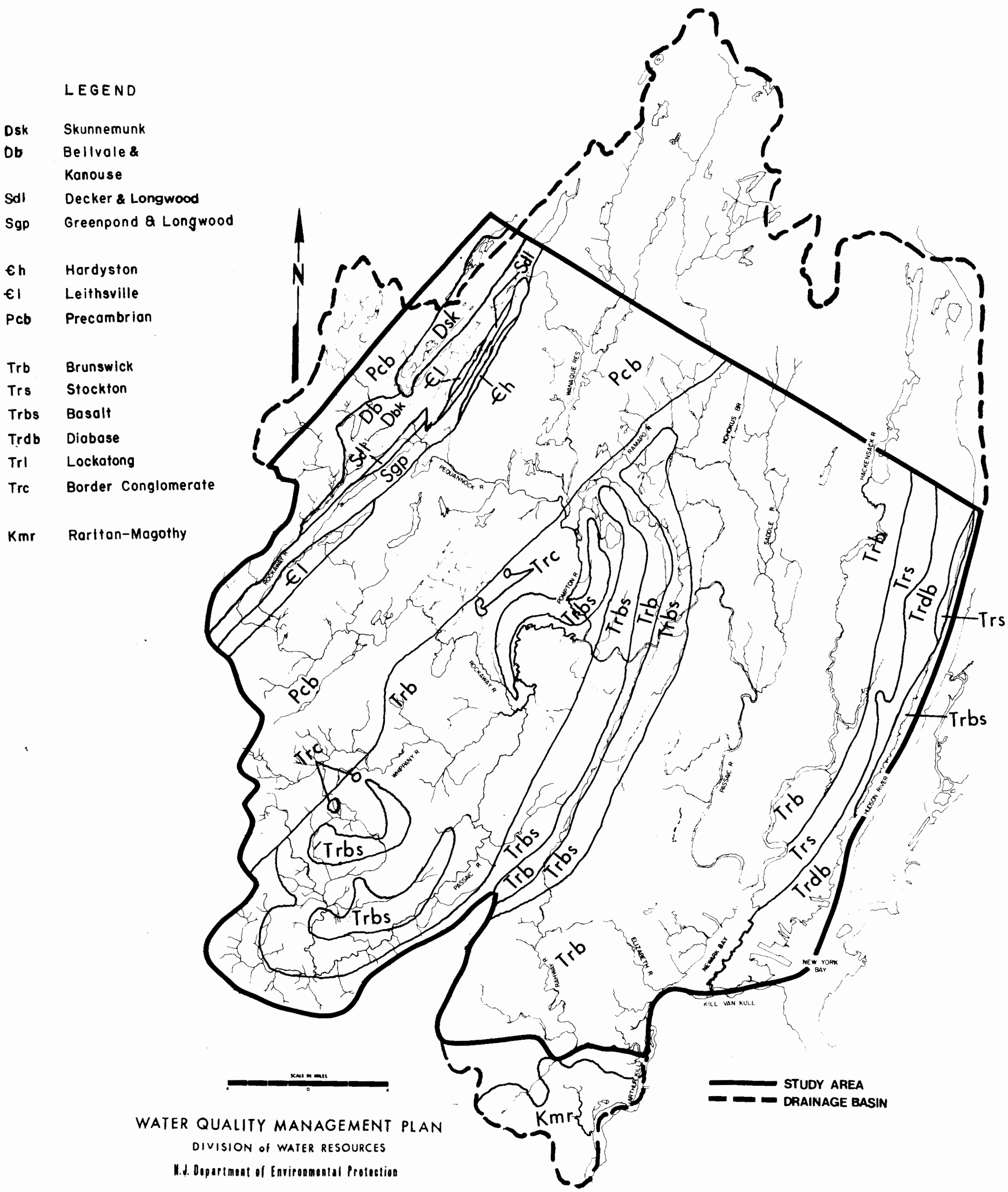
(continued next page)

Table III-21 (continued)

NORTHEAST BEDROCK STRATIGRAPHIC COLUMN

Era	Period	Number of Million Years Ago	Symbol	Formation	Lithology	Hydrologic Characteristics	Thickness	Aerial Extent
PALEOZOIC	Devonian	350-400	**Dsk**	Skunnemunk	Massively bedded conglomerate inter-bedded with sandstone.	Primary permeability is lacking Some water is available from joints and fractures.	2500-?	Moderate
		350-400	**Dbk**	Bellvale-Kanouse	Shales, sandstones, and conglomerates.	Generally a poor source of ground water. Minor quantities are found in fractures in the lower portion of the formation.	200-2000	Moderate
	Silurian	400-440	**Sdl**	Decker-Longwood	Limestone overlying soft red shale. Some sandstone is present.	Ground water found in joints and solution channels. Both are minor aquifers.	200-500	Very Small
		400-440	**Sgb**	Green Pond	Quartzite and quartz conglomerate. Some sandstone is present	Lower portions of the unit are friable and may contain moderate quantities of water	1200	Moderate
	Cambrian	500-600	**€l**	Leithsville	Massively bedded, coarse-grained dolomite containing a siliceous shaley dolemite member in the lower half.	Units above the shaley member can be important water producers. Water movement is through a very well developed system of solution channels.	500	Small
		500-600	**€h**	Hardyston	Hard quartzitic conglomerate grading upward into calcer-ous sandstone	Generally a minor aquifer because of its variable thickness. Where over 100 feet and thick and weathered, moderate yields are possible.	0-50	Very Small
PRECAM-BRIAN		600+	**Pcb**	Various gneisses	Various gneisses, including marbles, skarns, and serpen-tines.	Variable yields due to diversity of the types of gneisses. Largest well yields found adjacent to major fault and weathered zones.	Unknown	Large

Figure III-22
Bedrock Geology of the Northeast Study Area



In the Rahway area, approximately 90% of the wells tap the Brunswick formation and together they yield more than 6 MGD (Anderson, 1968). Analyses of various wells in the Rahway area reveal high concentrations of sulfate, calcium, and total solids. Domestic potable wells drilled into the Brunswick Formation have been reported to be always productive. (Widmer, 1968).

Another productive bedrock formation, although not as extensive as the Brunswick, is the Stockton formation. Lying primarily along the Hudson River, this aquifer probably has the best hydraulic characteristics of all the consolidated rock aquifers in the Northeast Study Area.

The area along the Hudson River has not been extensively tapped for ground water supply, and very little water quality information is available. Generally the water drawn from wells in this area is of good quality, although it is occassionally high in sulfate and iron.

III.C.2 Ground Water Quality Assessment

Recent studies by EPA have produced evidence that carcinogens and potentially hazardous compounds are present in drinking water in the Northeast Study Area. Therefore, ground water sampling for the WQM Program concentrated on testing for potential toxic and carcinogenic substances.

The WQM program recommended sampling for industrial sources of pollutants where chemical manufacturers and those using chemicals in some production capacity might affect the water supply. Municipal and private wells were also selected in areas where pollution might be expected.

Four groups of contaminants were selected for analyses: volatile organics, PCB's and pesticides, metals, and standard parameters. Mean values and ranges were calculated, with two values assigned to parameters below the detection limit, that of zero and that of the detection limit. Highly sensitive analytical techniques were used in the laboratory. Unfortunately, as the sensitivity of analytical techniques increases so does the probability of error. In order to statistically control for the variability at very low values, a lower limit of 0.1 parts per billion (ppb) was established. Thus, any organics or pesticides detected below this limit are reported as "less than one tenth part per billion" (indicated by 0.1 ppb). The detection limit varies for the different metals. For Arsenic, Beryllium, Cadmium, Copper, Chromium, and Lead, the detection limits are 1 ppb. For Mercury and Zinc, the detection limits are 5 ppb.

Eighty existing wells were monitored, the first 65 samples concentrating on an even distribution of well locations within industrialized areas and selected locations in outlying aquifer recharge areas. Fifteen additional samples were taken, targeted toward likely pollution sources such as wells in the vicinity of landfills and heavily industrialized areas. Both rounds of sampling are included together in this report.

Analysis of ground water sampling data is particularly difficult because the movement of pollutants underground is often hard to predict. If a particular pollutant appears in one sample taken from a well but not in a subsequent sample, interpretation may be difficult. The contaminant may be travelling in the ground water in a slug that is flushed past the well before the next sampling. Alternatively, the original detection of the pollutant may have been an analytical error. In the case of complex compounds such as many of those monitored in this study, behavior is particularly hard to predict since little is known about what happens to these substances in the ground water. Similarly, the presence of contaminants in one well may or may not have implications for other wells in a region. Intensive study of geology, ground water movement, and proximity of other wells, as well as additional sampling, will be needed to fully evaluate the implications of sampling data from this initial study. Follow-up monitoring was done to insure that contamination from any wells does not threaten nearby aquifers used as sources of drinking water.

a. Standard Parameters (Physical, Chemical and Biological)
Results of these tests reveal that few of these parameters exceeded recommended drinking water standards. Tables III-22 and III-23 outline the range and calculated means for the standard parameters tested in both rounds of sampling.

Only one well contained more than one fecal coliform colony per 100 ml. (Recommended standard is 0/100 ml). This well was used by an industrial facility and not as a potable supply. No samples violated the recommended pH of 5-9; the mean value was 7.3.

Dissolved solids were usually below the recommended concentration of 500 ppm in the first round of sampling. The second round produced higher values, with five of the fifteen wells exceeding the recommended concentration. Mean values were 420.84 ppm and 1065.5 ppm for the first and second rounds respectively. The higher mean for the second round may be attributed to the biased sampling, which was done mainly in highly industrialized areas. Of the violations that were detected, all but two were found in wells used for industrial facilities. Total dissolved solids present in drinking water above the recommended concentration does not represent a hazard to human health. A recommended concentration is established only for aesthetic reasons.

Table III-22

GROUNDWATER QUALITY ANALYSIS OF N.E. 208 STUDY AREA

• PHYSICAL, CHEMICAL, & BIOLOGICAL PARAMETERS - FIRST ROUND SAMPLING

Parameter	a. Recommended Standards	Number of Violations of Recommended Standards (Northeast)	RANGES Northeast Study Area High	Low	Mean	# of Analyses	b. RANGES Bureau of Potable Water 1972-1977 High	Low	Mean	# of Analyses
C° Temperature	None	-	19	11.5	13.88	66	-	-	-	-
pH	5-9	0	8.8	6.2	7.3	61	8.1	4.2	7.0	50
Ammonia-N	None	-	.75	<.01	0.040	70	-	-	-	-
Organic-N	None	-	2.19	0.002	0.131	70	-	-	-	-
Nitrate-N	10.0	0	2.2	0	0.95	70	15.5	0	7.86	33
Nitrite-N	1.0	0	0.4552	0	0.0031	70	-	-	-	-
Phosphorous	None	-	0.18	0	0.056	70	-	-	-	-
Sulphate	250.00	1	275	17	74.23	70	552	7	77.7	19
Alkalinity	None	-	292	0	138.11	70	-	-	-	-
Chloride	250.00	3	1500	3.5	89.85	70	-	-	-	-
Flouride	1.5	1	5.4	< 0.5	0.67	70	21	0	0.84	27
Cyanide	0.2	0	.1	< .01	.011	70	225	0	0.035	21
LAS	0.5	0	.16	0	0.002	70	0.29	0	0.01	28
Dissolved Solids	500.0	11	3240.0	0	420.84	70	990	46	322.9	50
Fecal Coliform	0/100 ml.	1	1.0	0	.014	70	0	0	0	25

*Unless otherwise indicated, all data reported in mg/l (parts per million)

a. EPA Recommended Standards
b. Records compiled by Bureau of Potable Water for 5 year period

Table III-23

GROUNDWATER QUALITY ANALYSIS OF N.E. 208 STUDY AREA

Physical, Chemical, & Biological Parameters - Second Round Sampling

Parameters	a. Recommended Standards	Number of Violations of Recommended Standards	RANGES Northeast Study Area High	Low	Mean	# of Analyses
C Temperature	None	-	15	11	12.76	15
pH	5-9	1	9.2	5.9	7.5	14
Ammonia-N	None	-	2.0	< .01	.429	15
Organic-N	None	-	2.41	0	.401	15
Nitrate-N	10.0	0	2.1	.20	.721	15
Nitrite-N	1.0	7	42.0	0	7.64	15
Phosphorous	None	0	.12	0	.090	15
Sulphate	250.00	0	83	7.0	30.4	15
Alkalinity	None	0	238	17.0	162.6	15
Chloride	250.00	3	4400	5.3	520.6	15
Flouride	1.5	0	1.45	< .5	.975	15
Cyanide	0.2	0	.035	< .01	.026	15
LAS	0.5	0	Trace	0	0	15
Dissolved Solids	500.0	5	2260	192	1065.5	15
Fecal Coliforms	0/100 ml.	1	TNTC	0	-	15

Unless otherwise indicated, all data reported in mg/l (parts per million)

Due to uncertainties of the actual values, levels found below minimum recordable concentrations in the 2nd Round were not used to calculate means.

Chloride concentrations above maximum contaminant level (MCL) of 250.0 parts per million were found in six of the 80 wells tested. Because of the variability in location of wells sampled, immediate causes for these values can not be determined. A possible source of this pollutant may be salt water encroachment, as chloride levels as high as 1500 ppm were found in wells located near tidal waters along Newark Bay. Only one well exceeding the standard was a potable supply. The concentration found, however, was only slightly above MCL and this poses no danger to human health. No other standard parameter monitored was found to exceed recommended standards.

b. Volatile Organics A major issue in the Northeast Study Area is the contamination of potable water supplies by trace quantities of organic compounds and the resulting potential risks to human health. Developments such as the discovery of high incidences of a rare liver cancer among vinyl chloride workers and a statistical study linking elevated cancer rates to toxic contamination of the Mississippi River have spurred academic and government scientists to investigate the far-reaching effects of organics in the environment. Tests were conducted for a total of twenty different organic compounds. These are listed in Table III-24. No standards currently exist for organic compounds because not enough is known about the hazards of long term exposure to these substances. However, the Environmental Protection Agency has proposed an interim standard of 100 parts per billion for Trihalo-Menthanes (Chloroform, Bromoform, Dibromochloromethane, Triflouromethane). Chloroform exceeded the proposed standard in two industrial wells. No other trihalomethanes exceeded the recommended standard.

Laboratory analyses revealed detectable quantities of twelve organic contaminants in the first round of sampling. The second round indicated the same compounds present, with the addition of two others. The most frequently observed compounds were chloroform, carbon tetrachloride, trichloroethylene and trichloroethane. The wells exhibiting concentrations in excess of 100 parts per billion were located in or near industrial sites and were not potable water sources.

Of all the organics found, in no case was there an immediate threat to human health.

Table III-24

GROUNDWATER QUALITY ANALYSIS OF NORTHEAST 208 STUDY AREA

ORGANIC PARAMETERS

Compound	Ranges Northeast Study Area High 1	High 2	Low 1	Low 2	Mean 1	Mean 2	Ranges State 208 Study Area[1] High	Low	Mean	# of Analyses
Methylene Chloride	ND	1.20	ND	ND	ND	.08	ND	ND	ND	237
Methyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	237
Methyl Bromide	ND	ND	ND	ND	ND	ND	ND	ND	ND	237
*Chloroform	313.31	23.33	ND	ND	8.590	3.361	313.310	ND	5.2	237
*Bromoform	.360	1.20	ND	ND	.246	0.092	1.080	ND	0.2	233
Bromodichloromethane and 1,1,2-Trichloroethylene	407.47	449.501	ND	ND	17.46	51.65	407.47	ND	5.7	237
1,1,2,2-Tetrachloroethane	1.37	2.745	ND	ND	.062	.254	1.370	ND	0.1	234
1,1,2-Trichloroethane	7.59	7.10	ND	ND	.310	.768	7.540	ND	1.0	237
*Dibromochloromethane	.230	1.083	ND	ND	.012	.084	2.370	ND	0.1	227
*Trifluoromethane	ND	ND	ND	ND	ND	ND	.01	ND	1.0	237
Carbon Tetrachloride	38.14	.50	ND	ND	1.259	.080	38.140	ND	1.0	235
1,2 - Dibromoethane	87.85	54.28	ND	ND	1.58	3.63	87.85	ND	0.5	237
1,2 - Dichloroethane	ND	5.996	ND	ND	ND	.689	4.812	ND	0.10	237
1,1,1- Trichloroethane	441.83	33.454	ND	ND	14.42	9.17	441.83	ND	8.9	237
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	237
1,1,2,2 - Tetrachloroethylene	45.52	71.129	ND	ND	3.49	15.324	45.52	ND	2.1	237
O, M, P - Dichloro Benzene	ND	102.28	ND	ND	ND	9.68	ND	ND	ND	237
Trichloro Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	237
Diiodomethane	0.80	.069	ND	ND	.034	.005	0.80	ND	0.1	237

N.D. - Non-Detectable
Unless otherwise indicated, all data reported in pp/b (parts per Billion)

1 First Round Sampling, 76 Analyses (Non Biased)

2 Second Round Sampling 15 Analyses (Biased)
Due to uncertainties of the actual values, levels found below minimum recordable concentrations in the 2nd Round were not used to calculate means.

*No recommended standards currently exist for these compounds, but the Environmental Protection Agency has proposed an interim standard of 100 ppb for Triholo-Methanes.

c. Metals Virtually all wells tested contained trace levels of all metals tested. This is due, in part, to the fact that many metals occur naturally in mineral formations and ground water.

Of the 12 metals reported above trace levels, four were at concentrations above standards for domestic water supply. These are iron, manganese, mercury and sodium.

Iron exceeded the standard at 14 stations. Nine of these were industrial wells. Of the five potable wells containing high iron levels, only one well exceeded one part per million. Iron concentrations in the water supply appear to be a natural trend in many areas of the state, including the ground water of the Northeast Study Area.

Manganese levels ranged from .01 - 2.42 ppm. Twenty-three wells exceeded recommended standard of .05 parts per million. Fifteen of these were industrial wells, while eight were potable sources. High manganese levels may be a natural constituent of the ground water of the Northeast Study Area.

Six of 82 wells sampled for mercury evidenced concentrations exceeding EPA recommended drinking water standards of .002 ppm. Four of these were industrial wells, and two were municipal wells.

Sodium levels exceeding the recommended standard of 50 parts per million were found in nineteen wells sampled from both rounds. Ranges were from a high of 347.1 ppm to a low of 3.34 ppm, as shown in Tables III-25 and III-26. Four of the wells found to exceed standards were potable supplies. Resampling of these wells was performed by the Bureau of Potable Water, which indicated that only one well had slightly elevated sodium values upon resampling (68.0 ppm). High sodium concentrations present little health threat to most people, however persons with heart conditions or who are on prescribed sodium free diets may be affected. For these reasons, local health authorities and physicians were contacted and notified of the results. Follow-up routine inspection of these wells by the Bureau of Potable Water will continue.

d. Pesticides and PCB's The presence of pesticides in the ground water varies with land use; these compounds are mostly found in the agricultural areas of the state, and pesticide problems in the ground water of the Northeast Study Area are virtually non-existent. Table III-27 gives values and ranges for pesticides and PCB's found in the Northeast Study Area from the first round of sampling. The second round produced only two wells with detectable concentrations of any pesticides. Neither of these wells were potable suppliers and standards were not exceeded in either case.

Table III-25

GROUNDWATER QUALITY ANALYSIS OF N.E. 208 STUDY AREA

METALS - FIRST ROUND SAMPLING

Parameter	a. Recommended Standards	Number of Violations in Northeast	RANGES Northeast Study Area High	Low	Mean	# of Analyses	RANGES State Study Areas High	Low	Mean	# of Analyses	b. RANGES Bureau of Potable Water 1972-1977 High	Low	Mean	# of Analyses
Silver	0.05	None	.012	ND	.0011	70	.012	ND	-	-	0	0	0	18
Arsenic	0.05	0	.010	ND	.0004	69	.016	ND	.007	243	.005	0	.0002	20
Beryllium	No Std.	-	ND	ND	ND	70	.005	ND	.0009	245	-	-	-	-
Cadmium	0.01	0	ND	ND	ND	70	.01	ND	.0027	245	.001	0	.0001	22
Copper	1.0	0	.345	.001	.011	70	.345	ND	.0176	242	.085	0	.008	22
Chromium	0.05	0	.042	.001	.005	70	.158	ND	.0052	245	-	-	-	-
Iron	0.3	11	2.35	.01	.187	70	204.67	ND	-		13.67	0	10.0	23
Mercury	0.002	6	.0096	.0002	.0009	67	.0096	<.0002	-	-	.0005	0	<.0005	20
Manganese	0.05	16	2.42	.01	.137	70	2.42	ND	-	-	.75	0	.186	12
Sodium	**50.	12	347.1	3.34	35.0	70	.012	.012	-	-	-	-	-	-
Nickel	No Std.	-	.016	.005	.0056	70	.096	<.005	.0103	245	-	-	-	-
Lead	0.05	0	.023	.001	.002	70	.329	<.001	.006	245	.04	0	.005	24
Selenium	0.01	0	.005	.002	.002	70	.006	<.002	.0012	244	.10	0	.001	20
Zinc	5.0	0	.302	.005	.028	70	28.38	<.005	.228	245	3.90	0	.303	16

*Unless otherwise indicated, all data reported in mg/l (parts per Million)

**NJ Potable Water Standard

a. EPA Recommended Standards

b. Records compiled by Bureau of Potable Water for 5 year period

Table III-26

GROUNDWATER QUALITY ANALYSIS OF NE 208 STUDY AREA

Metals - Second Round Sampling (Mg/1)

Parameter	a. Recommended Standards	Number of Violations in Northeast	Ranges Northeast Study Area			# of Analyses
			High	Low	Mean	
Silver	0.05	0	<.001	<.001	<.001	15
Arsenic	0.05	0	.018	<.001	.005	15
Beryllium	No Std.	-	<.001	<.001	<.001	15
Cadmium	0.01	0	.001	<.001	<.001	15
Copper	1.0	0	.216	<.001	.035	15
Chromium	0.05	0	.016	<.001	.003	15
Iron	0.3	2	.528	<.02	.124	15
Mercury	0.002	0	.0015	<.0002	.0015	15
Manganese	0.05	7	1.41	<.01	.318	15
Sodium	*50	7	915	8.24	117.9	15
Nickel	No Std.	-	.015	<.005	.008	15
Lead	0.05	1	.079	<.001	.010	15
Selenium	0.01	0	<.002	<.002	<.002	15
Zinc	5.0	0	.530	<.005	.098	15

Unless otherwise indicated, all data reported in mg/l (parts per Million)
*NJ Potable Water Standard

a. EPA Recommended Standards

Due to uncertainties of the actual values, levels found below minimum recordable concentrations in the 2nd Round were not used to calculate means.

Table III-27

GROUNDWATER QUALITY ANALYSIS OF N.E. 208 STUDY AREA

PESTICIDES AND PCB's - FIRST AND SECOND ROUND SAMPLING

Parameter	a. Recommended Standards	Number of Violations of Recommended Standards	RANGES Northeaset Study Area High	Low	Mean	# of Analyses	RANGES State 208 Study Area High	Low	Mean	# of Analyses
PCB's	1.0	0	0.340[4]	ND	0.040	84	0.343[4]	ND	<0.1	250
BHC α	None	0	0.164	ND	0.006	84	0.164	ND	<0.1	250
BHC β	None	0	2.378	ND	0.049	84	2.378	ND	<0.1	250
LINDANE	4.0	0	0.125	ND	0.008	84	0.125	ND	<0.1	250
ALDRIN	1.0	0	0.040	ND	0.004	84	0.205	ND	<0.1	250
DIELDRIN	1.0	0	0.144	ND	0.003	84	0.169	ND	<0.1	242
HEPTACHLOR	0.1	0	0.050	ND	0.004	84	0.081	ND	<0.1	249
HEPTACHLOR EPOXIDE	0.1	1	0.545	ND	0.01	84	0.545	ND	<0.1	251
TOXAPHENE	5.0	0	ND	ND	ND	84	ND	ND	<0.1	250
o,p'-DDE	50.0	0	0.073	ND	0.001	84	0.241	ND	<0.1	252
o,p'-DDT	50.0	0	0.150	ND	0.003	84	0.413	ND	<0.1	249
p,p'-DDD	50.0	0	0.214	ND	0.007	84	0.396	ND	<0.1	-
p,p'-DDT	50.0	0	0.172	ND	0.006	84	0.640	ND	<0.1	-
METHOXCHLOR	1000.0	0	ND	ND	ND	84	ND	ND	<0.1	250
MIREX	None	0	0.063	ND	0.001	84	0.095	ND	<0.1	250
ENDRIN	0.5	0	0.093	ND	0.002	84	0.147	ND	<0.1	251
CHLORDANE	3	0	0.145	ND	0.005	84	0.145	ND	<0.1	250

*Unless otherwise indicated, all data reported in pp/b (parts per Billion)   a. EPA Recommended Standards

[4]AROCLOR 1254

One pesticide, heptachlor epoxide, was observed in a single well in concentration exceeding the recommended federal drinking water standard (0.1 parts per billion). The same well, located at a metal finishing plant in Hudson County, exhibited high concentrations of benzene hexachloride. No standard has yet been set for that parameter. Other than this well, pesticide levels were very low or non-detectable.

PCB's were detected at twelve wells, however none of these values exceed the suggested limits for drinking water. Potential health risks from exposure to PCB's include skin lesions and an increase in liver enyzme activity that may effect reproductive processes.

III.C.3. Recommendations

In the Northeast Study Area, evidence of detectable concentrations of several pollutants in the ground water indicate the need for protecting underground water supplies from degradation. Many of the water quality problems in the Study Area could not be resolved in the initial phase of planning. Consequently, this plan will propose solutions to some of the more obvious and resolvable problems.

The need for a more complete quality controlled data base is of primary importance in developing a ground water protection program. For the sampling program conducted for the Northeast Study Area, grab samples were taken from selected wells. While this method may be adequate for making an initial water quality assessment for a particular region, it is not appropriate in cases where water quality may be affected by non-point sources or natural conditions. Therefore, it is recommended that future sampling be done on a continuing and intensive basis to fill existing data gaps and allow for seasonal or other variations affecting the water supply.

More frequent sampling should also be done in highly developed areas and areas where problems are already known to exist. In cases where a continous sampling program is not possible, duplicate sampling of individual wells should be done to allow for analytical or sampling errors. In the Northeast Study Area, many areas use potable water derived from shallow surficial aquifers. It is therefore recommended that, when sampling is done in these areas, more samples should be taken from shallow wells to obtain an accurate assessment of the water being used.

Protection of ground water recharge areas is another important element to ground water management. Presently, the geologic maps for northeastern New Jersey are outdated and sometimes inaccurate. The Division of Water Resources has plans to conduct a mapping program for all primary and secondary aquifers that may be used for potable water. These will provide planners and local officials with sufficient information to protect sensitive areas. These areas are important because storm and rainwater drainage from them replenishes ground water supplies.

Lagoons, pits, or ponds which are frequently used for storage and/or treatment of wastes, may seriously affect ground water quality. Presently, lagoons which discharge to the ground, unlike those discharging to surface supplies, are not regulated by the NPDES program. Many such lagoons are not even known to exist by the State. Currently, an 18-month surface impoundement assessment (SIA) is underway through a grant from EPA. An objective of the SIA is to rate contamination potential of ground water from surface impoundments. The WQM Program recommends that all impoundments should contain an impermeable lining material and that a permit system should be instituted for wastewater impoundments. This would help eliminate unknown existing lagoons which may be degrading ground water supplies as well as give planners more accurate descriptions of wastes stored in the impoundments.

In addition to the above, a ground water management program needs regulations for protection of ground water from spray irrigation. There is also a need for the program to have veto powers over landfill permits. Currently, the ground water program has only review and comment responsibilities for landfill design and operation permits. Also, as any water quality program must be based on water quality standards, there is an urgent need to develop water quality standards for ground water.

Another major problem which exists is that of data handling. Presently, each group in the Division maintains its own methods of recording and storing analytical data. In order to determine what information is available, and where it can be found, there is a need for more efficient data processing within the entire Division.

It is also recommended that stricter requirements for incoming well log information be enforced. Although well logs are required whenever a new well is drilled, past records have frequently been incomplete. Much of the omitted information is necessary in developing sampling or other hydrological studies.

CHAPTER III

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IV POPULATION, ECONOMY AND LAND USE

IV. POPULATION, ECONOMY AND LAND USE

Overview

Population, economy, and land use are socioeconomic factors which need to be considered in water quality management. When combined with environmental factors and technical, legal, and institutional considerations, they provide the basis for a water quality management plan. Presentations of socioeconomic factors in this chapter include both inventories of existing conditions and projections of future conditions. Inventories of population, economic activity, and land cover aid in the identification of current water quality management problems; projections of future socioeconomic conditions allow planners to anticipate potential water quality management problems and to therefore design management strategies to prevent these problems from occurring. These strategies may include the determination of priorities and the scale of available State and federal funds for the construction of sewage treatment works, for the implementation of non-point source control measures, and for continued planning and research.

IV.A. Population Considerations

Population projections are an essential aspect of water resources management. Such projections allow future point and nonpoint pollution loads to be estimated, and provide direction for the development and design of wastewater treatment facilities.

Applications for planning and construction grants for public wastewater treatment facilities, under the Section 201 program of the Clean Water Act, must conform to population projections adopted through Water Quality Management Plans. Previously, no formal process existed for ensuring consistency between local 201 facilities planning population projections and state, regional, and county growth policies, plans and projections. The experience of the DEP has demonstrated that some assumptions used in 201 facilities planning would, in total, result in a projection greater than would be reasonable for the State as a whole. Consequently, a DEP policy has been established for the development and review of population projections for water resource management planning, and projections have been developed for the planning area in accordance with this policy.

This section summarizes the policy and the resulting forecasts.

IV.A.1. Summary of DEP Policy on Population Projections

As the Water Quality Management Plan was prepared, there was no applicable Statewide policy to guide the development of the population projections to be used for water quality management planning. The need to wisely use federal sewerage funds within the State, combined with recent federal regulatory requirements, has provided the initiative for the DEP to establish a uniform framework for the development and review of population projections to be used for this purpose. The resulting policy and procedures are presented in full in Appendix IV-1, "Policy and Procedures for the Development and Review of Population Projections for Water Resource Management Planning". The highlights of this policy are discussed below.

Federal regulations (40 CFR, Part 35, Subpart E Appendix A as amended: 43 FR 17697, at 17712, April 25, 1978), addressing the forecasting of future populations for 201 facilities planning, not only require that population projections for facilities plans be consistent with those presented in corresponding Water Quality Management Plans, but also specify that these projections must be based upon a "disaggregation" (breakdown) of a single total State population projection for the year 2000. Furthermore, according to these regulations, this statewide projection is to be consistent with that prepared by the Federal Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce. In response to these regulations, the manner in which the projection for the total State population is to be determined and disaggregated for water resource management planning has been developed as the policy of the New Jersey Department of Environmental Protection.

The Water Quality Management (WQM) Program has prepared policy-based projections of resident population for New Jersey and its twenty-one counties for the year 2000. These projections have been developed by the DEP in association with the New Jersey Departments of Labor and Industry (DLI) and Community Affairs, each of which possess a responsibility to develop and/or review population projections, in an effort coordinated through the Governor's Office of Policy and Planning. Population projections used by the DEP for water resource management are to be consistent with the policy-based projections as well as with all policies and regulations applicable to New Jersey water resource management programs. Modifications to the policy-based projections may be proposed by the Commissioner of the DEP, subject to approval by the Governor's Office of Policy and Planning, for use in water resource management if, in the opinion of the Commissioner, the policy-based projections are themselves found to conflict with policies and regulations applicable to New Jersey's water resource management programs.

Within the DEP, the Division of Water Resources possesses the responsibility to develop and review population projections for water resource management in a manner consistent with this policy, subject to the approval of these projections by the Commissioner of the DEP. The Division of Water Resources is to develop a projection of the State's overall resident population growth, presented in five year intervals over at least a twenty year period, based upon the adopted year 2000 projection. County projections are to be disaggregated from the statewide projection(s) in a manner consistent with this policy. Once the County projections have been approved, all future Areawide Water Quality Management Plans are to be consistent with them.

Given these projections of resident State and county population, projections of resident population for each facilities planning area are to be developed by the appropriate agencies responsible for areawide water quality management planning (including the Division of Water Resources). Facilities planning area population projections must not, in sum, exceed the applicable county projections (allowing for reasonable changes in the population of lands not included in facilities planning areas). Seasonal population forecasts, where applicable, must be developed by the agencies responsible for 201 facilities planning and, although subject to review by the areawide water quality management planning agency and the DEP, will not be limited by the adopted county projection for resident population.

These facilities planning area projections, once adopted by the Commissioner of the DEP, are to be used for areawide water quality management, including 201 facilities planning. All unapproved 201 facilities plans, and those approved plans which have not yet reached the design phase (Step II), must utilize these projections as a basis for facilities planning. 201 facilities plans in the design phase, up to the construction phase (Step III), may also be required to utilize these projections if the DEP finds a major discrepancy to exist between the adopted projections and those being currently used by the facilities planning agency.

The DEP policy includes a provision for the trade-off of sewage treatment capacity where the designated capacity has been over-or underutilized. The DEP will encourage that surplus or deficit wastewater treatment capacity resulting from commitments based on obsolete population projections for facilities planning areas would, wherever feasible, be reallocated among adjoining areas with corresponding deficits and surpluses in treatment capacity. Consequently, where facilities have been constructed in excess of expected needs as determined by the population projections prepared for facilities planning areas, the apparent overcapacity will not necessarily prohibit remaining parts of the region from obtaining federal sewerage funding.

If privately funded facilities have been built and have provided capacity for future growth in an area where publicly funded projects are being planned or designed, the 208 projections will be modified accordingly. The sewer service for future growth provided by private facilities will be evaluated in 201 plans for each area. The population projections will also apply to DEP's review of privately funded projects to the extent that the siting of these facilities can have an impact on the fiscal viability of publicly funded projects.

The population projections for water quality management planning are not to be used to impose a direct limit on the growth of a municipality, but rather are to place an upper limit on the sizing of wastewater treatment facilities for which federal grant funds for planning and construction are used. Sewerage service area population projections will normally be prepared by facilities planning agencies, but may be prepared for planning purposes by the Division of Water Resources.

Revisions to these population projections may be made by the Water Quality Management Planning Program, subject to the review and approval of the Governor's Office of Policy and Planning.

IV.A.2. Existing Population

Before a forecast of future population in the study area may be made, an analysis of current population trends must be performed. Tables IV-1 and IV-2 present historical data and recent estimates of population for the study area and its consistent facilities planning areas, respectively.

The Northeast Study Area contained almost half (49 percent) of the State's 1975 population. This was a decline from 1970, when the area's share was 52 percent. Population in the study area is concentrated around the urban centers of Newark, Elizabeth, Jersey City and Paterson. Although some of these cities have been losing population to the suburban areas, they still account for almost 25 percent of the Northeast's population.

During the past century, growth in the Northeast Study Area has radiated outward from New York City, and it is continuing to do so today. Growth has followed the expansion of the transportation network and the availability of land. Rapid

Table IV-1

County Population Trends

County	1940[1]	1950[1]	1960[1]	1970[2]	1975[2]
Bergen	409,646	539,139	780,255	897,148	879,100
Essex	837,340	905,949	923,545	932,526	881,600
Hudson	652,040	647,437	610,734	607,839	577,600
Morris	125,732	164,371	261,620	383,454	395,000
Passaic	309,353	337,093	406,618	460,782	452,200
Somerset	74,390	99,052	143,913	198,372	203,700
Union	328,344	398,138	504,255	543,116	520,500

[1]U.S. Census

[2]Provisional Population Estimates for New Jersey; July 1, 1976; Office of Demographic and Economic Analysis, Department of Labor and Industry

Table IV-2

FACILITIES PLANNING AREA POPULATION

Facilities Planning Area	1970	1975
Bergen County Utilities Authority	549,950	544,410
Caldwell	34,506	34,511
Edgewater	23,980	27,279
Essex and Union County Joint Meeting	440,663	420,997
Hudson County Sewerage Authority	556,511	526,089
*Bayonne	72,161	71,025
*Hoboken	155,810	146,830
*Jersey City East	315,322	295,823
*Secaucus	13,228	12,411
Linden-Roselle Sewerage Authority	63,994	61,956
Livingston-Florham Park	38,221	39,004
*Livingston	30,127	30,314
*Florham Park	8,094	8,690
Northwest Bergen County Utilities Authority	80,856	81,852
Passaic Valley Sewerage Commissioners	1,152,158	1,092,322
Parsippany-Troy Hills	79,431	76,892
Peckman River	45,219	43,298
*Cedar Grove	15,115	13,166
*Little Falls	11,977	12,004
*Verona	18,127	18,128
Pequannock, Lincoln Park and Fairfield	30,075	29,866
Pequannock River Basin Sewerage Authority	24,657	24,462
Pompton Lakes	28,055	27,470
Rahway Valley Sewerage Authroity	164,505	154,842
Ridgewood-Fair Lawn	51,091	48,739
*Fair Lawn	23,544	22,480
*Ridgewood	27,547	26,259
Rockaway Valley Regional Sewerage Authority	95,556	97,994
Totowa-West Paterson	23,272	22,286
*Totowa	11,580	11,362
*West Paterson	11,692	10,924
Upper Passaic River Basin	101,198	101,371
*Berkeley Heights	13,078	13,216
*Bernards	12,640	12,795
*Chatham	8,093	8,176
*Madison-Chatham	26,276	25,411
*Morris-Woodland	7,960	7,952
*New Providence	13,796	13,504
*Passaic-Stirling	12,376	13,033
Wanaque Valley Regional Sewerage Authority	34,083	38,707
Wayne	49,141	47,559
Whippany River Basin	46,096	45,815
*Hanover	10,700	11,351
*Morristown	19,468	18,731
*Morris-Butterworth	15,189	14,906
TOTAL	3,743,345	3,587,721

*These figures are not included in Totals.

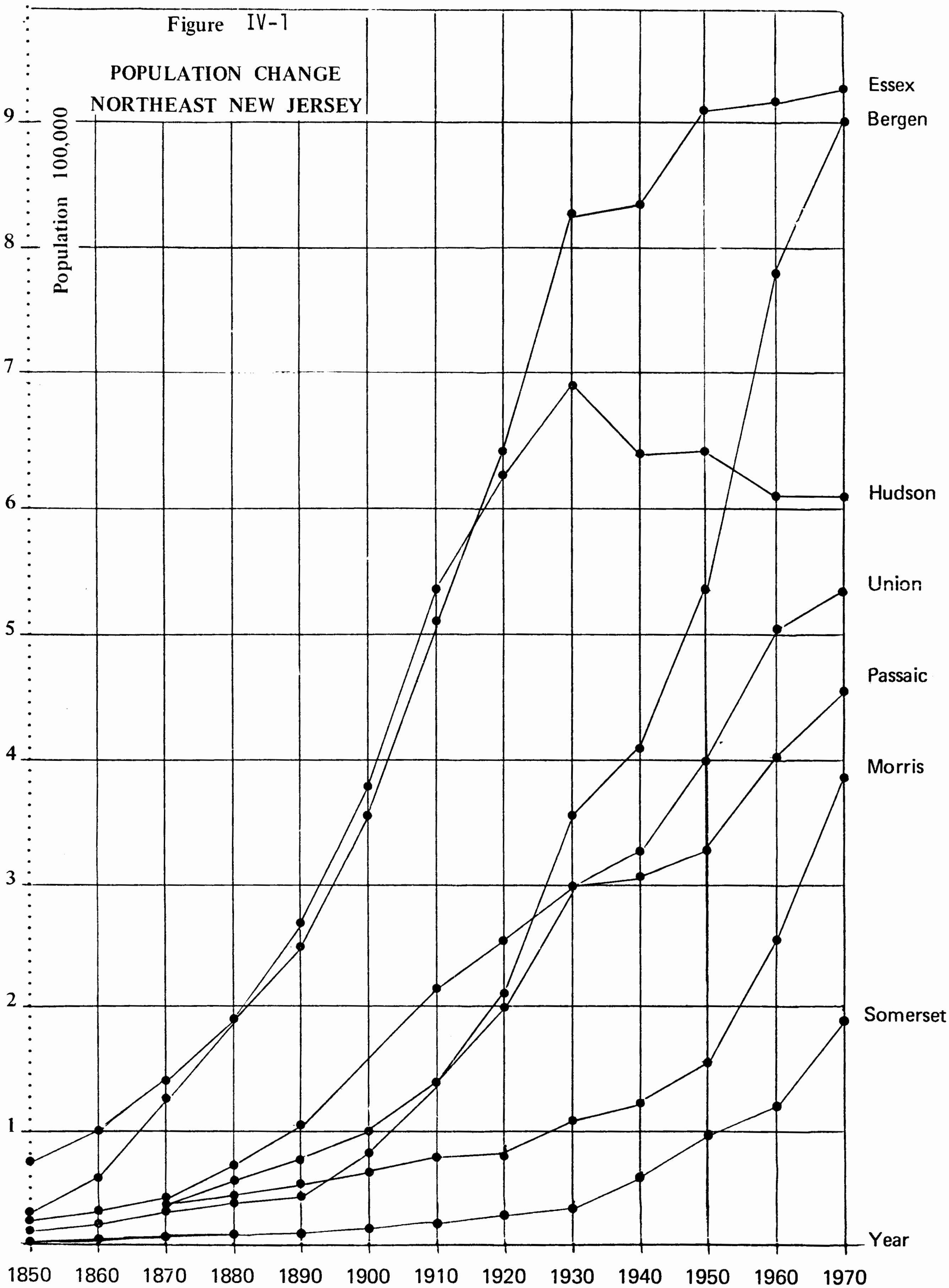
population growth first occured closest to New York City, with Essex and Hudson counties having the greatest populations by 1940. As the transportation network expanded and the available land diminished in Essex and Hudson, the population of Bergen, Passaic and Union Counties grew rapidly from 1940 to 1970. Morris and Somerset Counties followed with rapid development between 1950 and 1970 as the transportation network was further expanded. During the period from 1970 to 1977 the more urban counties (Bergen, Essex, Hudson, Passaic and Union) declined in population while the suburban counties (Morris and Somerset) continued to grow, but at a reduced rate. Figure IV-1 graphically illustrates these trends for the period 1850 to 1970.

IV.A.3 Projections of Future Population

Projections of future population have been prepared in three stages in accordance with the policy described in Section IV.A.1., above: a state projection, county projections, and facilities planning area projections. In the absence of official population projections to be used by all agencies of the State of New Jersey, each projection was based on observed population trends, modified on the basis of existing State policies by the DEP in consultation with other State agencies.

a. State Projection - The DEP has, in consultation with other State agencies, proposed a statewide total of 9.066 million individuals as the year 2000 population for water resource management planning in New Jersey. This statewide population represents an increase of approximately 1.7 million individuals, or 23.4%, in the growth of New Jersey from established 1975 population levels.

This statewide projection was developed from the trend projection for New Jersey prepared by the New Jersey Department of Labor and Industry (DLI). Population projections are periodically developed by the DLI; a new series of interim projections of the State population were released in June, 1978. The "ODEA" series of projections, the "preferred series" prepared by the DLI, is based upon a demographic-economic model which takes account of national and county birth and death rates, county data for net migration and commutation patterns, and special regional developments such as the advent of casino gambling in Atlantic City. The State population for the year 2000, forecast by the ODEA model, is expected to be 8.975 million, a 22.4% increase from 1975. However, since the ODEA projection did not take into account the ongoing and proposed development of the Hackensack Meadowlands the State total was adjusted upward to reflect this development. The State total was further modified by applying the State policy of urban revitalization to those counties where the ODEA projection predicted a



Source: U.S. Census of Population

decline in population, resulting in stabilized populations for those counties, and by accepting the Delaware Valley Regional Planning Commission projections for Mercer, Burlington, Camden and Gloucester counties. These modifications resulted in the State projection of 9.066 million.

The statewide projection of 9.066 million for the year 2000 is only slightly higher (3.7%) than the corresponding projection of 8.747 million prepared by the Federal Bureau of Economic Analysis. The BEA projection is generated for every state through the use of a sophisticated national econometric model. The BEA model takes into account an extensive collection of demographic and economic data compiled by federal agencies for the determination of national and regional growth trends. The use of a nationwide series of population projections was conceived by the U.S. Environmental Protection Agency as an improved method by which federal water pollution control funds could be allocated among regions and states.

The statewide population projection of 9.066 million is considered by the DEP to be consistent with the BEA projection, in accordance with federal requirements for the Statewide projection (see Section IV.A.1., above).

b. County Projections - Interim Policy Projections have been prepared for the population of each county with reference to the statewide projection of 9.066 million. These county projections, presented in Table IV-3, were developed based on an analysis of county population trends, modified by State policies.

The "ODEA" series of trend projections prepared by the New Jersey Department or Labor and Industry (DLI), from which the statewide projection was developed, was based upon a model linking employment and population growth to produce population projections for each county in five year intervals through the year 2000. These county projections indicated a decline in population for three intensively urbanized counties and a movement of population into New Jersey's semi-rural areas, including the Pine Barrens. This projected distribution of population from the ODEA model is consistent with recent trends observed in the State toward a dispersal of population.

However, by using the DLI projections as a basis for water resource management planning, these trends would be reinforced, counter to many State land use and economic policies. For example, a result would be to plan for the decline of urban areas in spite of State policies designed to encourage the revitalization of urban centers. Another result would be to plan for expensive State facility investments in rural areas with comparatively low populations, which would result in high service costs to the users. In effect, the present trends toward population dispersal would be strengthened, in conflict with these State policies, if the trend projections

Table IV-3

Interim Policy Projections:

County Resident Population

	1975*	1980	1985	1990	1995	2000	% Growth (1975-2000)
New York Metropolitan Area							
Bergen	879,100	865,700	885,700	923,900	954,400	980,000	11.5
Hudson	577,600	584,100	590,600	597,100	603,600	610,000	5.6
Essex	881,600	881,600	881,600	881,600	881,600	881,600	-0-
Union	520,500	520,500	520,500	520,500	520,500	520,500	-0-
Passaic	468,800	448,300	462,900	488,000	504,500	520,000	10.9
Morris	395,000	420,000	445,000	470,000	495,000	520,000	31.6
TOTAL	3,722,600	3,720,200	3,786,300	3,881,100	3,959,600	4,032,100	8.3
Central New Jersey							
Somerset	203,700	218,900	234,200	249,500	264,700	280,000	37.5
Middlesex	594,000	602,000	660,000	730,000	785,000	820,000	38.0
Monmouth	491,400	517,100	542,800	568,600	594,300	620,000	26.2
TOTAL	1,289,100	1,338,000	1,437,000	1,548,100	1,644,000	1,720,000	33.4
Philadelphia Metropolitan Area							
Mercer	318,000	348,641	364,330	379,976	395,579	410,400	29.1
Burlington	347,600	379,024	399,942	420,793	441,609	460,900	32.6
Camden	475,600	526,617	552,937	579,079	605,069	629,640	32.4
Gloucester	190,900	217,193	232,287	247,319	262,295	277,022	45.1
TOTAL	1,332,100	1,471,475	1,549,496	1,627,167	1,704,552	1,777,962	33.5
Southern New Jersey							
Salem	62,400	62,700	63,700	66,400	69,400	72,100	15.5
Cumberland	132,000	138,800	149,400	159,400	166,700	172,600	30.8
TOTAL	194,400	201,500	213,100	225,800	236,100	244,700	25.9
Coastal New Jersey							
Ocean	293,800	360,800	425,600	483,300	487,700	487,700	66.0
Atlantic	187,900	209,500	275,600	307,200	311,900	311,900	66.0
Cape May	72,300	86,200	114,900	120,000	120,000	120,000	66.0
TOTAL	554,000	656,500	816,100	910,500	919,600	919,600	66.0

Table IV-3 (Cont'd)

	1975*	1980	1985	1990	1995	2000	% Growth (1975-2000)
Northwestern New Jersey							
Sussex	99,000	117,000	132,400	150,500	164,300	164,300	66.0
Warren	80,000	85,000	87,300	93,900	98,700	100,100	25.1
Hunterdon	78,500	84,000	88,900	95,500	102,400	107,700	37.2
TOTAL	257,500	286,000	308,600	339,900	365,400	372,100	44.5
STATE TOTAL	7,349,700	7,673,675	8,110,546	8,532,567	8,829,252	9,066,462	23.4

* Source: Provisional Population Estimates for New Jersey, July 1, 1977: Official State Estimates. N.J. Dept. of Labor and Industry, Office of Demographic and Economic Analysis. October, 1978.

were used without modification. This is especially true for water resource management planning, in that a central concern is the provision or extension of population serving facilities.

In order to incorporate the anticipated impacts of existing State polices in the projection of future county populations, the DLI projections were modified in accordance with the following policy statements:

(1) Population levels in intensively urbanized areas should be stabilized at or near present levels. Most existing neighborhoods should be preserved and revitalized. Any new development should occur in a range of densities most compatible with the surrounding area.

(2) The total population in exurban areas should remain relatively low. Exurban areas with unusual natural features, such as the Pine Barrens, Skyland, and Delaware Water Gap, should remain substantially rural. Instead, county population growth should be channeled to other more suitable locations within each county.

(3) Most growth should occur in suburbanizing areas. New development should be within or adjacent to areas of existing development and infrastructure so that more concentrated centers or corridors are created (suburban infill).

Using these expressions of State policy, an interim series of county population projections were developed by representatives of the Departments of Environmental Protection, Community Affairs and Labor and Industry in an effort coordinated through the Governor's Office of Policy and Planning. The methods used to develop Interim Policy Projections for the twenty-one counties are described below:

New York Metropolitan Area: In anticipation of State policies for urban revitalization, the intensively urbanized counties of Essex and Union were projected to remain at estimated 1975 levels of population. An additional population of 108,000 individuals, indicated by the development plans of the Hackensack Meadowlands Development Commission, was added to the trend projection for Bergen County (75,500) and the 1975 population for Hudson Counties (32,500). In accordance with the above policy statements, the population of Hudson County, for which the trend projection indicated a decline, was assumed to remain stable through the year 2000 with the exception of the Hackensack Meadowlands district for which substantial growth was projected.

Due to the Skylands conservation area proposed by the New Jersey Department of Community Affairs, the trend projection for Passaic County was reduced by approximately three percent. The population projection prepared by the Tri-State Regional Planning Commission was used for Morris County (see Central New Jersey description below).

Central New Jersey: Projections for the year 2000 prepared by the Tri-State Regional Planning Commission were used for Somerset, Middlesex, and Monmouth Counties. These projections not only reflect State policies favoring concentrated growth areas in the suburbs (in contrast to the DLI projections) but were developed by Tri-State on a regional basis in consultation with its constituent counties.

Philadelphia Metropolitan Area: County projections developed for the Water Quality Management Plans prepared by the Delaware Valley Regional Planning Commission (DVRPC) were used for the four counties (Mercer, Burlington, Camden and Gloucester) in the DVRPC jurisdiction. These forecasts were developed with explicit recognition of the State's policies for urban revitalization and conservation of natural resources such as the Pine Barrens, and were therefore directly incorporated into the Interim Policy Projections.

Southern New Jersey: The trend projections prepared by the New Jersey Department of Labor and Industry ("ODEA" model) were used for Salem and Cumberland Counties. These projections reflect a continuing moderate rate of growth for these primarily rural counties.

Coastal New Jersey: The trend projections prepared by the New Jersey Department of Labor and Industry ("ODEA" model) were modified for Ocean, Atlantic and Cape May Counties. This is in keeping with the State policy of discouraging growth in exurban areas, and conservation of the Pine Barrens. Also, the DLI projections were considered to have overestimated the impact of casino gambling in Atlantic and its surrounding counties. Furthermore, Ocean County was considered to be already overcommitted through the year 2000 in terms of sewerage capacity as a result of earlier 201 facilities plans; therefore, the population projection for Ocean County need not reflect the extent of this service. Due to these factors, the DLI projections of 74% growth for Atlantic, 126% for Cape May and 90% for Ocean were considered excessive. Since there are many uncertainties concerning the growth in these counties and Sussex County a growth rate of 66% was allocated to each county. This growth rate was determined by subtracting the projections for the other seventeen counties from the State total, which resulted in room for approximately 66% growth in each county over 1975 estimates. At this time the downward adjustment of these counties was assumed to be uniform. If more specific information on the relative growth potential in these counties becomes available, these projections can be adjusted in accordance with the revision process discussed in the DEP "Policy and Procedures for the Development and Review of Population Projections for Water Resource Management Planning" contained in Appendix IV-1.

Northwestern New Jersey: The trend projections prepared by the New Jersey Department of Labor and Industry ("ODEA" model) were utilized for Warren and Hunterdon Counties, since these projections allow moderate growth in rural areas. The trend projection for Sussex County, indicating a 96% growth rate, is considered to be excessive due to the lack of a strong economic base in combination with State policies toward revitalization with the nearby urban areas. A growth rate of 66% was allocated to Sussex County, as discussed above for the Coastal New Jersey area.

These Interim Policy Porjections, used for the first time by the WQM Program, are subject to continuing review by other State agencies, county agencies, and other interested groups. The projections were designed to be refined periodically, in response to direction by the Governor's Office and in accordance with DEP policy (see Section IV.A.1), with the goal of developing a single set of population projections for use in planning by all State agencies involved in public investment and community services.

c. Facilities Planning Area Population Projections - Population projections for public wastewater treatment facilities planning areas in the study area have been prepared based upon the county population projections presented above. Population projections for these areas include the total (sewered and non-sewered) resident population for each area. These projections are presented in Table IV-4.

The county population projections were disaggregated to the municipal level by several methods depending on the policies utilized in developing the county projection. In Union county, where no growth was projected, the 1975 municipal estimates were held constant for the projection period. Essex County also received a no growth projection. The municipal projection, however, could not be held constant due, to significant declines and growth in several municipalities. Therefore, the municipal projections were adjusted from their 1975 levels based on trends of declines or growth.

In Hudson County the only growth projected was for development in the Hackensack Meadowlands. The 1975 municipal projections were held constant for the projection period, with the exception of Secaucus where growth in the Meadowlands was added.

The total Bergen County projection had been determined by adding the growth projected in the Hackensack Meadowlands to the population predicted by the "ODEA" model. Therefore, the municipal projections were developed by utilizing a proportional share method for the "ODEA" growth and adding the Meadowlands projections to the affected municipalities. The proportional share method utilized in these projections

Table IV-4

Interim Forecasts

Resident Population for Facilities Planning Areas

Facilities Planning Area	1980	1990	2000	% Growth[1]
Bergen County Utilities Authority	557,511	594,992	627,942	15.3
Caldwell	47,772	47,772	47,772	38.4
Edgewater	25,105	26,793	28,680	5.1
Essex & Union County Jt. Meeting	417,515	417,515	417,515	-0.8
Hudson County S.A.	534,452	546,346	558,450	6.2
Bayonne	71,027	71,027	71,027	0.0
Hoboken	148,208	148,208	148,208	0.9
Jersey City East	295,815	295,815	295,815	0.0
Secaucus	19,402	31,296	43,400	249.7
Linden-Roselle S.A.	61,956	61,956	61,956	0.0
Livingston-Florham Park	44,240	45,340	46,440	19.1
Livingston	35,000	35,000	35,000	15.5
Florham Park	9,240	10,340	11,440	31.6
Northwest Bergen County Utilities Authority	80,510	85,923	92,310	12.8
Passaic Valley Sewerage Commissioners	1,047,449	1,085,566	1,119,212	2.5
Parsippany-Troy Hills	81,060	90,710	100,360	30.5
Peckman River	46,988	47,980	48,752	12.6
Cedar Grove	15,450	15,450	15,450	17.3
Little Falls	12,090	13,082	13,854	15.4
Verona	19,448	19,448	19,448	7.3
Pequannock, Lincoln Park & Fairfield	37,340	40,190	42,665	42.9
Pequannock River Basin	25,459	28,162	30,424	24.4
Pompton Lakes	26,264	28,390	29,945	0.9
Rahway	154,842	154,842	154,842	0.0
Ridgewood-Fair Lawn	44,151	47,119	50,155	2.9
Fair Lawn	20,251	21,612	23,005	2.3
Ridgewood	23,900	25,507	27,150	3.4
Rockaway Valley Regional S.A.	104,580	117,030	129,475	32.1
Totowa-West Paterson	21,967	23,912	25,480	14.3
Totowa	11,208	12,200	13,000	14.4
West Paterson	10,759	11,712	12,480	14.2
Upper Passaic River Basin	107,665	117,778	128,092	26.4
Berkeley Heights	13,216	13,216	13,216	0.0
Bernards	14,447	16,467	18,411	43.9
Chatham	8,820	9,870	10,920	33.6
Madison-Chatham	26,880	30,080	33,280	31.0
Morris-Woodland	8,400	9,400	10,449	31.4
New Providence	13,504	13,504	13,504	0.0
Passaic-Stirling	15,003	16,943	17,453	33.9
Wanaque Valley Regional S.A.	39,002	42,456	45,318	17.1
Wayne	47,071	51,240	54,600	14.8
Whippany River Basin	48,720	54,520	61,314	33.8
Hanover	12,180	13,630	15,080	32.0
Morristown	20,100	22,560	24,730	33.0
Morris-Butterworth	15,540	17,390	19,424	30.4
Total	3,601,619	3,756,532	3,901,699	8.8

[1] % Growth is for period 1975-2000.

assumes that a municipality's share of the 1975 county population will remain constant for the projection period. The municipal projections for Passaic and Morris Counties also utilized the proportional share method. The proportional share method conforms to the state policies on urban revitalization and suburban infill since municipalities that have experienced urban or suburban development will have a larger precentage of the county's population than the rural municipalities, and therefore will receive the majority of the county's growth.

In Somerset County, which is mostly in the Upper Raritan Study Area, it was determined that a statistical method of least squares analysis was more appropriate for the municipal projections than the proportional share method. This method involves the fitting of a "trend" line of past population levels and projecting the trend into the future. These trend populations were then adjusted by means of proportional reductions, to sum to the county projection. (see Upper Raritan WQM Plan for a more detailed discussion of the Somerset County population projections).

Facilities planning area forecasts were then obtained by grouping the municipal projections into the appropriate facilities planning areas. For those municipalities only partially within a facilities planning area, the proportion of the municipal population in the facilities planning area, determined by current 201 facilities plans where possible, was used. The projections for each municipality wholly or partly within the facilities planning area were then summed to obtain the total facilities planning area projection. For facilities planning areas in which two or more sewage treatment plants exist and are expected to continue in operation, an attempt was made to project the population for the service area of each treatment plant wherever possible.

The facilities planning area projections presented in this Water Quality Management Plan support the current regional trends in population growth observed within the study area (see Section IV.A.2, "Existing Population"). However, a number of factors may necessitiate revisions to these projections. For example, major currently unanticipated changes in State policy, expressed on a regional or local scale, may conceivably possess enough impact to significantly affect growth trends by the year 2000. Major residential developments concentrated in small areas, such as P.U.D.'s and P.R.D.'s, may dramatically increase municipal population, enough to be expressed as significant increases in future population for facilities planning areas. To attempt to anticipate these developments, however, is in most cases strictly a matter of speculation; this procedure is questionable when public investment funds and costs to users of the wastewater treatment services are involved. Consequently, speculative developments were usually excluded in the preparation of the facilities planning area projections. These projections are subject to modifications, within the constraints of the statewide and county projections, should a greater assurance of the occurance of such development be provided to the satisfaction of the Water Quality Management Planning Program.

IV.B Economic Considerations

IV.B.1 Existing Economic Conditions

In the analysis which follows, the six Counties of Bergen, Essex, Hudson, Morris, Passaic, and Union are used to characterize the Northeast New Jersey (NENJ) Study Area. The urban area and freshwater area have also been approximated by combinations of whole counties. Thus, the data for Morris and Passaic Counties have been added to approximate the characteristics of the freshwater area. The remaining four Counties of Bergen, Essex, Hudson, and Union are used to characterize the urban area.

In Tables IV-5 through IV-7 which follow, the same method has been used. The urban area and freshwater area definitions refer to the same groupings of counties.

Table IV-8 summarizes data on income which were taken from the 1970 Census of Population. These data are not available by county, and are therefore presented in a different format.

The data are presented for the State of New Jersey and for that portion of the population classified as urban. This classification does not correspond to the above defined four-county urban area, but refers instead to persons living in center cities or the immediately surrounding areas. As will be seen, difference in income cannot be attributed to geographic location.

a. Employment Total employment in New Jersey reached a high of 2.165 million persons in 1970. The 1970 high was followed by a year of decline and then two of increase to a new high in 1973 of 2.246 million employed persons.

Manufacturing employment also reached highs in 1970 and 1973. However, the 1973 level (826,903) of employment in manufacturing was not as high as in 1970 (883,830).

This cyclical pattern of employment generally follows for the total study area.

In the entire study area, total employment declined in 1971 from the 1970 level of 1.348 million, then rose again during the next two years, reaching a new high of 1.355 million in 1973.

In the urban area, the cycle reached a high in 1970 of 1.092 million total employed, which was almost reached again in 1973 (1.089 million). Employment was higher in 1973 than in 1970 in the State as well as in the freshwater area. Only in the urban area did 1973 employment fail to recover to the 1970 level.

TABLE IV-5
POPULATION AND EMPLOYMENT
NEW JERSEY AND THE STUDY AREA

		N.J.	NENJ	Bergen	Essex	Hudson	Morris	Passaic	Union	Urban Area*	Fresh Water Area**	Somer-set
I. Pop.[1]	1970	7168164	3824865	897146	932525	607839	383454	460782	543116	2980629	844236	198372
	1960	6066782	3487027	780255	923545	610734	261620	406618	504255	2818789	668238	143913
	1950	4835329	2992127	539139	905949	647437	164371	337093	398138	2490663	501464	99052
Avg. Ann. Pct. Growth												
	1960-1970	1.68%	0.93%	1.41%	0.10%	-0.05%	3.90%	1.26%	0.75%	0.56%	2.37%	3.26%
	1950-1960	2.29	1.54	3.77	0.19	-0.58	4.76	1.89	2.39	1.25	2.91	3.81
II. Total Emp.[2]												
	1973	2245552	1354938	302036	349718	209730	101638	164662	227154	1088638	266300	51235
	1972	2144707	1307421	290965	342166	203580	93684	158333	218693	1055404	252017	48465
	1971	2121015	1304993	280090	346110	209605	91491	157438	220199	1056004	248929	48356
	1970	2165236	1347524	281959	362092	221312	91377	164128	226656	1092019	255505	49407
Annual Change												
	1972-1973	4.70	3.63	3.80	2.21	3.02	8.49	4.00	3.87	3.15	5.67	5.72
	1971-1972	1.12	0.19	3.88	-1.14	-2.87	2.40	0.57	-0.68	-0.06	1.24	0.23
	1970-1971	-2.04	-3.16	-0.66	-4.41	-5.29	0.12	-4.08	-2.85	-3.30	-2.57	-2.13
III. Mfg. Emp.[2]												
	1973	826903	521986	106460	106311	94463	42229	76575	95948	403182	118804	20492
	1972	801492	509249	102764	105161	94623	38749	74623	93329	395877	113372	19807
	1971	819242	518914	101510	106972	99108	39694	74795	96835	404425	114489	21702
	1970	883830	564022	107591	118256	107972	42321	81782	106100	439919	124103	23483
	1967[3]	881300	560900	107200	123600	107200	38400	82800	101700	438700	121200	28600
	1963[3]	829201	536259	95891	126189	109534	31332	80599	92414	424328	111931	19224
	1958[3]	794992	528508	83152	130594	124348	26554	75393	98467	426561	101947	18274

TABLE IV-5 (cont'd)
POPULATION AND EMPLOYMENT
NEW JERSEY AND THE STUDY AREA

	N.J.	NENJ	Bergen	Essex	Hudson	Morris	Passaic	Union	Urban Area*	Fresh Water Area**	Somer-set
Avg. Ann. Pct Growth											
1967-1973	-1.06	-1.19	-0.12	-2.48	-2.09	1.60	-1.29	-0.97	-1.43	-0.33	-5.40
1967-1972	-1.88	-1.91	-0.84	-3.18	-2.47	0.18	-2.06	-1.70	-2.08	-1.33	-7.08
1963-1967	1.54	1.13	2.83	-0.58	-0.54	5.22	0.68	2.42	0.89	2.01	10.44
1958-1963	0.86	0.29	2.89	-0.64	-2.51	3.36	1.34	0.88	-0.10	1.89	1.02
1958-1972	0.06	-0.26	1.52	-1.54	-1.93	2.74	-0.07	0.38	-0.53	0.76	0.58
Annual Change											
1972-1973	3.17	2.50	3.60	1.09	-0.17	8.98	2.62	2.81	1.85	4.79	3.46
1971-1972	-2.17	-1.86	1.24	-1.69	-4.53	-2.38	-0.23	-3.62	-2.11	-0.98	-8.73

IV. Pop. Share	N.J.	NENJ	Urban	Fresh
1970	100.00%	53.36%	41.58%	11.78%
1960	100.00%	57.48%	46.46%	11.02%
1950	100.00%	61.88%	51.51%	10.37%

Source: 1 - U.S. Census of Population
2 - CBP, Except as noted
3 - C of Mfgs.

Notes: * Comprised of Bergen, Essex, Hudson, and Union Counties.
** Comprised of Morris and Passaic Counties.

TABLE IV-6
1973 EMPLOYMENT
NEW JERSEY AND THE STUDY AREA

1973-CBP	SIC	N. J.	NENJ	Bergen	Essex	Hudson	Morris	Passaic	Union	Urban Area*	Fresh Water Area**	Somer set
Total Emp.		2245552	1354938	302036	349718	209730	101638	164662	2271154	1088638	266300	51235
Agr-Svcs-For-Fish		5385	2094	606	475	87	359	209	358	1526	568	236
Mining		2693	706	178	56	37e	231	93	111	382	324	311
Construction		112020	57450	13841	14654	6899	4045	7109	10902	46296	11154	2632
Manufacturing		826903	521986	106460	106311	94463	42229	76575	95948	403182	118804	20492
Food Prods.	20	49802	30178	5474	9058	8347	863	2858	3578	26457	3721	773
Textiles	22	29386	23192	6123	785	5413	724	8109	1438	13759	9433	274e
Apparel	23	68832	45712	6438	6827	18858	583	9005	4001	36124	9588	367
Lumber	24	4979	2445	300	581	430	344	213	577	1888	557	186
Furniture	25	10891	8464	1413	2151	1046		1741	2113	6723	1741	
Paper	26	31228	18412	5447	2887	3465	1636	2807	2170	13969	4443	361
Printing	27	40767	29555	9709	5862	4046	2007	3615	4316	23933	5622	690
Chemicals	28	102548	61135	9344	16591	7194	5718	8298	13990	47119	14016	3360
Ind. Inorg.	281	28915	10786	1424	2573	1332	715	1531	3211	8540	2246	2370
Plastics	282	8523	3247	234	1301	290		902	520	2345	902	188e
Drugs	283	28894	20799	1094	8414	376e	2923	396e	7596	17480	3319	789
Cleaners	284	19186	14479	3708	1422	4282	823e	2918	1326	10738	3741	
Paints	285	5972	3633	642	1475	514	100	494	408	3039	594	
Other	289	9491	7226	2176	1301	330	489	2015	915	4722	2504	
Petro. Ref.	29	6487	2236		441	738		170	887e	2066	170	755e
Rubber	30	32406	19958	2927	3228	850	2621	5506	4826	11831	8127	421
Leather	31	9763	7771	1851	1435	2929	563e	440	553e	6768	1003	
Stone/Clay	32	37057	8608	1278e	1245	2363	1371	1670	681	5567	3041	2173
Prim. Metals	33	29894	15280	1589	3438	3273	1345	1733	3902	12202	3078	316
Fabric.Metals	34	57676	38765	7833	8191	4261	2922	5326	10232	30517	8248	539
Metal Svcs.	347	3784	2743	657	1025	188		395	478	2348	395	

TABLE IV-6 (cont'd)
1973 EMPLOYMENT
NEW JERSEY AND THE STUDY AREA

		N. J.	NENJ	Bergen	Essex	Hudson	Morris	Passaic	Union	Urban Area*	Fresh Water Area**	Somer set
Plating	3471	2286	1494	339	454	115		162	424	1332	162	
Machinery	35	67311	42433	8182	9496	4934	3866	5481	10454	33066	9367	2381
Elec. Mach.	36	96897	66613	9504	14756	16806	4450	10332	10765	51831	14782	2916
Transp. Eqmt.	37	27788	13782	2284e	2833	1691	223e	937	5814	12622	1160	
Instruments	38	21972	14700	4479	3599	765	1227	3127	1503	10346	4354	1179e
Other	39	25754	18449	3866	4985	4344	644	1553	3057	16252	2197	
Trans-P.U.		160324	107851	19926	35013	24605	5048	7218	16041	95585	12266	2215
Wholesale		171903	122362	36211	28783	16966	4133	11956	24363	106323	16039	3254
Retail		419194	224484	60312	53271	29105	19640	28049	34107	176795	47689	11624
Fin-Ins-RE		133658	87157	14398	39699	9078	4223	8133	11626	74801	12356	2377
Services		394685	226378	48995	70335	27666	21390	34846	33146	108142	46236	7881

Source: U.S. Department of Commerce, County Business Patterns, 1973, New Jersey

Notes: * Comprised of Bergen, Essex, Hudson, and Union Counties

** Comprised of Morris and Passaic Counties

e Employment estimated, data not released by Bureau of Census

TABLE IV-7
1973 EMPLOYMENT SHARES
NEW JERSEY AND THE STUDY AREA

1973-CBP		N. J.	NENJ	Urban Area*	Fresh Water Area**
Total Emp		100.00%	100.00%	100.00%	100.00%
Agr-Svcs-For-Fish		0.24	0.15	0.14	0.21
Mining		0.12	0.05	0.04	0.12
Construction		4.99	4.24	4.25	4.19
Manufacturing		36.82	38.52	37.04	44.61
Trans-P.U.		7.14	8.13	8.78	4.61
Wholesale		7.66	9.03	9.77	6.02
Retail		18.67	16.57	16.24	17.91
Fin-Ins-RE		5.95	6.43	6.87	4.64
Services		17.58	16.71	16.55	17.36
Manufacturing		100.00%	100.00%	100.00%	100.00%
	SIC				
Food Prods.	20	6.02	5.78	6.56	3.13
Textiles	22	3.55	4.44	3.41	7.94
Apparel	23	8.32	8.76	8.96	8.07
Lumber	24	0.60	0.47	0.47	0.47
Furniture	25	1.32	1.62	1.67	1.47
Paper	26	3.78	3.53	3.46	3.74
Printing	27	4.93	5.66	5.94	4.73
Chemicals	28	12.40	11.71	11.69	11.80
Ind. inorg.	281	3.50	2.07	2.12	1.89
Plastics	282	1.00	0.62	0.58	0.76
Drugs	283	3.49	3.98	4.34	2.79
Cleaners	284	2.32	2.77	2.66	3.15
Paints	285	0.72	0.70	0.75	0.50
Other	289	1.15	1.38	1.17	2.11
Petro. Ref.	29	0.78	0.43	0.51	0.14
Rubber	30	3.92	3.82	2.93	6.84
Leather	31	1.18	1.49	1.68	0.84
Stone/Clay	32	4.48	1.65	1.38	2.56
Prim. Metals	33	3.62	2.93	3.03	2.59
Fabric.Metals	34	6.97	7.43	7.57	6.94
Metal Svcs.	347	0.46	0.53	0.58	0.33
Plating	3471	0.28	0.29	0.33	0.14
Machinery	35	8.14	8.13	8.20	7.88
Elec. Mach.	36	11.72	12.76	12.86	12.44
Transp. Eqmt.	37	3.36	2.64	3.13	0.98
Instruments	38	2.66	2.82	2.57	3.66
Other	39	3.11	3.53	4.03	1.85

Source: De-ived from data contained in U.S. Department of Commerce, Cou. y Business Patterns 1973, New Jersey

Notes: * Comprised of Bergen, Essex, Hudson, and Union Counties

** Comprised of Morris and Passaic Counties.

TABLE IV-8
1969 INCOME OF FAMILIES
NEW JERSEY STATE

	The State				Urbanized Areas*			
	Total	White	Negro	Puerto Rican	Total	White	Negro	Puerto Rican
Total Families	1838809	1657936	172607	29941	1636308	1464443	164486	28909
Income								
$3000	111669	85844	24584	4421	98737	173482	23330	4341
$ 3000- 4999	125054	98401	25784	5713	109948	84521	24661	5603
$ 5000- 6999	164349	136145	27176	6449	144766	117879	25953	6272
$ 7000- 8999	221995	194990	26059	4427	195400	169861	24689	4266
$ 9000-11999	371112	339951	29822	4605	328161	298561	28437	4387
$12000-14999	302283	281804	19355	2156	270631	251140	18523	2007
$15000-24999	413366	394082	17479	1849	372202	353883	16648	1736
$25000-49999	110045	107563	2087	256	99117	96774	1997	238
$ 50000+	19436	19156	261	65	17346	17079	248	59
Median Income	$11407	11711	7644	6459	11469	11868	7643	6398
Mean Income	$13025	13505	8493	7395	13079	13602	8493	7317
Mean Income for Family Member	$ 3654	3834	2152	1728	3677	3872	2158	1715
Families with Female Head	202005	149840	51225	5702	188751	138002	48821	5614
Mean Income	7448	8254	5114	3859	7454	8307	5118	3859
Income								
$ 3000	6.05%	5.18%	14.24%	14.77%	6.03%	11.85%	14.18%	15.02%
$ 3- 4999	6.08	5.94	14.94	19.08	6.72	5.77	14.99	19.38
$ 5- 6999	8.94	8.21	15.74	21.54	8.85	8.05	15.78	21.70
$ 7- 8999	12.07	11.76	15.10	14.79	11.94	11.60	15.01	14.76
$ 9-11999	20.18	20.50	17.28	15.38	20.05	20.39	17.29	15.18
$12-14999	16.44	17.00	11.21	7.20	16.54	17.15	11.26	6.94
$15-24999	22.48	23.77	10.13	6.18	22.75	24.17	10.12	6.01
$25-49999	5.98	6.49	1.21	0.86	6.06	6.61	1.21	0.82
$ 50,000+	1.06	1.16	0.15	0.22	1.06	1.17	0.15	0.20

Source: U.S. Department of Commerce, 1970 Census of Population, New Jersey

Notes: * The urbanized areas do not correspond to the Urban portion of the Study Area.

The relatively heavy capital requirement of manufacturing firms coupled with the more rapid recovery of the light industry, construction, and service sectors, renders the manufacturing industries particularly sensitive to economic fluctuations. Recent fluctuations, including the small recession of 1966 and the severe recession of 1969, have caused a decline in the numbers of small, older manufacturing plants in favor of larger, new plants. The higher cost of living and of doing business in New Jersey (the result of strong unions and of high-cost transporation) has led manufacturers to seek other locations when replacing lost production.

Data for the 1958-1972 and the 1958-1973 periods are shown in Table IV-5. As can be seen, manufacturing employment declined in both periods for the study area, while it improved slightly in the State. Again, the decline was most severe in the urban area. In fact, manufacturing employment in the Counties of Essex and Hudson show declines in almost all periods covered from 1958 to 1973. The growth shown by the freshwater counties however surpassed that of the State.

Tables IV-6 and IV-7 present the distribution of employment in the State in the study area. The nationwide movement of manufacturing to rural counties is also reflected in the ratios of employment in the different areas of New Jersey. In the State, manufacturing firms employed 37% of the labor force in 1973. The ratio was a slightly higher, 39%, for the study area. That ratio is higher in the freshwater area (45%), reflecting the current trend of manufacturing locating outlying areas.

Because of the proximity to New York and New England, Northeast New Jersey, and particularly the urban area, contains a high proportion of the transportation jobs in New Jersey. The freshwater area contains a relatively low share of wholesale employment and a relatively high share of retail employment, in comparison with the urban area.

The transportation and finance-insurance-real estate industries show a preference for the urban area, while the service sector has a slightly lower share of 1973 employment in the urban area than in the freshwater area.

b. Income The 1969 income data shown in the 1970 Census of Population are summarized here. The data are from a survey conducted as part of the 1970 Census, and pertain to "income earned in the previous year."

Income data are presented only for the State and for urban families. As mentioned above, the urban category does not correspond to the urban area. The Census disaggregates income data only to the SMSA level and therefore the data cannot be aggregated by basin. Data are presented for families by race. The characteristics indicated by the family data correlate well with data for unrelated individuals (single persons not related in the data category which covers families) as well as with data for the U.S. as a whole.

Data for urbanized area were examined as well; these latter data do not represent the urban area. As will be seen, an urban or rural location does not affect income disparities.

Median income in New Jersey in 1969 was $11,407 per family. However, it was more than 50% higher for Whites ($11,711) than Blacks ($7,644) or Puerto Ricans ($6,459). Mean income per family member show an even greater disparity: White - $3,834, Blacks - $2,152, Puerto Rican - $1,728.

Approximately 89% of New Jersey's families (and 92% of the unrelated individuals) live in the urbanized sections of the State. For urban family units, the same income characteristics are evident with the disparity slightly more pronounced.

Urban White families earned a median income of $11,868 in 1969 compared to $7,643 for Blacks and $6,398 for Puerto Ricans. The mean income for urban family members was about the same as the average for the State: $3,872 for Whites, $2,158 for Blacks, and $1,715 for Puerto Ricans.

As seen in Table IV-8, the income categories representing most White families are in the $9,000 to $25,000 range. For New Jersey as a whole, 61% of White families have income in that range.

Blacks earn considerably less, with 77% of the families earning less than $12,000. There is some tendency for family income to cluster in the upper half of the under - $12,000 range.

Incomes in New Jersey of Puerto Rican families are also low. An even greater percentage (85%) earn less than $12,000. For this group, the tendency is for incomes to be in the $3,000 to $7,000 range.

For urban family units in New Jersey, the distribution of income is the same. Incomes for White urban families cluster in the $9,000 to $25,000 range (62%); for Blacks, below $12,000 (77%) and tending toward the upper half of the range; for Puerto Ricans, below $12,000 (86%) and tending toward the $3,000 to $7,000 range.

IV.C. Land Use Considerations

IV.C.1 Existing Land Use

Historically, growth in the Northeast has largely been the result of the region's proximity to and interaction with New York City. The provision of various transportation modes, water, rail and highway has been the primary stimulus to the region's growth outward from New York. However, highways have probably had the greatest influence on the region's growth and development patterns in recent years.

The type and extent of development varies considerably in the Northeast 208 Planning Area. The eastern portion of the study area generally adjacent to New York City, which includes the counties of Hudson, Bergen, Essex and Union exemplifies the classic urban/industrial complex. This area is extensively developed with approximately 70% of the total urban area land devoted to active development. Residential land use is at various densities with the highest densities occurring in the urban core of Newark and Hudson County. Industry is generally of the heavy type, advantageously located near rail, highway and water. Recreation land and open space are at a premium.

Proceeding concentrically from the urban core to the west, the urban/industrial character yields to what is characteristically described as "suburban sprawl"; highway-oriented, medium and low density housing interspersed with light industrial/research facilities and commercial highway-strip development. Such suburban development has been gradually taking its toll of the remaining rural land in the Northeast. Generally, active development comprises approximately 35% of the total freshwater area land with the remaining land devoted to conservation, recreation and vacant uses. Residential land use is commonly medium to low density single-family with the exception of the occurrance of multi-family garden apartments and rural urban centers. This suburban/semi-rural development occurs in the counties of Bergen, Essex, Union, Passaic, Somerset and Morris.

Much of the planning area is extensively utilized as a source of potable water supply. The surface drainage from approximately 875 square miles of the region is used to supply the potable water requirements of 3.5 million people, most of whom are located in the urban portion of the study area.

For the purpose of this discussion, the planning area is divided into two subareas; the freshwater and the urban. The freshwater area generally encompasses the land that drains to Little Falls on the Passaic River while the urban area includes the land downstream from Little Falls and the areas draining to the Hackensack, Elizabeth and Rahway Rivers.

The existing land use information presented in this section has been adapted from the Northeast New Jersey Water Quality Management Study. The information represents a synthesis of 1966 State data, County inventories ranging in date from 1968 to 1970, 1970 USGS maps and 1972 aerial photos (DEP). Data on existing land use formed a basic component in the non-point source analysis (Chapter VI). While the age of the existing land use data acted as a constraint in the non-point source analysis, the analysis was not performed at a level of intricacy which would have justified additional research.

Table IV-9 summarizes 1970 land use by county according to eight categories. Table IV-10 defines each land use category.

a. <u>Residential Land</u> Residential land use, which can include a variety of densities, comprises approximately 37% of the total land use in the urban area. This land use type is the single largest developed land use category (i.e., all land uses except vacant, recreation and conservation), and accounts for over half of the total developed land in the urban area.

Residential land use varies considerably as to its type (detached single-family units, two-family, high-rises), density (dwelling units/residential acre), and age.

The spatial location of different housing types, and density are generally differentiated in accordance with the geographical extent of the urban core and its surrounding suburbs. The urban core has traditionally been associated with the New York City-Hudson County-Newark region. The outlying communities generally fall into categories which specify various rings of housing intensity. Thus, although urbanization has taken place throughout Northeast New Jersey, the character of housing varies from the older, heavily developed central cities to the newer, less dense, single family, subdivided development on the outer fringes of the urban area. (See Figure IV-2, Residential Density).

Table IV-9
1970 Land Use (acres) by County

County	Streets	Single Family	Multi-Family	Industrial	Commercial	Public/ Quasi-Public	Conservation/ Recreation	Vacant	Total
Bergen	18,403	52,923	921	6964	5691	5964	26,593	36,938	154,397
Essex	9842	27,565	4864	7502	1629	7390	9804	12,974	81,570
Hudson	3176	2176	3312	10,202	1361	1701	2985	4841	29,754
Morris	8663	39,831	1221	6094	1884	9048	37,042	90,026	193,809
Passaic	5488	19,764	1248	5273	2952	5339	33,351	44,601	118,016
Somerset	1672	7479	49	601	118	1070	2068	13,953	27,010
Union	7291	22,728	1425	6762	2223	2981	6056	8125	57,591
TOTAL	54,535	172,466	13,040	43,398	15,858	33,493	117,899	211,458	662,147

Source: Northeast New Jersey Water Quality Management Study

Table IV-10

LAND USE CATEGORIES

Streets	Acres of streets in the study area.
Single Family Residential	Includes all single family units regardless of its density.
Multifamily Residential	Includes two family homes, garden apartments, town houses, trailer parks and high rises.
Industrial	Includes light and heavy industry, research, warehousing, railroad yards, utilities, communications and their respective right-of-way.
Commercial	Includes service, retail and hotels.
Public and Quasi-Public	Includes governmental institutions, schools, hospitals, churches, airports, historical and cultural establishments, camps, public golf courses, and cemeteries.
Conservation and Recreation	Includes preserved open space and major recreation, watersheds, lakes and marshes.
Vacant	Includes all vacant land plus agriculture and forested areas less swampland.

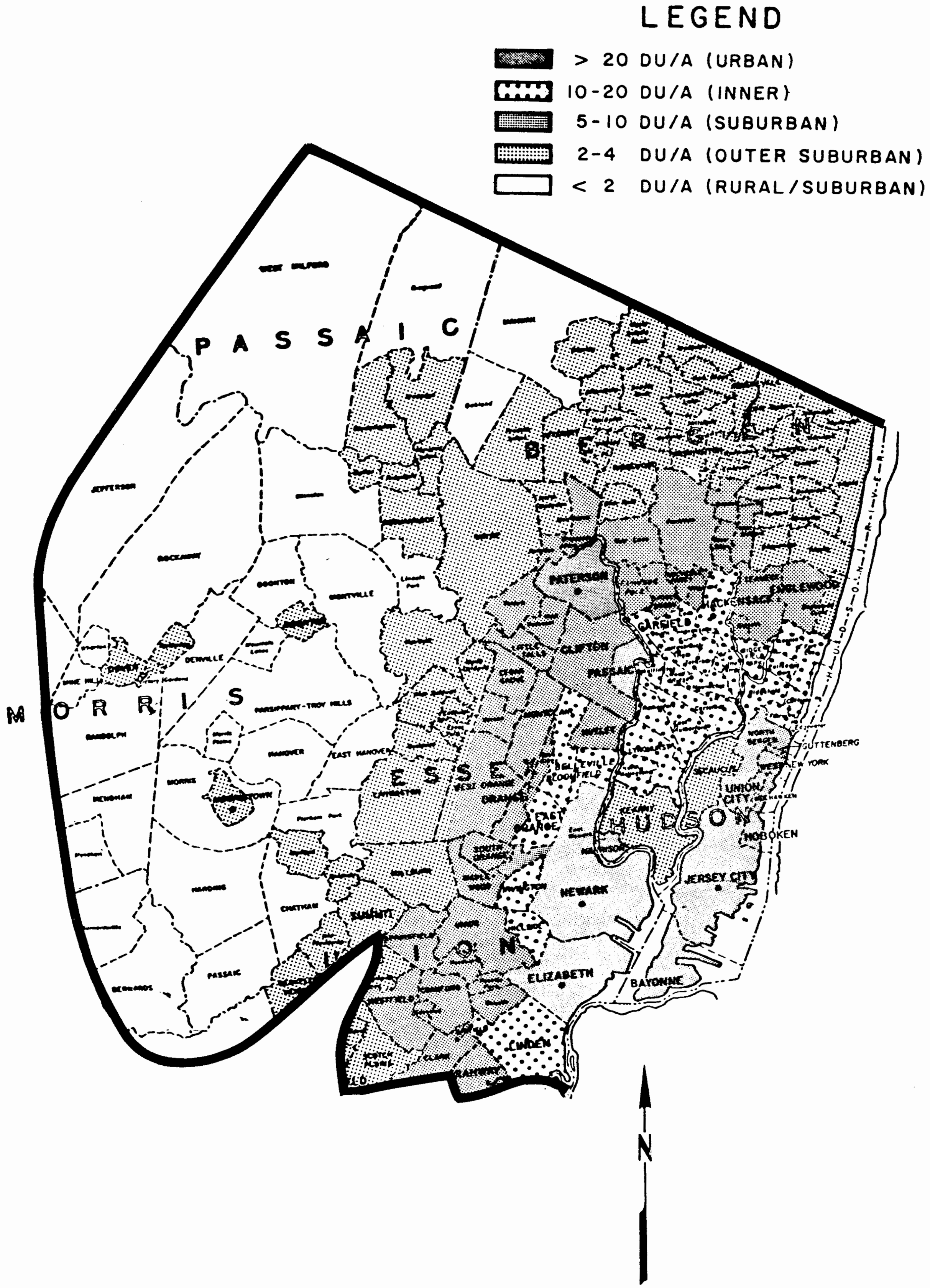


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FIGURE IV-2
1970 RESIDENTIAL DENSITY
(DWELLING UNITS / RESIDENTIAL ACRE -- DU/A)

Source: N.E. Management Study, Berger & Associates and Betz Engineers Inc.

Residential land use is the third largest land use type in the freshwater area. It is, however, the largest single developed land use type in the freshwater area, accounting for over 70% of the region's total developed land. Residential land use can be divided into single and multiple-family types. The single-family residential category is the most common, consisting of 74,400 acres or 98% of the total residential land in the freshwater area.

i. Density of Urban Area Residential Land (as specified by rings of development)

Urban, or Center Ring The greatest residential densities (greater than 20 dwelling units/residential acre (DU/A) appear in the urban centers of Newark, Elizabeth, Passaic, Paterson, and all of Hudson County (with the exception of Secaucus and Kearny, where single-family homes predominate). This high density implies the predominance of multifamily housing units, two-family homes and high-rise apartment buildings, with few single-family units appearing. Residential land use in Union City, West New York, and Hoboken (all Hudson County) consists almost entirely of densities greater than 40 dwelling units/residential acre. Except for recent construction of garden apartments in some suburbs, multifamily residential land use is still primarily found in central cities. Newark and Elizabeth, for example, contain 71% and 67%, respectively, of the multifamily housing in their counties of Essex and Union.

Inner Ring The second level of residential density (10-20 DU/A) is found in communities immediately boardering urban (center ring) areas, and in the sections of Bergen County adjacent to Hudson County. Hackensack is characterized by this density of residence. The inner ring communities include East Orange, Irvington, Belleville, and Bloomfield in Essex County; Hillside and Linden in Union County; Hackensack and the Hudson River-oriented communities such as Fort Lee and Cliffside Park in Bergen County. Inner ring housing supply consists of high-rise apartments, garden apartments, and single family homes (often attached).

Surburban Ring The third level of density (5-10 DU/A) includes the suburban Essex communities near Newark, several Union County communities around Elizabeth, the central Bergen County area, and the urban area portion of Passaic County, with the exception of North Haledon, Paterson and Passaic. In this group of municipalities, multifamily units are predominantly concentrated along major roads or commuter rail lines and are adjacent to commercial concentrations.

This suburban ring of communities around Newark includes Nutley, Montclair, West Orange, and Maplewood (all in Essex County). Near Elizabeth, the suburban ring encompasses an area in Union County which includes the region from Roselle to Cranford, from Union south to Rahway. The mix of single and multifamily housing in these suburban municipalities is roughly 95% single-family and 5% multifamily.

Outer Suburban Ring The remainder of the urban area has the lowest density, 2-4 DU/A, and is the only portion of the urban area whose residential density is comparable to that of the freshwater area. This portion of the urban area, whose residential land supply is predominantly single-family, includes the remainder of urban Union County, Millburn in Essex County, and the northern Bergen County area.

ii. Density of Freshwater Area Residential Land

Since single-family housing is the most prevalent residential type, housing density in the freshwater area is low compared to the urban area. In Morris County, where over 50% of the residential land is situated, almost half of the single-family dwelling units are on lot sizes of greater than one acre. Overall, the housing density of the freshwater area is less than four dwelling units per residential acre compared to an average of 10 DU/A in the urban area (see Figure IV-2.)

Single-Family Housing The greatest residential densities (2-4 DU/A) prevail in the counties of Essex and Passaic along the urban/freshwater transition area where the intensity of development is an extension of the urban area characteristics. Similar residential densities appear in the freshwater boroughs and in small, urban areas, scattered throughout the freshwater area such as Morristown, Dover and Chatham. The freshwater area Essex County and Union County communities, the freshwater area communities of Ringwood and Wayne in Passaic County and Butler and Pequannock in Morris County, are also included in this density. The remainder of the freshwater area is composed of single-family residential densities of 1-2 DU/A. These densities prevail in the Morris County communities of Kinnelon, Boonton, Montville, Rockaway, and Morris Township and in the Somerset County freshwater communities.

Multiple-family Housing Multifamily residential land is basically confined to two types of development: relatively small areas clustered around traditional Central Business Districts (CBD), and new garden apartment and townhouse complexes in suburban and semi-rural areas, generally along major arterials. Multifamily units following the CBD-type of development are found in Morristown, Dover, and Summit. More numerous are major garden apartment and townhouse complexes being constructed in Wayne, in Passaic County, and in Parsippany-Troy Hills in the vicinity of Interstates 80 and 287 and Route 46 in Morris County.

b. Industrial Land Use Industrial land use accounts for approximately 12% (36,000 acres) of total land use in the urban area and constitutes 19% of the total developed land uses in the entire urban area. The largest concentration of industrial land use is found in Hudson County, where the 10,000 acres of this land use type comprise one-third of the county's entire land area. The predominance of industrial land use in Hudson County is not found elsewhere in the urban area. In Essex County, where a large number of industrial acres are located (7,000), industrial land use makes up only 12% of the urban portion of the County (Figure IV-3 displays existing industrial land use).

Four distinct types of industrial land use appear in the urban area: heavy industry; light industry; industrial/research and development; railroads and utilities.

Heavy industries within the urban area are concentrated in port areas, alongside navigable rivers, and adjacent to railroads. One of the most notable locations of heavy industries is an industrialized strip which lines the New Jersey side of the Hudson River from Edgewater in Bergen County to the tip of Bayonne in Hudson County, encompassing North Bergen, Weehawken, Hoboken, and Jersey City. Large, heavy manufacturing plants in the food processing, apparel, electrical and chemical industries predominate.

The heavy industry zones in Bayonne are primarily oil storage facilities, due to the proximity of the ports of Elizabeth and Newark. These port areas, along with other municipalities along the Arthur Kill such as Linden (Union County), support large concentrations of heavy industry, including petroleum refining and machinery and chemical manufacturing. In the Hackensack River port area in Kearny, the Nation's largest ship-scrapping concern maintains an active facility which transforms the port area to a parking area for old ships about to be scrapped. In addition, there are port facilities in Hoboken, Bayonne and Jersey City.

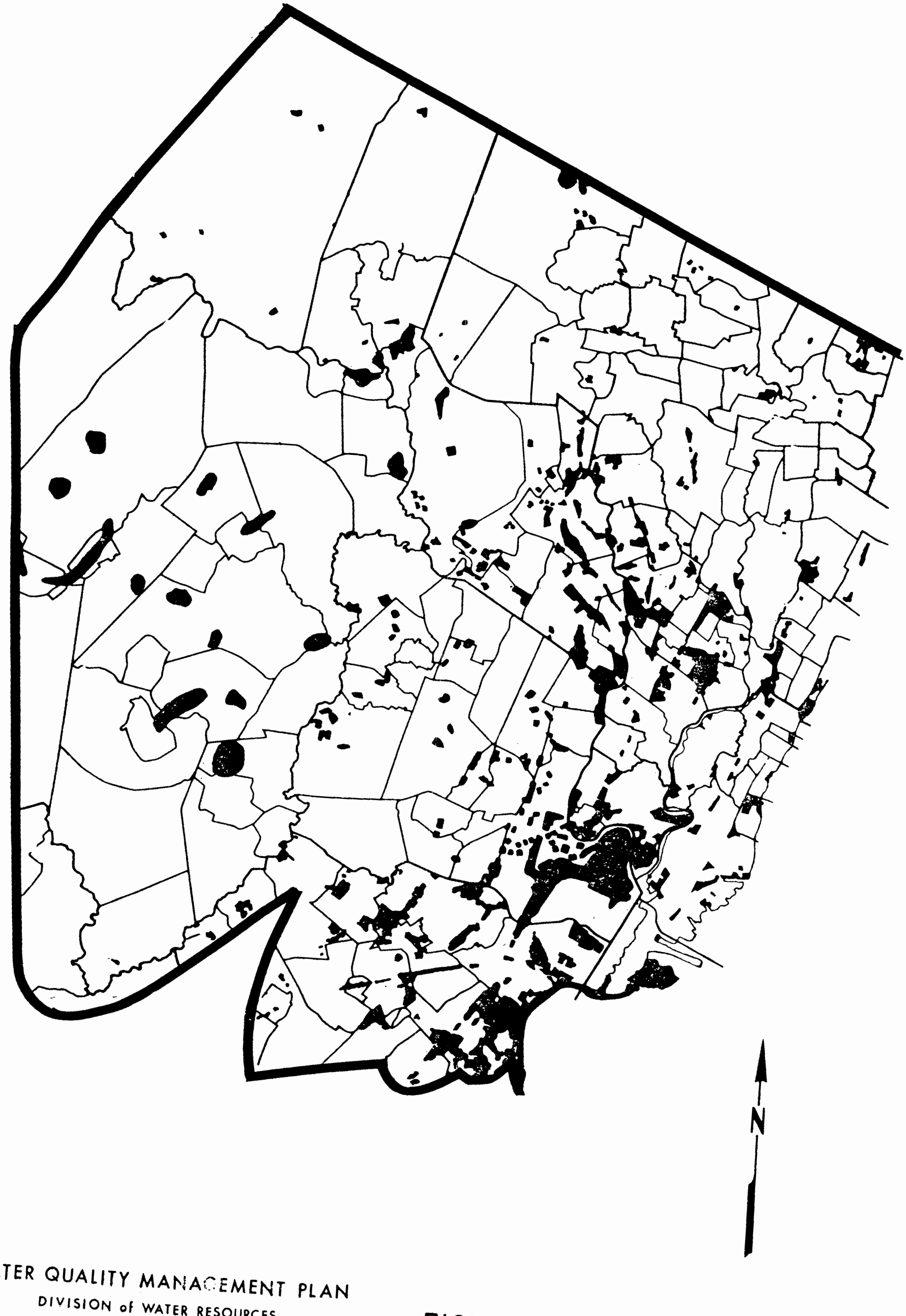

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FIGURE IV-3
EXISTING INDUSTRIAL LAND USE

Source: N.E. Management.Study, Berger & Associates and Betz Engineers, Inc.

Another concentration of heavy industry is located along the Passaic River in the cities of Paterson, Passaic, and Clifton. These are largely paper, dye, chemical, and textile manufacturers. Individual heavy industrial firms such as the Marcal and Garden State Paper Companies are also located along the Passaic River, in the city of Garfield (Bergen). Further down the Passaic River, closer to its confluence with the Hackensack at Newark Bay, the river is lined with heavy industrial plants.

A second major category of industrial land use includes light industry and warehousing. Both are land intensive and depend upon access to highways. Light industries are typically capital-intensive and thus are less dependent on the immediate labor force provided in the central urban areas. The majority of the light industries and warehouses are located in the Hackensack Meadowlands communities of Carlstadt, Moonachie, Teterboro, East Rutherford and Rutherford in Bergen County and in Kearny and Secaucus in Hudson County. Warehousing and truck distribution are also major land uses in Elizabeth and Newark in conjunction with the port areas.

Warehousing and distribution are not confined only to the urbanized areas such as Hackensack and Paterson, but are of growing importance in suburban areas, in particular along the entire length of Route 17 in central Bergen County. Light industrial and warehousing establishments are mixed with commercial complexes in Wood Ridge, South Hackensack, Saddle Brook, Elmwood Park, and Englewood, which are all accessible to Interstate 80 and Routes 4 and 17. Along Route 208 in Fairlawn and Glen Rock, a similar mix of light industry and commercial activity is found.

Research and development parks appear in Springfield (Union County), in Lyndhurst, River Vale and Montvale along the Garden State Parkway (Bergen County). Many corporate headquarters are located along the Hudson River, especially in Englewood Cliffs (Bergen County).

Extensive railyards are located in Kearny, Jersey City, Newark, Secaucus, and Hoboken. Power plants are located in Kearny Point, Newark, Jersey City, Ridgefield Park and Linden.

Industrial land use in the freshwater area is mostly highway-oriented, in contrast with the industrial land use in the urban area, much of which still conforms to traditional locational requirements of water for low cost transport and processing and proximity to major freight yards and port areas (see Figure IV-6). Industrial development accounts for only 3% (10,000 acres) of the total freshwater area acreage, in contrast with 12% in the urban area (industrial land use represents only about 10% of total developed land uses in the freshwater area). Most of the industrial land in the freshwater area is located in Morris County (1,221 acres, or 73% of the freshwater area industrial land).

Heavy industry concentration in the freshwater area is found in the Dover/Wharton area in Morris County, within easy access to Routes 46, 10, and Interstate 80.

Most of the industrial development in industrial parks or light industry, research and development office parks are found in the Hanover area surrounded by Interstates 80, 280, 287, and Routes 46 and 10. Electronics manufacturing and warehousing are found along I-80 in the Parsippany-Troy Hills area. Several similar light industrial uses are located in New Providence and Berkeley Heights (Union).

Light industries are also in Wayne (Passaic) where corporate offices, research and development facilities and small processing establishments are located in numerous industrial/office/research parks. Small industrial parks are situated in the Essex County communities of Fairfield and Caldwell.

Industrial development in freshwater Bergen County is predominantly light industry and research activity located along major arterials. The largest of these is the Ford Assembly Plant in Mahwah.

Several national corporate headquarters have been locating in the freshwater area. In Morris County they include: Warner-Lambert, Allied Chemical, Keuffel and Esser, and Airtron (a division of Litton), all on the edges of Morristown. There is also the Pharmaceutical and Chemical Division of Sandoz, Inc. in East Hanover; and Interpace, and Bankers National Life Insurance Company in Parsippany-Troy Hills.

In Passaic County, American Cyanamid and Union Camp have located in Wayne; Ciba Corporation is in Summit (Union).

Other freshwater counties also contain major headquarters; these include Prudential and Exxon Research & Development in Florham Park, Bell Laboratories in Chatham (both in Morris) and Foster-Wheeler in Livingston (Essex).

c. Commercial Land Use Commercial land use represents 4% of the total urban area land. The 12,000 acres devoted to this land use constitute 5% of the total developed land in the urban area. Over 40% (5,378 acres) of urban area commercial land use is situated in Bergen County. Commercial land use includes a variety of activities which have differing land-consumptive characteristics. These are: traditional central business districts, regional shopping centers, commercial development along major arterials, neighborhood services, and office activities.

The central business district (CBD) is the major form of commercial development in the central cities. Central business districts, as typified by Newark, Elizabeth, and Jersey City, function as shopping centers and workplaces and accommodate many of the administrative services required by surrounding counties.

Regional shopping centers are replacing many of the functions traditionally provided in the CBD. Their presence on large tracts of land with convenient access and ease of parking has had a significant economic impact on CBD's throughout the area. Besides attracting shoppers and businesses away from a central city location, regional shopping centers have induced construction of land use activities such as apartment complexes, strip commercial development, and office and research and development establishments.

In the urban area, there is one major regional shopping area located in Paramus, which includes four separate malls. The Paramus center, accessible from the Garden State Parkway, Routes 4 and 17, serves all but the most western part of Bergen County.

Part of the urban area is serviced by regional malls in the freshwater area. Willowbrook Mall in Wayne (Passaic County) draws shoppers from Bergen and northern Essex Counties while Short Hills Mall in Millburn and Livingston Mall (both in Essex County) attract shoppers from southern Essex and northern Union Counties.

Intense commercial strip development occurs along Route 4 from Paramus to Hackensack (Bergen), along Route 46 from Wayne to Clifton (Passaic) and from Elmwood Park to Lodi (Bergen), along the entirety of Route 22 in both Essex and Union Counties, and along the portion of Route 17 between Hackensack and Ridgewood. In addition, commercial strip development is found along Route 27 in Linden, Roselle, and Elizabeth and along Route 28 from Westfield to Elizabeth (this section actually encompasses the small central business districts of several municipalities).

Neighborhood commercial activity is scattered throughout the urban area to meet the everyday needs of the populace. Common activities within this use include small shops and stores.

Another type of commercial development is the hotel/office complex, such as that which has recently developed at the intersection of Interstate 80 and the Garden State Parkway in Saddle Brook (Bergen County). Similar commercial uses are part of the office/industrial park in Lyndhurst (Bergen).

Commercial land use accounts for only 1% of total land acreage in the freshwater area. Furthermore, it accounts for only 4% of the total developed land uses in this area. Commercial development is oriented toward several major shopping centers in the eastern part of the freshwater area. Willowbrook Mall in Wayne (Passaic) on Route 23 has been accompanied by Wayne Hills, another shopping complex also in Wayne. Together they serve Passaic, northeast Morris, and northern Essex Counties. The Short Hills Mall in Millburn, along with the Livingston Mall in Livingston, serve southern Essex, southern and eastern Morris, and northern Union Counties.

The balance of Morris County notably lacks a regional shopping center. This absence of a regional mall has helped preserve the Morristown CBD as a major shopping area for the central Morris area. Downtown Dover also has a significantly large CBD. According to the 1972 Census of Retail Trade, Morristown captures 14% and Dover 9% of the retail dollars spent in Morris County. The populations of those two cities only account for 5% and 4%, respectively, of the total 1970 county population.

Commercial strip development in the freshwater area is confined largely to the following major arterials: Route 17 in Upper Saddle River and Ramsey (Bergen), along Route 46 in Parsippany-Troy Hills (Morris), along Route 509 (Bloomfield Avenue) in Caldwell (Essex), scattered along Route 10 from Morris Plains to Hanover (Morris), along Route 82 in Madison, Chatham, and Morris Plains (Morris), and, to a lesser extent, along Springfield Avenue in New Providence and Berkeley Heights (Union).

d. Public/Quasi-Public The land use category of public/quasi-public includes governmental institutions, schools and universities, hospitals, churches, museums, historical sites, airports, cemeteries, camps, and public golf courses. The nature of this category contrasts sharply from the urban to the freshwater area, with the former tending to represent more intensive, paved uses and little green space, while the latter represents larger land areas and generally includes some green area. For example, schools in the urban area generally can afford little green space, whereas freshwater area school acreage is largely open space. The same applies for hospitals, churches, and university campuses.

Public land use accounts for 6% of the total land use in the urban area. Over half of the urban area public lands is located in Bergen (4,782 acres) and Essex (5,259 acres) Counties.

The largest public/quasi-public uses in the urban area are Newark Airport, the Elizabeth/Newark container port, and the U.S. Naval Supply Center in Bayonne. All of these represent extensively paved surfaces. Other major facilities in the area include airports in Linden (Union County) and Teterboro (Bergen County) and the U.S. Army Terminal in Jersey City.

The largest public/quasi-public use in the freshwater area is Picatinny Arsenal in Rockaway (Morris) which contains much open land. Other major facilities in the freshwater area include airports in Caldwell (Essex), Morristown (Morris), and West Milford (Passaic); and camps and other similar quasi-public open space uses not classified under conservation/recreation. Camps and similar open area recreation-oriented land uses are one of the land use types not commonly found in the urban area.

e. Streets Streets and other paved road surfaces account for 13% of the total land distribution in the urban area. The 40,105 acres of recorded streets constitute almost 40% of the total developed land in the urban area. Over 60% of the streets are situated in Bergen (16,986 acres) and Essex (8,019 acres) Counties. An additional 23% (6,432 acres) are contained within Union County.

These three counties encompass areas of major highway thoroughfare and dense urban development, both of which represent street-demanding activities.

Streets and other paved surfaces account for 5% of the total land area in the freshwater area. The 17,440 acres of streets represent 16% of the total developed land in the freshwater area. Fifty percent (8,663 acres) of the street land use is situated in Morris County, while Passaic and Essex have 17% (2,890 acres) and 13% (2,195 acres) respectively.

f. Conservation and Recreational Land Use The conservation/recreation land use classification includes watersheds and preserved open space, public recreational areas, swamp and water acreage. Although all of the above categories represent open space, each has a different attraction for and potential of utilization and enjoyment. Recreational lands, which include State, Federal, county, and municipal parks, receive extensive use in contrast with the conservation areas such as watersheds and swamp lands, which generally are restricted to protect water sources.

The urban area is generally characterized by a lack of open space. The shortage of public open space is most acute in Hudson County, where all municipalities except Kearny and Secaucus are below the 5.6 acres/1000 population recommended by the Hudson County Planning Board. In 1975, urban Bergen had an average county park acreage of only 2.5 acres/1000 residents, in sharp contrast with freshwater (Northwest) Bergen, which had 17.8 per 1000.(1) The lack of open space in the urban area can be characterized by noting that in spite of a very low ratio of 2.5 acres/1000 residents, urban Bergen County contains more than half (20,901 acres) of this land use type in urban area. In Hudson County, the 2,983 acres of recreational land make up only 8% of the county's total land area and constitute less than 10% of the conservation and recreational land use situated in the urban area.

Open space and recreational areas can be grouped into four major categories:

i. Resource-based areas whose significance is centered on their unique natural settings, scenic beauty, or historical significance. This includes national parks or state forests.

ii. Intermediate areas which are both resource- and user-oriented, more accessible to population, and which provide facilities for camping, swimming, and other activities.

[1] Bergen County Open Space and Recreational Inventory, 1975.

iii. User-oriented recreation areas, which have as their main feature accessibility to population centers and hence are generally located in urban areas in the form of linear riverside parks or municipal parks.

iv. Areas of ecological significance preserved in their natural state by public or private agencies or by the inability of man to develop them, as would be the case with a swamp area.

The majority of public open space in the urban area is intermediate or user-oriented in nature: either linear river parks and small mountain reservations, or municipal parks. This limited variety in open space results from land constraints (such as steep slope) which have prevented development and also from the need of a densely populated area for local recreational facilities and open space. All of these types of facilities which are found in the urban area, particularly linear and municipal parks, decrease in importance in the freshwater area due to the wide availability of alternative forms of open space.

Most of the regional resource-based recreational areas, such as Greenwood Lake State Park (Passaic) and Campgaw Mountain Reservation (Bergen), are located outside the urban area. The only major area of this type within the urban area is the Palisades Interstate Park (2,300 acres) which stretches along the Hudson River for ten miles from Fort Lee to Alpine in Bergen County. This park includes scenic lookouts and a wildlife sanctuary along with some user facilities such as boat berths. There are also 750 acres reserved in the Kingsland and Sawmill Creeks Wildlife Management Preserves in the Hackensack Meadowlands, where user facilities have yet to be developed.

Major linear county parks are located along the Saddle River, Pascack Brook, and Overpeck Creek in Bergen; in the Passaic and Hackensack Riverside Park (Passaic and Bergen); and in Union, on the Rahway and the Elizabeth Rivers. Small mountain reservations, such as Garrett Mountain (Passaic), Eagle Rock Reservation (West Orange, Essex), and parts of South Mountain and Watchung Reservations (Millburn and Summit, respectively) are also part of the urban area open space lands. Municipal parks which cater to community users include Branch Brook and Weequahic Parks in Newark, Warinanco Park in Elizabeth, and Lincoln Park in Jersey City. Local-oriented recreational land use (small municipal parks and playgrounds) comprises the balance of this land use category.

Ecologically significant land is found primarily in the urban area portion of Bergen and Hudson Counties in the Hackensack Meadowlands. Southwest Bergen, for example, has roughly 6,000 acres of water and swamp.

Conservation/recreational land use comprises a significant portion of freshwater land use accounting for 91,723 acres of land or 23.5% of the freshwater area's total land use. Over 90% of this land use category is situated in Passaic (31,921 acres) and Morris (37,042 acres) Counties.

Water, swamp, and conservation areas make up a dominant portion of this category. The overwhelming majority of utility-owned watershed area as well as the two principal ones, Pequannock (35 square miles) and Wanaque (15 square miles), are located in Passaic County and northern Morris County. A more detailed discussion of potable watersheds is contained elsewhere in this chapter.

Over 75% of the acreage of this category in Morris County is water and swamp. However, a large part of this is either lakes or areas such as the Great Swamp National Wildlife Refuge (6,000 acres). Troy Meadows and Great Piece Meadows are also considered to be a conservation/recreational use.

The majority of the regional resource-based recreational areas are found in the freshwater area as well. These include the Morristown National Historical Park, Abram S. Hewitt and Norvin Green State Forests (Passaic), and Ringwood Manor Skyland State Park (Bergen and Passaic). Other important State parks with both a user and resource orientation are Hopatcong State Park, Troy Meadows State Park, and Farny State Park (Morris) and Great Piece Meadows State Park (Essex).

Some county parks also serve as regional facilities in the freshwater area. These are found principally in Bergen County: Campgaw Mountain Reservation (1,351 acres), Ramapo Mountain Reservation (681 acres), and Darlington County Park (347 acres). Mahlon Dickenson Reservation is in Morris County.

Near the urban/freshwater transition area most of the open space is in the form of highly accessible linear river parks (West Essex Park in Essex County and Passaic River Park in Union) or reservations in the urbanized areas, Watchung (Union) and South Mountain (Essex). The balance of the freshwater open space is in the form of municipal parks, which are more numerous in the eastern, more densely developed portion of the freshwater area.

g. Vacant Land Vacant land is the second largest land use category in the urban area. It consists of all remaining undeveloped land not accounted for by the other land use categories. Vacant land accounts for over 47,000 acres and represents 15% of the total land area. Agricultural land as well as forested land not included as conservation/recreation is included in this category. Forty-five percent of this land area, or 21,300 acres, is situated in Bergen County.

The largest land use category in the freshwater area is vacant land. Over 170,000 acres (44% of freshwater land) are undeveloped. A majority of the vacant land, especially in Morris County and freshwater Passaic County, is forested land on steep slopes. The only county where agricultural land use consumes a significant part of vacant land is Morris, where 8% of the total land area is still farmed (as of 1970). About half of Morris County is vacant, and is neither farmed nor developed.

Table IV-11 lists 1970 land use by municipality according to eight categories.

Table IV-11

1970 LAND USE (Acres) BY MUNICIPALITY

MCD	Streets	Single Family	Multi-Family	Industrial	Commercial	Public	Conservation/ Recreation	Vacant	Total Area
BERGEN COUNTY									
Allendale	159	893	--	44	46	51	126	598	1917
Alpine	433	339	--	8	25	55	2740	496	4096
Bergenfield	364	949	71	36	74	61	275	90	1920
Bogota	106	260	48	49	21	23	37	1	545
Carlstadt	160	247	60	244	182	7	1630	160	2690
Cliffside Park	136	190	186	20	31	27	16	8	614
Closter	229	939	18	168	73	32	88	503	2050
Cresskill	220	530	--	22	20	45	164	279	1280
Demarest	153	496	--	5	5	27	271	388	1345
Dumont	289	695	5	21	29	29	56	28	1152
East Paterson	305	785	77	137	93	48	121	175	1741
East Rutherford	206	279	30	177	181	7	1246	361	2487
Edgewater	55	118	22	195	90	31	8	99	618
Emerson	150	586	--	366	33	96	249	120	1600
Englewood City	475	1685	20	129	218	131	269	241	3168
Englewood Cliffs	196	380	5	71	85	19	414	100	1270
Fair Lawn	596	1722	72	197	202	119	326	217	3451
Fairview	88	164	136	43	63	129	5	19	547
Fort Lee	442	637	142	13	149	43	214	15	8660
Franklin Lakes	307	1757	--	90	170	210	1162	2534	6230
Garfield	230	414	296	116	170	43	103	39	1421
Glen Rock	266	1004	--	61	60	178	149	61	1779
Hackensack	481	830	240	195	491	123	221	92	2673
Harrington Park	113	537	--	161	11	21	213	234	1290
Hasbrook Heights	193	544	78	177	58	44	8	47	941
Haworth	159	418	--	83	14	60	522	194	1450
Hillsdale	279	989	--	57	47	46	155	283	1856
Hohokus	157	614	--	19	10	19	36	295	1150

Table IV-11 (Cont'd)

MCD	Streets	Single Family	Multi-Family	Indus-trial	Com-mercial	Public	Conservation/ Recreation	Vacant	Total Area
BERGEN COUNTY (Cont'd)									
Leonia	154	345	30	18	26	19	291	98	981
Little Ferry	129	283	5	78	45	110	163	226	1039
Lodi	258	676	70	105	188	82	31	52	1468
Lyndhurst	229	500	140	190	73	32	1698	146	3008
Mahwah	511	1853	43	693	135	252	3729	9234	16450
Maywood	178	413	40	91	66	21	16	15	840
Midland Park	167	650	—	43	43	57	21	100	1081
Montvale	277	1286	14	180	103	114	114	486	2574
Moonachie	71	150	--	161	22	444	15	207	1070
New Milford	270	590	250	20	36	61	63	120	1410
North Arlington	168	350	158	119	45	228	489	57	1614
Northvale	105	418	--	43	43	9	127	49	794
Norwood	146	659	--	188	26	115	214	508	1856
Oakland	350	1587	--	67	41	98	783	2898	5824
Old Tappan	120	803	--	84	23	66	638	774	2508
Oradell	183	696	--	67	29	71	369	235	1650
Palisades Park	202	206	150	46	49	16	120	35	824
Paramus	860	2034	--	167	599	535	1060	1612	6867
Park Ridge	214	918	74	23	68	50	119	200	1666
Ramsey	265	1377	58	60	122	100	378	1406	3766
Ridgefield	198	336	36	284	111	27	675	79	1773
Ridgefield Park	393	351	42	92	84	28	425	13	1226

Table IV-11 (Cont'd)

MCD	Streets	Single Family	Multi-Family	Indus-trial	Com-mercial	Public	Conservation/ Recreation	Vacant	Total Area
BERGEN COUNTY (Cont'd)									
Ridgewood	546	2339	20	43	84	114	255	305	3706
River Edge	199	596	20	30	70	37	168	90	1210
River Vale	1461	219	--	1	27	17	647	378	2750
Rochelle Park	125	294	10	13	50	13	114	49	668
Rockleigh	31	105	--	40	10	61	198	185	630
Rutherford	380	632	75	86	51	36	505	50	1815
Saddle Brook	349	667	20	170	42	200	199	73	1720
Saddle River	157	1677	--	--	31	30	65	1240	3200
South Hackensack	63	73	--	82	83	12	9	24	346
Teaneck	731	1715	132	178	141	147	858	91	3983
Tenafly	418	1351	15	22	58	126	361	482	2833
Teterboro	36	2	--	328	--	296	5	45	712
Upper Saddle River	270	1534	--	16	140	19	117	1270	3366
Waldwick	237	811	--	12	35	47	88	84	1314
Wallington	111	89	135	89	85	15	67	33	624
Washington	238	878	--	--	21	141	226	480	1984
Westwood	187	650	40	37	66	48	208	300	1536
Woodcliff Lake	259	1092	--	51	28	22	274	587	2313
Wood-Ridge	124	279	60	177	26	13	9	31	719
Wyckoff	402	2339	19	105	60	85	183	1086	4288
COUNTY TOTAL	18,719	52,824	3,062	7,203	5,741	5,738	26,924	33,110	153,321

Table IV-11 (Cont'd)

MCD	Streets	Single Family	Multi-Family	Industrial	Commercial	Public	Conservation/ Recreation	Vacant	Total Area
ESSEX COUNTY									
Belleville	326	1075	90	269	13	128	211	--	2112
Bloomfield	531	1790	141	205	38	555	111	--	3371
Caldwell	134	499	32	--	33	19	51	--	768
Cedar Grove	346	1107	38	13	6	448	365	557	2880
East Orange	474	1562	243	83	53	109	38	--	2562
Essex Fells	128	538	--	--	--	31	32	102	831
Fairfield	262	806	--	166	--	352	186	4883	6655
Glen Ridge	160	597	--	--	--	98	55	--	910
Irvington	371	685	282	147	128	70	109	--	1792
Livingston	717	2560	--	154	141	480	2400	2509	8961
Maplewood	448	1146	134	26	51	224	531	--	2560
Milburn	787	2828	38	--	269	231	1984	263	6400
Montclair	710	2509	179	--	109	192	224	45	3966
Newark	2003	979	3450	5766	563	1798	896	--	15455
North Caldwell	160	659	--	--	--	428	--	608	1855
Nutley	371	1242	51	218	13	51	230	--	2176
Orange	250	858	58	90	51	52	50	--	1409
Roseland	122	371	--	122	19	13	403	1190	2240
South Orange	326	1178	26	32	--	102	64	--	1728
Verona	243	1088	32	19	33	256	77	45	1793
West Caldwell	288	858	6	64	51	480	704	941	3392
West Orange	685	2630	64	128	58	1273	1082	1831	7751
COUNTY TOTAL	9,842	27,565	4,864	7,502	1,629	7,390	9,803	12,974	81,569

Table IV-11 (Cont'd)

MCD	Streets	Single Family	Multi-Family	Industrial	Commercial	Public	Conservation/ Recreation	Vacant	Total Area
HUDSON COUNTY									
Bayone	391	119	680	801	114	426	179	323	3025
East Newark	10	15	2	26	3	3	--	1	59
Guttenberg	27	47	8	12	9	4	--	--	107
Harrison	93	5	134	681	34	36	50	25	1046
Hoboken	159	15	145	245	75	123	17	28	808
Jersey City	1340	514	1365	3047	628	564	455	1330	9243
Kearny	353	659	131	2564	100	162	1848	837	6654
North Bergen	304	393	447	1067	164	324	208	606	3114
Secaucus	137	295	35	1218	66	128	181	1602	3662
Union City	180	100	247	76	100	81	21	21	793
Weehawken	52	--	136	325	10	9	7	33	580
West New York	122	5	217	154	57	35	17	35	642
COUNTY TOTAL	3,176	2,167	3,312	10,202	1,361	1,701	2,983	4,841	29,743

Table IV-11 (Cont'd)

MCD	Streets	Single Family	Multi-Family	Industrial	Commercial	Public	Conservation/ Recreation	Vacant	Total Area
MORRIS COUNTY									
Boonton Town	168	459	21	85	50	159	258	408	1608
Boonton Twp.	134	942	--	118	2	20	554	4044	5814
Butler	149	480	--	50	28	66	10	530	1313
Chatham Boro.	182	726	77	96	42	75	517	180	1895
Chatham Twp.	179	1177	62	133	43	40	2182	2115	5931
Denville	462	2152	--	210	55	207	827	4337	8250
Dover	241	624	63	141	79	60	42	332	1582
East Hanover	264	1152	20	459	97	311	1122	1713	5138
Florham Park	188	1342	--	262	34	274	1350	1395	4845
Hanover	362	1475	60	816	93	189	1183	2693	6871
Harding	311	1853	--	44	46	46	2843	6988	12131
*Jefferson	399	852	--	50	70	548	4050	15936	21905
Kinnelon	327	2080	--	44	89	45	1433	8489	12507
Lincoln Park	217	893	62	222	25	16	1286	1324	4045
Madison	250	1488	85	44	58	250	57	408	2640
*Mendham Twp.	5	22	--	--	--	--	370	2035	2432
Mine Hill	132	434	--	102	8	15	43	1199	1932
Montville	455	2178	--	272	65	83	1213	7690	11956
Morris Plains	126	583	--	171	19	19	23	748	1689
Morris Twp.	581	2919	80	297	68	340	673	5118	10076
Morristown	158	909	90	74	104	169	152	359	2015
Mountain Lakes	110	620	--	50	16	64	131	850	1841
Par-Troy-Hills	1014	4041	400	257	209	474	3874	5898	16167
Passaic Twp.	276	1555	15	123	42	51	2361	3216	7639
Pequannock	317	1537	32	79	204	104	259	1920	4447
*Randolph	605	2392	82	301	193	126	1481	8771	13951
Riverdale	85	320	22	103	21	16	32	730	1329
Rockaway Boro.	150	448	--	73	60	75	46	490	1342
Rockaway Twp.	575	3163	42	467	58	5240	8477	11396	29318
*Roxbury	18	82	--	980	--	20	680	697	2477
Victory Gardens	25	59	--	--	1	--	--	19	104
Wharton	141	374	8	273	14	13	64	434	1321
Mendham Boro.	126	784	15	8	13	65	26	2773	3816
COUNTY TOTAL	8,732	40,115	1,236	6,404	1,906	9,180	37,619	105,235	210,427

* = Part of MCD within study area

Table IV-11 (Cont'd)

MCD	Streets	Single Family	Multi-Family	Indus-trial	Com-mercial	Public	Conservation/ Recreation	Vacant	Total Area
PASSAIC COUNTY									
Bloomingdale	170	601	32	166	109	775	2022	1946	58
Clifton	787	3277	160	1453	134	442	77	838	71
Haledon	90	307	--	45	115	339	--	275	11
Hawthorne	262	1101	--	282	90	77	179	294	22
Little Falls	179	742	--	192	90	45	70	474	17
North Haledon	147	627	--	83	19	179	45	736	18
Passaic	217	582	243	371	192	51	122	269	20
Paterson	627	1792	595	813	499	218	326	442	53
Pompton Lakes	192	800	19	563	70	109	128	365	22
Prospect Park	26	96	--	77	13	13	--	32	2
Ringwood	266	998	--	96	58	45	5266	10752	174
Totowa	141	410	--	269	179	506	109	883	24
Wanaque	154	582	32	51	96	51	1120	3162	52
Wayne	1099	3803	167	606	851	1395	915	6850	156
West Milford	1009	3521	--	180	315	1030	22441	16666	451
West Paterson	122	525	--	26	122	64	499	563	19
COUNTY TOTALS	5,488	19,764	1,248	5,273	2,952	5,339	33,348	44,547	11,795

Table IV-11 (Cont'd)

MCD	Streets	Single Family	Multi-Family	Indus-trial	Com-mercial	Public	Conservation/ Recreation	Vacant	Total Area
SOMERSET COUNTY									
*Bernards	788	3885	--	413	45	846	1137	6659	13773
*Bernardsville	251	2279	49	115	52	156	441	228	3571
*Far Hills	3	15	--	--	--	--	--	552	570
*Warren	630	1300	--	72	20	68	490	6514	9094
COUNTY TOTAL	1,672	7,479	49	600	117	1,070	2,068	13,953	27,008

* = part of MCD within study area

Table IV-11 (Cont'd)

MCD	Streets	Single Family	Multi-Family	Industrial	Commercial	Public	Conservation/ Recreation	Vacant	Total Area
UNION COUNTY									
*Berkley Heights	162	865	--	63	43	178	--	836	2146
Clark	403	1157	8	209	64	130	558	466	2995
Cranford	448	1576	13	174	61	161	291	412	3136
Elizabeth	1197	986	958	1807	448	780	970	432	7578
*Fanwood	71	344	--	18	19	9	10	33	504
Garwood	79	209	4	72	28	9	21	26	448
Hillside	250	626	80	237	200	54	210	88	1745
Kenilworth	153	322	17	289	42	88	184	190	1285
Linden	780	1279	67	2497	278	268	357	1482	9008
*Mountainside	172	907	--	68	58	58	49	203	1515
New Providence	216	1310	20	150	89	85	102	396	2368
*Plainfield	76	279	--	--	--	26	--	19	400
Rahway	472	1228	26	169	169	101	243	216	2624
Roselle	289	802	51	59	59	77	263	128	1728
Roselle Park	203	520	16	4	46	2	97	3	891
*Scotch Plains	303	2109	7	33	4	202	789	1264	4711
*Springfield	226	1166	33	153	162	97	814	534	3185
*Summit	481	2028	23	103	75	131	114	419	3374
Union	777	2503	87	618	267	306	555	630	5743
Westfield	515	2444		39	110	214	421	348	4081
Winfield	18	68	10	--	2	5	7	--	110
TOTAL	7,291	22,728	1,425	6,762	2,223	2,981	6,055	8,125	57,585

* = Part of MCD within study area

IV.C.2 Protection and Management of Environmentally Sensitive Areas

a. Definition of Environmental Factors Certain lands possess a more direct relationship to or influence on water resources than other lands. Such lands may be important as natural resources or, because of physical and hydrological factors, may have significant development constraints. Generally, unrestricted disturbance of these lands results in intensified water quality problems. The State, through the Water Quality Management Program, has been given responsibility to identify a process to control water pollution resulting from land use. Fundamental to this process is the identification of the natural features that possess a significant relationship to water resources. The WQM Program has identified and defined in the following pages, environmental factors which should receive special consideration, from a local and regional water quality perspective, in any land use decision-making process. The factors are classified according to four categories: surface water, ground water, soils and topography, and vegetation and wildlife. For each factor, a discussion is included of the relevance to water quality and sources of information available.

i. Surface Water

Flood Hazard Areas Flood hazard areas consist of the floodway and any additional portions of the flood plain inundated during flood periods where the flow exceeds the channel capacity. (The floodway consists of the stream channel and those portions of the adjacent flood plain necessary to carry and discharge the flood flow of any natural stream. Development in flood hazard areas leads to increased runoff, reduction of flood storage capacity, increased size and frequency of flooding, stream bank erosion and downstream sedimentation, and water pollution due to litter and debris. The location of waste disposal facilities (e.g. landfills and septic systems) and hazardous material storage facilities in flood hazard areas may result in serious water pollution problems.

Flood hazard areas are delineated by DEP according to a complex engineering method. The resulting water surface profile elevations are superimposed on topographic maps to identify areas of inundation. DEP is presently delineating all flood hazard areas. To date, delineations have been completed for the entire Raritan River Basin. Of 6,500 miles of streams in New Jersey, 618 miles had been delineated as of May 1978, and an additional 216 miles were scheduled for completion by the end of the year.

The Army Corps of Engineers has defined, for certain streams, the water surface profiles which have been developed for both floodway and flood hazard area design floods. However, the delineation of the flood hazard area must be determined on a case by case basis due to lack of accurate elevation maps. A complete list of streams affected by this delineation can be found in the N.J.A.C. 7:13-1.11 et seq.

In areas where the delineation of flood hazard areas using this engineering method is not complete, DEP determines the flood hazard areas on a case by case basis using detailed elevation and stream profile information.

Where data gaps exist, flood hazard areas can be approximated by the use of U.S. Geological Survey Flood Prone Areas maps (scale 1:24,000), supplemented with soil information for the small watersheds in the upland flood plains.

In tidal areas, 100 year tidal elevations have been identified for most municipalities by the U.S. Army Corps of Engineers, and can be readily indicated on USGS topographic maps as flood prone areas (there are no floodways in tidal flooding).

Wetlands Wetlands are found in both tidal and freshwater areas. Tidal wetlands are defined by State law (Wetlands Act of 1970, Chapter 272, N.J.S.A. 13:9A-1 et seq) as those lands which lie below, or seaward of, one foot above local extreme high tide and which are capable of supporting certain plant species ecologically associated with wetlands. Federal regulations promulgated pursuant to Section 404 of the Clean

Water Act (33 CFR 320-329) define wetlands, including inland freshwater wetlands, as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Wetlands are vital natural resources. They provide natural flood control, recharge of aquifers, natural purification of waters, stabilization of stream flow, and habitats for a diversity of terrestrial and aquatic wildlife. Wetlands act as sediment and pollutant traps, and remove nutrients from water under certain conditions.

Tidal wetlands are identified on infra-red stereo based photomaps (scale 1"=200') located at the DEP Division of Marine Services, Bureau of Marine Lands Management. The landward limit of tidal wetlands, as well as plant species, are identified on the maps. A process to identify inland freshwater wetlands is currently being developed by the Division of Water Resources.

<u>Lands Adjacent to the Water Bodies</u> Riparian lands, immediately adjacent to the banks of streams, rivers, and lakes, form corridors along the water bodies and serve as buffers against water pollutants. One of the major water quality impacts resulting from disturbance of these lands is sedimentation from accelerated bank erosion. Riparian vegetation serves as a filter for runoff entering a water body and maintains cooler water temperatures by providing shade. Vegetated buffers along water bodies provide wildlife corridors within which wildlife can travel with relative ease. Buffers along water bodies can increase water-oriented recreational opportunities through easier public access to streams and lakes.

Lands adjacent to water bodies can be identified using aerial photography overlays to U.S. Geological Survey 7.5 Minute Topographic Quadrangles. The width of the buffers depends on local conditions and preferences.

Headwater Areas Headwater areas are land areas which drain into emphemeral and intermittent streams. Ephemeral streams are those which carry water during and immediately after rain. Intermittent streams are defined as streams with a MA7CD10 low flow of less than 0.1 cubic feet per second.

Incompatible development in headwater areas can have significant water quality impacts, both locally and throughout a watershed. At a local scale, development in headwater areas can result in contaminated runoff entering streams which have little or no capacity to assimilate the polluted runoff. The impervious cover associated with development can result in increased runoff and decreased ground water recharge, and thus, a reduction in base flow. A reduction in base flow effectively reduces stream assimilative capacity.

At a watershed scale, downstream reaches can be significantly degraded by the cumulative contribution of contaminated headwater streams. Good water quality downstream is highly dependent on headwater areas supplying adequate amounts of unpolluted water. Headwater areas can be identified using U.S.G.S. 7.5' topographic maps and stream flow data.

ii. Ground Water

Prime Aquifer Recharge Zones Aquifers are water-bearing geological formations. Aquifers that constitute the principal or sole source of potable water supply for an area are referred to as prime aquifers. Aquifers are replenished through recharge zones, or areas that allow rainfall and runoff to permeate through the ground into the aquifer. It is through such recharge zones that aquifers are most susceptible to contamination. The contamination of a prime aquifer will, at best, result in higher water treatment costs and, at worst, result in an irretrieveable loss of a water supply. Thus, the potential for contamination of a prime aquifer poses a significant threat to the public health, safety, and welfare.

Recharge areas of prime aquifers may be identified using detailed hydrologic, geohydraulic, climatological, geological, and soils information. The Division of Water Resources has staff geologists who can assist in the identification of aquifer recharge areas.

iii. Soils and Topography

Seasonal High Water Table Areas of seasonal high water table are those in which the water table is at 0 to 4 feet from the surface during a period of at least four weeks. Areas with high water table conditions are highly susceptible to ground water pollution because of the greatly reduced filtration capability of saturated soils. Seasonal high water table is a prime consideration in the location of septic systems and other land application waste disposal systems. Soils which reflect conditions of seasonal high water table are rated as having severe constraints for on-site waste disposal systems.

Areas with a seasonal high water table are identified in soil surveys prepared by the U.S. Department of Agriculture, Soil Conservation Service.

Highly Erodible Soils Erosion is a natural process of detachment and movement of soil particles from the land surface caused by wind or precipitation. Erosion cannot be completely prevented. However, certain lands, because of the physical properties of the soil, the slope of the land, and the nature of vegetative cover, are more susceptible to erosion than other lands. Disturbance of areas with highly erodible soils may accelerate erosion to undersirable levels.

Soil erosion can have a significant effect on stream systems. Suspended sediments in water bodies increase turbidity which, in turn, increases water temperature, inhibits aquatic plant photosythesis, and ultimately reduces dissolved oxygen levels. Eroded soil particules are often the vehicle for the transport of other pollutants such as pesticides and fertilizers, which become attached to the sediments. Sediments affect stream biota interfering with feeding mechanisms and by burying habitats. The potential for flooding is increased by stream channels filling in with sediments.

Highly erodible soils are identified and mapped in soils surveys prepared by the U.S. Department of Agriculture, Soil Conservation Service.

Steep Slopes Slope refers to the vertical change in elevation per horizontal distance, usually expressed in per cent. Slopes of 12% or greater, when considered in association with soil properties and vegetative cover material, are potentially unstable. Disturbance of such slopes can cause accelerated erosion and sedimentation, increased runoff, and flooding.

Slope maps have been produced by the U.S. Geological Survey under contract with the DEP and are available for inspection at the DEP Office of Coastal Zone Management. Slope information is also incorporated in the soil survey maps prepared by the U.S. Department of Agriculture, Soil Conservation Service.

iv. Vegetation and Wildlife

Trout Waters Trout Waters are those streams or lakes in which both the habitat and water quality are conducive to the maintenance and/or propagation of trout, and in which trout populations actually exist. Water quality standards for trout waters are contained in the New Jersey Surface Water Quality Standards, N.J.A.C. 7:9-4 *et seq*. In order to maintain a viable population, trout require high quality water, with average dissolved oxygen levels of at least 6.0 mg/l and generally cool temperatures. More than many other types of aquatic fauna, they are extremely sensitive to variations in water quality. Consequently, the watersheds which sustain trout populations require careful management.

A list of trout production and trout maintenance waters has been prepared by the DEP Division of Fish, Game, and Shellfisheries and is included in Chapter III of this report.

Woodlands Woodlands are defined as forested areas generally larger than 20 contiguous acres. Woodlands retard runoff, minimize erosion, and filter out pollutants before they reach ground or surface waters. Woodlands have a moderating effect on weather and local climate by reducing local temperature, retaining moisture, and minimizing the effects of wind and storms (thus reducing erosion). Woodlands are often associated with other natural features such as steep slopes, lake shores, stream banks, and wetlands. Woodlands, especially those associated with other sensitive natural features, must receive careful management in order to maintain high quality waters.

Information concerning woodlands may be obtained from the NJDEP Division of Parks and Forestry, the U.S. Department of Agriculture, and from aerial photograph overlays to the U.S. Geological Survey 7.5 Minute Topographic Quandrangles.

Wildlife Habitats Wildlife habitats are defined as areas that maintain viable and diverse communities of wildlife species through the provision of adequate food, cover, and space. Areas containing a diversity of wildlife indicate the presence of environmental conditions conducive to the maintenance of high water quality. Wildlife habitats are usually associated with other sensitive natural features such as woodlands, wetlands, floodplains, lands adjacent to water bodies, and steep slopes.

The DEP Division of Fish, Game, and Shellfisheries has locally based staff biologists who can assist in the identification of wildlife habitats. The Division's endangered and non-game species project locates and, in some areas, maps the occurrence of such species.

b. Strategy for Management - The strategy for management of environmentally sensitive areas calls for both State and local involvement. Local involvement is considered essential to effective management since the authority to regulate land use rests primarily with the municipalities. The State, with the resources to conduct much of the necessary planning for these areas, is responsible for developing the programs through which sensitive areas may be managed, and providing the technical guidance to municipalities desiring to manage sensitive areas in their own juridictions.

i. Local Strategy - Local land use decision-making, in order to achieve water quality objectives, should be predicated on local and regional environmental conditions. Municipalities have the opportunity and responsibility to plan for the management of environmentally sensitive areas in their juridictions. The Municipal Land Use Law (Chapter 291, Laws of New Jersey, 1975) requires municipalities to take environmental features into account in the preparation of master plans. To accomplish this, municipalities must compile environmental information and synthesize that information into a meaningful interpretation of environmental conditions. Information on environmental conditions provides a basis, along with information on social and economic conditions, upon which master planning can proceed. Environmentally-based master planning is valuable in identifying areas where development could cause significant water quality problems and, conversely, in identifying areas where development should be directed because of favorable environmental conditions which would tend to minimize water quality problems.

The Northeast PAC has devised a method for environmental inventory and analysis which may be of value to municipalities in the planning and decision-making processes. The method, described in Chapter II, Section D, is an example which serves to demonstrate what can be done by a municipality to identify sensitive areas and areas favorable for development. The PAC example is but one of several inventory and analysis techniques which can be used by a municipality. Since they vary in complexity and utility, a municipality should exercise care in selecting the technique which best suits its purposes and its available resources.

The results of environmentally-based master planning can be integrated into the decision-making process by adopting ordinances. Traditional tools such as zoning, subdivision, and site plan review can be used innovatively to protect water quality when ordinances providing for such reflect the analysis and synthesis of environmental factors. For example, two types of zoning can be used innovatively to manage sensitive areas; natural resource zoning and development zoning.

In natural resource zoning, a municipality can adopt ordinances regulating development on particular environmental features such as those identified in the previous section. An environmental inventory and analysis is required to accomplish this. In development zoning, environmental standards are applied to achieve water quality objectives, leaving flexibility as to the design of development as long as standards are met. This approach is more complicated and requires a more detailed analysis and synthesis of environmental data. Both techniques can be used together so as to be complementary. For example, in an area zoned as a steep slope district, certain land uses might be prohibited while for the remaining land uses, runoff standards and vegetation removal standards might be applied.

Undoubtedly, many municipalities will require technical guidance in such an endeavor. The following section describes the role of DEP in the management of environmentally sensitive areas.

ii. <u>DEP Strategy</u> - The thrust of the DEP strategy for management of environmentally sensitive areas is twofold- to direct existing DEP programs toward prevention of water quality degradation due to development of the environmental features defined above, and to develop model programs for management of environmental features by local government.

The first step for both aspects of the strategy is to prepare a rationale which substantiates the relationship between each environmental feature and water quality. Existing literature such as the reports listed in the reference section of this chapter will be relied upon as much as possible to provide the necessary information. The next step is the identification of the specific levels of control to be placed upon the features and development occurring on the features in order to meet water quality objectives. This involves analysis of the environmental feature/water quality relationships in order to determine whether non-structural or structural controls, or a combination of these controls, would be most effective in producing the desired result.

The implementation approach, the next step in the DEP strategy, depends, in part, upon the relationship the feature has to water quality and the level of control necessary to manage the problem effectively. Possible implementation methods include voluntary programs, model ordinances to be used by municipalities, the conditioning or denial of State permits and grants, pricing policies, legislation, and acquisition.

DEP is authorized under several laws to manage specific environmental features. In particular, the following laws give DEP specific land use management authority:

Flood Hazard Area Control Act	NJSA 58:16A-50 et. seq.
Stream Encroachment Act	NJSA 58:1-26 et. seq.
Riparian Lands Act	NJSA 12:3-1 et. seq.
Coastal Wetlands Act	NJSA 13:9A-1 et. seq.
Waterfront and Harbor Facilities Act	NJSA 12:5-3 et. seq.
Pinelands Environmental Council Act	NJSA 13:18-1 et. seq.
Delaware and Raritan Canal State Park Law	NJSA 13:13A
Coastal Areas Facility Review Act	NJSA 13:19-1 et. seq.
Wild and Scenic River Act	NJSA 13:8-45 et. seq.
Natural Areas System Act	NJSA 13:1B-15.12a et. seq.

Upon completion of the analysis of controls needed to protect water quality, DEP will examine its existing programs to see how they should be more specifically directed toward water quality management objectives.

The DEP recognizes its responsibility to the other levels of government in the State in providing leadership, guidance, and technical assistance so that they may plan for and manage environmentally sensitive areas in their jurisdictions. The DEP will continue to fulfill that responsibility in the continuing planning process.

Planning will occur on a priority basis. Each step in the DEP strategy will be completed for each individual environmental feature according to priority. The WQM Program has prepared a chart (Figure IV-4) which identifies preliminary priorities among the environmental features identified above in conjunction with broad land use categories. The chart is based upon a literature review and known conditions within the State. The priorities on the chart may be refined as information becomes available. The numbers on the chart indicate:

"1" High Environmental Priority
"2" Moderate Environmental Priority
"3" Low Environmental Priority

A detailed discussion of the procedure for assigning priorities for continuing planning is contained in Chapter VIII.

Figure IV-4

PRIORITIES FOR ENVIRONMENTAL FEATURES

PRIORITIES FOR ENVIRONMENTAL FEATURES / LAND USES	ENVIRONMENTAL FACTORS	i. SURFACE WATER	-Flood Hazard Areas	-Wetlands	-Land Adjacent to Water Bodies	-Headwater Areas	ii. GROUND WATER	-Prime Aquifer Recharge Zones	iii. SOILS AND TOPOGRAPHY	-Seasonal High Water Table	-Highly Erodible Soils	-Steep Slopes	iv. VEGETATION AND WILDLIFE	-Trout Waters	-Woodlands	-Wildlife Habitats
i. RESIDENTIAL																
-Rural			1	1	2	2		1		2	2	2		2	3	2
-Suburban			1	1	1	1		2		2	2	2		2	2	2
-Cluster			1	1	2	1		2		2	2	2		2	2	1
-Mixed Use (P.U.D.)			1	1	1	1		2		2	2	2		2	2	1
ii. RECREATION																
-Land Oriented			2	2	3	2		3		3	2	2		2	2	2
-Water Oriented			3	2	2	2		3		3	3	3		2	2	2
iii. PRODUCTION																
-Agriculture			2	2	1	2		2		2	2	2		2	2	2
-Forestry			2	2	1	2		2		2	2	2		1	2	2
-Mining			1	1	1	2		2		2	2	2		1	2	2
iv. INDUSTRY																
-Light Industry			1	1	2	1		2		2	2	2		1	2	2
-Heavy Industry			1	1	1	1		1		2	2	1		1	2	1
-Commercial			1	1	1	1		2		2	2	1		1	2	1
v. ENERGY																
-Nuclear			2	1	1	1		1		2	2	1		1	2	1
-Hydroelectric			2	1	1	1		2		2	2	2		1	2	2
-Fossil Fuel			2	1	1	1		2		2	2	2		1	2	1

c. Guidelines for the Evaluation of Environmentally Sensitive Areas in 201 Facilities Planning Areas

The preceeding section discussed the strategies that will be utilized to identify controls that may be needed for environmentally sensitive areas. One of those strategies will be the development of guidelines for the evaluation of environmentally sensitive areas in 201 facilities planning areas. These guidelines will be developed by DEP during the continuing planning process. The purpose of the guidelines will be to specify DEP policy and to clarify EPA policy and procedures concerning the use of federal and state funds for the construction of sewage collection and treatment facilities.

The facilities planning area population projects developed in this chapter have not considered the possibility that the projection may not be appropriate for the area, due to large areas of environmentally sensitive lands in a facilities planning area or other environmental constraints (i.e. air pollution, water supply etc.). It will be the responsibility of the 201 agencies to determine the extent of sensitive lands in their planning areas and whether the WQM Program's projection is appropriate given the amount of resources for development after environmentally sensitive areas have been identified. The environmentally sensitive areas that should be considered, and limits that will be placed on funding sewage facilities for development in the sensitive areas, will be specified in the guidelines.

EPA has developed policy for the funding of sewage collection systems (PRM 78-9) which states "The collection system shall not afford capacity for new habitation or other establishments to be located on environmentally sensitive lands such as wetlands, floodplains or prime agricultural lands." The EPA Construction Grants Program for Municipal Wastewater Treatment Works, Handbook of Procedures, further states that "undevelopable lands, such as steep slopes, highway rights-of-way, power line easements, water bodies, environmentally sensitive areas, parks, etc., are not to be included when estimating future flows based upon the land uses." The EPA policies, along with State policies on the development of wetlands and flood plains, will be applied to ongoing facilities planning until the guidelines are developed. Environmentally sensitive areas discussed in EPA policy and procedures will be specifically defined in the guidelines. Until then, environmentally sensitive areas will continue to be dealt with on a case by case basis. These sensitive areas will not be included in the developable portion of the facilities planning area, with regards to determining the size and location of sewage facilities, unless the planning area has adequate control measures to insure that the development of the sensitive areas will not result in environmental degradation.

IV.C.3 Summary of Future Land Use Patterns

A forecast of the land uses expected to be encountered in the planning area by the year 2000 is a useful component of the water quality management planning process. Although it is impossible to forecast changes in land use for specific parcels of land over several decades, a summary of future land use patterns that are most likely to occur given the historical and contemporary trends provides a rational basis to forecast the distribution of potential water quality problems on a watershed basis in the future. By anticipating these problems through such a forecast, the Water Quality Management Program will have the opportunity to concentrate its future efforts upon acting to prevent the area's water resources from being seriously damaged, rather than on attempting to restore these resources which, by that time, may have been irretrievably destroyed.

a. Forecast of General Land Use Patterns Based on a continuation of historical and contemporary trends, it is likely that those areas containing relatively large tracts of vacant land will continue to be subjected to the pressures of suburbanization. This pressure is expected to be greatest in those Bergen, Morris, Somerset, and Passaic County areas of high accessibility, particularly along Route 10, 15, 17, 23, 46, 202 and 208, in the vicinity of interchanges along Interstate Routes 287, 280, and 80, and along rail lines. The overall character of the suburban development is expected to be predominantly single family residential interspersed with pockets of garden apartments and economic activity with somewhat higher densities near highway interchanges and rail lines. Low density development is expected to occur in northern Passaic County where rugged topography imposes restrictions on construction.

In-fill, at relatively higher densities, of the remaining vacant land in almost completely developed Union County, the built-up areas of Essex, Bergen, and Passaic Counties, and the rural centers of the study area appears likely since these areas generally contain the necessary infrastructure and services to sustain such development. Redevelopment of older urban and rural centers is expected to occur primarily through rehabilitation of existing structures rather than mass urban renewal, except in Hudson County where new high-rise development may become prevalent.

Generally, the urban areas are expected to experience growth in the service industry while the suburban portions of the study area, with favorable access, large amounts of vacant land, and active industrial park developments, will most likely attract office and research, distribution, and light manufacturing facilities. Manufacturing, though not expected to decline in numbers, may experience a relative decline in importance in the urban areas.

b. Reversing the Trends: Land Use Objectives From a water quality perspective, the continuation of unlimited suburban sprawl may no longer be desirable. Sprawl-type development has already encroached upon areas serving as sources of potable water supply and on sensitive environmental features. Unfortunately, the effects this development may have on water quality, quantity, and the costs of potable water treatment are not fully understood and are deserving of future study. Suburban sprawl has in certain instances, led to the over extension of sewers at a great expense. While the sewers may have been necessary to eliminate a water pollution problem, the additional development induced by the sewers may have created new problems for which there may be no simple solutions.

If the undesirable effects of the trends are to be eliminated, it is necessary to alter the forces which act to form the trends. For example, the increasing cost of energy is expected to exert a great influence over land use patterns by encouraging energy-efficient settlements capable of sustaining viable mass transit systems and optimizing operational efficiencies. The price of a newly-constructed home, as another example, may already be beyond the economic reach of the average New Jerseyan due to increasing land and construction costs thus encouraging development at higher densities and rehabilitation of existing housing. Factors such as these, however, may not, in themselves, be sufficient to modify the trends.

Policies, controls and incentives are needed which will work in a conserted, mutally reinforcing manner in order to alter the trends and eliminate any future undesirable effects on water quality. In order to achieve this, the investment, regulatory, and legislative authority of the Department should be effectively used to attain the following objectives:

- conserve sensitive environmental features
- concentrate development
- guide development to and redevelopment of areas with existing infrastructure and support services
- revitalize cities, urban areas, and rural centers
- encourage land use development standards which mandate specific site improvements for water quality management in order to ameliorate the need for publicly-financed structural solutions.

Currently, most Department policies and programs are being reevaluated with regard to achieving these objectives. The Department recognizes that policies which promote unlimited suburban growth are no longer viable if environmental and economic objectives are to be met and that a conscious effort to improve urban conditions is an important factor in attaining the objectives.

Attainment of the objectives is expected to effectively stabilize the magnitude of non-point sources of pollution by containing the non-point source problems to those areas currently experiencing such problems. Future management efforts can then be directed toward developing solutions to non-point problems in those areas. Operational efficiencies are expected to be realized through the maximized use of existing infrastructure and services thus facilitating an optimum return on public capital investments. Numerous other environmental, social, and economic benefits may also be eventually realized. However, a reversal of the trends is not expected to occur overnight. Many issues concerning the future of the Northeast region and the State still remain to be resolved.

To facilitate dicussion concerning the future development of the State, the Department of Community Affairs has prepared a State Development Guide Plan. The plan suggests a configuration of growth and conservation throughout the State and is intended to provide a framework for decisions on public and private investment. As such, the Plan may be considered a step toward a unified State development policy. Unfortunately, the Guide Plan was prepared without the benefit of the results of various ongoing functional planning programs and consequently lacks the specificity that such planning programs will eventually provide. In recognition of this, the Northeast Policy Advisory Committee was asked to comment on the Guide Plan and identify any modifications to the Plan necessary to meet water quality objectives. The PAC's statement on the Guide Plan is contained in Chapter II.

c. <u>Recommendations for Implementation of Land Use Objectives</u>
The following recommendations represent the results of a first attempt by the Water Quality Management Planning Program to deal with the issue of land use as it impacts water quality. Many of the recommendations have been prepared in collaboration with the Northeast public and have been endorsed by the Northeast Policy Advisory Committee (see Chapter II).

As a starting point in meeting the land use objectives, the Water Quality Management Program recommends:

- Priority be given to cities, urban areas, and rural nodes of development with a need for new, upgraded or expanded wastewater facilities;

- Wastewater facilities projects which open for development large amounts of vacant land be discouraged;

- Establishment of a program to control changes in land use in areas serving as sources of potable water supply;

- Green Acres funds be directed toward the fee simple acquisition or purchase of development rights of sensitive environmental features whenever possible;

- Expansion of authority of the DEP stream encroachment permitting program to include analysis and impact of a project on water quality and measures to mitigate the impact;

- Expansion of the DEP water quality certification procedure to include projects involving the dredging and/or deposition of fill;

- Public investment be provided at maintenance levels in areas serving as sources of potable water supply and in specially-valued areas;

- In areas with existing infrastructure and support services, public investment be provided at levels which promote economic expansion and attain operational efficiencies.

- The State assume an affirmative role with regard to natural resource management in the administration of its permitting programs;

- The State adopt a development policy to guide decisions concerning public and private investment, provide a rational basis for coordinated growth, and facilitate coordination of planning and program activities among governmental agencies;

- A mechanism be established which facilitates the incorporation of the results of functional planning into a comprehensive Statewide plan.

d. Recommendations for Future Planning Concerning Land Use

Future planning efforts concerning land use/water quality relationships should concentrate principally on the protection of sources of potable water supply and concomitantly, the protection and management of environmentally sensitive areas. To this end, the Water Quality Management Planning Program recommends:

- Analysis be undertaken to identify the relationship between land use control and the efficacy of economically feasible potable water treatment;

- Inventory of measures to protect sources of potable water supply and analysis of the effectiveness of such measures;

- Formulation of special development and performance standards for watersheds serving as sources of potable water supply;

- Development of a comprehensive State policy on protection of water supply watersheds which recognizes the limits of cost-effective water treatment and the need for land management;

- Development of model programs for the protection and management of environmentally sensitive areas with priority given to inland wetlands, headwater areas, lands adjacent to water bodies, and prime aquifer recharge zones;

- Formulation of guidelines for the standardized preparation of environmental resource inventories and a description of various environmental analysis techniques which emphasize water quality management.

Chapter IV

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V POINT SOURCE CONTROL

V. POINT SOURCE CONTROL

Introduction

To attain the water quality goals of the Northeast Study Area, the problems indicated in the Water Quality Analysis (Chapter III) must be solved through controls on pollution from point and nonpoint sources. The control measures needed are identified in Chapters V (Point Source Control) and VI (Non-Point Source Control), which utilize the projections and socio-economic background information in Chapter IV.

The purpose of this chapter is to determine control measures for point source dischargers in the area needed to ensure clean water. Before determining actual control measures, it is necessary to obtain a complete view of the point sources of the area and the substances they discharge. Thus, the first portion of this chapter is an inventory of the existing dischargers. Only the major dischargers are included in the chapter; a complete inventory of all dischargers is contained in Working Paper 4.1. This initial section, along with the Working Paper, presents background information on the dischargers which was utilized in developing both the point and nonpoint source control plans.

The remainder of the chapter describes the treatment measures which will be needed to control the dischargers of the area. It begins by describing the status of 201 sewerage facilities plans in the area. The status of the plans range from instances where all planning and construction has been completed to areas where construction is scheduled to begin, to areas where planning has not even been initiated. For areas where 201 planning has been completed, the results have been incorporated into this WQM Plan, whereas in areas where 201 planning is still in progress or scheduled to begin, the recommendations of the WQM Plan must be incorporated in the 201 plans.

The section (V.B.1) on facilities plans describes the present flows to the sewage treatment plants, as well as their design capacities, in million gallons per day (MGD) of "dry weather flow." In discussing sewage treatment systems, it is important to distinguish between flows of wastewater during dry and wet weather, since during and after rainfall the flows of many systems increase. The increase in wastewater during wet weather is due to leakage into the sewer system (termed infiltration and inflow, or I/I), or due to the use of combined storm and sanitary sewers. (Unless otherwise noted, sewerage systems described in the section are separate, rather than combined). High wet weather flows can cause serious water quality problems, because if sewage treatment plants exceed their design capacities it is possible that wastewater may not be receiving effective treatment before being discharged.

To ensure the best use of Federal and State sewerage investment funds, the next section (V.B.2) utilizes the population projections developed for this plan to establish wastewater flow projections for the municipal treatment systems of the study area. The projections are made in terms of capacities for which the systems should be designed to handle wastewater flows in the year 2000. The utilization of alternatives to regional facilities for wastewater treatment is sometimes the most cost-effective use of sewerage funds. Section V.B.3 discusses alternatives, such as septic systems, which may prove viable in some areas if properly managed. New DEP guidelines developed by the WQM program are presented, which will require facilities plans done in the future to analyze these alternatives. An initial analysis of legal and institutional aspects required of an on-site system management program is also presented.

The key to actual improvement of water quality is in setting limitations on the amount of pollution that will be discharged, and in implementing the controls necessary to decrease pollutant loads. Section V.B.4 presents a new procedure for determining quantities of pollution discharge to be permitted, and Section V.B.5 lists the actual quantities to be permitted for the dischargers of the Northeast area. These allocations and recommendations will be incorporated into the discharge permits (NPDES) required for all point source dischargers, and into the 201 facilities plans.

Most of the industries in the Northeast do not discharge effluent directly to waterways. Instead, the majority of the industrial wastewater producers discharge their effluents to municipal or regional facilities. To avoid failures or complications at the regional facilities, pretreatment by the industrial contributors is usually required. Section V.B.6 discusses these requirements. A continuing dilemma in our efforts to clean up the waterways is that solids removed from wastewater still present a difficult disposal problem. Since ocean dumping of sludge is being phased out, new plans for sludge disposal are being developed as discussed in section V.B.7.

This chapter recommends numerous improvements for sewage treatment facilities. The last major step toward attainment of clean water goals will be to carry out those improvements through planning and construction of adequate treatment systems. Section V.B.8 presents priority ranks, funding, and time tables for the sewerage facilities and facilities planning projects needed to implement this plan.

V.A. Inventory of Existing Dischargers

This section consists of an inventory of the major dischargers within the Northeast Study Area. The inventory divides the dischargers into municipal-institutional and industrial categories. Table V-1 gives a summary of the number of dischargers in each category by river segment. Of the 530 dischargers in the study area 145 are municipal-institutional and 385 are industrial. The complete inventory of all the dischargers in the study area along with information on their effluent quality and effluent limitations is contained in Working Paper Task 4.1. (Inventory of Existing Discharges, Northeast 208 Study Area, October 1978. Copies available upon request from Water Quality Management Program).

V.A.1. Municipal and Institutional Discharge Inventory

The municipal and institutional inventory is presented in Table V-2. The dischargers included in the municipal and institutional inventory are those that have been classified as major dischargers by the Environmental Protection Agency (EPA) and whose discharge is domestic in nature. This includes municipal facilities, institutions, such as hospitals and schools and industrial office buildings, where the discharge contains only treated sanitary wastes.

Information contained in Table V-2 includes the National Permit Discharge Elimination System (NPDES) number, the municipality, receiving stream and the stream's classification and the discharge location for each discharger. The table also includes the design capacity and 1976 average flow for the facilities. The map number in the table corresponds to Figure V-1, which shows the location of the municipal-institutional dischargers.

V.A.2. Industrial Discharge Inventory

The industrial inventory is presented in Table V-3. The dischargers included in the industrial inventory are those that have been classified as major dischargers by EPA and whose discharge contains process water, cooling water or a combination of the above with sanitary wastes.

As with the municipal-institutional table the industrial discharge table (Table V-3) contains the NPDES number, the municipality, receiving stream and the stream's classification and the discharge location for each discharger. The table also contains the 1976 average flow discharged by the industries. The map number in Table V-3 corresponds to Figure V-2, which shows the location of the industrial dischargers.

Table V-1

SUMMARY OF DISCHARGERS BY SEGMENT

Segment	Major Industrial	Minor Industrial	Major Municipal-Institutional	Minor Municipal-Institutional
Arthur Kill	7	8	3	1
Elizabeth R.	4	3	1	0
Hackensack R.	21	55	7	6
Hudson R.	2	8	5	3
Kill Van Kull	5	7	1	1
Lower Passaic R.	12	81	8	8
Newark Bay	6	12	2	0
Pequannock R.	1	7	1	7
Pompton R.	0	3	3	5
Rahway R.	2	22	0	1
Ramapo R.	2	5	0	20
Rockaway R.	0	14	3	5
Saddle R.	0	12	3	3
Upper New York Bay	1	5	1	1
Upper Passaic R.	8	38	9	17
Wanaque R.	1	5	1	9
Whippany R.	6	22	5	5
Total	78	307	53	92

TABLE V-2

MUNICIPAL-INSTITUTIONAL DISCHARGES

Map No.	NPDES Permit Number	Discharger	Municipality	Receiving Stream & Classification	Discharge Location Lat/Long.	Flow (mgd) Des. Cap.	Avg.
1	0020648	Elizabeth	Elizabeth	Elizabeth R. TW3			
2	0024741	Jt. Mtg. of Essex and Union Counties	Elizabeth	Arthur Kill TW3	40°38'17"/74°11'51"	50	69
3	0024953	Linden Roselle SA	Linden	Arthur Kill TW3	40°36'25"/74°12'23"	17	11.2
4	0024643	Rahway Valley SA	Woodbridge	Arthur Kill TW3	40°35'13"/74°12'35"	35	29
5	0020028	Bergen Cty S.A.	Little Ferry	Hackensack R TW2	40°49'54"/74°01"57"	50	63
6	0025291	N.Arlinton-Lyndhurst Jt. Mtg.	No. Arlington	Kingsland Crk. TW2	40°47'37"/74°06'57"	1.73	1.73
7	0029076	No. BergenCentral	North Bergen	Cromakill Crk. TW2	40°47'05"/74°01'15"	2.0	
8	0029092	No. Bergen-Northern	North Bergen	Bellmans Crk. TW2	40°48'51"/74°01'44"	1.0	
9	0025038	Secaucus STP	Secaucus	Mill Creek TW2	40°47'55"/74°02'54"	2.25	1.05
10	0022756	Tri Boro Jt. Mtg.	Rutherford	Berry's Creek TW2	40°48'37"/74°05'36"	4	2.3
11	0025186	Wood-Ridge	Wood-Ridge	Berry's Creek TW2	40°48'37"/74°05'36"	.89	
12	0020591	Edgewater	Edgewater	Hudson River TW2	40°48'56"/73°59'03"	3.0	2.2
13	0026085	Hoboken	Hoboken	Hudson River TW2	40°45'13"/74°00'58"	20.8	14.5
14	0027014	Jersey City East	Jersey City	Hudson River TW2	40°42'04"/74°02'47"	46.6	36.7
15	0029084	No.Bergen-Woodcliff	North Bergen	Hudson River TW2	40°47'28"/73°59'59"	3.34	
16	0025321	West New York	West New York	Hudson River TW2	40°47'16"/74°00'03"	10	8.7
17	0025836	Bayonne STP	Bayonne	Kill Van Kill TW3	40°38'57"/74°06'55"	21	12
18	0027022	Jersey City West	Jersey City	Newark Bay TW3	40°43'00"/74°06'18"	36	21.6
19	0022161	Kearny STP	Kearny	Newark Bay TW3	40°43'00"/74°06'50"	3.03	
20	0021016	Passaic Valley SC	Newark	Upper New York Bay TW2	40°42'45"/74°03'42"	225	258
21	0025330	Cedar Grove STP	Cedar Grove	Peckman River FW3	40°52'00"/74°13'30"	1.5	1.7
22	0021687	Essex Cty Hosp.	Cedar Grove	Peckman River FW3	40°50'53"/74°14'03"	1.5	.5
23	0024732	Little Falls STP	Little Falls	Peckman River FW3	40°53'10"/74°13'10"	.86	1.4
24	0024724	Newark Dept. of Public Works	Newark	Passaic River TW3			
25	0025925	Orange Dept of Public Works	Orange	Wigwam Brook FW3			
26	0022071	Riverview STP	Totowa	Passaic River FW3	40°53'35"/74°13'12"	1.0	1.3
27	0024490	Verona STP	Verona	Peckman River FW3	40°50'38"/74°14'06"	4.1	2.3

TABLE V-2 (Continued)

MUNICIPAL-INSTITUTIONAL DISCHARGES

Map No.	NPDES Permit Number	Discharger	Municipality	Receiving Stream & Classification	Discharge Location Lat/Long.	Flow (mgd) Des. Cap.	Avg.
28	0022098	West Paterson STP	West Paterson	Passaic River FW3	40°53'38"/74°12'08"	0.8	2.3
29	0022039	Butler-Bloomingdale	Bloomingdale	Pequannock R. FW2	41°00'08"/74°19'05"	1.4	2.25
30	0029386	Pequannock, Lincoln Park, Fairfield SA	Lincoln Park	Pompton River FW2	40°54'12"/74°16'17"		
31	0023698	Pompton Lakes MUA	Pompton Lakes	Pompton River FW2	40°58'55"/74°16'55"	1.2	.71
32	0026841	Sheffield Hills STP	Wayne	Pompton River FW2			1.3
33	0026867	High Ridge S.Co.	Jefferson	Mitts Pond FW2		.125	.07
34	0002500	Picatinny Arsenal	Rockaway-Dover	Green Pond Brk FW2	40°56'02"/74°34'22"		
					Discharge #1	.39	.21
					#2	.5	.01
					#4		.01
					#9		2.88
35	0022349	Rockaway Valley Regional SA	Parsippany	Rockaway R. FW2	40°53'50"/74°23'30"	9.0	6.6
36	0023671	Fair Lawn STP	Fair Lawn	Saddle River FW3	40°56'58"/74°06'04"	3.3	2.3
37	0024813	Northwest Bergen County SA	Waldwick	HoHoKus Brk. FW2	41°00'23"/74°07'12"	8.5	4.2
38	0024791	Ridgewood STP	Glen Rock	HoHoKus Brk. FW2	40°57'38"/74°06'24"	5.0	3.5
39	0027961	Berkley Hgts. STP	Berkley Heights	Slough Brk. FW2	40°41'23"/74°25'31"	1.5	1.38
40	0022845	Bernards SA	Bernards	Dead River FW2	40°38'27"/74°50'40"	1.2	.87
41	0020427	Caldwell Boro	West Caldwell	Passaic River FW2	40°50'40"/74°19'37"	4.5	3.8
42	0025518	Florham Pk. SA	Florham Park	Passaic River FW2	40°44'58"/74°22'10"	1.0	.68
43	0024511	Livingston Twp	Livingston	Passaic River FW2	40°45'50'/74°20'33"	3.0	2.88
44	0024937	Madison-Chatham Jt. Mtg.	Chatham	Passaic River FW2	40°44'54"/74°22'05"	4.0	3.0
45	0024929	Morris Woodland	Morris	Loantaka Brk FW2	40°47'27"/74°27'45"	2.0	1.2
46	0028002	Mountain View	Wayne	Singac Brook FW2	40°54'30"/74°15'00"	4.0	
47	0021636	New Providence STP	New Providence	Passaic River FW2	40°42'50"/74°24'15"	2.8	1.6
48	0021741	Wanaque MUA	Wanaque	Raccoon Crk. FW2		.3	.25

TABLE V-2 (continued)

MUNICIPAL-INSTITUTIONAL DISCHARGES

Map No.	NPDES Permit Number	Discharger	Municipality	Receiving Stream & Classification	Discharge Location Lat/Long.	Flow (mgd) Des. Cap.	Flow (mgd) Avg.
49	0024911	Butterworth STP	Morris	Whippany River FW2		2.0	1.5
50	0026689	Greystone Hosp.	Parsippany	Jaqui Pond FW2		1.4	.32
51	0024902	Hanover SA	Hanover	Whippany River FW2	40°49'14"/74°22'58"	3.0	1.8
52	0025496	Morristown STP	Hanover	Whippany River FW2	40°48'31"/74°27'21"	1.5	2.0
53	0024970	Parsippany Troy Hills STP	Parsippany	Whippany River FW2	40°50'47"/74°20'40"	16	5.5

Fig. V–1 MUNICIPAL AND INSTITUTIONAL DISCHARGES

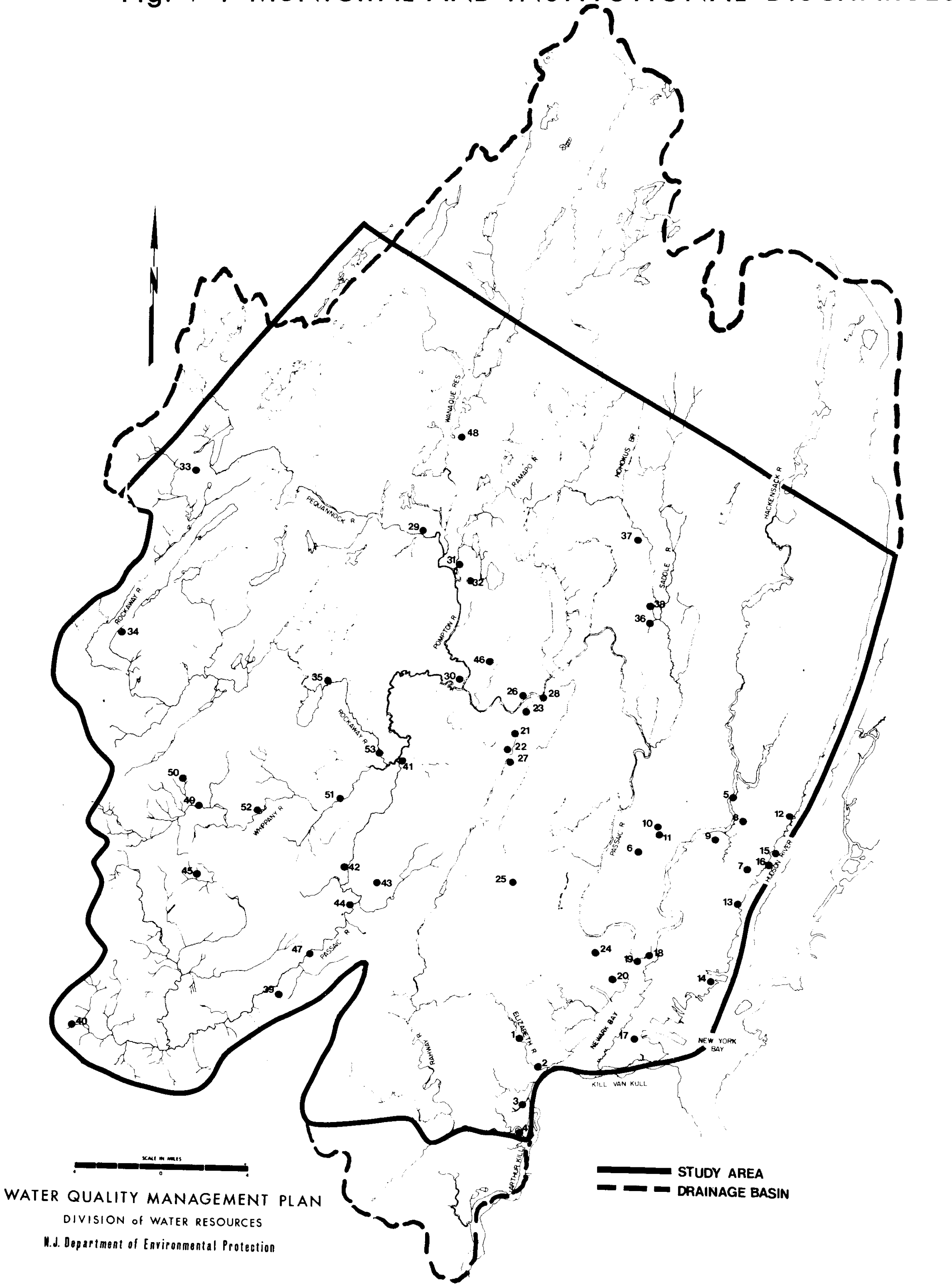


TABLE V-3

INDUSTRIAL DISCHARGES

Map No.	NPDES Permit Number	Discharger	Municipality	Receiving Stream & Classification	Discharge Location Lat/Long.	Flow (mgd) Avg.
1	0000264	Chevron Oil Co.	Elizabeth	Arthur Kill TW3	40 38'22"/74 11'46"	
2	0002640	EI Dupont DeNemour	Linden	Arthur Kill TW3	40 37'00"/74 12'20"	
3	0001511	Exxon Co. USA	Linden	Morses Creek TW3	40 38'00"/74 12'10"	
4	0000019	GAF Corp.	Linden	Arthur Kill TW3	40 36'31"/74 12'15"	5.0
5	0003778	Linden Chlorine Products Inc.	Linden	Arthur Kill TW3	40 36'31"/74 12'15"	.15
6	0000663	PSE&G	Linden	Piles Creek TW3	40 37'12"/74 12'30"	328.0
7	0002224	Solvents Recovery Service NJ	Linden	Kings Creek TW3	40 37'00"/74 15'10"	
8	0001783	American Can Co.	Hillside	Trib. Elizabeth River FW3	40 42'20"/74 14'00"	.075
9	0024201	Chemical Control Corp.	Elizabeth	Elizabeth River TW3		
10	0002291	Schering Corp.	Union	Elizabeth River FW3	40 41' /74 13'	1.11
11	0003107	Volco Brass & Copper	Kenilworth	Elizabeth River FW3	40 41'00"/74 17'00"	
12	0002097	Bendix Corp.	Teterboro	West Ditch TW2	40 51'33"/74 04'00"	
				Discharge	#001	.005
					#002	.204
					#003	.246
					#004	.098
					#005	.033
13	0002402	Diamond Shamrock Corp.	Jersey City	Hackensack R. TW3	40 45'13"/74 03'32"	.02
14	0002461	Diamond Shamrock	Kearny	Dead Horse Crk. TW3		
15	0002798	Diamond Shamrock	Carlstadt	Berry's Crk. TW2	40 50'19"/74 04'55"	9.0
16	0003930	Haag Brothers Inc	Secaucus	Penhorn Crk. TW3		
17	0003310	Hackensack Wtr. Co	Oradell	Hackensack R TW1		
18	0023868	Haward Corp.	No. Arlington	Saw Mill Crk TW3		
19	0001694	Koppers Co.	Kearny	Hackensack R. TW3	40 44'50"/74 04'45"	.115
20	0002721	Matheson Gas Prod. Will Rose Inc.	E. Ruterford	Ackermans Crk. TW2	40 49'55"/74 05'15"	

TABLE V-3 (continued)

INDUSTRIAL DISCHARGES

Map No.	NPDES Permit Number	Discharger	Municipality	Receiving Stream & Classification	Discharge Location Lat/Long.	Flow (mgd) Avg.
21	0002356	Owens-Illinois Inc	North Bergen	Bellmans Crk TW2	40 49'05"/40 00'55"	
22	0000574	PSE&G	Jersey City	Hackensack R TW3	40 44'20"/74 04'40"	5.0
23	0000621	PSE&G	Ridgefield	Overpeck Crk TW2	40 50'11"/74 01'47"	
				Discharge	#01A	.01
					#301	455
24	0000647	PSE&G	Jersey City	Hackensack R TW3	40 45'05"/74 04'40"	
				Discharge	#361	835
25	0000655	PSE&G	Kearny	Hackensack R TW3	40 44'15"/74 05'47"	
				Discharge	#381	212
					#385	.01
26	0000671	PSE&G	Jersey City	Hackensack R TW3	40 44'42"/74 04'30"	
				Discharge	#422	1.9
27	0027979	Ragen Precision Industries Inc.	No. Arlington	Kingsland Crk TW2	40 46'49"/74 08'03"	
28	0003212	Scientific Chem. Processing Inc.	Carlstadt	Peach Island Crk TW2	40 49'30"/74 04'	
				Discharge	#001	.117
					#002	.056
					#003	.078
29	0005754	Technical Oil Products Inc	Carlstadt	Berry's Crk TW2	40 51'04"/74 04'28"	
30	0002101	Transcontinental Gas Pipe Line	Carlstadt	Hackensack R TW2		
31	0003875	Union Textile	Secaucus	Hackensack R TW2	40 47'14"/74 03'13"	
32	0001252	Universal Oil Prod	E. Rutherford	Ackerman's Crk TW2	40 50'00"/74 05'20"	.15
33	0000957	Colgate-Palmolive	Jersey City	Hudson R. TW2	40 42'53"/74 02'03"	11.3
34	0002143	Lever Brothers Co	Edgewater	Hudson R. TW2	40 48'20"/73 59'30"	
				Discharge	#001	.28
					#002	.08
					#004	.19
					#005	.31
35	0001341	Bayonne Ind. Inc	Bayonne	Platty Kill Crk TW2	40 39'00"/74 06'20"	
36	0003361	El Dorado Termn.	Bayonne	Kill Van Kull TW3	40 38'57"/74 05'56"	.003
37	0002968	General Cable Corp	Bayonne	Kill Van Kull TW3	40 38'40"/74 08'33"	.127

TABLE V-3 (continued)

INDUSTRIAL DISCHARGES

Map No.	NPDES Permit Number	Discharger	Municipality	Receiving Stream & Classification	Discharge Location Lat/Long.	Flow (mgd) Avg.
38	0003018	Kenrich Petro-Chemicals Inc.	Bayonne	Kill Van Kull TW3	40 39'00"/74 06'10"	.024
39	0003565	National Oil Recovery Corp.	Bayonne	Kill Van Kull TW3	40 38'58"/74 05'42"	.65
40	0020877	Ideal Farms Inc.	North Haledon	Molly Ann Brook FW3		
41	0000124	Intermediates Div.	Garfield	Passaic R TW2	40 52'20"/74 06'42"	
				Discharge	#001	.43
					#002	3.0
42	0002674	Marcal Paper Mills	East Paterson	Passaic R. FW3	40 54'11"/74 08'00"	.29
43	0000035	Nat'l Standard Athenia St.	Clifton	Weasel Brk TW2		.008
44	0000566	PSE&G Co.	Harrison	Passaic R. TW3	40 44'00"/74 09'30"	
				Discharge	#04A	7.0
45	0000639	PSE&G Co.	Newark	Passaic R. TW3		
				Discharge	#341	95
46	0000591	PSE&G Co.	Paterson	Passaic R. FW3	40 55'45"/74 10'00"	
				Discharge	#48A	1.4
					#48B	1.7
47	0002682	Royce Chem. Co.	East Rutherford	Trib. Passaic R TW2	40 50'30"/74 06'43"	.11
48	0003531	S.B. Penick Co.	Lyndhurst	Storm Sewer TW2	40 48'54"/74 07'18"	.0024
49	0001287	Shulton Inc.	Clifton	Weasel Brk. TW2	40 52'30"/74 09'50"	
				Discharge	#002	.078
					#005	.432
					#006	.02
50	0020443	Western Electric	Kearny	Passaic R. TW3	40 43'28"/74 07'00"	.11
51	0001457	Whippany Paper Board Co.	Clifton	Passaic R. TW2	40 52'45"/74 07'15"	
				Discharge	#001	0.7
					#002	0.3
52	0002241	A. Gross & Co.	Newark	Newark Bay TW3	40 42'36"/74 07'42"	.76
53	0003166	Allied Chemical	Elizabeth	Newark Bay TW3	40 39'52"/74 09'55"	.5
54	0001171	Engelhard Mineral & Chemical Corp.	Newark	Pierson's Crk TW3	40 42'50"/74 08'50"	
				Discharge	#001	.078
					#002	.0016
					#004	.0067

TABLE V-3 (continued)

INDUSTRIAL DISCHARGES

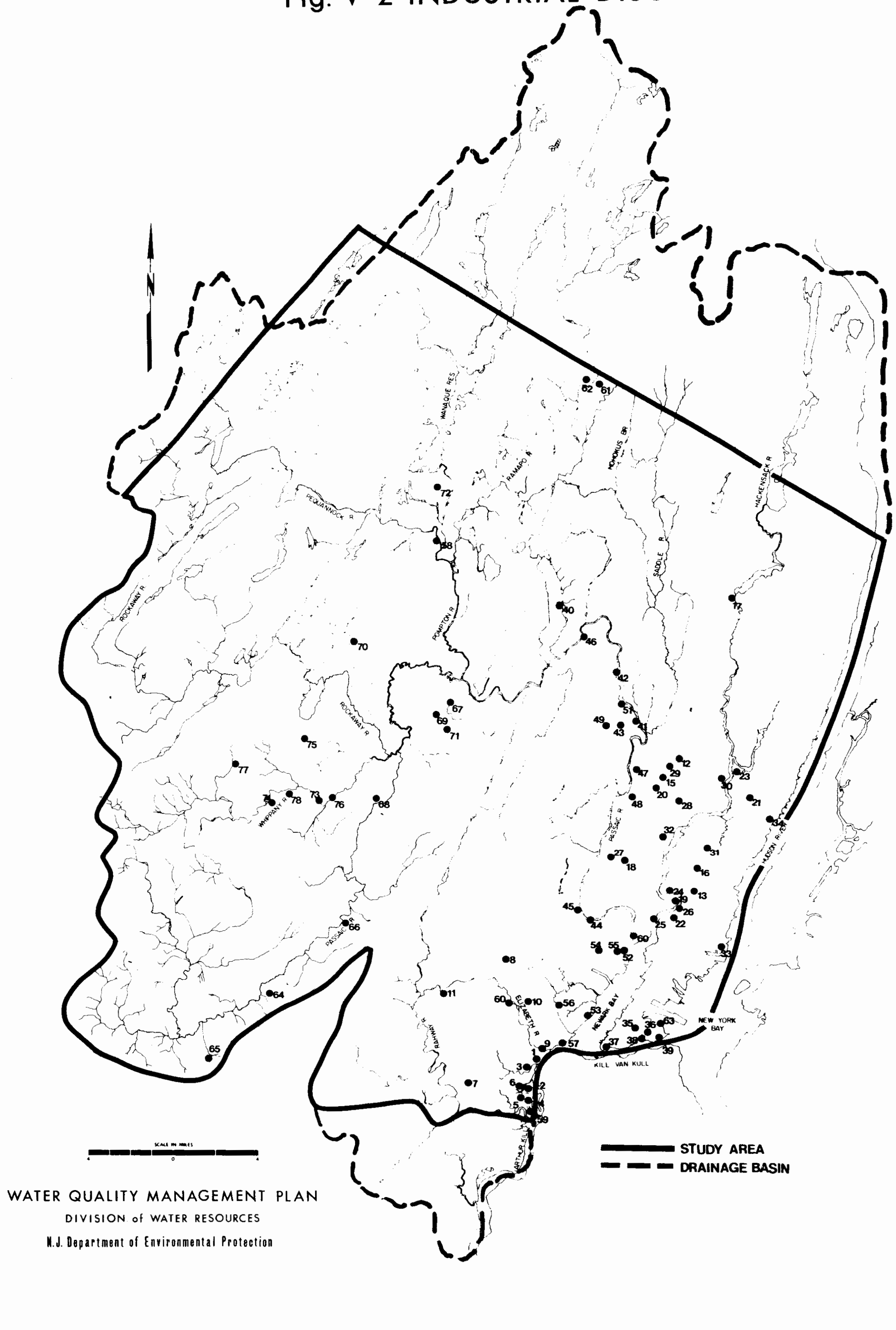
Map No.	NPDES Permit Number	Discharger	Municipality	Receiving Stream & Classification	Discharge Location Lat/Long.	Flow (mgd) Avg.
55	0001279	Inland Chemical	Newark	Newark Bay TW3	40 42'49"/74 07'22"	.037
56	0003824	Port N.Y. Authority	Newark	Port Newark Channel TW 3	40 40'38"/74 11'19"	
57	0001465	Singer Co.	Elizabeth	Newark Bay TW3	40 39'01"/74 10'28"	.218
58	0002852	Houdaille Const. Materials Inc.	Riverdale	Pequannock R. FW2	40 59'05"/74 17'46"	
59	0001058	American Cyanamid	Linden	Rahway R. TW3	40 35'55"/74 12'05"	
60	0002305	Schering Corp.	Kenilworth	Rahway R. FW2	40 41'07"/74 13'55"	
				Discharge	#001	.53
					#002	.07
61	0000108	Abex Corp.	Mahwah	Mahwah R. FW2	41 06'13"/74 09'02"	
				Discharge	#002	.044
					#003	.018
				#004	41 06'01"/74 08'58"	.029
62	0002704	Ford Motor Co.	Mahwah	Ramapo R. FW2	41 06'20"/74 09'50"	.554
63	0002089	Exxon Co. USA	Bayonne	Upper New York Bay TW2	40 39'17"/74 05'11"	
				Discharge	#001	2.18
					#002	.65
64	0002551	Armour Pharma-ceutical Reheis	Berkeley Heights	Trib Passaic R. FW2	40 40'41"/74 26'07"	.99
65	0002607	Burroughs Corp Elec Comp Div.	Warren	Cory's Brk FW2	40 37'56"/74 30'08"	.038
66	0000540	Ciba-Geigy Corp. Ciba Pharm.	Summit	Passaic R FW2	40 43'50"/74 22'40"	
				Discharge	#001	.36
					#002	.16
67	0002976	Curtiss-Wright	Fairfield	Deepavaal Brk FW2		
				Discharge #001	40 52'46"/74 17'00"	.038
				#002	40 52'51"/74 16'54"	.002
68	0001651	Fritzche Dodge & Olcott	East Hanover	Passaic R. FW2	40 49' /74 21'	
69	0001741	Industrial Cir-cuits Co. Inc.	Fairfield	Deepavaal Brk FW2	40 52'20"/74 17'40"	

TABLE V-3 (continued)

INDUSTRIAL DISCHARGES

Map No.	NPDES Permit Number	Discharger	Municipality	Receiving Stream & Classification	Discharge Location Lat/Long.	Flow (mgd) Avg.
70	0002585	S.B. Penick Co. CPC Intl	Montville	Crooked Brk FW2	40 54'59"/74 23'13"	.27
71	0000850	Welsh Farms Ice Cream Co.	West Caldwell	Green Brook FW2	40 51'45"/74 17'04"	.002
72	0001317	Arrow Group Ind. Coating Line Plt.	Wanaque	Post Brook FW2		.027
73	0000833	Bell Telephone Labs	Hanover	Whippany R FW2	40 48'58"/74 24'19"	
				Discharge	#001	.03
					#002	.003
					#003	.001
74	0001325	ITT Rayonier Inc	Hanover	Whippany R FW2	40 49'00"/74 26'50"	.05
75	0003450	Pfizer Inc.	Parsippany	Eastmans Brk FW2	40 51'30"/74 25'20"	
76	0001155	Sandoz Wander Inc	East Hanover	Black Brk FW2	40 48'38"/74 23'36"	
				Discharge	#001	.024
					#002	.046
					#003	.289
					#004	.037
77	0002542	Warner-Chilcott Labs	Morris Plains	Watnong Brk FW2	40 50'30"/74 28'30"	
78	0002828	Whippany Paper Board Co.	Hanover	Whippany R FW2	40 49'17"/74 25'38"	
				Discharge	#001	8.5
					#003	4.8
					#004	3.6

Fig. V-2 INDUSTRIAL DISCHARGERS



V.B. Municipal and Industrial Waste Treatment Systems

This section presents the recommendations of the Water Quality Management Plan for the point source dischargers in the study area. This planning effort has focused on the municipal dischargers since many of the 201 facilities plans are nearing completion and the industrial dischargers are in the process of meeting their requirements as mandated by the Act.

Included in this section is a discussion of the existing and future 201 facilities planning areas, and the wastewater flow projections that set the level of funding for the municipal facilities. Also in the section is a discussion of the alternative waste treatment systems that need to be considered in the facilities planning process. The remaining portions of the section present the procedure for determining wasteload allocations, the treatment level and treatment plant locations for the municipal plants and the project priority list for allocating funds to these facilities.

V.B.1 Existing and Future 201 Facilities Planning Areas

a. Delineation and Discussion of Existing 201 Facilities Planning Areas. The facilities planning areas within the Northeast 208 Study Area are presented in Figure V-3. Table V-4 lists the planning areas that are presented on the map.

USEPA regulations (35.900) describe a three step process for planning and construction of sewage treatment plants. Step I consists of preliminary facilities planning, divided into a cost-effective analysis of alternatives, an environmental assessment statement (EAS) and an infiltration/inflow (I/I) analysis. Step II is the design of the facilities recommended in the Step I plan. Step III is the construction of the facilities. Table V-5 gives the status of the facilities plans regarding the three step process.

A discussion of the existing conditions in each facilities planning area is presented below. The discussion includes the municipalities in the planning area, along with the existing treatment facilities. The type of treatment, design capacity and average flow is included for the treatment plants. A brief description of the type of collection system and possible infiltration/inflow (I/I) problems are presented where information is available. Unless noted in the discussions the collection systems are separate, not combined. Problems that are delaying approval of the facilities plans are also included.

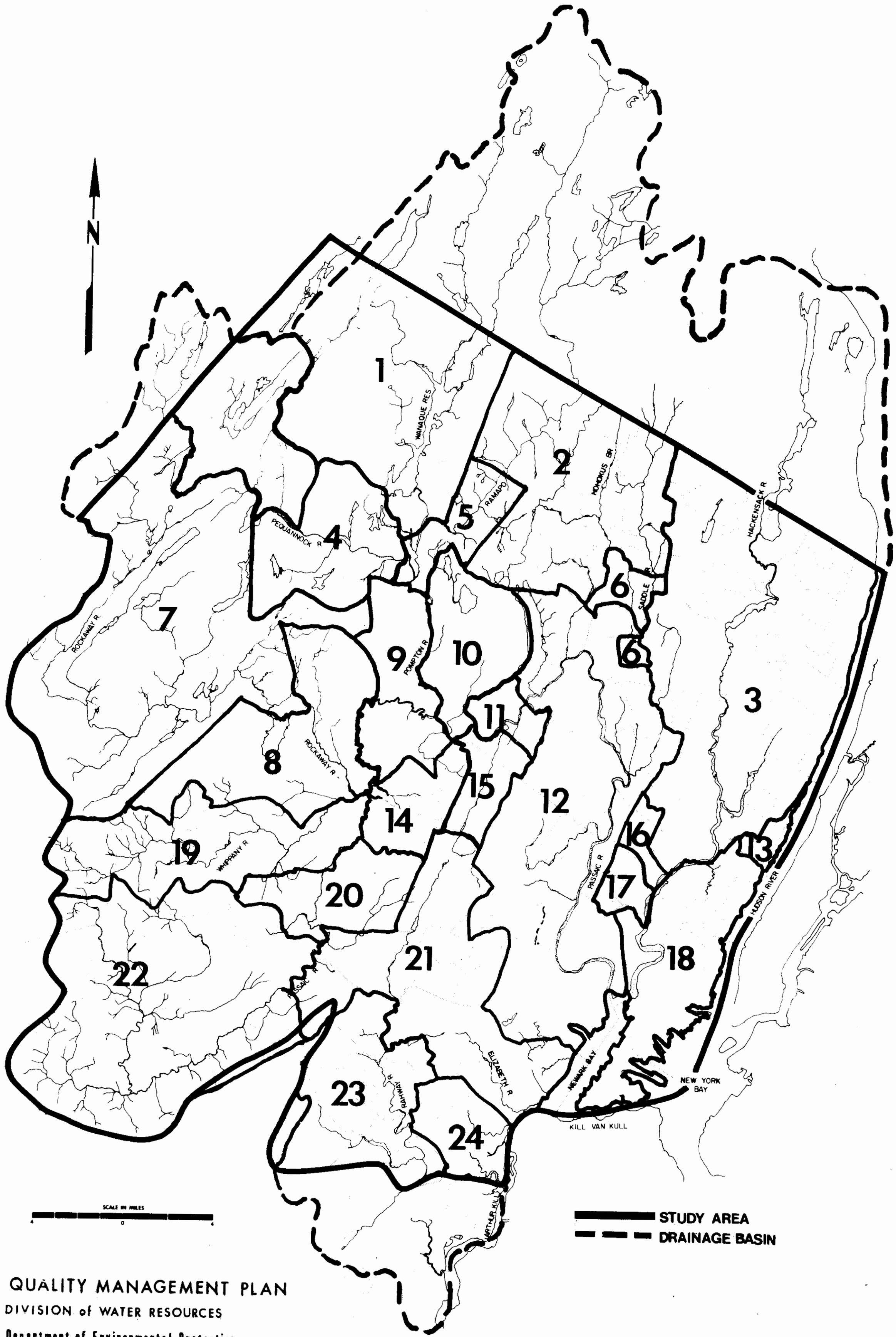
TABLE V-4

FACILITY PLANNING AREAS

Map No.	Planning Area
1.	Wanaque Valley Regional Sewerage Authority
2.	Northwest Bergen County Utilities Authority
3.	Bergen County Utilities Authority
4.	Pequannock River Basin Regional Sewerage Authority
5.	Pompton Lakes
6.	Ridgewood-Fair Lawn
7.	Rockaway Valley Regional Sewerage Authority
8.	Parsippany-Troy Hills
9.	Pequannock, Lincoln Park and Fairfield
10.	Wayne
11.	Totowa-West Paterson
12.	Passaic Valley Sewerage Commissioners
13.	Edgewater
14.	Caldwell
15.	Peckman River
16.	Tri-Borough Joint Meeting
17.	North Arlington-Lyndhurst Joint Meeting
18.	Hudson County Sewerage Authority
19.	Whippany River Basin
20.	Livingston-Florham Park
21.	Essex and Union County Joint Meeting
22.	Upper Passaic River Basin
23.	Rahway Valley Sewerage Authority
24.	Linden-Roselle Sewerage Authority

Fig.V-3

Existing 201 Facilities Planning Areas



WATER QUALITY MANAGEMENT PLAN
DIVISION of WATER RESOURCES
N.J. Department of Environmental Protection

TABLE V-5

STATUS OF 201 FACILITY PLANS

201 Planning Area	Step I			Step II	Step III
	Cost-Effective Analysis	FAS	I/I		
Wanaque Valley Regional S.A.	Approved	Approved	Approved	Segment in progress	Not initiated
Northwest Bergen County S.A.	------------------------	Not initiated	--------------------	Not initiated	Not initiated
Bergen County S.A. (Expansion)	Approved	Approved	Approved	Approved	Under construction
Bergen County S.A. (Upgrading)	------------------------	Grant application Approved by DEP		--	
Pequannock River Basin Regional S.A.	Completed	Completed	Approved	Not initiated	Not initiated
Pompton Lakes	------------------------	Not initiated	-----------	Not initiated	Not initiated
Ridgewood-Fair Lawn	In progress	In progress	In progress	Not initiated	Not initiated
Rockaway Valley Regional S.A.	Approved ----------Subject to EIS	Approved -------------	Approved -------------	In progress for plant Interceptor design approved	Not initiated for plant Interceptor under construction
Parsippany-Troy Hills	Approved	Approved	Approved	Approved	Completed secondary treatment units.
Pequannock, Lincoln Park and Fairfield	Approved	Approved	Approved	Approved	Under construction

TABLE V-5 (continued)

STATUS OF 201 FACILITY PLANS

201 Planning Area	Step I			Step II	Step III
	Cost-Effective Analysis	EAS	I/I		
Wayne	Approved	Approved	Approved	In progress	Not initiated
Totowa-West Paterson	Under revision	Under revision	Under revision	Not initiated	Not initiated
Passaic Valley Sewerage Commissioners	Approved	Approved	Approved	Approved	Under construction
Wood-Ridge	------------------------	Not initiated	--------------------	Not initiated	Not initiated
Edgewater	------------------------	Not initiated	--------------------	Not initiated	Not initiated
Caldwell	In progress	In progress	Submitted	Not initiated	Not initiated
Peckman River	Under revision	Under revision	Under revision	Not initiated	Not initiated
Tri-Borough Jt. Mtg.	Submitted	Submitted	Submitted	Not initiated	Not initiated
North Arlington Lyndhurst Jt. mtg.	Submitted	Submitted	Submitted	Not initiated	Not initiated
Hudson County S.A.	In progress	In progress	In progress	Not initiated	Not initiated
Whippany River Basin	Submitted	Submitted	Submitted	Not initiated, except for Morristown which has design approved	Not initiated except for Hanover which has secondary treatment units under construction

TABLE V-5 (continued)

STATUS OF 201 FACILITY PLANS

201 Planning Area	Step I			Step II	Step III
	Cost-Effective Analysis	EAS	I/I		
Livingston-Florham Park	------------------------Not initiated------			Not initiated	Not initiated
Essex and Union County Jt. mtg.	Approved	Approved	In progress	Approved	Under construction
Upper Passaic River Basin	Submitted ----------Subject to EIS--------------------------	Submitted	Submitted	Several municipalities have designs pending an approved facilities plan	Not initiated
Rahway Valley S.A.	Designs to expand and upgrade treatment plant completed before facility planning regulations took effect.				
Linden-Roselle S.A.	Approved	Approved	Approved	Approved	Under construction

1. Wanaque Valley Regional Sewerage Authority

The Wanaque Valley facilities planning area comprises all of Wanaque and Ringwood and the portion of West Milford that drains to the Wallkill and Wanaque Rivers.

Disposal of sewage in the area is accomplished by on-site systems and small packaged plants. The packaged plants serve limited areas of clustered development, schools or shopping centers.

Wanaque has two domestic plants that are operated by the Wanaque MUA. The Haskell plant was originally constructed in 1919 and expanded in 1957. The design capacity of the plant is .3 MGD, and the plant utilizes a high rate trickling filter. The collection system consists of approximately 730 residential connections. The other Wanaque plant is Meadowbrook which was recently constructed at a capacity of .148 MGD and utilizes the extended aeration process.

Ringwood has four domestic plants, two of which serve residential and commercial areas (High Point Homes and Ringwood Shopping Center) and two that service the Peter Cooper and Robert Erskine schools. The Ringwood Shopping Center plant has a design capacity of .011 MGD and utilizes the extended aeration process. The High Point Homes plant has a capacity of .04 MGD and also uses extended aeration. Both plants were recently constructed and together service around 5 percent of the Borough's population.

West Milford has three public plants in the facilities planning area that are operated by the West Milford MUA and serve local residential developments. Old Milford Estates utilizes the extended aeration process and will have a design capacity of .172 MGD after completion of the proposed expansion. The Awosting plant has a design capacity of .045 MGD and utilizes the activated sludge process. The Crescent Park plant has a design capacity of .064 MGD and uses contact stabilization. There are also three private plants in West Milford with a total design capacity of .045 MGD that serve local areas.

A facilities plan and a supplement have been submitted to DEP for review. The facilities plan has been certified for a new 2.5 MGD plant located near Lake Inex. The expanded facility will serve Wanaque and part of Ringwood.

2. Northwest Bergen County Utilities Authority

The facilities planning area includes the following municipalities: Allendale, Franklin Lakes, Waldwick, Ho-Ho-Kus, Midland Park, Wyckoff, Ramsey, Saddle River, Upper Saddle River, Mahwah and Oakland. The NWBCUA treatment plant currently serves all of Waldwick, Ho-Ho-Kus, and Midland Park and parts of Wyckoff, Allendale, Ramsey and Saddle River. The treatment plant was constructed in the late 1960's and began operation in 1970. The plant has a design capacity of 8.5 MGD and had an average flow of 4.2 MGD for 1976. The NWBCUA sewer system serves some 10,534 residential connections, 13 apartment and 204 commercial establishments.

One of the major problems in the facilities planning area was whether the municipalities of Oakland and Mahwah would be served by NWBCUA or Pompton Lakes. The two towns were within the legal jurisdiction of the Authority but lie in the Ramapo River Basin. A separate facilities plan for these municipalities recommended that Oakland be served by Pompton Lakes and Mahwah by NWBCUA. Figure V-3 utilizes this recommendation and includes Oakland in the Pompton Lakes facilities planning area.

Additional facilities planning for NWBCUA has not been initiated. However, a plan will be required for the upgrading required by this Plan.

3. Bergen County Utilities Authority

The municipalities in the facilities planning area for BCUA are: Alpine, Bergenfield, Bogota, Carlstadt, Cliffside Park, Closter, Cresskill, Demarest, Dumont, East Rutherford, Emerson, Englewood, Englewood Cliffs, Fairview, Fort Lee, Hackensack, Harrington Park, Hasbrouck Heights, Haworth, Hillsdale, Leonia, Little Ferry, Maywood, Old Tappan, Oradell, Palisades Park, Paramus, Park Ridge, Ridgefield, Ridgefield Park, River Edge, River Vale, Rochelle Park, Rockleigh, South Hackensack, Teaneck, Tenafly, Teterboro, Washington, Westwood and Woodcliff Lake. All of the municipalities are sewered, in whole or in part, to the BCUA plant except for Alpine, Old Tappan and Rockleigh. The area currently served by the Tri-Borough Joint Meeting and Wood Ridge will be connected to BCUA in the near future.

The BCUA operates the domestic treatment plant for the entire service area. The plant is currently being expanded from 50 MGD to 75 MGD. The 1976 flow to the plant was 63 MGD, with about 11% of this from industrial sources. Contact stabilization is being used at the plant and will continue to be utilized after the expansion.

The sewage collection systems are separate sanitary sewer types except for those in Englewood Cliffs, Fort Lee, Hackensack, Ridgefield Park and Palisades Park, which have combined sewerage systems, and Cliffside Park, where a portion of the system is combined. The first four of the above listed municipal systems are equipped with regulators which bypass excessive peak storm flows. Nevertheless, storm flows at the treatment plant increase to approximately 93 MGD, significantly higher than the dry weather flow. Hackensack and Cliffside Park have applied for Federal aid to separate their combined sewers. A preliminary I/I analysis was completed by the BCUA and approved by DEP.

The BCUA treatment plant is fed by two major interceptor facilities. The Overpeck Trunk Sewer, constructed in 1953 to serve the Overpeck Creek Valley and a portion of the area on the east side of the Hackensack River. The reported peak capacity of the interceptor is 57 MGD. The Stage II Trunk Sewer constructed in 1960 serves the Hackensack River Valley. Peak capacity for the interceptor is reported at 185 MGD. The sewage collection systems tributary to the interceptors are owned, operated and maintained by the individual municipalities.

A proposal for a new facilities plan has been approved by DEP. The plan will examine the options of either providing advanced treatment and continuing to discharge to the Hackensack River, or moving the discharge to the Hudson River without advanced treatment.

4. Pequannock River Basin Regional Sewerage Authority

The facilities planning area (FPA) includes all of Butler and Bloomingdale and portions of Kinnelon, West Milford and Riverdale.

The major treatment facility in the FPA is the Butler-Bloomingdale plant. There are also 6 small packaged plants serving schools and local developments, with a total capacity of around .15 MGD. The Butler-Bloomingdale plant utilizes high rate trickling filters and has a design capacity of 1.4 MGD. The average flow to the plant in 1976 was 2.25 MGD, which exceeds the design capacity.

Wet weather flows exceed average flows and an I/I analysis for existing sewers in Butler and Bloomingdale has been completed, although an evaluation survey is needed.

The collection system has 3,432 residential connections on record in Butler, a large portion of southern Bloomingdale and a small part of Kinnelon. Under the revised plan West Milford will not be sewered but Kinnelon and Riverdale are preparing wastewater facilities plans for their municipalities.

Problems delaying the project include the lack of a service agreement between the municipalities and possible impact to a historical site.

5. Pompton Lakes

The facilities plan that will be initiated for the Pompton Lakes sewage treatment plant will include the municipalities of Pompton Lakes, Oakland and the portion of Riverdale not covered in the Pequannock River Basin Facility Plan. As mentioned earlier, Oakland was studied in a facilities plan for Oakland and Mahwah which recommended sewering Oakland to Pompton Lakes. This recommendation is incorporated into this 208 plan, so that when Pompton Lakes begins its facilities plan Oakland will be included.

The Pompton Lakes treatment plant is the major facility in the area. Additionally, there are 5 small plants in Oakland that serve schools and small areas, with a total capacity of around .12 MGD. The Pompton Lakes plant uses an activated sludge process and has a design capacity of 1.2 MGD. The average flow to the plant in 1976 was .7 MGD. Wet weather flows have exceeded the plant's design capacity and an I/I study has been conducted.

The collection system consists of 27 miles of sewers and six pumping stations which service approximately 3,500 residential, commercial and industrial connections in Pompton Lakes and a portion of Riverdale.

Pompton Lakes has not initiated a facilities plan. A plan will be needed for the expansion and upgrading recommended by this 208 Plan.

6. Ridgewood - Fair Lawn

The facilities planning area includes the municipalities of Ridgewood and the Radburn (northeast) section of Fair Lawn. The facilities plan has recently been completed and is under review by DEP.

Each municipality operates its own treatment facility and sewage collection system. The Ridgewood plant has a design capacity of 5.0 MGD and uses the contact stabilization process. The average flow to the plant was 3.5 MGD in 1976. Fair Lawn's plant also utilizes contact stabilization and has a design capacity of 3.3 MGD. The average flow in 1976 was 2.3 MGD. Wet weather flows are higher than average flows for both plants and in Fair Lawn have exceeded the design capacity. This indicates the possible presence of I/I. An I/I analysis has not yet been initiated, but will be included as part of the facilities plan.

7. Rockaway Valley Regional Sewerage Authority

The facilities planning area for RVRSA is the Rockaway River drainage area above the outlet of the Boonton Reservoir. The municipalities included in the planning area are: Dover, Wharton, Rockaway, Denville, Rockaway Borough, Victory Gardens, Boonton Town, Boonton Township, Randolph, Jefferson, Roxbury, Mine Hill and Kinnelon.

The RVRSA operates the major domestic plant in the basin. There are also 4 small package plants serving schools and cluster developments in Rockaway, Randolph and Jefferson. The total design capacity of these plants is around .2 MGD. The RVRSA plant has a design capacity of 9.0 MGD and utilizes the activated sludge process. The average flow to the plant in 1976 was 6.6 MGD.

The collection system consists of an interceptor sewer and municipal collection systems extending from the Borough of Wharton to the plant site below Boonton Reservoir. The municipalities totally or partly sewered to the plant include: Boonton Town, Boonton Township, Denville, Dover, Rockaway Borough, Victory Gardens, Wharton, Randolph and

Rockaway Township. The interceptor sewer was constructed in the early 1920's and presently services over 59,000 residents. The interceptor sewer is inadequate to handle present peak flows and consequently during wet weather there are overflows into the Rockaway River.

Plant records indicate that wet weather flows exceed the average flow by around 75 percent. Since all the alternatives in the facilities plan recommended construction of a new interceptor sewer, work has begun on this portion of the project.

The facilities plan has been reviewed and certified by DEP. The plan will result in the expansion and upgrading of the RVRSA plant to 12 MGD. However, this certification and EPA approval is contingent upon the preparation of an Environmental Impact Statement.

8. Parsippany - Troy Hills

The facilities planning area for Parsippany - Troy Hills encompasses the municipalities of Parsippany - Troy Hills, Mountain Lakes and Montville. East Hanover will be sewered to Parsippany-Troy Hills in the future.

The major treatment facility in the area is the Parsippany - Troy Hills plant. This plant was recently expanded from its 4 MGD design capacity to 16 MGD. The average flow to the plant in 1976 was 5.5 MGD. The recent expansion was for the activated sludge units. Biological nitrification and denitrification units will be constructed in order to conform with the advanced treatment required by DEP and EPA.

The collection system for Parsippany - Troy Hills consists of 7,738 residential, 7,030 apartment and 275 commercial connections. The collection system is being expanded with the completed Troy Meadow interceptor in Parsippany - Troy Hills and collection systems for portions of Mountain Lakes and Montville.

9. Pequannock, Lincoln Park and Fairfield

The facilities planning area for Pequannock, Lincoln Park and Fairfield Sewage Authority encompasses the three municipalities. A new plant is under construction in Lincoln Park to treat the sewage of the three municipalities.

The plant will have a design capacity of 7.5 MGD and utilize a two stage activated sludge process. The plant was scheduled to be completed in September 1978. In the interim 8 small package plants will continue to serve local developments in the area. The total capacity of these plants is around 1.25 MGD.

The only sewage collection systems in the area are for the limited areas served by the package plants. Sewage collection systems are under construction in Fairfield and Lincoln Park. Pequannock's collection system will be constructed in the future.

10. Wayne

The facilities planning area for Wayne is the municipal boundary of the Township. Two municipal plants serve approximately 95 percent of the developed areas. The Sheffield Hills plant services the northern portion of the Township and discharges to the Pompton River. The Mountain View plant services the southern portion, and discharges to Singac Brook.

The Sheffield Hills plant has a design capacity of 1.0 MGD and utilizes the contact stabilization process. The plant averaged 1.3 MGD in 1976, with most of its wastes being domestic in nature. Wet weather flows have exceeded 2 MGD, indicating a possible I/I problem. An I/I study has been submitted to DEP and approved. The Sheffield Hills plant is being expanded and upgraded slightly until it can be connected to the Mountain View plant.

The Mountain View plant has a design capacity of 4.0 MGD and utilizes the activated sludge process. The plant averaged 5.0 MGD in 1974, receiving 20 percent industrial wastes. The collection system has 5,644 residential 1,663 apartment and 359 industrial connections recorded. Plant records indicate that wet weather flows exceed the average flow by close to 100 percent. The system is subject to severe I/I problems.

A facilities plan for Wayne has been approved by DEP. There had been a problem in determining the design capacity for the Mountain View plant. The capacity that has been agreed to by Wayne, EPA and DEP is 13.5 MGD. The design of the plant is under way while construction of the sludge handling facilities is nearly complete.

11. Totowa - West Paterson

The facilities planning area for the Totowa - West Paterson Sewerage Authority encompasses the two municipalities.

The three municipal plants in the planning area are Totowa - West End, Totowa - Riverview and West Paterson. There is also a small treatment facility at the North Jersey Training School, but that plant and the West End plant will be phased out to a regional facility at the recommendation of the facilities plan.

Totowa is approximately 98 percent sewered to either the West End or Riverview facilities. The West End plant has a design capacity of .375 MGD and utilizes a high-rate trickling filter. The average flow in 1976 was .6 MGD. Besides being hydraulically overloaded, the plant is overloaded with organic matter due to the fact that 50 percent of its wastes are received from industrial and commercial sources. The collection system has 550 residential, 63 commercial and 34 industrial connections. The Riverview plant has a design capacity of 1.0 MGD and also utilizes a high-rate trickling filter. The wastes entering the plant are primarily domestic, with an average 1976 flow of 1.3 MGD. The collection system has 2,200 recorded connections. Both plants have wet weather flows exceeding average flows by 30 to 100 percent. The I/I conditions for both systems have been studied in the facilities plan.

West Paterson is approximately 92 percent sewered to its treatment facility. The plant has a design capacity of 0.8 MGD and utilizes a standard rate trickling filter. The average flow in 1976 was 1.3 MGD, with 45 percent industrial wastes. The collection system for West Paterson has 2,030 residential, 895 apartment, 46 commercial and five industrial connections. Wet weather flows indicate the presence of significant I/I, which has been investigated in the facilities plan.

A facilities plan for Totowa - West Paterson has been prepared and submitted to DEP for review. Due to problems concerning the recommendations of the facilities plan an additional Step I document was submitted in January 1977.

In this document a change was presented, from the previously recommended regional plant at Riverview, to the expansion of both West Paterson and Riverview, phasing out the plants at West End and the Training School to connect them to Riverview. There is still a problem with the design capacities for the individual treatment plants; the capacities recommended in the facilities plan are higher than in this 208 Plan. This problem will have to be resolved in a revised facilities plan.

12. Passaic Valley Sewerage Commissioners

PVSC was formed by a special act of the New Jersey State Legislature in 1902. The Commission was created to abate pollution in the Passaic River Basin, between the Great Falls in Paterson and the mouth of the river at Newark Bay.

The facilities planning area for PVSC encompasses 30 municipalities, which occupy a total sewered area of 55,600 acres (87 square miles). A list of these municipalities by county, and the portion of each municipality served by PVSC, is presented in Table V-6.

PVSC operates the domestic treatment plant for the entire service area. The plant is currently being expanded from 225 MGD to 300 MGD. The 1976 average flow to the plant was 258 MGD. The plant was originally constructed in 1912 as a primary facility. The current expansion will also upgrade the facility to secondary treatment by utilizing the activated sludge process. Due to the large industrial contribution (37 percent) the plant will have to provide greater than 85 percent removal of BOD and SS, or 92.4 percent for BOD and 93.7 percent for SS. This is necessary in order to meet the NPDES permit requirements for the plant.

The PVSC system presently serves approximately 1,100,000 people and over 3,000 commercial and industrial establishments. Wastewater from the PVSC service area is collected by a 21.2-mile-long main interceptor and 12 branch interceptors. The main interceptor extends along the western bank of the Passaic River, from the Newark Bay pumping station in Newark, to Prospect Street in Paterson. Hundreds of miles of local collection sewers are connected to the interceptor system.

TABLE V-6

PVSC SERVICE AREA

Municipality	Portion of Municipality Served	Acres
Bergen County		
East Paterson	Total Area	1,647
East Rutherford	Section in Passaic Drainage Basin	198
Fair Lawn	Total Area except Radburn Section	2,008
Garfield	Total Area	1,379
Glen Rock	Total Area	1,768
Lodi	Total Area	1,451
Lyndhurst	Section in Passaic Drainage Basin	794
North Arlington	Section in Passaic Drainage Basin	475
Rutherford	Section in Passaic Drainage Basin	582
Saddle Brook	Total Area	1,627
South Hackensack	Garfield Park Section	50
Wallington	Total Area	595
Essex County		
Belleville	Total Area	2,112
Bloomfield	Total Area	3,456
East Orange	Section in Passaic Drainage Basin	2,035
Glen Ridge	Total Area	832
Montclair	Total Area	3,968
Newark	Total Area except for Newark Airport, Port Newark, Vailsburg, Ivy Hill Section, Western end of Queen and Peddie Districts	12,215
Nutley	Total Area	2,176
Orange	Total Area	1,408
Hudson County		
East Newark	Total Area	54
Harrison	Total Area	678
Kearny	Western Section	1,625
Passaic County		
Clifton	Total Area	7,367
Haledon	Total Area	797
Hawthorne	Total Area	2,297
North Haledon	Future Connections	---
Passaic	Total Area	2,053
Paterson	Total Area	5,288
Prospect Park	Total Area	295
Little Falls	Southeast Corner	---

Source: Manganaro, Martin and Lincoln.
Report on Proposed Sewerage Facilities
Passaic Valley Sewerage Commissioners.
(Revised - October, 1973).

Several large areas within the PVSC system contain combined sewers; this includes approximately 19 square miles and about 19 percent of the PVSC service area. The City of Paterson, portions of the City of Newark and the Kearny - Harrison area have combined sewers. An estimated 375,000 people (about 35 percent of the total population) are served by combined sewers.

The combined sewer areas of the PVSC system include 73 overflow stations along the main interceptor. With a one-inch rainfall, an estimated 125 million gallons of combined storm and sanitary sewage are discharged into the river from overflow points in the PVSC system (Killam, 1975). In addition, many other overflow stations are located in combined collector systems connected to the main interceptor. Also, with a one-inch rainfall, approximately 100 to 130 million gallons of overflow occur at regulators and bypasses located within the cities of Newark and Paterson. The combined sewers also cause high peak flows at the treatment plant during rainfall events due to the direct entry of stormwater. The PVSC system is also subject to infiltration from groundwater. It has been estimated that about 40 MGD is attributable to infiltration from groundwater during wet weather periods (Killam, 1975).

The facilities plan for PVSC has been submitted and approved. Construction of the plant is due to be completed between 1981 and 1982. The problem of combined sewer overflows will require additional study.

13. Edgewater

The facilities planning area for Edgewater includes: all of Edgewater, 86 percent of Cliffside Park and the 20 acres of Fort Lee where the Palisades Amusement Park was located.

There is one treatment facility for the area, which is located in Edgewater. The plant was constructed in 1954 as a primary facility. Subsequent additions have expanded the plant to its existing 3.0 MGD design capacity. The average flow in 1976 was 2.2 MGD. The Bio-Disc process is being tested in a demonstration project to determine if that process can be used to achieve secondary treatment.

A facilities plan has not been initiated but will be required for the expansion and upgrading recommended by this 208 Plan.

14. Caldwell

The Caldwell facilities planning area includes all of Caldwell, West Caldwell, North Caldwell, Essex Fells and Roseland.

The area is served by a regional facility located in West Caldwell. The plant has a design capacity of 4.0 MGD and uses trickling filters. The flow to the plant in 1976 was 3.8 MGD. The sewer collection system has 8,335 residential, 20 apartment, and 221 commercial connections recorded. Plant records indicate that wet weather flows exceed average flows by around 85 percent which indicates I/I problems.

A facilities plan will be submitted to DEP for review in the near future.

15. Peckman River

The facilities planning area includes Little Falls, Cedar Grove and Verona. There are four major treatment plants in the area, one in each municipality and one serving the Essex County Hospital in Cedar Grove.

The Little Falls plant, constructed in 1917, now has a design capacity of .86 MGD and utilizes standard rate trickling filters. The average flow in 1976 was 1.4 MGD. The plant serves all but a small portion of Little Falls and small portions of Cedar Grove and North Caldwell. Little Falls' collection system has 2,978 residential, 69 apartment, 143 commercial and six industrial connections. Wet weather flows have exceeded 2.0 MGD, which indicates that significant I/I may be present.

The Cedar Grove plant was originally constructed in 1946. Subsequent modifications have enlarged the plant to its current design capacity of 1.5 MGD. High rate trickling filters are utilized by the plant, which had an average flow of 1.7 MGD in 1976. All of Cedar Grove except that portion served by Little Falls is sewered to the plant. The collection system has 3,015 residential, 586 apartment, 98 commercial and 40 industrial connections. Wet weather flows more than double average flows, indicating significant I/I.

The Verona plant has a design capacity of 4.1 MGD and utilizes standard and high rate trickling filters. The plant serves all of Verona and had an average flow of 2.3 MGD in 1976. Verona's sewer system includes 3,351 residential, 1,078 apartment, 134 commercial and six industrial connections. The collection system probably has severe I/I, with wet weather flows 100 percent higher than average flows.

The Essex County Hospital serves the hospital with a 1.5 MGD treatment plant. The facility utilizes high rate trickling filters and had an average flow of .5 MGD in 1976.

A facilities plan for the Peckman River has been submitted to DEP for review. Numerous problems have delayed approval of the plan. The problems include the recommended design capacities, level of treatment and treatment plant configuration. EPA has been working with DEP in order to resolve the problems so that design work can begin. Additional revisions of the facilities plan will be required before approval can be granted.

16. Tri-Borough Joint Meeting

The facilities planning area for the Joint Meeting includes most of Rutherford and portions of East Rutherford and Carlstadt. The remaining portions of these municipalities are sewered to either BCUA or PVSC.

The Tri-Borough Joint Meeting operates a treatment plant that serves the entire planning area. The plant was built in 1940 with a design capacity of 4.0 MGD. Current flow to the plant is around 2.3 MGD, of which .8 MGD is industrial. The plant utilizes trickling filters, but due to operation and maintenance problems is producing effluent which does not meet secondary treatment criteria. The collection system serves approximately 22,500 people in the three municipalities. The local collection systems are owned and maintained by the individual municipalities, while the interceptor sewers and treatment plant are owned and maintained jointly.

A facilities plan has been submitted to DEP for review. As a result of that plan the Tri-Borough treatment plant will be phased out to BCUA. Service agreements have been signed between the three municipalities and BCUA.

17. North Arlington-Lyndhurst Joint Meeting

The facilities planning area includes North Arlington and Lyndhurst. The municipalities are served in part by PVSC and in part by their own treatment plant.

The Joint Meeting plant was constructed in 1956 as a primary treatment facility. The plant has a design capacity of 1.73 MGD, which was also the average flow in 1976. Industries contribute approximately .34 MGD to the facility, with an additional .06 MGD scheduled to be connected when capacity becomes available. The plant serves around 34 percent of the municipalities' population, or 14,000 people. The collection system is old and has been experiencing high I/I. This is evident by the fact that wet weather flows triple the average flow.

A facilities plan for North Arlington-Lyndhurst has been submitted to DEP for review.

18. Hudson County Sewerage Authority

The facilities planning area for the HCSA encompasses Hudson County with the exception of Harrison, East Newark and the portion of Kearny that is served by PVSC. For the purpose of facilities planning the County has been divided into three regions. Area I encompasses Secaucus, Jersey City and portions of Kearny and North Bergen. Area II is the City of Bayonne. Area III takes in Hoboken, Union City, Weehawken, West New York, Guttenberg and the portion of North Bergen not covered in Area I.

Area I

There are six municipal facilities in Area I, two in North Bergen and Jersey City and one in Kearny and Secaucus.

The two North Bergen plants service the portion of the township that drains to the Hackensack River. The Northern plant is a primary facility that has a design capacity of 1.0 MGD. The average flow in 1974 was 2.0 MGD. The Central plant is also a primary facility but its design capacity is 2.0 MGD. The average flow to the plant was 1.7 MGD in 1974.

In Jersey City one of the plants serves the west side of the City and the other serves the east side. The dividing line is the basin divide between the Hackensack and Hudson Rivers. Both plants are operated by the Jersey City Sewer Authority. The Jersey City West plant is a primary facility, with a design capacity of 36 MGD. The 1976 average flow was 21.6 MGD. The Jersey City East plant is also a primary facility, with a design capacity of 46.6 MGD. The average flow was 36.7 MGD in 1976. The collection system in Jersey City is over 50 years old and almost entirely of the combined type.

The Kearny plant serves the portion of the municipality that is not included in the PVSC system. The plant is a 3.03 MGD primary facility, that had an average flow of 2.6 MGD in 1974. The wastes entering the plant are mostly industrial in nature.

The Secaucus plant was constructed in 1963 as a 2.25 MGD facility. Trickling filters are used at the facility, which had an average flow of 1.05 MGD in 1976. Only the northern portion of the town is currently sewered, with the remainder served by industrial plants or septic tanks. Portions of the sewered area are not connected to the treatment plant, and the wastewater is discharged to the Hackensack River without treatment.

In order to rectify these condition Secaucus completed a facilities plan that has been certified by DEP. The plan recommends connecting the raw discharge sewers to the treatment plant and extending interceptors ito the southern portion of the town. Secaucus would then be in compliance with the HCSA facilities plan.

Area II

The Bayonne treatment plant is the major facility in the Area. The plant has a design capacity of 21 MGD and provides primary treatment. The average flow to the plant was 12 MGD. The collection system for Bayonne serves approximately 75,000 people and an estimated 185 industrial and commercial establishments. The system is made up of combined sewers and includes 18 mechanical regulators that bypass excessive flow during periods of heavy rainfall. Ten regulators discharge to Newark Bay, five bypass to the Kill Van Kull and three bypass to Upper New York Bay. Despite the regulators wet weather flows average around 30 MGD at the treatment plant.

Area III

There are three treatment facilities that service this Area. One in West New York, one in North Bergen and the other in Hoboken. All three plants provide primary treatment. The West New York plant has a design capacity of 10 MGD and had an average flow of 8.7 MGD in 1976. The North Bergen Woodcliff plant has a design capacity of 3.34 MGD with a 1974 average flow of 1.7 MGD. The Hoboken facility is the largest in the Area with a design capacity of 20.8 MGD. The average flow in 1976 was 14.5 MGD. The Hoboken plant serves approximately 75,000 people, about 370 commercial establishments and an estimated 140 industries. The collection system is of the combined type and has seven mechanical regulators which bypass to the Hudson River during heavy rainfall. Despite the regulators, wet weather flows to the Hoboken plant average around 22 MGD.

The facilities plan for HCSA was scheduled to be completed by about December 1978.

19. Whippany River Basin

The facilities planning area (FPA) includes the portions of all municipalities within the drainage area of the Whippany River above its confluence with Troy Brook. The municipalities in the planning area along with the extent of sewer service and the treatment plants serving the area are listed in Table V-7.

There are three major treatment plants in the planning area, Hanover, Morristown and Morris-Butterworth.

The Hanover plant was constructed in 1960 as a secondary facility utilizing high-rate trickling filters. The plant was recently expanded from its original design capacity of 1.5 MGD to 3.0 MGD. The 1976 average flow was 1.8 MGD, with .45 MGD being contributed by three major industries and numerous commercial and business establishments. The collection system services approximately 2,600 connections

TABLE V-7

MUNICIPAL SEWER SYSTEMS - WHIPPANY RIVER BASIN

Municipality	Treatment Plant	Extent of Service
East Hanover		Not presently sewered
Hanover	Hanover S.A.	Mostly sewered
Morris Plains	Butterworth Hanover S.A.	Mostly sewered
Morristown [1]	Morristown	All sewered
Morris[1]	Butterworth	Partly sewered
Mendham[1]		Not presently sewered
Parsippay-Troy Hills[1]	Parsippay-Troy Hills Hanover S.A.	Portion in FPA is partly sewered
Denville[1]	RVRSA	Portion in FPA not presently sewered
Mountain Lakes[1]	RVRSA	Mostly sewered
Randolph[1]	RVRSA	Portion in FPA is partly sewered
Harding[1]	Covered in Upper Passaic River Basin FPA	
Florham Park [1]	Covered in Florham Park FPA	
Madison Borough [1]	Covered in Upper Passaic FPA	

[1] Municipality partly in Whippany River Basin

Source: The information in this table was derived from "Draft Whippany River Basin Facilities Plan," Whippany River Basin Wastewater Management Committee, March 1977.

in Hanover and a small number of connections in Morris Plains and Parsippany-Troy Hills. Wet weather flows have exceeded average flow by 33 percent, which indicates possible I/I problems.

The Morristown plant was originally constructed in 1909, and has had major revisions in 1930 and 1955. The plant is designed at 1.5 MGD and utilizes the activated sludge process. The average flow to the plant in 1976 was 2.0 MGD. The collection system has 3,884 connections from residential and commercial establishments. Wet weather flows indicate possible I/I, since those flows exceed average flows by 66 percent.

The Morris-Butterworth plant was constructed in 1960 and expanded in 1969 to its current design capacity of 2.0 MGD. The plant utilizes the contact stabilization process. Two industries contribute approximately .245 MGD of the 1976 average flow of 1.5 MGD. The collection system has 2,080 residential, one apartment, three commercial, and two industrial connections recorded. Wet weather flows exceed average flows by around 28 percent.

A facilities plan has been submitted to DEP for review. Before the plan can be approved, a problem dealing with the recommended future capacities of the treatment plants must be resolved. The facilities plan recommends higher capacities than this 208 Plan for some of the facilities.

20. Livingston-Florham Park

The facilities planning area includes the Township of Livingston and the Borough of Florham Park. Each municipality operates its own treatment plant.

The Livingston treatment facility is currently being expanded from 3.0 MGD to 4.2 MGD, with secondary treatment (Step aeration). The flow to the plant in 1976 was 2.88 MGD. The collection system consists of 8,259 connections. Wet weather flows exceed average flows by 54 percent. Recent studies (Metcalf & Eddy, 1974) indicate that the collection system experiences significant I/I problems during wet weather.

The Florham Park plant has a design capacity of 1.0 MGD and utilizes the activated sludge process. The average flow in 1976 was .68 MGD. Plant records indicate that there are 8,094 connections to the collection system.

A facilities plan has not been initiated for the area but will be required for the expansion and upgrading required by this 208 Plan.

21. Essex and Union County Joint Meeting

This facilities planning area includes the following municipalities: Elizabeth, Hillside, Union, Irvington, Maplewood, Millburn, Summit, South Orange, West-Orange and portions of Roselle Park, East Orange, Orange and New Providence.

The Essex and Union County Joint Meeting treatment plant services the planning area. The plant has been expanded from a 50 MGD primary facility to a 75 MGD secondary treatment (activated sludge) plant. The sewer system serves a population of approximately 420,000. Each member of the Joint Meeting operates its own collection system which, with the exception of Elizabeth, has a separate sanitary and storm sewer system. The Elizabeth collection system is currently being studied under their own facilities planning grant. Wet weather flows have reached 92 MGD, indicating a substantial amount of I/I. The entire Joint Meeting system is being studied and recommendations will be forthcoming to control excessive I/I.

22. Upper Passaic River Basin

The facilities planning area for the Upper Passaic River Basin encompasses the municipalities within the drainage basin of the Passaic River above the Canoe Brook Reservoir. There are nine municipal plants in the planning area that serve portions of the municipalities. The municipalities in the planning area, along with the extent of sewer service and the treatment plants serving the area are listed in Table V-8.

The Madison-Chatham Joint Meeting plant was initially constructed in 1910. Subsequent expansions and modifications have enlarged the facility to 4.0 MGD, and incorporated the activated sludge process. The latest improvement occurred in 1971 when tertiary treatment facilities were added in the form of aerated stabilization basins. The average daily flow in 1976 was 3.0 MGD, with only small amounts of industrial wastes. The collection system has approximately 9,600 residential connections. There are approximately 26 miles of sewer in the Borough of Chatham and around 51 miles in Madison. A 1973 study of wet weather flows in the collection system indicated that although infiltration was not significant, substantial quantities of inflow occured during severe storms.

The Bernards plant was constructed between 1963 and 1966 and expanded in 1974 to 1.2 MGD. The facility utilizes high rate trickling filters and had an average flow of .87 MGD in 1976. The municipal system consists of approximately 41 miles of sanitary sewer, with around 2,000 connections, including 75 small businesses. I/I studies (Killam) indicate substantial inflow during wet weather, with flow rates exceeding average flows by over 70 percent.

TABLE V-8

MUNICIPAL SEWER SYSTEMS - UPPER PASSAIC RIVER BASIN

Municipality	Treatment Plant	Extent of Service
New Providence	Jt. Mtg. Essex & Union Co./ New Providence	All sewered
Passaic	Passaic (Stirling)	Partly sewered
Chatham Twp.	Chatham Twp.	Partly sewered
Chatham Boro	Madison-Chatham Jt. Mtg.	All sewered
Madison[1]	Madison-Chatham Jt. Mtg.	All sewered
Berkeley Heights[1]	Berkeley Heights	Mostly sewered
Warren[1]	Warren Stage I-II Warren Stage IV	Partly sewered
Bernards[1]	Bernards Twp. S.A.	Partly sewered
Morris[1]	Woodland	Partly sewered
Harding[1]		Not presently sewered
Summit[1]	Jt. Mtg. Essex and Union Co.	All sewered
Far Hills [1]		Not presently sewered
Bernardsville[1]		Not presently sewered
Mendham Boro[1]	Mendham Boro	Mostly sewered
Mendham Twp.[1]		Not presently sewered
Morristown	Covered in Whippany River Basin FPA	

[1]Municipality partly in Upper Passaic River Basin

Source: The information in this table was derived from "Final Draft Upper Passaic River Basin Facilities Plan," Upper Passaic River Basin Wastewater Management Committee, March 1977.

The Chatham Township plant was constructed in 1966 at a capacity of .75 MGD. The plant utilizes high rate trickling filters and had an average flow of .73 MGD in 1976. The collection system consists of 35 miles of sewer and has over 2,380 connections. An analysis of plant flow (Killam, 1972) indicated that I/I was not a serious problem in the collection system.

The Morris-Woodland plant was constructed in 1960 and expanded in 1967 to its present design capacity of 2.0 MGD. The plant utilizes the activated sludge process and had an average flow of 1.2 MGD in 1976. The collection system has 1,219 residential, nine apartment and 21 commercial connections. Wet weather flows exceed average flows by 60 percent, indicating some I/I problems.

The wastes from New Providence were originally sent to the City of Summit for delivery to the Essex and Union County Joint Meeting. The design capacity of the pumping station to Summit is 1.5 MGD. Excess flow is treated at a 2.8 MGD trickling filter plant. The average flow to the plant was 1.6 MGD on 1976. The municipal system consists of approximately 41 miles of sewer currently servicing 3,422 residential, 595 apartment and 68 commercial connections. Wet weather flows increase by around 50 percent, which is indicative of I/I problems.

The Berkeley Heights plant was originally constructed in 1956 and expanded to its current design capacity of 1.5 MGD in 1966. The plant utilizes high rate trickling filters and had an average flow of 1.38 MGD in 1976. The municipal collection system consists of approximately 54 miles of sanitary sewer and has 3,466 residential and 114 commercial connections. A study (Killam, 1971) concluded that the sewer system is subjected to excessive amounts of I/I. This is substantiated by the fact that peak flows during wet weather of approximately 6.0 MGD have been recorded.

The Warren Stage I and II plant was constructed in 1968 at a capacity of .3 MGD. The facility utilizes the contact stabilization process and had an average flow of .27 MGD in 1976. The Stage I and II collection system consists of 15 miles of sanitary sewer and two pumping stations. Recent repairs on the system have resulted in the elimination of around 70,000 gallons per day (gpd) of I/I. Additional inspections of possible problem areas have been authorized to locate other sources of I/I which currently exist.

The Warren Stage IV plant was constructed in 1965 at a capacity of .3 MGD. The plant utilizes the contact stabilization process and had an average flow in 1976 of .21 MGD. The Stage IV collection system consists of approximately 15 miles of sewer and five pumping stations servicing the western portion of the township. On-going studies indicate that substantial inflows of around 100,000 gpd occur during wet weather periods.

The Township of Passaic operates a trickling filter plant that has a capacity of .65 MGD. The 1976 average flow to the facility was .51 MGD. The municipal collection system, located in the Stirling section of Passaic, has over 1,000 residential and 53 commercial connections. Plant records indicate that wet weather flows exceed average flows by approximatey 50 percent. This would indicate an I/I problem in the system.

A facilities plan for the Upper Passaic River Basin has been submitted to DEP for review. A conflict with the 208 Plan regarding the year 2000 design capacities for the plants must be resolved prior to DEP approval.

23. Rahway Valley Sewerage Authority

The facilities planning area includes the Rahway River Valley from its mouth upstream to Springfield. Municipalities in the area include: Clark, Cranford, Garwood, Kenilworth, Rahway, Springfield, Westfield, Mountainside, Winfield and portions of Roselle Park, Fanwood, Woodbridge and Scotch Plains.

The Rahway Valley S.A. treatment plant serves the entire area with a facility that was upgraded and expanded in 1975. The plant utilizes the activated sludge process and has a design capacity of 35 MGD. The 1976 average flow was 29 MGD. The RVSA maintains a trunk line to accept the sewage from the municipalities' collection systems. The collection system is generally separate, although some combined sewers exist. There is some tidal I/I in the older sewers along the estuary portion of the river.

No new facilities planning is required for the treatment plant, however, combined sewer overflow and I/I studies will be conducted.

24. Linden-Roselle Sewerage Authority

The facilities planning area includes Linden and Roselle. The 12.5 MGD primary facility that serves the area is being expanded and upgraded, with construction scheduled for completion in 1979. The new facility will utilize the activated sludge process and have a design capacity of 19 MGD. The 1976 average flow to the plant was 11.2 MGD. The existing sewer system is of the combined type. This has resulted in wet weather flows of over 16 MGD. The problem of combined sewers in the planning area has been examined in an I/I analysis (Alexander Potter and Assoc., 1973), with plans recommending the construction of new interceptors to relieve overflows from inadequate sewers.

b. Future 201 Facilities Planning Areas The future 201 facilities planning areas will not change considerably from the existing areas. The only areas where a change is recommended is in the Hackensack, Whippany and Upper Passaic River Basins. The Whippany and Upper Passaic facilities plans were initiated on the river basin level; however, the recommendations of the facilities plans call for a continuation of the individual municipal plants except for the combination of the Passaic and Warren plants. Therefore, it is not necessary to continue with regional facilities plans.

The specific recommendations concerning future facilities planning in the Hackensack, Whippany and Upper Passaic River Basins are discussed below and are presented in Figure V-4 and Table V-9.

The Bergen County portion of the Hackensack River Basin currently is divided into three facilities planning areas. Under the recommended point source control plan, discussed later in this chapter, the Tri-Borough and North Arlington-Lyndhurst Joint Meetings would be connected to the Bergen County Utilities Authority (BCUA). Therefore, future planning in this area should be combined under the BCUA. There is still a question, however, as to whether connecting the Joint Meetings to the BCUA will be feasible. If it proves unfeasible, North Arlington-Lyndhurst will continue as its own facilities planning area and may incorporate a portion of the existing Tri-Boro area. The BCUA will be the planning agency for its existing area and either all or part of the Tri-Boro planning area. A final decision on the North Arlington-Lyndhurst and BCUA planning areas will be made in continuing planning only if the recommended plan cannot be implemented.

For the Whippany River Basin facilities planning area it is recommended that East Hanover be included in the Parsippany-Troy Hills area. This is because East Hanover is to be sewered to the Parsippany-Troy Hills treatment facility in the future. It is also recommended that Hanover and Morristown do their own facilities planning since they have their own treatment facilities. Morris Township, which is divided into the Whippany and Upper Passaic Basins should also do facilities planning for the township in conjunction with Morris Plains, since that municipality is connected to one of Morris Township's treatment facilities. Mendham Township and Mendham Borough are also divided by the Whippany, Upper Passaic, and Raritan River Basins. It is recommended that the Township and Borough do a combined facilities plan if the need arises.

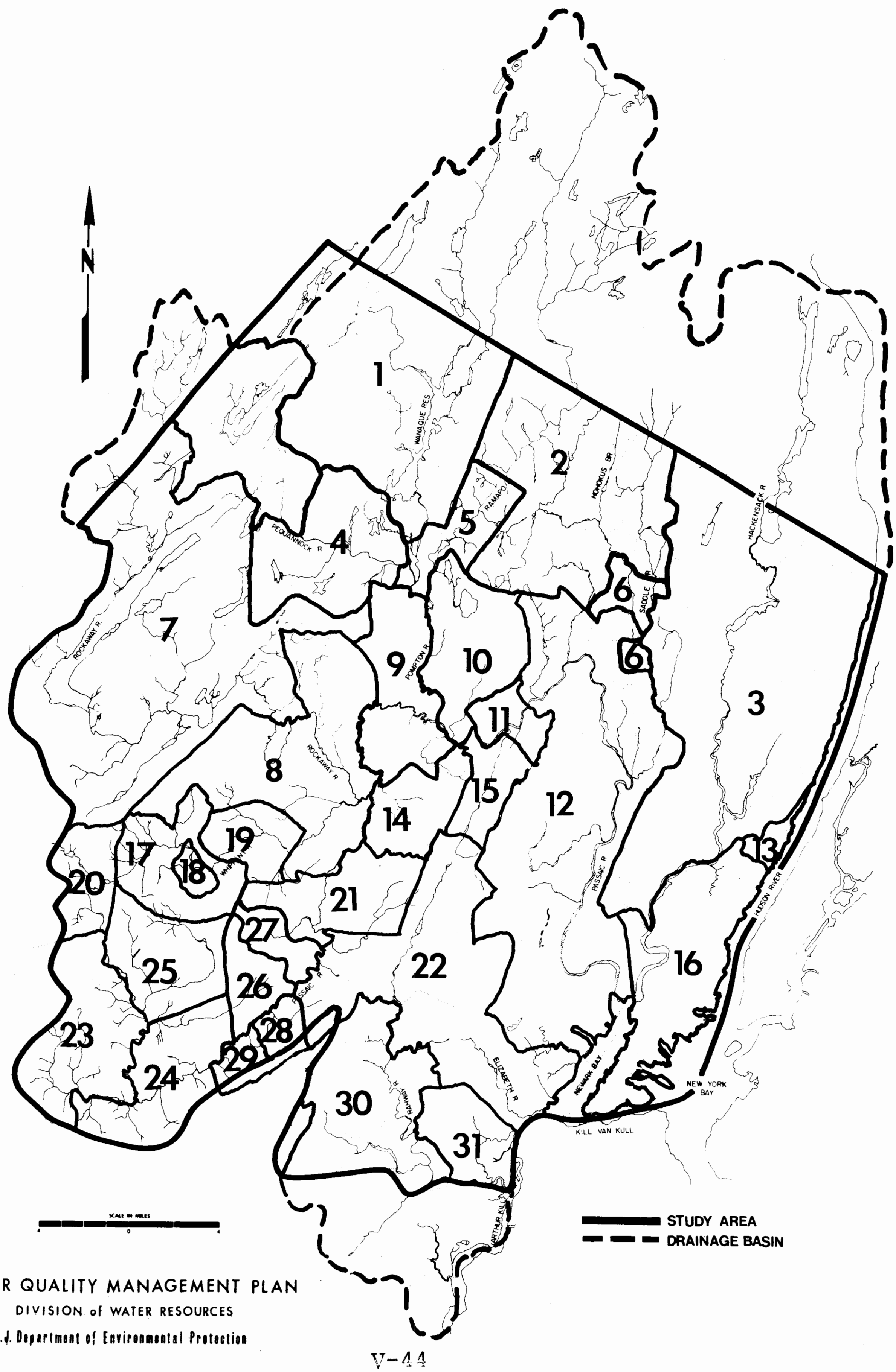
It is recommended that the Upper Passaic River Basin facilities planning area be divided for the purposes of future planning. New Providence, Berkeley Heights, Chatham Township, and Harding should do facilities plans for their municipalities; Madison and Chatham Borough and Passaic and Warren should do joint facilities plans, since these municipalities will be served by a common treatment facility. Bernards should also do its own facilities planning, but in conjunction with Bernardsville and Far Hills, since portions of those municipalities are within the Upper Passaic River Basin.

Table V-9

FUTURE FACILITY PLANNING AREAS

Map No.	Planning Area
1.	Wanaque Valley Regional Sewerage Authority
2.	Northwest Bergen County Utilities Authority
3.	Bergen County Utilities Authority
4.	Pequannock River Basin Regional Sewerage Authority
5.	Pompton Lakes
6.	Ridgewood-Fair Lawn
7.	Rockaway Valley Regional Sewerage Authority
8.	Parsippany-Troy Hills
9.	Pequannock, Lincoln Park and Fairfield
10.	Wayne
11.	Totowa-West Paterson
12.	Passaic Valley Sewerage Commissioners
13.	Edgewater
14.	Caldwell
15.	Peckman River
16.	Hudson County Sewerage Authority
17.	Morris Township
18.	Morristown
19.	Hanover
20.	Mendham Township and Mendham Borough
21.	Livingston-Florham Park
22.	Essex and Union County Joint Meeting
23.	Bernards
24.	Passaic-Warren
25.	Harding
26.	Chatham
27.	Madison-Chatham
28.	New Providence
29.	Berkeley Heights
30.	Rahway Valley Sewerage Authority
31.	Linden-Roselle Sewerage Authority

Fig. V-4
Recommended Future 201 Facilities Planning Areas



WATER QUALITY MANAGEMENT PLAN
DIVISION of WATER RESOURCES
N.J. Department of Environmental Protection

V.B.2 Wastewater Flow Projections

This section presents wastewater flow projections for the municipal sewage treatment plants in the Northeast 208 Study Area (Table V-10). Projections have not been made for treatment plants that will be phased out to another facility or for packaged plants (sewage treatment plants with a design capacity of 150,000 gallons per day or less).

These projections are a departure point, and are subject to change through the facilities planning process. The areas where changes may be made include the portion of the population, to be sewered, the existing industrial flow and the gallons per capita per day figure. The total facilities planning area population, however, cannot be revised, unless another area in the same county is also adjusted to compensate for the difference. The amount of federal and state funds that will be allocated to each facilities planning area will be based on the wastewater flow projections. If an area wishes to construct a facility larger than set forth below, the additional capacity will have to be financed entirely by the municipalities in the facilities planning area.

The section is organized into two parts. The first part details the methodology utilized to determine the projections, while the second part gives a brief description of the projection for each treatment plant.

a. Wastewater Flow Projection Methodology The methodology utilizes a three step process for determining the wastewater flow projections. The first step is a determination of the domestic flow for each facilities planning area. For the purpose of these projections, the domestic flow includes wastewater flow from residential sources, commercial sources and nonexcessive infiltration/inflow (I/I). The estimate of 100 gallons per capita per day (gpcpd) was used, along with the population to be served by each treatment plant, for projecting domestic flow.[1] The facilities planning area population projections discussed in Chapter IV are utilized as a starting point in determining the sewered population. For those areas where the facilities planning area will not be totally sewered by the year 2000 an estimate of the percent to be sewered was made. The Northeast New Jersey Water Quality Management Study had developed percentages of the population to be sewered, based on population density. This information was utilized and updated with information from the facilities plans. Table V-11 presents the sewered population and the population not to be sewered to a regional facility for each facilities planning area. With the sewered population determined, the domestic flow was derived by multiplying that figure by 100 gpcpd.

[1] The 100 gpcpdestimate includes 60-80 gpcpd from residential, commercial and institutional sources (40 CFR, Part 35, Subpart E, Appendix A) and 20-40 gpcpd from nonexcessive I/I.

TABLE V-10

Wastewater Flow Projections

Treatment Plant	Domestic Flow	Existing Industrial Flow	Future Industrial Flow	Other Flow	Total Flow
Bergen County Utilities Auth.	62.6	10.2	3.6	6.2 (I/I)	82.6
Caldwell	4.8	1.0	0.3		6.1
Edgewater	2.9	0.2	0.2		3.3
Essex & Union County Jt. Meeting				Constructed at	75
Hudson County Sewerage Authority					
Bayonne	7.1	1.4	0.4	1.2 (I/I)	10.1
Hoboken	14.8	3.1	0.9	2.3 (I/I)	21.1
Jersey City East	32.4	7.7	2.0	14.2 (I/I)	56.3
Secaucus				No expansion	2.25
Linden-Roselle Sewerage Authority				Under Construction at	19
Livingston-Florham Park					
Livingston	3.5	A			B
Florham Park	0.9	A			B
Northwest Bergen County Utilities Authority	7.4	A			B
Passaic Valley Sewerage Commissioners				Under Construction at	300
Parsippany-Troy Hills				Constructed at	16
Peckman River					
Cedar Grove	1.6	A			B
Little Falls	1.4	A			B
Verona	2.0	A			B
Pequannock, Lincoln Park & Fairfield				Under Construction at	7.5
Pequannock River Basin	2.3	A			B
Pompton Lakes	2.8	A			B
Rahway				Constructed at	35
Ridgewood-Fair Lawn					
Fair Lawn	2.3	0.0	0.1		2.4
Ridgewood	2.7	0.0	0.2		2.9
Rockaway Valley Regional Sewerage Auth.				Certified at	12.0
Totowa-West Paterson					
Totowa	1.3	0.4	0.1	0.3 (I/I & Training School)	2.1
West Paterson	1.3	0.7	0.2		2.2

TABLE V-10 (continued)

Wastewater Flow Projections

Treatment Plant	Domestic Flow	Existing Industrial Flow	Future Industrial Flow	Other Flow	Total Flow
Upper Passaic River Basin					
Berkeley Heights				Certified at	3.1
Bernards	1.5	0.1	0.1	0.6 (Lyons & Warren)	2.3
Chatham	0.9	0.0	0.1		1.0
Madison-Chatham	3.3	0.0	0.2		3.5
Morris-Woodland	1.1	0.5	0.1	0.3 (I/I & Harding)	2.0
New Providence	1.4	0.3	0.1	0.3 (I/I)	1.0[1]
Passaic-Stirling	1.3	0.2	0.1	0.1 (I/I)	1.7
Wanaque Valley Regional S.A.				Certified at	2.5
Wayne				Certified at	13.5
Whippany River Basin					
Hanover	1.5	1.3	0.3		3.1
Morristown				Certified at	3.45
Morris-Butterworth	1.9	0.6	0.2	0.6 (Greystone & Randolph)	3.3

A - To be determined in 201 facilities plan.
B - To be determined during continuing planning.

Note: All flows are in MGD. [1]1.1 MGD from New Providence to Summit.

Table V-11

Future Facilities Planning Area Population-Year 2000

Facilities Planning Area	Population Sewered	Population Not Sewered
Bergen County Utilities Authority	626,132	1,810
Caldwell	47,772	0
Edgewater	28,680	0
Essex & Union County Jt. Meeting	417,515	0
Hudson County Sewerage Authority	558,450	0
Bayonne	71,027	0
Hoboken	148,208	0
Jersey City East	295,815	0
Secaucus	43,400	0
Linden-Roselle Sewerage Authority	61,956	0
Livingston-Florham Park	44,266	2,174
Livingston	35,000	0
Florham Park	9,266	2,174
Northwest Bergen County Utilities Authority	74,020	18,290
Passaic Valley Sewerage Commissioners	1,119,212	0
Parsippany-Troy Hills	87,984	12,376
Peckman River	48,752	0
Cedar Grove	15,450	0
Little Falls	13,854	0
Verona	19,448	0
Pequannock, Lincoln Park & Fairfield	37,753	4,912
Pequannock River Basin	23,118	7,306
Pompton Lakes	27,480	2,465
Rahway	154,842	0
Ridgewood-Fair Lawn	50,155	0
Fair Lawn	23,005	0
Ridgewood	27,150	0
Rockaway Valley Regional Sewerage Authority	102,856	26,619
Totowa-West Paterson	25,480	0
Totowa	13,000	0
West Paterson	12,480	0
Upper Passaic River Basin	109,043	19,049
Berkeley Heights	13,216	0
Bernards	14,729	3,682
Chatham	8,736	2,184
Madison-Chatham	33,280	0
Morris-Woodland	10,449	0
New Providence	13,504	0
Passaic-Stirling	12,629	4,824
Wanaque Valley Regional Sewerage Authority	20,446	24,872
Wayne	54,600	0
Whippany River Basin	60,095	179
Hanover	15,080	0
Morristown	24,730	0
Morris-Butterworth	19,245	179
TOTAL	3,780,607	121,092

The second step in the methodology is to determine the existing and future industrial flows. Existing industrial flows, where available, were taken from the facility plans. For those facilities planning areas that have not initiated a facilities plan or did not present the existing industrial flows, this information will have to be determined before a final flow projection can be derived. As specified in USEPA Cost-Effectiveness Analysis Guidelines additional future industrial flows must be determined by one of the following two techniques. The first technique sums the domestic flow, existing industrial flow and any documented future industrial flows and multiplies this by 5 percent (10 percent for towns with less than 10,000 population). This is considered to be the future industrial flow. The second technique allows the additional future industrial flow to be 25 percent of the existing and documented future industrial flow.

With the domestic and industrial flows determined, the wastewater flow projections can be determined by summing the flows developed in the two preceding steps. This wastewater flow projection is considered to be the design capacity of the treatment plant, unless the facility will receive the flow from an institutional treatment plant that will be phased out or the service area has excessive I/I that cannot be cost-effectively removed. In these cases the additional flow from those faclities to be phased out or the amount of excessive I/I is added to wastewater flow projection to determine the design capacity of the treatment plant.

b. Treatment Plant Wastewater Flow Projections The wastewater flow projections for each treatment plant are discussed below. Information contained in the discussion will include the municipalities totally and partly sewered, a projection of the sewered population for the year 2000 for each facility, the domestic flow, the industrial flow and the resulting design capacity. For municipalities partly sewered, the percent of the year 2000 population that will receive treatment is indicated in parentheses after each municipality. Municipalities not listed under any treatment plant are Alpine, Franklin Lakes, Mendham Boro, Mendham Township, Rockleigh and West Milford; the portions of these municipalities in the study area are not scheduled to be sewered to a regional plant.

1. Bergen County Utilities Authority (BCUA). The municipalities to be totally sewered to the BCUA plant in the year 2000 include; Bergenfield, Bogota, Carlstadt, Closter, Cresskill, Demarest, Dumont, Emerson, Englewood, Englewood Cliffs, Fairview, Hackensack, Harrington Park, Hasbrouk Heights, Haworth, Hillsdale, Leonia, Little Ferry, Maywood, Montvale, Moonachie, New Milford, Northvale, Norwood, Old Tappan, Oradell, Palisades Park, Paramus,

Park Ridge, Ridgefield, Ridgefield Park, River Edge, River Vale, Rochelle Park, Teaneck, Tenafly, Teterboro, Washington, Westwood, Woodcliff Lake and Wood Ridge. The municipalities that will be partly sewered to the plant by the year 2000 are; Cliffside Park (14%), East Rutherford (86%), Fort Lee (91%), Lyndhurst (56%), North Arlington (50%) Rutherford (67%), South Hackensack (92%).

The year 2000 sewered population from the above municipalities is projected at approximately 626,000 with a resulting domestic flow of 62.6 MGD. The industrial flow is projected to be 13.8 MGD. This results in a wastewater flow projection of 76.4 MGD. However, since the BCUA service area has some combined sewers and areas that experience excessive I/I, an allowance of 6.2 MGD, above the nonexcessive I/I incorporated in the 100 gpcpd figure is incorporated into the design capacity. Therefore, the year 2000 design capacity of the BCUA facility is 82.6 MGD.

2. <u>Caldwell</u> - The Caldwell plant will totally serve Caldwell, Essex Fells, Roseland and West Caldwell and partially serve Fairfield (2.8%), North Caldwell (98.1%) and West Orange (0.3%) by the year 2000. The population to be served by the plant by 2000 is projected at approximately 48,000, which results in a domestic flow of 4.8 MGD. The industrial flow is projected to be 1.3 MGD. Summing the above projections results in a year 2000 design capacity of 6.1 MGD.

3. <u>Edgewater</u> - The Edgewater plant will totally serve Edgewater while partly serving Cliffside Park (86%) and Fort Lee (9%). The projected sewered population of these municipalities for the year 2000 is about 29,000. The resulting domestic flow is 2.9 MGD, while the industrial flow is projected to be .4 MGD. The year 2000 design capacity of the Edgewater plant is therefore 3.3 MGD.

4. <u>Essex and Union County Joint Meeting</u>. The municipalities that will be totally served by the Joint Meeting plant include; Irvington, Maplewood, Millburn, South Orange, Elizabeth, Hillside, Summit and Union. Municipalities that will be partly sewered are East Orange (26%), Newark (9%), West Orange (92.7%) and Roselle Park (87%). The projected sewered population for these municipalities for the year 2000 is approximately 418,000. The Joint Meeting plant has recently been expanded to 75 MGD, and this capacity will be sufficient to the year 2000.

5. Hudson County Sewerage Authority (HCSA). The HCSA area is currently served by nine primary plants and one secondary plant. Five of the primary plants are recommended to be phased out by the year 2000, therefore, wastewater flow projections were developed and are discussed below for the four plants that will serve the area.

Bayonne - The Bayonne plant will continue to serve most of the municipality (99.2%), which is projected to have a sewered population of around 71,000 persons by the year 2000. The domestic flow is projected to be 7.1 MGD, while the industrial flow is projected to be 1.8 MGD. Due to the combined sewers in Bayonne an allowance of 1.2 MGD for excessive I/I is included in the year 2000 design capacity of 10.1 MGD.

Secaucus - The 2.25 MGD secondary facility serving a portion of Secaucus will remain in operation at that capacity. The flow from Secaucus above 2.25 MGD will be transmitted to the Jersey City East Facility for treatment.

Jersey City East - The Jersey City East plant will continue to serve its existing service area along with flows from the North Bergen North and Central plant, the Jersey City West facility and the flow from Secaucus above 2.25 MGD. Jersey City will be totally served by the facility along with portions of Bayonne (0.8%), North Bergen (79.7%) and Union City (28.5%). The domestic flow from the 296,000 persons projected for the year 2000 is therefore projected to be 29.6 MGD; with an additional 9.7 MGD in industrial flow. Adding in the flow from Secaucus above 2.25 MGD (2.8 MGD) along with the tidal inflow and excessive I/I (14.2 MGD), the year 2000 design capacity of the Jersey City East plant is 56.3 MGD.

Hoboken - The Hoboken plant will serve its existing service area along with the areas currently served by the West New York and North Bergen - Guttenberg facilities. The Hoboken facility will totally serve Hoboken, Weehawken and West New York along with portions of North Bergen (20.3%) and Union City (71.5%). The projected sewered population for this area for the year 2000 is approximately 148,000. The resulting domestic flow is 14.8 MGD, with an additional 4.0 MGD in industrial flow. Due to the combined sewers in the area an allowance of 2.3 MGD for excessive I/I is included in the year 2000 design capacity of 21.1 MGD.

6. Linden-Roselle Sewerage Authority - The Linden-Roselle plant serves Linden and Roselle, which are projected to have a combined population of 62,000 in the year 2000. The Linden-Roselle plant, has recently been expanded to 19 MGD, which will be the year 2000 design capacity.

7. Livingston - Florham Park - Livingston and Florham Park each operate their own treatment plant and are discussed separately below.

Livingston - The Livingston plant will totally serve the municipality, which is projected to have a sewered population in the year 2000 of approximately 35,000. The domestic flow is therefore 3.5 MGD. The existing industrial flow will be determined by the facilities plan for this area and will be added to the domestic and future industrial flows to arrive at the year 2000 design capacity.

Florham Park - The Florham Park plant is projected to serve 81 percent of the municipality's population. The projected sewered population for the year 2000 is approximately 9,000, which gives a domestic flow of 0.9 MGD. As is the case for Livingston the facilities plan will determine the existing industrial flow and utilize the above methodology to derive the year 2000 design capacity.

8. Northwest Bergen County Utilities Authority (NWBCUA) The NWBCUA plant will totally serve Hohokus, Midland Park, and Waldwick, while partly serving Allendale (89%), Mahwah (68%), Ramsey (93%), Saddle River (71%), Upper Saddle River (85%) and Wyckoff (92%). The projected year 2000 sewered population for these municipalities is approximately 74,000 which results in a domestic flow of 7.4 MGD. The existing industrial flow will be determined in the facilities plan and will be added to the domestic and future industrial flows to arrive at the year 2000 design capacity.

9. Passaic Valley Sewerage Commissioners (PVSC). The PVSC plant will totally serve Elmwood Park, Gairfield, Glen Rock, Lodi, Saddle Brook, Wallington, Belleville, Bloomfield, Glen Ridge, Montclair, Nutley, Orange, East Newark, Harrison, Kearny, Clifton, Haledon, Hawthorne, North Haledon, Passaic, Paterson, and Prospect Park. The municipalities that will be partially served include; East Rutherford (14%), Fair Lawn (38%), Lyndhurst (44%), North Arlington (50%), Rutherford (33%), South Hackensack (8%), East Orange (74%), Newark (91%), and Little Falls (3%). The projected sewered population from the above municipalities is about 1,119,000 for the year 2000. The PVSC plant has been expanded to 300 MGD, which will be the year 2000 design capacity.

10. Parsippany-Troy Hills - The Parsippany-Troy Hills plant will serve part of East Hanover (81%), Montville (76%), Mountain Lakes (86%) and Parsippany-Troy Hills (92%).

The projected year 2000 sewered population for the municipalities is approximately 88,000. Since the Parsippany-Troy Hills plant has a design capacity of 16 MGD, the year 2000 design capacity will be 16 MGD.

11. Peckman River - The domestic flow projections for the four treatment plants in the Peckman River basin are discussed separately since each plant will remain in operation. The ongoing facilities plan will determine the existing industrial flow for each plant. The year 2000 design capacities will then be determined.

    Cedar Grove - The Cedar Grove plant will serve around 96.7 percent of the municipality's year 2000 population or 16,000 persons. The domestic flow is therefore 1.6 MGD.

    Essex County Hospital - The Peckman River facilities plan projects a decrease in the flow of the hospital from an existing 0.5 MGD to around 0.36 MGD by 1987. Therefore, the existing 1.5 MGD capacity is sufficient for the year 2000.

    Little Falls - The municipalities partly served by the Little Falls plant include; Little Falls (97%), Cedar Grove (3.3%), and North Caldwell (1.9%). The projected year 2000 sewered population of the three municipalities is approximately 14,000, which results in a domestic flow of 1.4 MGD.

    Verona - The Verona plant will serve the entire municipal population, along with part of West Orange (7%). The sewered population of the municipalities is projected to be about 20,000 for the year 2000. The domestic flow is therefore 2.0 MGD.

12. Pequannock, Lincoln Park and Fairfield - The municipalities that will be partially served by the new Pequannock, Lincoln Park and Fairfield plant are, Fairfield (90%), Lincoln Park (83%), and Pequannock (89%). The year 2000 sewered population for these municipalities is around 38,000. The design capacity of the new plant is 7.5 MGD. If this capacity is insufficient for the year 2000 a decision on the necessary capacity will be made as the need arises.

13. Pequannock River Basin Regional Sewerage Authority - The Butler-Bloomingdale plant will totally serve Butler and Bloomingdale and partially serve Kinnelon (27%) and Riverdale (18%). Population projections for the year 2000 indicate the plant will serve approximately 23,000 persons. The domestic flow is therefore 2.3 MGD. The ongoing facilities plan will determine the existing industrial flow for the facility. The year 2000 design capacity will then be determined.

14. Pompton Lakes - The Pompton Lakes plant will totally serve Pompton Lakes while partly serving Oakland (87%) and Riverdale (66%). These municipalities have a projected sewered population for the year 2000 of around 28,000, which results in a domestic flow of 2.9 MGD. The existing industrial flow will be determined by the facilities plan for this area and will be added to the domestic and future industrial flows to derive the year 2000 design capacity.

15. Rahway Valley Sewerage Authority - The municipalities that will be totally sewered to the Rahway plant include; Clark, Cranford, Garwood, Kenilworth, Mountainside, Rahway, Springfield, Westfield, and Winfield. The plant will partially serve Fanwood (5%), Roselle Park (13%) and Scotch Plains (44%). A portion of Woodbridge in Middlesex County, is also sewered to the Rahway plant. The projected sewered population for the above municipalities, excluding Woodbridge, is approximately 155,000 for the year 2000. The Rahway plant was recently expanded to 35 MGD, which will be the year 2000 design capacity.

16. Ridgewood-Fair Lawn - The Ridgewood and Fair Lawn treatment plants were originally recommended to be phased out to PVSC. However, more recent information indicates that will not be possible and the plants should remain in operation. Therefore, wastewater flow projections are compiled for each plant.

    Fair Lawn - The Fair Lawn plant serves around 62 percent of the municipal population or a year 2000 projection of approximately 23,000 persons. Summing the domestic flow of 2.3 MGD with the projected industrial flow of 0.1 MGD results in a year 2000 design capacity of 2.4 MGD.

    Ridgewood - Ridgewood's projected year 2000 population of about 27,000 will be served by their plant. Adding the domestic flow of 2.7 MGD to the projected industrial flow of 0.2 MGD results in a year 2000 design capacity of 2.9 MGD. However, the Ridgewood plant has large quantities of infiltration and inflow which may necessitate a higher design capacity. This will depend on the results of the facilities plan.

17. Rockaway Valley Regional Sewerage Authority (RVRSA). Municipalities that will be totally served by the RVRSA plant include, Boonton Town, Dover, Rockaway Boro, Victory Gardens, and Wharton. The plant will also serve portions of Boonton Township (60%), Denville

(83%), Jefferson (20%), Mine Hill (58%), Randolph (65%), Rockway Township (61%), and Roxbury (3%). The projected sewered population from the above municipalities is around 103,000 for the year 2000. The RVRSA plant has been certified for an expansion to 12.0 MGD, which should be sufficient for the year 2000.

18. Totowa-West Paterson - The Totowa and West Paterson plants were to be combined at a regional facility in Totowa. However, since that alternative no longer seems implementable both plants will probably remain in operation. Therefore, wastewater flow projections were compiled for each plant.

Totowa - The Totowa plant will serve the municipalities projected year 2000 population of approximately 13,000. Summing the domestic flow of 1.3 MGD, the projected industrial flow of 0.5 MGD and the 0.3 MGD from the North Jersey Training School and infiltration/inflow, results in a year 2000 design capacity of 2.1 MGD.

West Paterson - West Paterson's treatment plant will serve the municipalities projected population of around 13,000 for the year 2000. This results in a domestic flow of 1.3 MGD, which when added to the projected industrial flow of 0.9 MGD gives a year 2000 design capacity of 2.2 MGD.

19. Upper Passaic River Basin - The wastewater flow projections for the seven treatment plants that will remain in operation in the basin are discussed below. The existing industrial flows utilized in the following projections may be outdated and will be revised on an individual basis.

Berkeley Heights - The Berkeley Heights plant will totally serve the municipality's projected year 2000 population of about 13,000 persons. Summing the 1.3 MGD domestic flow with the 0.2 MGD from Watchung and the projected industrial flow of 1. 4 MGD results in a wastewater flow projection of 2.9 MGD. However, since this facility has been designed at 3.1 MGD and it would not be cost-effective to redesign the facility, the year 2000 design capacity will be 3.1 MGD.

Bernards - Bernards' treatment plant will serve about 15,000 persons or 76 percent of the projected population for the year 2000. Adding the 0.2 MGD from Warren results in a domestic flow of 1.7 MGD. The projected industrial flow is 0.2 MGD. Using the above domestic and industrial flows plus the 0.4 MGD that will come from the Veterans Hospital at Lyons, gives the Bernards plant a year 2000 design capacity of 2.3 MGD. However, since the municipality is subject to excessive I/I the year 2000 design capacity may have to be increased. This problem will be resolved through the facilities planning process.

Chatham Township - The Chatham Township plant will serve 80 percent or about 9,000 persons of the projected year 2000 population. This results in a domestic flow of 0.9 MGD, which when added to the projected industrial flow of 0.1 MGD gives the plant a year 2000 design capacity of 1.0 MGD.

Madison Chatham Joint Meeting - The Joint Meeting plant will totally serve Chatham Boro and Madison. The projected population of these two municipalities is approximately 33,000 for the year 2000, which results in 3.3 MGD of domestic flow. Summing the domestic flow with the projected industrial flow of 0.2 MGD gives the plant a 3.5 MGD design capacity for the year 2000.

Morris-Woodland - The Morris-Woodland plant will serve 41 percent of the Township's projected year 2000 population or about, 11,000 persons. This results in a domestic flow of 1.2 MGD, with the inclusion of 0.1 MGD from Harding. The industrial flow is projected to be 0.6 MGD. Adding the domestic and industrial flows and an allowance of 0.2 MGD for I/I results in a year 2000 design capacity of 2.0.

New Providence - New Providence has its own treatment plant which treats the flows in excess of the amount pumped to Summit for delivery to the Essex and Union Joint Meeting plant. The municipality is projected to have a population of about 14,000 by the year 2000. The resulting domestic flow is 1.4 MGD and the industrial flow is projected to be 0.4 MGD. This gives a total flow of 1.8 MGD, however, only part of this is treated at the New Providence plant. The maximum flow that can be sent to Summit is 1.5 MGD but usually only around 1.1 MGD is transmitted. This leaves a wastewater flow projection for the New Providence plant at 0.7 MGD. However, since the municipality is subject to excessive I/I in the amount of 0.3 MGD the year 2000 design capacity is 1.0 MGD. This capacity will be for the nitrification units only.

Passaic - Stirling - The Stirling plant will serve portions of Passaic (66%) and Warren (39%). The projected sewered population of these municipalities is approximately

13,000 for the year 2000, which gives a domestic flow of 1.3 MGD. Adding the domestic flow to the projected industrial flow of 0.3 MGD and an I/I allowance of 0.1 MGD results in a year 2000 design capacity of 1.7 MGD.

20. Wanaque Valley Regional Sewerage Authority - The Wanaque plant will totally serve Wanaque and partially serve Ringwood (69%). The sewered population for the two municipalities is projected to be about 21,000 by the year 2000, which is 2.1 MGD in domestic flow. The Wanaque plant has been certified by DEP for 2.5 MGD, which will be the year 2000 design capacity.

21. Wayne - The Mountainview plant will totally serve the municipalities forecasted population of around 56,000 for the year 2000. The Wayne plant has been certified and approved by EPA and is under design at 13.5 MGD, which will be the year 2000 design capacity.

22. Whippany River Basin - Wastewater flow projections for the three treatment plants that will serve the basin are discussed below.

    Hanover - The Hanover plant will serve Hanover's entire year 2000 population, or approximately 15,000 persons, which results in a domestic flow of 1.5 MGD. The Hanover plant already serves a few industries in East Hanover and will continue to due so when East Hanover is sewered to Parsippany-Troy Hills. Therefore the industrial flow projection is 1.6 MGD, which gives a year 2000 design capacity of 3.1 MGD.

    Morristown - The Morristown plant will totally serve Morristown and partly serve Morris Township (9.3%). The sewered population for the municipalities is projected to be about 25,000 persons by the year 2000. The Morristown plant has been certified at 3.45 MGD and that will be the year 2000 design capacity.

    Morris Butterworth - The Butterworth plant will partially serve Morris Township (49%) and totally serve Morris Plains. The projected sewered population for the two municipalities is around 19,000 for the year 2000. This gives a domestic flow of 1.9 MGD, while the industrial flow is projected to be 0.8 MGD. Summing the domestic and industrial flows and adding in the flow from Greystone Hospital (0.4 MGD) and Randolph Township (0.2 MGD) results in a year 2000 design capacity of 3.3 MGD.

V.B.3. Alternative Waste Treatment Systems

The traditional method of providing community wastewater treatment has been through the construction of regional collection systems and central treatment plants. In certain localities such as high density areas, this has proven to be the most cost effective and environmentally acceptable method available. However, due to the high capital and operating costs, these regional treatment systems have put a burden on smaller communities and emphasis on them has in some instances postponed action to alleviate pollution problems. Because of the high costs of these systems, it has become necessary to analyze alternatives to regional systems. Alternatives to regional systems involve three basic methods of wastewater treatment: (1) on-site disposal in which the effluent is disposed in the immediate vicinity of its source (examples: septic tanks, mound systems, aerobic systems) (2) small waste treatment systems serving a limited area (examples: conventional sewage plants, lagoons, and spray disposal systems) (3) methods involving reduction or recycling of liquid wastes (examples: separation of grey and black water effluent, chemical toilets, composting toilets, and conservation techniques.)

In addition to those areas being considered for regional sewage treatment systems there are areas in the State that are experiencing septic tank failures which need to analyze that problem and determine a solution. Often in the more rural portions of the state the solution will utilize some form of on-site disposal. These areas are now eligible for federal grants to aid in the analysis and implementation of individual disposal systems. In order to qualify for the federal grants a 201 facilities plan will have to be developed that incorporates the new rules and regulations for these plans along with the guidelines presented later in this section.

Section 201 of the Act provides federal funds to municipalities for the planning and construction of sewage treatment facilities. Proper facilities planning, however, involves a comparison of all feasible alternatives for wastewater treatment so that the most cost-effective solutions, which will minimize total costs to the community and the environment over time, can be found. Some of the alternatives which should be evaluated include soil treatment systems such as septic tanks and their modifications, aerobic treatment, wastewater separation, recycle systems, lagoons, community septic systems and small decentralized treatment plants. These systems are briefly described in Section a., below.

This Plan gives guidance to 201 facility planning agencies and communities on how to determine areas that need to be sewered and those which may utilize alternative systems. This has been done by the development of Guidelines for the Evaluation of Alternatives to Regional Treatment Systems in 201 Facilities Plans.

The continuing planning program will develop technical working papers on determining the sites suitable for land disposal of wastewater, on-site disposal and spray irrigation systems, and standards and management practices for such systems. These working papers will be utilized in the facilities planning process in order to aid in the evaluation of the alternative systems. The 201 facilities planning process will be responsible for determining the areas that can utilize alternative systems including on-site disposal by conducting the analyses mandated by the Guidelines.

Delineation of these areas may result in continued or increased use of on-site disposal techniques; therefore it will be necessary to implement a management program for the use of on-site systems. This management program should include both planning and regulatory responsibilities, administered by one or more agencies. Planning responsibilities could include determining the acceptable upper limit for septic tank density, identifying a method of rehabilitating or replacing septic systems that have failed and finding answers and locations for disposal of septage. Regulatory responsibilities of the agency or agencies could include insuring proper site selection, design, installation and maintenance of the on-site systems. The Water Quality Management Planning Program is in the process of developing this on-site system management program. The results and recommendations from the initial analysis in the development of this program are discussed in the last part of this section.

a. Description of Alternative Wastewater Disposal Systems

The most common types of alternative systems include septic tanks, standard treatment followed by spray irrigation, decentralized treatment plants, lagoons, and composting toilets. These systems are each described briefly below. Sketches of the systems in operation are provided in Figures V-5 - V-10 and Table V-12 compares ranges of the capital costs and installation. These cost estimates are for the purpose of illustration on a Statewide basis only, they are not intended to replace the site-specific estimates which are necessary to assess the cost-effectiveness of alternative wastewater disposal systems in 201 facilities planning.

Septic Tanks

The most common on-site wastewater treatment systems are septic tanks. This is mostly due to the fact that they are relatively inexpensive and simple to operate and maintain. A septic tank, as the name implies, requires anaerobic

Table V-12

Cost Estimates for Selected
Alternative On-Site Wastewater Disposal Systems

Average Initial Costs of Home Treatment/Disposal Systems

Type of System	Initial Cost
Septic Tank/Leach Field System	$1,200-$3,200
Septic Tank/Subsurface Disposal Beds	$1,200-$6,900
Septic Tank/Mound	$3,000-$7,500
Aerobic Treatment Units	$1,000-$4,000
Composting Toilets	$1,500-$2,000

Source: On-Site Disposal Systems and Septage Treatment and Disposal, U.S.E.P.A. National Conference on 208 Planning and Implementation, Presented by Anderson-Nichols & Co., Inc., Boston, Massachusetts, March 15-17, 1977.

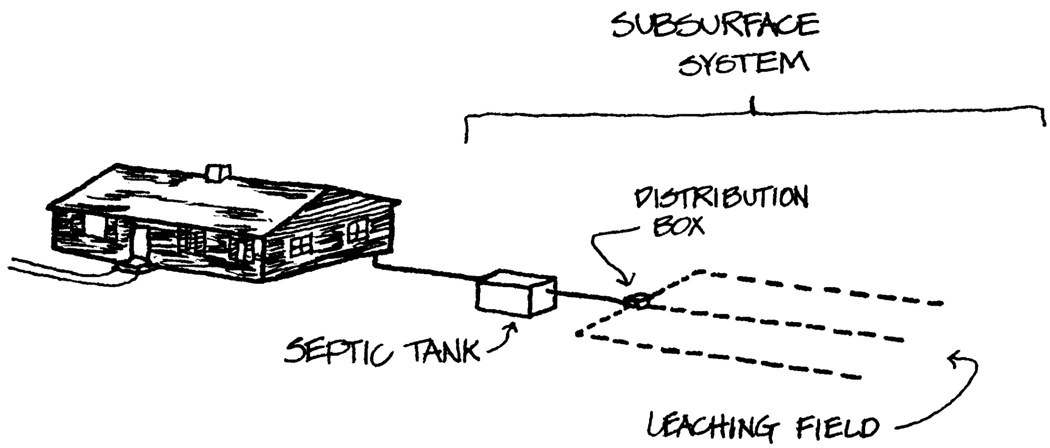


Figure V-5

Typical Layout of a Septic Tank and Leaching Field

Source: Cleaning up the Water. Private Sewage Disposal in Maine
Maine Department of Environmental Protection, July 1974

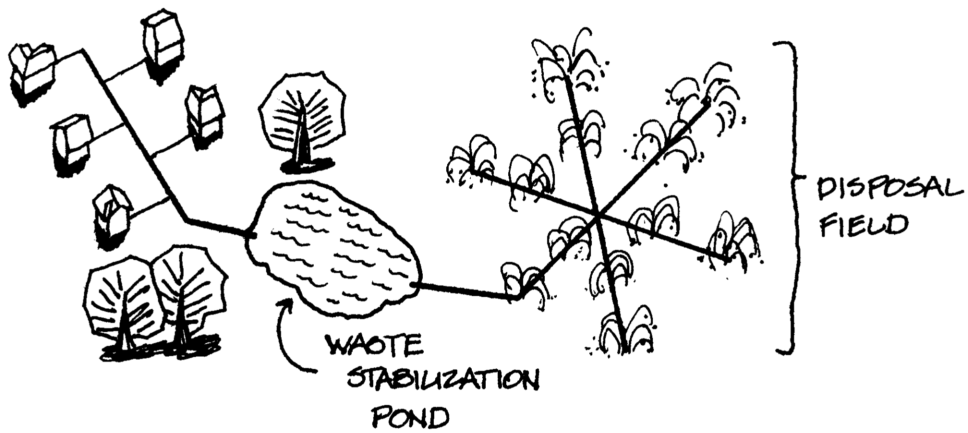


Figure V-6

Typical Spray Irrigation System

Source: Goldstein, Steven N. and Walter J. Moberg, Jr. Wastewater Treatment Systems for Rural Communities. Commission on Rural Water, Washington, D.C., 1973.

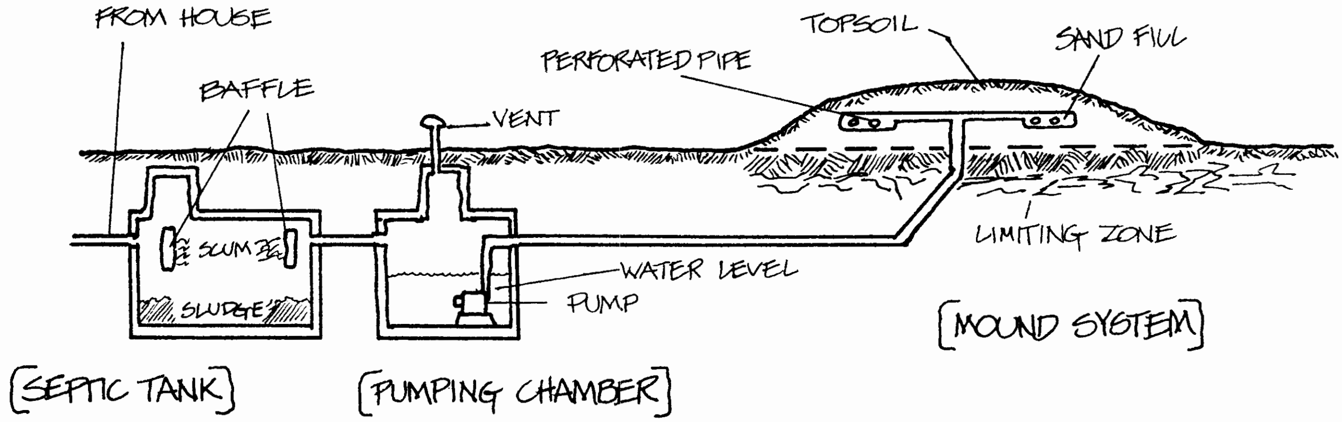


Figure V-7

Typical Layout of a Mound System

Source: Alternatives for Small Wastewater Treatment Systems. Environmental Protection Agency, Environmental Research Information Center, Cincinnati, Ohio. October, 1977.

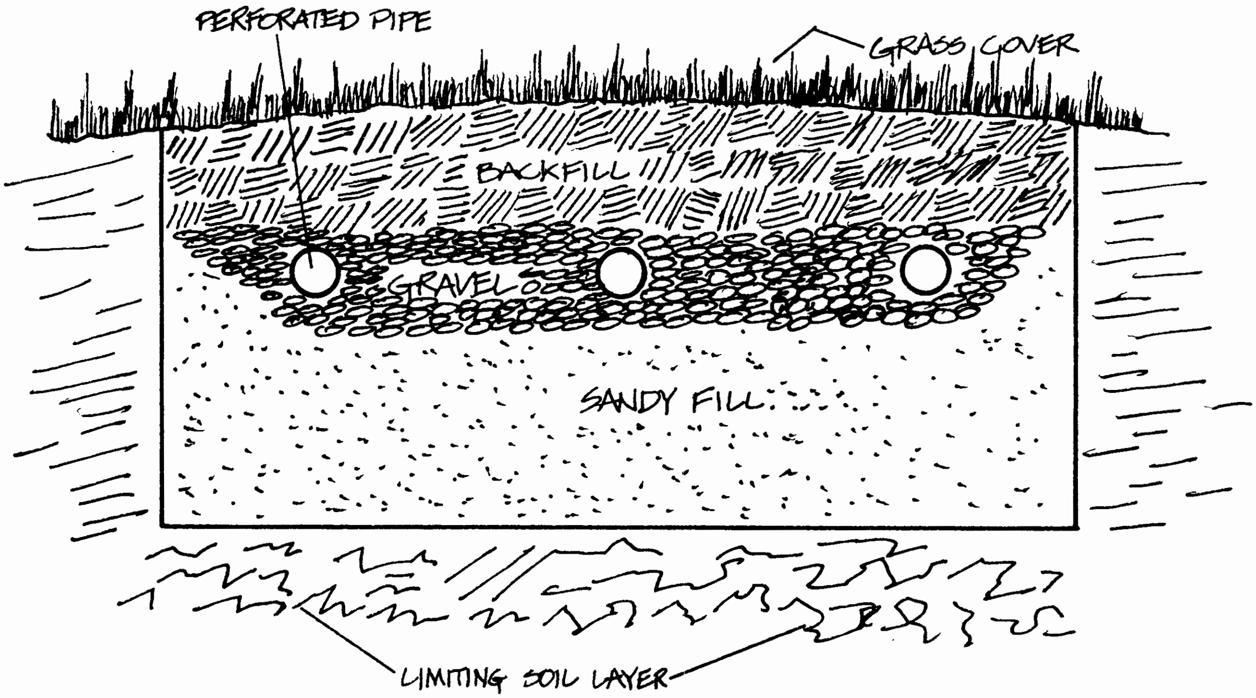


Figure V-8

Sand Lined Bed

Source: Home Sewage Disposal. Special Circular 212, Pennsylvania State University, College of Agriculture, University Park, Pennsylvania.

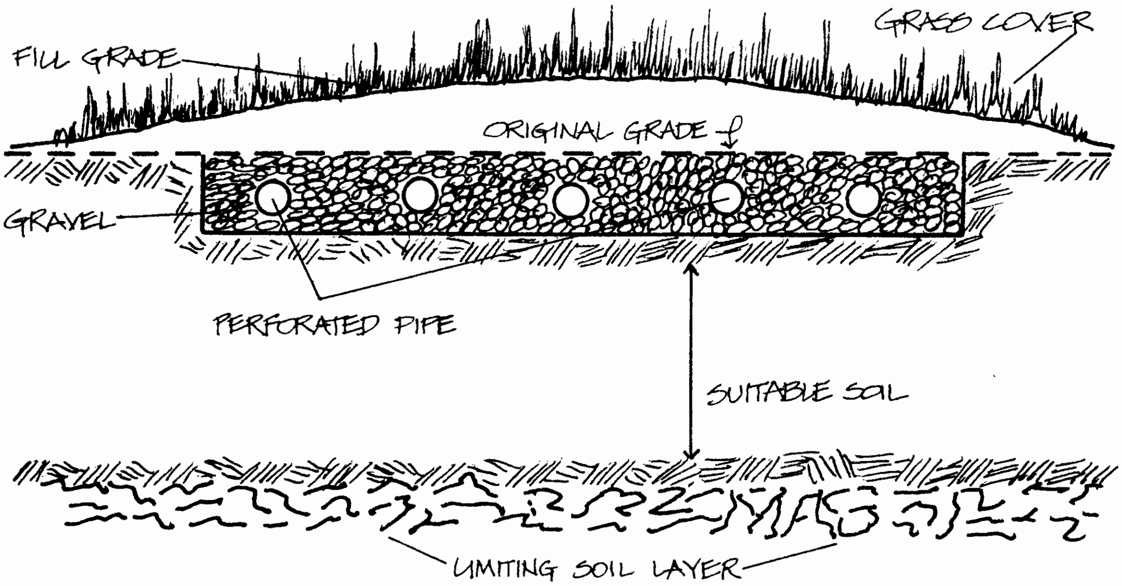


Figure V-9

Shallow Placement Absorption Area

Source: Home Sewage Disposal. Special Circular 212, Pennsylvania State University, College of Agriculture, University Park, Pennsylvania.

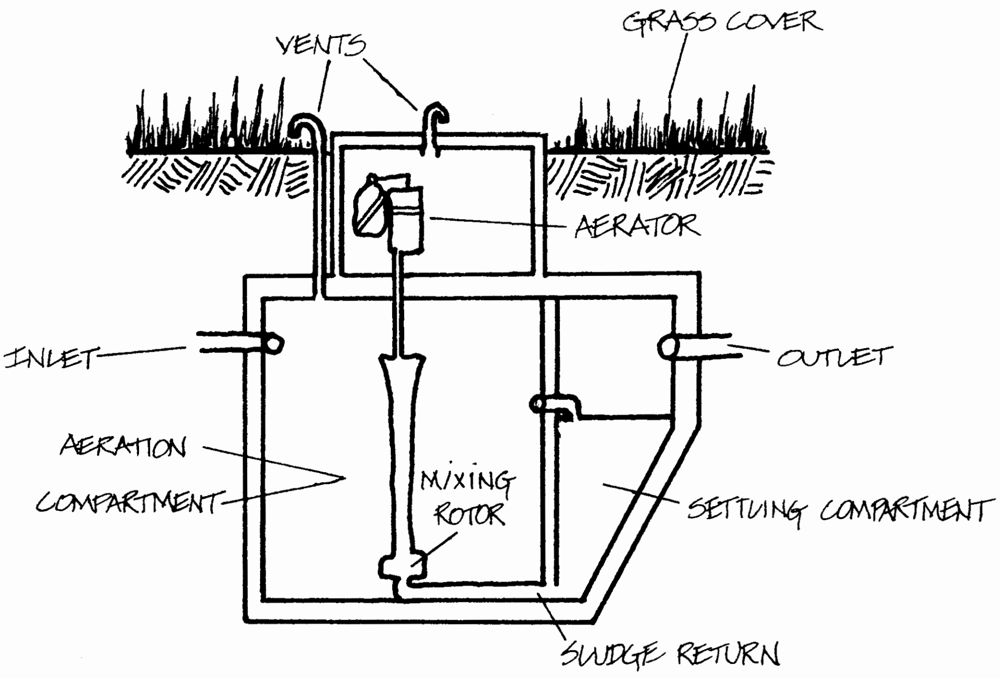


Figure V-10

Aeration Tank with Mechanical Aerator

Source: Home Sewage Disposal. Special Circular 212, Pennsylvania State University, College of Agriculture, University Park, Pennsylvania.

conditions (sepsis refers to bacterial action in the absence of air). There are two major components to a septic tank, the settling tank and its field disposal system. The tank is a watertight chamber that retains sewage long enough for solids to settle out and for some anaerobic digestion to take place. Materials most commonly used in construction of these tanks include concrete, steel, and reinforced fiberglass. The disposal system disperses the treated effluent over a subsurface area through perforated tile or pipe. The type of leaching field varies with soil and site conditions and various designs will be discussed below. When the entire system is covered with soil and planted with grass, no part of it is visible. When the soil conditions are satisfactory, a properly constructed and maintained septic system should last for many years.

Mound Systems

In areas where soils are underlain by a hardpan, shallow seasonal high water table, shallow depth to bedrock, or fractured bedrock, conventional soil absorption systems may not provide adequate filtration of the wastewater. One alternative method for effluent filtration is an above ground mound system. In this system, additional soil is brought to the site and formed into a mound. The system operates by pumping the wastewater into a dispersion bed inside of the mound.

The advantage of this technique is that the amount and type of soil filtering the wastewater can be adjusted to meet the needs of the site. In some situations the mound may be built downslope from the septic tank, thus eliminating the need for a pump.

Sand Lined Beds and Trenches

This disposal field technique is useful in areas where the permeability of the soil is too rapid for adequate filtration. This method consists of filling the trenches where the drainage pipe lays with a sandy fill in order to regulate the percolation rate. The amount of the sandy fill required in the trench is dependent on many factors such as the permeability of the native soils and seasonal high water table.

Oversized Absorption Area

These systems are recommended for sites where the permeability is too slow. By designing a large absorption field, more soil treats and absorbs the same amount of effluent, thus providing adequate treatment.

Shallow Placement Absorption Area

A drainage field of this type has laterals less than a foot from the surface. This technique is used when the distance from the surface to the most limiting soil factor is less than four feet. When the distribution pipes are placed in this manner, a minimum of one foot of fill is required over the absorption area.

Combined Septic Systems

On parcels of land that are zoned for clustering or for Planned Unit Development (PUD), portions of the site may be suitable for on-site disposal while others may not. An alternative to sewering the entire development is to use combined septic systems with a single large soil disposal field. Septic effluent is collected in a community holding tank (or tanks) which then distributes the wastewater into the soil through perforated drain tiles.

This system should be custom designed for each specific site, since the soil conditions, density of dwelling units, and size of the absorption field required may vary considerably.

Aerobic Units

Aerobic units are dissimilar to septic systems in that oxygen is circulated through the wastewater during treatment. In a typical aerobic system, the aeration is provided by forcing compressed air through the settling chamber, and may be aided by mechanical stirring.

Under proper conditions, aerobic systems have reported higher quality effluent than is attainable through septic systems. Aeration, stirring and aerobic bacteria in these systems result in effluent that contains lower BOD and suspended solids, and higher dissolved oxygen concentrations than effluent from septic systems. These units can vary considerably in design; some are constructed to function as small activated sludge treatment plants, while others are nothing more than tanks with air bubblers.

Although aerobic units have a higher cost than the basic septic systems, they may be suitable in areas where there is higher density zoning (more then 1 Dwelling Unit/Acre) or where the soils are marginal for septic drainage fields. This is due to the fact that the soil absorption system needed to filter the higher quality effluent does not have to be as large or as efficient as for a septic system.

Spray Irrigation

Another alternative to in-stream disposal is spray irrigation of treated effluent. In this process, sewage is usually pretreated to a minimum of 85% removal of the BOD and suspended solids. The treated effluent, after disinfection by chlorination, is then applied to the land.

One advantage of spray irrigation over subsurface disposal is that more complete removal of nitrogen, phosphorus, and organic particles is possible through nutrient uptake by cover vegetation and microorganisms. These cover crops, when spray irrigated with treated effluent, are able to achieve higher yields than non-irrigated crops.

As with subsurface disposal, the characteristics of the soil are limiting factors in the siting of a spray irrigation field. In addition, the choice of cover vegetation is an important design factor which must be taken into account.

Decentralized Treatment Plants

Decentralized treatment plants are smaller conventional sewage plants. These plants vary in capacity and type of treatment, although most employ the activated sludge process. Decentralized treatment plants may be an acceptable alternative to subsurface disposal in areas where the soil is not able to accept large quantities of wastewater, or where the zoned densities are too high. This type of system may also be effective in areas where the development density precludes on-site disposal yet it is not desirable to construct an interceptor sewer to a regional facility.

It should be noted that although high treatment capabilities have been established in small plants, regular attention by skilled operators and routine maintenance is required in order for them to function properly. In some areas, further treatment by stabilization lagoons, sand filtration, or spray irrigation may be required.

Lagoons

Sewage lagoons are shallow lakes or ponds which retain sewage long enough for bacterial decomposition to take place. There are two basic types of sewage lagoons: facultative and aerobic. In a facultative lagoon, the upper layers of water operate aerobically while the lower layers are anaerobic. In aerobic lagoons, more complete treatment is attained because mechanical aeration permits fuller biological decomposition of the wastewater. Sunlight also aids the treatment process by keeping algae growing, which helps to further decompose the waste.

Lagoons are usually not a very effective way to treat sewage. The soil conditions for proper operation are restrictive, and if the effluent is going to be discharged in-stream, then disinfection is required.

Wastewater Separation and Recycle Systems

Wastewater from the home can be broken down into grey water (showers, kitchen and laundry) and black water (toilet). In areas where a conventional septic system cannot be utilized due to marginal soils or insufficient area, wastewater separation may alleviate treatment problems. By separately treating the black and grey water the area required for final disposal can be reduced significantly.

Grey water can be treated easily through a septic tank and a leaching field. The advantage of treating only the grey water in the septic system is that since the solids content and volume of grey water is much less than that of a system treating grey and black water the size of the septic tank and leaching field can be reduced by as much as 50 percent.

The black water contains most of the solids from the home which can be treated by several recycling techniques. Some of these are incinerator toilets, chemical toilets, recycle toilets and composting toilets (discussed separately below). The purpose of all of these systems is to dispose of home wastes with little or no water being used. In this way the solids can be contained in a limited area and disposed of separately.

Composting Toilets

This alternate system may be suitable for sites that are not able to accommodate any other types of on-site disposal. In composting toilets, human and garbage waste are decomposed in the same way as a garden compost. The decomposition chamber, which is generally located in the basement, receives the waste from the bathroom and kitchen through vertical chutes. The chamber has three compartments and the decomposition takes place in the lowest one. Vents or a mechanical fan aid in the breakdown, and a vertical duct releases heat to the outside.

Using this system decomposition takes from several months to two years. Although this system is not at present very popular, it promises to be a favorable on-site disposal technique.

b. <u>Guidelines for Evaluation of Alternative Systems</u>
The following document, prepared by the WQM program, provides Guidelines in order to ensure that alternatives to regional sewage treatment are evaluated in 201 facilities plans.

DRAFT

Guidelines for the Evaluation of Alternatives To Regional Treatment Systems in 201 Facilities Plans

New Jersey Department of Environmental Protection

Division of Water Resources

Trenton, New Jersey

Jeff Zelikson, Director

November, 1978

I. Scope and Purpose

The purpose of this document is to set forth DEP guidance on the evaluation of alternatives to regional sewer systems and the level of detail necessary in 201 facilities plans.

The Guidelines are designed to clarify the DEP Recommended Format for a Facilities Plan and new federal regulations concerning the analysis of septic systems and other small wastewater treatment systems in 201 facilities plans. Previously, the information and analyses required by the Guidelines has been necessary in facilities plans, but at a lower level of detail. These Guidelines, therefore, will apply to future facilities plans and ongoing plans that have not yet received Step I certification, unless an exemption is granted by DEP. Exemptions can be given for on-going facilities plans if it is determined that sufficient analyses have been performed on alternatives to regional systems or where a regional system is in existence and no major increase in the sewered area is recommended.

Facilities plans for municipal sewage treatment plants and interceptor sewers must comply with Section IV parts A and B, while facilities plans for sewer collection systems must incorporate the requirements of Section IV parts A and C.

II. Authority

The authority for DEP to implement these guidelines is contained in the Clean Water Act of 1977 (P.L. 95-217). Section 510 of the Act allows the State to adopt or enforce any limitation or standard of performance which is not less stringent than the limitations or standards of performance set forth in the Act. Additional authority is contained in the Rules and Regulations for Grants for Construction of Treatment Works (40 CFR Part 35 Subject E). These rules and regulations (35. 917-7) require the State to certify that the facilities plans conform to the requirements of the Act and to 208 plans, of which these Guidelines are a part. The rules and regulations require (35. 918-1) an analysis of individual systems as part of the facilities plans. The Guidelines specify the level of detail the State believes is necessary to meet the requirements of the rules and regulations.

III. Background

In some areas, alternatives to regional sewerage systems, such as septic tanks and small wastewater treatment systems, may be preferable because of their comparable effectiveness at a relatively low cost. The alternatives to regional systems can have additional environmental benefits such as ground water recharge and maintenance of larger stream base flows. In addition, since these systems are sized to serve a well-defined immediate need, they do not leave reserve capacity and thus do not have a tendency to induce future development.

To insure that septic tanks and other small wastewater treatment systems are adequately considered in the 201 Municipal Wastewater Facilities Program, the Office of Areawide Planning has developed these Guidelines for the Evaluation of Alternatives to Regional Treatment Systems in 201 Facilities Plans. The Guidelines are consistent with, and further clarify how DEP will implement, the EPA Program Requirements Memorandum (78-9) concerning Funding of Sewage Collection System Projects, the Clean Water Act of 1977 (P.L. 95-217) and DEP Guidelines for Facilities Plans.

By requiring the analysis called for in the guidelines, DEP is aiming to insure adequate wastewater treatment, at a minimum cost to the residents of New Jersey.

The Guidelines are presented in three sections. The first section deals with coordination between 208 and 201 plans, while the second and third sections present the analyses required for sewage treatment plant-interceptor sewer and sewage collection system projects, respectively.

IV. Guidelines

A. Coordination with 208 Plans

All 201 facilities plans must conform to approved 208 Plans or portions thereof for the 201 planning area. The 208 Plans should contain the population projections which must be used in the facilities plans, along with information on the suitability of soils for septic tanks, the delineation of areas that should utilize on-site systems and the legal issues pertaining to on-site system management. This information should be used as a starting point in the facilities plans and expanded for the particular planning area.

In 208 Plans where the above information has not been completed, the facilities plans will be required to include the analysis necessary to obtain that information.

The concept of on-site system management, where an agency insures the proper design, construction, operation, maintenance and repair of on-site systems, is just beginning to be considered throughout the Nation.

Analyses conducted by DEP on the existing statutes indicate that there is no agency or institution in New Jersey that has authority over all of the above items. Therefore, until recommendations are developed for new statutory authority through the continuing planning program, the existing agencies with partial control over on-site systems must insure that the systems do not result in a health hazard or pollution problem. The facilities plan must specify what authority the various agencies will have for the components of on-site system management.

B. Sewage Treatment Plant and Interceptor Sewer Projects

To insure that septic systems and other on-site or small wastewater treatment systems are used where economically and environmentally acceptable, the following analyses must be conducted in the facilities plan for sewage treatment plant and interceptor sewer projects.

1. Determine Areas Potentially Suitable for Septic Systems.

The facilities plan must include a detailed analysis of the suitability of soils for septic systems in areas not currently sewered. Any available 208 outputs on soil suitability must be used as a starting point for this analysis.

When determining soil suitability for septic systems the U.S. Soil Conservation Service Soil Surveys should be utilized, when available, along with the records of violations and failures kept by Municipal or County Health Departments. Soil rated unsuitable for septic systems must be evaluated for the constraints that result in the rating and a determination of whether the constraint could be overcome with an alternative system. Some of the alternative systems that should be considered in the facilities plan are discussed below, in Section 4.

2. Determine the Probable Causes of Septic System Failures.

The facilities plan must document the nature, number, and location of malfunctioning septic systems in the planning area. The probable cause of septic system failures must be determined. General categories, such as poor site suitability, improper design or installation, and/or poor maintenance should be used in suggesting the probable cause of failure. Often, a septic system fails because the system was designed or installed improperly, became overloaded due to increased wastewater volume, or was not properly maintained due to infrequent pumpouts which can result in the clogging of the leaching field.

The above analysis will aid in determining if an area having septic system failures should be sewered or if the septic systems should be rehabilitated. Rejection of septic systems must not be based solely on the number of failures in an area. In areas where septic system failures are due to improper design, installation or maintenance, the rehabilitation of the systems must be considered in the cost-effective analysis. Also, in areas where the failures are due to poor site suitability, an analysis must be performed to determine whether an alternative on-site system or a small wastewater treatment system is a cost-effective alternative.

3. Population and Wastewater Flow Projections

The population and wastewater flow projections must be at the level of detail necessary to analyze the alternatives under consideration and their secondary impacts. For some projects this analysis will only have to be conducted at the municipality level while other projects will have to develop projections by population node within the municipality. The exact level of detail will depend on the existing conditions (such as population and housing distribution) in the planning area and the recommendations of the 208 plans concerning areas that will not require central sewers.

At a minimum the projections must include the existing and future population, sewered and non-sewered, and wastewater flow. The projection of sewered and non-sewered population should be developed by applying at least the following criteria: existing population density, land use and sewered areas along with zoning, environmentally sensitive areas, soil suitability for on-site systems and probable cause of septic tank failure. If portions of the existing non-sewered population are included in the future sewered population the need for sewering that population must be documented.

The future population and wastewater flow projections developed through the above analysis may be revised as the alternatives are considered. It may also be necessary to use different sets of projections for the various alternatives being considered.

4. Alternatives to Regional Systems to be Evaluated in Facilities Plans

Alternatives to be evaluated in facilities plans must include, but need not be limited to, septic tanks and alternative leaching fields, other on-site treatment systems, and small wastewater treatment systems for limited service areas.

a. Septic Systems and Alternative Leaching Fields

Septic systems must be considered as an alternative to regional sewer systems where the use of septic systems is not limited by density, zoning or soil suitability. Septic systems should be considered where the household density/zoning is one-half acre or greater unless other factors preclude their use. The use of alternative leaching fields such as mounds, "dual" disposal systems and sand lined beds, must be considered where conventional disposal systems are unacceptable due to soil suitability.

The cost-effective analysis for septic systems must include the construction costs for new systems and rehabilitation costs for those systems that have failed. Operation and maintenance costs associated with septic systems are mainly for pumping out and disposing of septage. It is recommended that for purposes of the cost analysis a pumpout and inspection would be done for each septic tank every three years. Other pertinent costs associated with septic systems for the individual planning areas should also be included.

b. Other On-Site Treatment Systems

In areas where the soil suitability is unacceptable for septic systems or septic tanks with alternative leaching fields, but with a household density/zoning of one-half acre or larger, an analysis of other on-site systems must be performed. The additional on-site systems that should be examined include, but are not limited to, aerobic treatment, wastewater separation and recycle systems. A brief analysis should also be conducted on alternative designs that have been submitted to DEP in accordance with the "Standards for the Construction of Individual Subsurface Sewage Disposal Systems."

c. Small Wastewater Treatment Alternatives for Limited Services Areas

Certain areas will not be able to use one of the on-site alternatives discussed above due to unsuitable soils, or because the household density/zoning is less than one-half acre. In those areas, the posibility of using lagoons, "community" septic systems for clusters of homes, and packaged plants (sewage treatment plants with a design capacity of 150,000 gallons per day or less), must be considered along with the alternative of regional sewage treatment.

A "community" septic system could be useful in an area where the homes are located on small lots and/or unsuitable soils for on-site systems, and suitable conditions are found in the vicinity. It is recommended that several septic systems and not one gigantic "central" septic tank be considered for such an area. Lagoons and packaged plants should be considered for areas where subsurface disposal cannot be utilized and where it may not be cost-effective to connect the area to a regional treatment facility.

5. Incorporation of Water Conservation in Facilities Plans

Facilities plans must analyze the use of water conservation techniques and if shown to be cost-effective and implementable, the plan must incorporate these results. The water conservation techniques to be evaluated should be grouped into three categories; devices to eliminate wastewater flow, techniques to reduce flow into either on-site or wastewater treatment plants, and individual homeowner water conservation patterns. The flow elimination devices that should be examined include but are not limited to, chemical recirculating toilets, incinerator toilets and composting toilets. The flow reduction techniques to be evaluated include, but are not limited to, water conservation toilets and shower heads, recycle systems in which only a portion of the wastewater is reused, and hybrid treatment systems which separately handle black water (toilet wastes) and grey water (bath and laundry wastewater).

The individual water conservation patterns deal with the water savings that can be accomplished by people using water more wisely. Strategies to promote water conservation by homeowners include, but are not limited to, metering, cost penalities for high usage and educational programs.

6. Evaluation of Environmental Aspects of On-Site and Small Wastewater Treatment Systems

The environmental assessment prepared for the facilities plans must include an assessment of on-site and small wastewater treatment system alternatives. This environmental assessment must include, but need not be limited to, the topics discussed below.

a. Ground Water Impacts

A discussion on the effects of all feasible alternatives on the area's ground water. This must include the potential impact of each alternative on the quality and quantity of the area's ground water supply. This should be compared to the existing and projected demand for ground water in the area.

b. Surface Water Impacts

A discussion on the effects of all feasible alternatives on the area's surface water. This must include the potential impact of each alternative on the quality and quantity of the area's surface water. Topics of concern include the reduction of base stream flow due to the construction of regional systems and the resulting decrease in assimilative capacity and impairment of the stream's uses or aesthetics. Increases in base flow that may occur downstream of the regional plant could actually be beneficial to the waterway, and should also be discussed.

c. Impact of Induced Development

A discussion on induced development that could result from each alternative. The President's Council on Environmental Quality has completed a study which concludes that interceptor sewers stimulate housing sprawl. Since this type of unplanned development often results in adverse environmental impacts, projects that can induce this type of growth are not encouraged.

C. Sewage Collection System Projects

Projects for sewage collection systems are divided into funded and non-funded projects. Both types of projects are required to utilize the information and recommendations of the Facilities and WQM Plans. Also, those projects requesting a federal grant must comply with the EPA Program Requirements Memorandum 78-9, Funding of Sewage Collection Systems Projects.

Projects requesting federal funds for sewage collection systems shall incorporate the following analyses along with the EPA requirements to insure that the proposed collection system is the most cost-effective and environmentally sound alternative.

1. Need for collection system

The need for the proposed collection system must be documented. Acceptable reasons for a collection system include, but are not limited to, water quality degradation or health hazards that are resulting from existing on-site systems which cannot be corrected through the use of a cost-effective and environmentally sound alternative system. Collection systems are not recommended for areas with a household density of two acres or more unless on-site systems cannot be utilized. For areas with a density of less than two acres, collection systems can be considered, but must be compared with the alternatives discussed below.

2. Alternatives to collection systems

In the areas where a need for a collection system has been identified, alternatives to sewers must be considered and analyzed on the basis of cost-effectiveness and environmental acceptability. The alternatives that need to be considered include, but are not limited to, rehabilitation of existing septic systems, including the use of mounds or dual disposal systems; aerobic systems or other individual on-site systems; and on-site systems to serve a cluster of households. These alternative systems will also be considered in the facilities plan for sewage treatment. The information in those plans should be utilized where appropriate in order to eliminate any duplication of effort.

c. <u>On-Site Management Program</u> The preceding sections establish the procedure for determining the areas that should utilize on-site systems due to cost-effectiveness and environmental acceptability. Through the 201 facilities planning process the areas recommended for on-site systems will be designated and the necessary facilities constructed. However, a management program must also be developed to insure that the on-site systems are properly designed, installed and maintained, and therefore do not result in health or pollution problems. The following discussion includes a summary of the analysis conducted during the initial phase of Water Quality Management Planning, along with recommendations for further analysis to be conducted in the continuing planning process.

The management program will include all facets of on-site disposal, from the design of the systems to the disposal of the septage (septic tank residue). The planning and regulatory responsibilities necessary in the management program and the existing agencies with potential jurisdiction over each of these responsibilities are presented in Table V-13. Since there is no explicit authority for an on-site management program, the authority of the individual agencies to manage these systems must be implied from the statutes. A complete analysis of legislation that could apply to on-site system management is included in Appendix V-1.

The On-Site System Management Chart (Table V-13) indicates that the sewerage and municipal utilities authorities, along with the joint meetings, potentially have jurisdiction over many of the responsibilities needed in a management program. Since these agencies currently do not regulate any on-site systems these responsibilities would be in addition to their existing duties. By use of service charges the authorities and joint meetings probably have the most appropriate means of financing on-site wastewater treatment management programs. In this way, those areas utilizing on-site systems would be assessed a yearly service charge that would include the periodic costs of pumping and disposing of septage and inspection of the systems. The authorities and joint meetings would also be eligible for federal funds under the 201 construction grants program for the rehabilitation or replacement of on-site systems that have failed.

There are several important responsibilities, however, for which sewerage and municipal utilities authorities and joint meetings do not seem to have any jurisdiction. The responsibilities these agencies cannot assume are the determination of an acceptable upper limit for septic tank density and the review and approval of on-site system applications. Municipal planning and zoning boards could have control over

Table V-13

ON-SITE SYSTEM MANAGEMENT CHART

Responsibilities:	DESIGN	CONSTRUCT	REVIEW	APPROVE	MONITOR	CLEAN-OUT	REPAIR	REPLACE	DENSITIES	FINANCING
AGENCIES:										
Sewerage Authorities	X	X			X	X	X	X		BONDING & SERVICE CHARGES
Municipal Utilities Authorities	X	X			X	X	X	X		BONDING & SERVICE CHARGES
Joint Meetings	X	X			X	X	X	X		BONDING & SERVICE CHARGES
Health Departments			X	X						MUNICIPAL BUDGETS
State Government			X	X						STATE TREASURY
Planning & Zoning Boards									X	MUNICIPAL BUDGETS

septic tank density, while the health departments and State government would maintain the responsibility to review and approve on-site system applications.

From the above discussion it can be concluded that no single agency has the authority to implement all of the responsibilities that are necessary in the management program. Therefore, until new recommendations can be developed in the continuing planning process, the local and State governments will continue to exercise control over on-site systems.

The continuing planning process will, however, include additional analyses in order to develop a comprehensive management program. This analysis will further examine the possibility of using the existing agencies or proposing new legislation that would create a separate agency to oversee on-site disposal.

Under the first alternative, the responsibilities of each agency would be specified in order to prevent duplication of effort. In the second alternative, legislation from other states that have developed on-site management programs would be analyzed and a legislative bill providing explicit authority for an agency would be drafted. Whatever alternative is selected, an agency (or system of agencies) would be specified to have jurisdiction over areas determined suitable for on-site disposal. An area that will utilize on-site systems, in combination with the agency or agencies with jurisdiction over that area, will be called a Septic Tank Management District (STMD). The designation of Septic Tank Management Districts will be conducted during the continuing planning process in conjunction with 201 facilities planning.

V.B.4. Waste Load Allocation Process

One of the major functions of Water Quality Management Planning is to establish waste load allocations for point sources of pollution. A waste load allocation is an assignment of the amount of waste that a point source will be permitted to discharge into a water body and still meet the water quality goals of the State. Though non-point sources of pollution have received a great deal of attention in the 208 planning process throughout the United States, point sources are still major contributors of pollution to our waters. In contrast to non-point sources, point sources can be easily identified, the technology exists to treat them, and the regulatory authority for their control has been firmly established. The question then is, how much control is necessary to meet the 1983 goals of fishable and swimmable waters.

The answer to this question is not an easy one, considering the number of technical and policy questions which affect the answer. The water quality data and analytical tools are not always available to develop effluent limits. The relative impact of non-point sources of pollution compared to point sources of pollution has not been well established. Water quality standards have not been developed for a number of water quality parameters including possible carcinogens. In addition, State policies which would protect the various stream uses throughout the State are limited.

The following sections will define the factors the Department of Environmental Protection will consider in establishing waste load allocations, define policies which affect waste load allocations, and develop a process for determining point source effluent limitations. These policies and procedures apply to both funded and non-funded projects. Additional requirements for approval of non-funded projects are promulgated in the regulations (N.J.A.C. 7:14-1.1 et seq.) pursuant to the authority of N.J.S.A. 58:10A-1 et seq. For funded projects the requirements of EPA's Section 201 construction grant program will also apply.

a. Factors to be Considered As discussed above, a number of factors will be considered by the Department in developing policies and procedures for establishing effluent limitations. Below, each factor is listed including a brief definition of that factor.

Type of Effluent - Two basic types of effluents would be considered, toxic and non-toxic. An effluent consisting of such parameters as heavy metal or pesticides would be in the toxic category while parameters such as BOD and phosphorus are non-toxic.

Type of Receiving Waters - Four basic types of receiving waters will be considered, fresh waters, lakes and impoundments, tidal and coastal. For each type of water body there are a number of classifications which are defined in the water quality standards in Chapter III.

Receiving Water Use - In determining effluent criteria, one of the most important considerations is the existing and potential use of that waterway by the public. Some of these uses are potable water supplies, fishing, swimming, other recreational activities, industrial and navigation. The use of each stream classification is defined in the water quality standards in Chapter III.

Existing Water Quality and Water Quality Standards - The water quality of a stream will either fall in one of two categories, above water quality standards (or equal to) or below standards. In addition streams will also be defined as being water quality limited (WQL) or effluent limited (EL) which are defined in Chapter III.

Analytical Techniques - A number of analytical techniques will be employed to determine effluent criteria. These include water quality mathematical modeling using calibrated and verified models and simplified modeling techniques, simple mass balance techniques, intensive water quality sampling programs, and bioassays.

Point versus Non-Point Sources of Pollution - In determining effluent criteria for point sources of pollution, the magnitude of non-point sources of pollution and their effect on the receiving waters must be considered. In dealing with this factor, point sources versus non-point sources, a comparison must be made of the cost-effectiveness of controlling each, the ability to implement controls for each, and the relative impacts of controls on water quality. This factor will be the most difficult to analyze when developing effluent criteria.

Antidegradation Policy - The State's antidegradation policy forms the basis for developing water quality based effluent criteria. The complete text of the State and federal antidegradation policy is in the following section.

b. Policy Affecting the Allocation Process - There are a number of State and federal policies which establish guidelines for developing a process for setting effluent limitations and set minimum requirements. Those policies that have a major impact on effluent limitations are presented below beginning with the State and Federal antidegradation policies.

The State antidegradation policy is part of the surface water quality standards and reads as follows:

> Where existing water quality is better than the established criteria, the Department of Environmental Protection in the administration of these regulations shall maintain the quality of such waters unless it can be demonstrated that change is justifiable as a result of necessary economic or social development.

The antidegradation policy adopted by EPA which acts as minimum guidance to the States reads as follows:

> (1) Existing instream water uses shall be maintained and protected. No further water quality degradation which would interfere with or become injurious to existing instream water uses is allowable.
>
> (2) Existing high quality waters which exceed those levels necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water shall be maintained and protected unless the State chooses, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, to allow lower water quality as a result of necessary and justifiable economic or social development. In no event, however, may degradation of water quality interfere with or become injurious to existing instream water uses. Additionally, no degradation shall be allowed in high quality waters which constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges and waters of exceptional recreational or ecological significance. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and feasible management or regulatory programs pursuant to section 208 of the Act for nonpoint sources, both existing and proposed.

The Department is presently in the process of revising the water quality standards which includes revisions to the antidegradation policy to be consistent with that of EPA.

In the Northeast Study Area, regulations exist which establish minimum treatment levels for all discharges. In the Hackensack River Basin, Passaic River Basin and Newark Bay, the State has adopted minimum requirements. The Interstate Sanitation Commission (ISC) which has jurisdiction of interstate waters in the region, has established requirements which cover the Hudson River and Arthur Kill.

As contained in New Jersey Administrative Code 7:9-8.1, Treatment of Wastewaters Discharged into Waters of the State, the minimum effluent requirements established for the Hackensack River Basin, Passaic River Basin and Newark Bay were only in reference to biochemical oxygen demand (BOD). For those waters classified as FW-2, FW-3, or TW-1, the minimum percent reduction of BOD for both domestic waste and industrial waste was ninety percent (90%). For those waters classified as TW-2 or TW-3, the minimum percent reduction of BOD for all discharges is eighty percent (80%). These regulations also recognized that BOD was not the only parameter that affected water quality and allowed for the implementation of more stringent effluent requirements by DEP where such treatment was needed to comply with water quality standards.

The parameters that the Interstate Sanitation Commission established effluent limits for include BOD, fecal coliform and suspended solids (SS). In summary, the BOD and SS requirements are that they shall not exceed 30 mg/l on a 30 consecutive day average, 45 mg/l on a 7 consecutive day average, and 50 mg/l on a 6 consecutive hour average. Fecal coliform content shall not exceed 200 per 100 ml on a 30 consecutive day average; 400 per 100 ml on a 7 consecutive day average, and 800 per 100 ml on a 6 consecutive hour average but no sample may contain more than 2400 per 100 ml.

In addition to the above regulations, the Federal Water Pollution Control Act Amendments of 1972 and 1977 established minimum treatment requirements for both municipal and industrial discharges. For municipal facilities, secondary treatment (85 percent removal of biochemical oxygen demand and suspended solids) was established as the minimum requirement to be met by July 1, 1977. Under the 1977 amendments, this schedule can be extended to July 1, 1983 for those facilities where construction of needed facilities could not be completed by July 1, 1977 or financial assistance was not available through the 201 facilities planning process for needed construction activities.

Effluent limitation for industries were based on "best practicable control technology available" (BPT) and "best available technology, economically achievable" (BAT). The

BPT limitations were scheduled to be in effect by July 1977. However, as a result of the 1977 amendments to the Act extensions are available from EPA on a case by case basis. All industries will be required to meet the BPT requirement by April 1979. The BAT limitations were to become effective in July 1983. Under the new Act this requirement has been extended from one to four years, depending on the nature of the discharge. For those industries discharging toxics, BAT requirements must be in effect by July 1984. A list of the toxics identified by EPA is presented in Table V-14. Industries discharging "conventional" substances; BOD, SS, Fecal Coliform and pH, will have until July 1984 to meet "best conventional control technology" (BCT), which EPA will be determining. For those industries which discharge substances that are not covered by the above categories or "non-conventional" substances, BAT limitations must be met by July 1984. Extensions to July 1987 may be granted by the EPA on a case by case basis.

The Department has also promulgated regulations under New Jersey Administrative Code 9:9-11.1 Allocation of Waste Loads to Point-Source Discharges which describe the policy and methodology the Division of Water Resources shall use in the allocations of waste loads to point-source discharges. The methodology outlines a general process to be followed by DEP to develop effluent limitations.

c. Interim Procedures for Establishing Water Quality Based Effluent Limitations, and Appeal Procedure - The following sections which have been developed through the WQM planning process are a further clarification of the process the Department will use to determine effluent criteria for point source discharges. The documents are drafts and will be revised after public comment has been received.

Table V-14

LIST OF TOXIC POLLUTANTS

Pursuant to section 307(a)(1) of the Federal Water Pollution Control Act as amended by section 53(a) of the Clean Water Act of 1977, is a list of 65 toxic pollutants designated by the Administrator.

The list of toxic pollutants is:

1. Acenaphthene
2. Acrolein
3. Acrylonitrile
4. Aldrin/Dieldrin
5. Antimony and compounds
6. Arsenic and compounds
7. Asbestos
8. Benzene
9. Benzidine
10. Beryllium and compounds
11. Cadmium and compounds
12. Carbon tetrachloride
13. Chlordane (technical mixture and metabolities).
14. Chlorinated benzenes (other than dichlorobenzenes).
15. Chlorinated ethanes (including 1,2-dichloroethane, 1,1,1-trichloroethane, and hexachloroethane).
16. Chloroalkyl ethers (chloromethyl, chloroethyl, and mixed ethers).
17. Chlorinated naphthalene
18. Chlorinated phenols (other than those listed elsewhere; includes trichlorophenols and chlorinated cresols).
19. Chloroform
20. 2-chlorophenol
21. Chromium and compounds
22. Copper and compounds
23. Cyanides
24. DDT and metabolites
25. Dichlorobenzenes (1,2-, 1,3-, and 1,4-dichlorobenzenes).
26. Dichlorobenzidine
27. Dichloroethylenes (1,1-, and 1,2-dichloroethylene).
28. 2,4-dichlorophenol
29. Dichloropropane and dichloropropene
30. 2,4-dimethylphenol
31. Dinitrotoluene
32. Diphenylhydrazine
33. Endosulfan and metabolites
34. Endrin and metabolites
35. Ethylbenzene
36. Fluoranthene
37. Haloethers (other than those listed elsewhere; includes chlorophenylphenyl ethers, bromophenylphenyl ether, bis(dischloroisopropyl) ether, bis-(chloroethoxy) methane and polychlorinated diphenyl ethers).
38. Halomethanes (other than those listed elsewhere; includes methylene chloride methylchloride, methylbromide, bromoform, dichlorobromomethane, trichlorofluoromethane, dichlorodifluromethane).
39. Heptachlor and metabolites
40. Hexachlorobutadiene
41. Hexachlorocyclohexane (all isomers).
42. Hexachlorocyclopentadiene
43. Isophorone
44. Lead and compounds
45. Mercury and compounds
46. Naphthalene
47. Nickel and compounds
48. Nitrobenzene
49. Nitrophenols (including 2,4-dinitrophenol, dinitrocresol)
50. Nitrosamines
51. Pentachlorophenol
52. Phenol
53. Phthalate esters
54. Polychlorinated biphenyls (PCBs)
55. Polynuclear aromatic hydrocarbons (including benzanthracenes, benzopyrenes, benzofluoranthene, chrysenes, dibenzanthracenes, and indenopyrenes)
56. Selenium and compounds
57. Silver and compounds
58. 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)
59. Tetrachloroethylene
60. Thallium and compounds
61. Toluene
62. Toxaphene
63. Trichloroethylene
64. Vinyl chloride
65. Zinc and compounds

Interim Procedures for Establishing Water Quality Based Effluent Limitations

New Jersey Department of Environmental Protection
Division of Water Resources
Trenton, New Jersey 08625

Interim Procedures for Establishing Water Quality Based Effluent Limitations

I. Scope and Purpose

The purpose of this document is to set forth DEP policy and procedures for developing waste load allocations for waste treatment facilities treating domestic and/or industrial wastes which are discharged directly to the surface waters of the State. These procedures are intended to clarify the methodology presented in N.J.A.C. 9:9-11.1 titled "Allocation of Waste Loads to Point-Source Discharges" and to implement these regulations.

II. Authority

The authority for DEP to establish these procedures is contained in N.J.S.A. 13:1D-1 et seq. and N.J. 58:11A-1 et seq. The State is required by Section 303(e) of the Clean Water Act Amendments of 1977, P.L. 95-217 to develop waste load allocations for point source discharges and to develop programs and procedures to implement the State's antidegradation requirements (40 CFR 131.17). These procedures have been developed to implement this requirement.

III. Procedure

A. Background

A waste load allocation is the basic regulatory tool of the Department of Environmental Protection for controlling water pollution. It is an integral part of the issuance of National Pollutant Discharge Elimination System permits (NPDES) and the development of 201 facilities plans. With the passage of the New Jersey Water Pollution Control Act of 1977 which established the New Jersey Pollutant Discharge Elimination System (NJPDES), there is a need for a process for developing effluent limitations. Though many factors and policies will determine effluent limits and each stream segment has specific characteristics which make it different, it is necessary that this process be uniform throughout the State.

B. Procedures

1. Establishment of Categories of Streams

The waste load allocation process can be distinguished according to three different water quality conditions. The first category is for those water bodies that have water quality characteristics that are better than or equal to the State's water quality standards, and where the State and USEPA antidegradation policies apply. The effluent limitations established through the application of the State antidegradation policy may be appealed. Interim procedures for the appeal process have been developed by the Department.

If the result of the appeal is to allow some degradation of stream water quality, the stream segment would fall under category two for developing effluent limitations. Through the appeal process, the water quality parameters which will be allowed to be degraded and the level of degradation will be determined. Any effluent limitation developed under this category would still be limited by the State's water quality standards. The Department also reserves the right to decide that a stream should be considered as category two according to detailed criteria further explained below.

The third category are those stream segments which have water quality characteristics below the standards. It is the Department's goal to upgrade water quality to the water quality standards unless it can be demonstrated that the standards are not attainable due to natural background levels of pollution, or because of irretrievable man-induced conditions, or where high levels of treatment would result in an adverse economic and social impact. EPA regulations on upgrading water quality can be found in "Policies and Procedures for the Continuing Planning Process" (40 CFR Part 130).

In addition to these categories, a separate discussion for existing facilities is presented. The process for developing effluent limits for existing facilities will depend on both the water quality characteristics of the stream segment and the status of that facility.

The general process for developing a waste load allocation for each of these categories is presented below.

2. Data Requirements for Developing Effluent Limitations

The requirements outlined below will serve to clarify the information to be submitted by an applicant in order for the Department to develop a waste load allocation for purposes of a NPDES or NJPDES permit or conceptual approval of treatment works pursuant to the requirements of the New Jersey Water Pollution Control Act Regulations, N.J.A.C. 7:14-1 et. seq., subsection 7:14-2.17.a.2.

a. Type of waste (domestic-industrial) to be treated with an analysis of the effluent characteristics.

b. Type of treatment process and level of treatment being considered, if known.

c. U.S. Geological Survey maps showing treatment facility location, discharge point and the location of other treatment facilities on the receiving stream within a reasonable distance of the proposed discharge.

d. Name and classification of receiving stream including a description of the stream's beneficial uses.

e. Stream analysis which will include both a flow analysis to determine the seven (7) consecutive day - ten (10) year recurrence interval low flow and a water quality analysis program which will be developed in coordination with the Department. The 7 day, 10 year low flow will be used to calculate effluent limits.

f. Approval from the applicable county and municipal authorities, where relevant.

3. Effluent Limitation Methodology

Upon review of the above material, the Department will determine a waste load allocation following the procedures outlined for each category below:

Category One - Definition - Stream segments where the water quality characteristics are above or equal to State standards and where the antidegradation policy applies.

i. Methodology

The application of the antidegradation policy means that water quality parameters will not be allowed to degrade below low flow ambient levels. Therefore, the effluent limitations will solely be based on and must be equivalent to instream water quality during low flow conditions. The parameters to be considered are those contained in the water quality standards and any other that the Department feels may have a detrimental effect on the instream uses or significantly change the ecology of the stream.

ii. Appeals from Establishment of Effluent Limits for Category One

If an applicant believes that compliance with effluent limits established according to the above procedure (i) are too restrictive and would result in adverse social and economic impact, such limitations may be appealed according to the procedures contained in the interim "Procedures for Appealing Water Quality Based Effluent Limitations" in Section IV below.

Category Two - Definition - Stream segments where water quality characteristics are above State standards but due to justifiable economic or social needs, some degradation of water quality will be allowed.

i. Provisions for Classifying Streams as Category Two.

In determining an effluent limitation for streams falling in category one, the Department will reserve the right to make a determination that some degradation of existing water quality for some parameters is allowable provided that existing uses will be protected. After determining whether to classify a stream as category one or category two, the Department will document its decision on which category will be applied and present such documentation with any conceptual approval of a waste discharge pursuant to this decision.

After making a decision to allow some degradation of stream quality, the Department will develop a draft effluent limitation which shall establish the permissable concentration of pollutants in a discharge that will not interfere with or become injurious to the use of the stream. The Department will issue a draft conceptual approval to the discharger which incorporates the same described effluent limitation.

A copy of the draft conceptual approval (as well as the documentation of the decision to allow some change in stream quality) for any discharge to a stream exceeding minimum standards will be sent to the governing bodies of affected local jurisdiction. Where the DEP has made a determination to allow some degradation of stream quality (by classifying a stream as category two), the affected local government(s) have the right to appeal such effluent limitations by making an appeal in writing within thirty (30) days of its establishment. If the affected local governing body(s) do not choose to appeal the basis for the effluent limitations, the draft conceptual approval incorporating such effluent limitations shall become effective after forty five (45) days of the issuance of the draft conceptual approval.

It will be assumed that streams having the following characteristics will be classed as category one, due to their extreme sensitivy to changes in water quality:

1. All waters previously classified as FW-1.

2. Trout Production Streams

3. Trout Maintenance Streams

4. Streams above impoundments (that otherwise exceed stream quality minimum criteria).

5. Unique ecological areas of State and National importance (The Central Pine Barrens).

ii. Methodology

The effluent limitations developed under this category must take into consideration some reserve capacity in the stream segment. The resultant water quality to be allowed will therefore be at a level above the water quality standards.

The parameters to be considered in determining a waste load allocation can vary depending on type of discharge, the stream segments, its existing and potential use, and instream water quality. The parameters can be divided into two groups, non-toxic and toxic. For each group a number of technical analyses including water quality mathematical modeling, simple mass balances combined with water quality surveys, and bioassays, can be used to determine an effluent limitation. The following discussion outlines the procedures the Department will use for each group of parameters.

a. Non-toxic - In the past, the main thrust of developing waste load allocations has been to meet dissolved oxygen (D.O.) standards which involves establishing limitations for carbonaceous biochemical oxygen demand (CBOD) and nitrogenous biochemical oxygen demand (NBOD). These limitations will be determined using a calibrated and verified water quality mathematical model developed for a particular stream or a simplified modeling approach as outlined in the 1971 EPA document entitled "Simplified Mathematical Modeling of Water Quality." In those streams where these methods cannot be used, the CBOD and NBOD limits will be based on those developed for modeled downstream river segments unless the need for more stringent requirements can be shown.

In the use of a mathematical model for determining effluent limitations, it should be understood that the model is a simplification of the actual complex river system and therefore, the values produced should not be interpreted as an exact answer by the decision maker but should guide the development of final effluent limits.

For other non-toxic parameters, a mass balance will be determined using the State's water quality standards as the base including some reserve capacity. The following formula will be applied where applicable:**

$$V_1 C_1 + V_2 C_2 = (V_1 + V_2) [P(C_1-C_s) + C_s]$$

Where:

V_1 = Upstream Low Flow

V_2 = Effluent Design Flow

C_1 = Upstream Concentration

C_2 = Effluent Concentration Limitation (unknown)

C_s = Water Quality Standard

P = Percent Reserve

** For example, not applicable for D.O.

b. Toxics - The 1977 Amendments to the Clean Water Act increase the emphasis of controlling toxic pollutants. In accordance with these Amendments, sixty five (65) toxic pollutants have been initially identified which will require BAT effluent guidelines to be met by July 1, 1984. In developing effluent limitations for toxic pollutants, the Department is not limited to the list of toxics presented by EPA or the BAT effluent limits being developed for those pollutants. Where the State's water quality standards or a particular stream use warrants more stringent requirements, effluent limitations reflecting that need will be established. The BAT levels of treatment will be applied where they are more stringent than those developed by these procedures.

As with non-toxic parameters, the methodology for determining toxic effluent limitations will also be a mass balance using the State's water quality standards as the base. The standards for most toxics do not present specific limits for each toxic material, but rather present limits based on the results of bioassays. In applying the standards the following basic policies will be followed:

(1) <u>Statewide Effluent Limitations for Toxics</u>

Any discharge of an effluent shall not be more toxic than a 96 hour LC_{50} of 50% concentration. The lethal concentration (LC) is that concentration of a toxicant which will cause death in a specified percentage of organisms within a specified time period.

(2) <u>Effluent Constituent Limitations</u>

Where the toxic constituent(s) in an effluent is known, the level of the constituent(s) in the effluent shall be limited so that the concentration in the receiving stream shall not exceed either 1/20 (non-conservative toxic substances) or 1/100 (conservative toxic substances) of the 96 hour LC_{50} concentration.

(3) <u>Effluent Flow Limitations</u>

Where the toxic constituents are unknown, the effluent flow shall be limited so that the concentration of the effluent in the receiving stream shall not exceed 1/20 (where non-conservative toxic substances are suspected) or 1/100 (where conservative toxic substances are suspected) of the 96 hour LC_{50} concentration.

The procedure to be followed for determining toxic effluent limitations is as follows:

The applicant shall submit a report of the test results of an acute toxicity static bioassay and a laboratory chemistry analysis on the proposed effluent discharge(s). The methodology to be utilized in the conduct of the tests shall be approved by the Department.

The State will review each application and supporting data. If the effluent discharge(s) is determined not to be toxic to aquatic life, the State will insert the minimum toxicity effluent limitation into the NJPDES permit as a permanent condition in the event that some characteristics of the discharge may change.

If the effluent discharge(s) is determined to be toxic, based on the initial static bioassay test results, the State may, on a case-by-case basis, require more detailed bioassays (e.g., modified static or flow-through) to be performed as part of the application procedure to provide further data for evaluation.

The basic calculations that will be utilized by the State to determine the effluent limitations for toxic substances are:

Effluent Constituent Limitation Formula

Utilized for toxic substances

$$V_1 C_1 + V_2 C_2 = (V_1 + V_2) F [C_E D + (1-D)C_1]$$

Where:

V_1 = Upstream Low Flow

V_2 = Effluent Design Flow

C_1 = Upstream Concentration

C_2 = Effluent Concentration Limitation (unknown)

D = Dilution (96 hour LC_{50} Concentration)

F = Application Factor*

C_E = Pure Effluent Concentration Used in Bioassay

*1/20 for Non-conservative Toxic Substances

1/100 for Conservative Toxic Substances.

Effluent Flow Limitation Formula

Utilized for flow limitations where the toxic substances are unknown

$$V_2 = \frac{V_1 (F \times D)}{1- (F \times D)}$$

Where:

V_1 = Upstream Low Flow

V_2 = Effluent Flow Limitation (unknown)

F = Application Factor*

D = Dilution (96 hour LC_{50})

*1/20 where non-conservative toxic substances are suspected
1/100 where conservative toxic substances are suspected.

For new discharges where a bioassay is impossible the Department may use as a reference the EPA 1976 publication, "Quality Criteria for Water" (Red Book) or other reliable source or the results of other bioassay for particular substances to determine effluent limitations.

Category Three - Definition - Stream segments where the water quality characteristics are below State standards.

The goal of the Department for this category is to improve water quality to meet the standards and designated use of the stream segment. The methodologies discussed in category two will be applied to this category to determine effluent limitations for both existing and future discharges.

In those segments where the standards are not attainable, as discussed previously, effluent limitations would be developed to reflect the highest attainable water quality.

Category Four - Existing Facilities - Definition - An existing facility is a waste treatment facility that is presently in operation and has received construction and operation permits from the Department of Environmental Protection.

i. Methodology

The process for developing effluent limits for existing facilities can be divided into two classifications, those for which no expansion is proposed and those for which an expansion is being proposed.

a. Expansion not being proposed

For those facilities that discharge to a stream segment not meeting the water quality standards, the effluent limits will be formulated as discussed in Category Three.

For those facilities that discharge to a stream segment which meet or are above the water quality standards and are meeting their designated use, the effluent limitations will be based on the limits the Department developed for their present design capacity when the permits to construct and operate were approved or the minimum EPA requirements whichever is more stringent. In addition, the Department may require more stringent requirements for specific pollutants that have been shown to be a detriment to water quality and/or a potential health hazard. An example of this would be the possible implementation of more stringent requirements of chlorine residual being discharged.

b. Expansion being proposed

The process for determining the effluent limit for these facilities will be those outlined within these procedures. The data requirements outlined in these procedures will be required and a determination of the stream category will be made. A variance to these procedures will be granted if the resultant effluent from the expanded facility will improve overall stream water quality and upgrade stream use as determined by the Department.

In developing all effluent limitations, the Department reserves the right to apply more stringent effluent limitations than those derived by using the procedures outlined herein if it finds that more stringent limitations are necessary to aid in the restoration, enhancement and maintenance of the surface water quality.

IV. Procedures for Appealing Water Quality Based Effluent Limitations

A. General

Water quality based effluent limitations may be appealed by the applicant in two ways: (1) the applicant may request that the effluent limitations be modified in accordance with the procedures followed in (B) below; or (2) the applicant may request an adjudicatory hearing for the final effluent limitations in accordance with adjudicatory hearing regulations that are applicable to NPDES or NJPDES permits processes. However, the Department shall not modify the final effluent limitation at the adjudicatory hearing stage unless it can be shown by the applicant that the technical justification or methodology used to develop the limitations was applied incorrectly.

B. Procedures For Modifying Water Quality Based Effluent Limitations

1. Where Existing Water Quality is Currently Exceeding Applicable Water Quality Standards.

a. Whenever the Department determines that existing water quality within a segment is consistently better in quality than established water quality criteria, the Department shall establish water quality based effluent limitations for new dischargers or those existing dischargers who propose to increase their level of discharge, which effluent limitations can reasonably be expected to protect the high quality waters from degradation. In no case shall the Department establish a water quality based effluent limitation lower than that necessary to maintain the existing high quality water unless:

i. A person affected by any such effluent limitation demonstrates to the satisfaction of the Department, after a public hearing, that:

(a) There is no reasonable relationship between the economic and social costs of achieving the original antidegradation effluent limitation and the benefits to be obtained in maintaining existing water quality. Economic and social costs shall include social and economic dislocation in the affected community or communities; and

(b) Some degradation of high quality waters should be allowed because of necessary and justifiable economic or social development; and

(c) Alternative effluent limitations, at least as stringent as the technically based effluent limitations required by Section 301, 306, and 307 of the Federal Clean Water Act or state law, will not interfere with or be injurious to instream water uses; or

ii. The Department determines, after public hearing that:

(a) Some degradation of high quality waters should be allowed because of necessary and justifiable economic and social development; and

(b) Alternative effluent limitations, at least as stringent as the technically based effluent limitations required by Section 301, 306 and 307 of the Federal Clean Water Act or state law, will not interfere with or be injurious to instream water uses.

b. Additionally, no degradation shall be allowed in high quality waters which constitute an outstanding national resource such as waters of national and state parks.

2. Where Existing Water Quality is Equal to or less than Applicable Water Quality Standards.

a. Whenever the Department determines that water quality is consistently less than or equal to applicable water quality standards, and that discharges of pollutants from a point source or group of point sources with the application of technically based effluent limitations as stringent as the best available technology (as provided in the Federal Clean Water Act) would interfere with the attainment and maintenance of applicable water quality standards, the Department may establish more stringent effluent limitations which can reasonably be expected to protect and maintain water quality standards. In no case shall the Department establish a water quality based effluent limitation lower than that necessary to maintain water quality unless:

i. A person affected by any such effluent limitation demonstrates to the Department, after a public hearing, that there is no reasonable relationship between the economic and social costs of achieving the original effluent limitation and the benefits to be obtained in maintaining or meeting existing water quality standards. Economic and social costs shall include social and economic dislocation in the affected community or communities.

ii. However, in no case shall the Department allow for an effluent limitation less stringent than the best available technology as required by the Federal Clean Water Act.

V.B.5 Point Source Control Plan

The point source control plan presents the treatment level and locations of municipal treatment facilities in the study area. Industrial treatment levels are also presented for the industries in the area. The Northeast New Jersey Water Quality Management Study (1976) and 303(e) Basin Plan (1976) form the basis for this plan. For those facilities where the recommendations of the above plans are being implemented only the final decisions are presented. In areas where new information indicates that the recommendations of the previous studies need to be changed the new recommendations and the reasons are presented.

This section is divided into three parts, Required Treatment Levels, Sub-Basin Analysis and Industrial Discharge Analysis. The Required Treatment Levels section present the treatment necessary for each segment in the study area along with the associated limitations for each treatment level. The Sub-Basin Analysis describes the point source control plan for the major municipal and some industrial dischargers. The Industrial Discharge Analysis discusses the industrial treatment requirements for industries discharging to municipal plants or having direct discharges.

a. Required Treatment Levels The preceding section (V.B.4) discussed the policy and methodology to be utilized in determining waste load allocations, while this section presents the actual allocations for the study area. The water quality models described in the Northeast Study and Basin Plan were used in determining the necessary treatment levels required for the major river segments so as to meet water quality standards. The models were utilized for the major municipal dischargers and a few industrial dischargers but not the packaged plants in the area. Therefore, treatment levels have only been developed for the major dischargers. Treatment levels for the packaged plants will continue to be determined on a case by case basis. The continuing planning process will examine the existing waste load allocations for the packaged plants and revise them as necessary.

The concept of having increasingly stringent levels of treatment allows water quality standards to be met with the lowest capital outlay possible. The various treatment levels, starting with secondary treatment, are utilized in the water quality models to determine the specific level of treatment necessary for each discharger. The models are first run at secondary treatment and if water quality standards are predicted not to be met, the other levels are utilized in increasing order of stringency until the standards are shown to be met.

The specific limitations of each treatment level are shown in Table V-15. The treatment level required for the major dischargers in each river segment are presented in Table V-16.

b. Sub-Basin Analysis The analysis for each sub-basin includes the treatment level required for each discharger, the location of facilities, and the year 2000 design capacity. This information is summarized in Table V-17 along with the existing design capacity and 1976 average flow. Figure V-11 graphically illustrates the recommended plan and indicates the treatment plants that will remain in operation and those that will be phased out.

The study area has been divided into sub-basins for the purpose of the point source control plan. The sub-basins that are discussed below include; Peckman River, Mid-Passaic, Saddle River, Hackensack River-Newark Bay, Kill Van Kull, Upper New York Bay, Arthur Kill, Upper Passaic, Whippany/ Rockaway, Pompton/Mid Passaic.

Peckman River Sub-Basin

The four treatment plants currently discharging to the Peckman River will remain in operation but with higher levels of treatment and a change in discharge location for Little Falls. The design capacities of the plants will be determined through the facilities and continuing planning processes.

The Little Falls plant will be upgraded from a 0.86 MGD secondary plant to a facility utilizing treatment level 2. The outfall will be changed from the Peckman River to the Passaic River to allow a lower level of treatment than is required for the other facilities in the sub-basin.

The Cedar Grove facility will be upgraded from a 1.5 MGD secondary plant to a facility utilizing treatment level 4.

The Essex County Hospital operates a 1.5 MGD secondary plant, however the flow will only be around 0.36 MGD in 1982. Due to the excess capacity at the facility the requirements of treatment level 4 can be met with only the addition of post-aeration at the existing facility. Therefore, no action is required at the facility, with the exception of adding post-aeration.

The Verona plant has a design capacity of 4.2 MGD and utilizes secondary treatment. The facility will be upgraded to treatment level 4.

Table V-15

TREATMENT LEVEL CRITERIA

Treatment Level	BOD_5 30-Day Average	BOD_5 7-Day Average	CBODu 30-Day Average	CBODu 7-Day Average	NBODu 30-Day Average	NBODu 7-Day Average	NH_3-N 30-Day Average	NH_3-N 7-Day Average	Suspended Solids 30-Day Average	Suspended Solids 7-Day Average	D.O. 7-Day Average
Secondary	30	45	-	-	-	-	-	-	30	45	-
1	24	36	36	54	130	195	26	39	24	36	4
2	16	24	24	36	50	75	10	15	16	24	6
3	16	24	24	36	20	30	4	6	16	24	6
4	8	12	12	18	10	15	2	3	8	12	6
5	4	6	6	9	5	7.5	1	1.5	4	6	6

Note: All criteria are in mg/l

Table V-16

Required Treatment Levels

Sub-Basin	Treatment Level
Peckman River	
Little Falls	2
Cedar Grove	4
Essex County Hospital	4
Verona	4
Mid-Passaic	
Totowa-Riverview	1
West Paterson	1
Saddle River	
Northwest Bergen County Utilities Authority	3
Ridgewood	3
Fair Lawn	3
Hackensack River-Newark Bay	
Bergen County Utilities Authority	Secondary
Secaucus	1
Hudson River	
Edgewater	Secondary
Hoboken	Secondary
Jersey City East	Secondary
Kill Van Kull	
Bayonne	Secondary
Upper New York Bay	
Passaic Valley Sewerage Commissioners	Secondary
Arthur Kill	
Joint Meeting of Essex & Union Counties	Secondary
Linden-Roselle Sewerage Authority	Secondary
Rahway Valley Sewerage Authority	Secondary
Upper Passaic	
Bernards	4
Passaic	4
Berkeley Heights	4
New Providence	3
Chatham	4
Madison-Chatham	4
Morris (Woodland)	4 + phosphate removal
Livingston	4
Florham Park	4
Lyons Veterans Hosp.	4 (see addendum [illegible])

Table V-16 (continued)

Required Treatment Levels

Sub-Basin	Treatment Level
Whippany/Rockaway	
Morris (Butterworth)	4
Morristown	4
Hanover	4
Parsippany-Troy Hills	4 + denitrification
Rockaway Valley Regional Sewage Authority	5 + denitrification
Piscatinny Arsenal	4 or connect to RVRSA
Whippany Paperboard	4
Esso Research	4
Pompton/Mid-Passaic	
Butler-Bloomingdale	4
Wanaque	4
Pompton Lakes	4
Caldwell	4
Pequannock, Lincoln Park and Fairfield	4
Wayne (Mountain View)	4 + denitrification

Table V-17

MUNICIPAL TREATMENT PLANTS

Map No.	Treatment Plant	Existing Conditions Capacity (MGD)	Existing Conditions 1976 Flow (MGD)	2000 Conditions Capacity (MGD)	2000 Conditions Treatment Level	Recommended Action
Peckman River Sub-Basin						
1	Little Falls	0.86	1.4	-	2	Upgrade and Discharge to the Passaic
2	Cedar Grove	1.5	1.7	-	4	Expand and Upgrade
3	Essex Co. Hospital	1.5	0.5	No action required		
4	Verona	4.2	2.3	-	4	Upgrade
Mid-Passaic Sub-Basin						
5	Totowa-West End	0.375	0.6	-	-	Phase out to Totowa-Riverview
6	North Jersey Training School	0.15	0.12	-	-	Phase out to Totowa-Riverview
7	Totowa-Riverview	1.0	1.3	2.1	1	Expand and Upgrade
8	West Paterson	0.8	1.3	2.2	1	Expand and Upgrade
Saddle River Sub-Basin						
9	NWBCUA	8.5	4.2	-	3	Upgrade
10	Ridgewood	5.0	3.5	2.9	3	Upgrade
11	Fair Lawn	3.5	2.3	2.4	3	Upgrade
Hackensack River-Newark Bay Sub-Basin						
12	BCUA	75	63	82.6	Secondary	Discharge to the Hudson River
13	Tri-Boro Joint Meeting	4	2.3	-	-	Phase out to BCUA
14	Wood-Ridge	0.89	-	-	-	Phase out to BCUA

Table V-17 (Continued)

MUNICIPAL TREATMENT PLANTS

Map No.	Treatment Plant	Existing Conditions Capacity (MGD)	Existing Conditions 1976 Flow (MGD)	2000 Conditions Capacity[1] (MGD)	2000 Conditions Treatment Level	Recommended Action
15	North Arlington Lyndhurst	1.73	1.73	-	-	Phase out to BCUA
16	Secaucus	2.25	1.05	2.25	1	Upgrade, Flows greater than 2.25 MGD to Jersey City East
17	Jersey City West	36.0	21.6	-	-	Phase out to Jersey City East
18	Kearny	3.03	-	-	-	Phase out to PVSC
19	North Bergen Central	2.0	-	-	-	Phase out to Jersey City East
20	North Bergen-Northern	1.0	-	-	-	Phase out to Jersey City East
Hudson River Sub-Basin						
21	Edgewater	3.0	2.2	3.3	Secondary	Expand and Upgrade
22	West New York	10.0	8.7	-	-	Phase out to Hoboken
23	North Bergen-Guttenberg	3.34	-	-	-	Phase out to Hoboken
24	Hoboken	20.8	14.5	21.1	Secondary	Expand and Upgrade
25	Jersey City East	46.6	36.7	56.3	Secondary	Expand and Upgrade
Kill Van Kull Sub-Basin						
26	Bayonne	21.0	12	10.1	Secondary	Upgrade
Upper New York Bay Sub-Basin						
27	PVSC	300	258	300	Secondary	No Action

Table V-17 (Continued)

MUNICIPAL TREATMENT PLANTS

Map No.	Treatment Plant	Existing Conditions Capacity (MGD)	Existing Conditions 1976 Flow (MGD)	2000 Conditions Capacity[1] (MGD)	2000 Conditions Treatment Level	Recommended Action
Arthur Kill Sub-Basin						
28	Joint Meeting Essex and Union County	75	69	75	Secondary	No Action
29	Linden-Roselle	19	11.2	19	Secondary	No Action
30	Rahway	35	29	35	Secondary	No Action
Upper Passaic Sub-Basin				(1.9) - See Addendum		
31	Bernards	1.2	0.87	2.3	4	Expand and Upgrade
32	Passaic	0.65	0.51	1.7	4	Expand and Upgrade
33	Warren Stage I & II	0.3	0.27	-	-	Phase out to Passaic
34	Warren Stage IV	0.3	0.21	-	-	Phase out to Passaic
35	Berkeley Heights	1.5	1.38	3.1	4	Expand and Upgrade
36	New Providence	2.8	1.6	1.0	3	Upgrade
37	Chatham Twp.	0.75	0.73	1.0	4	Expand and Upgrade
38	Madison-Chatham Joint Meeting	4.0	3.0	3.5	4	Upgrade
39	Morris-Woodland	2.0	1.2	2.0	4+ Phosphate Removal	Upgrade
40	Livingston	3.0	2.88	-	4	Upgrade
41	Florham Park	1.0	0.68	-	4	Upgrade
Whippany/Rockaway Sub-Basin						
42	Morris-Butterworth	2.0	1.5	3.3	4	Expand and Upgrade

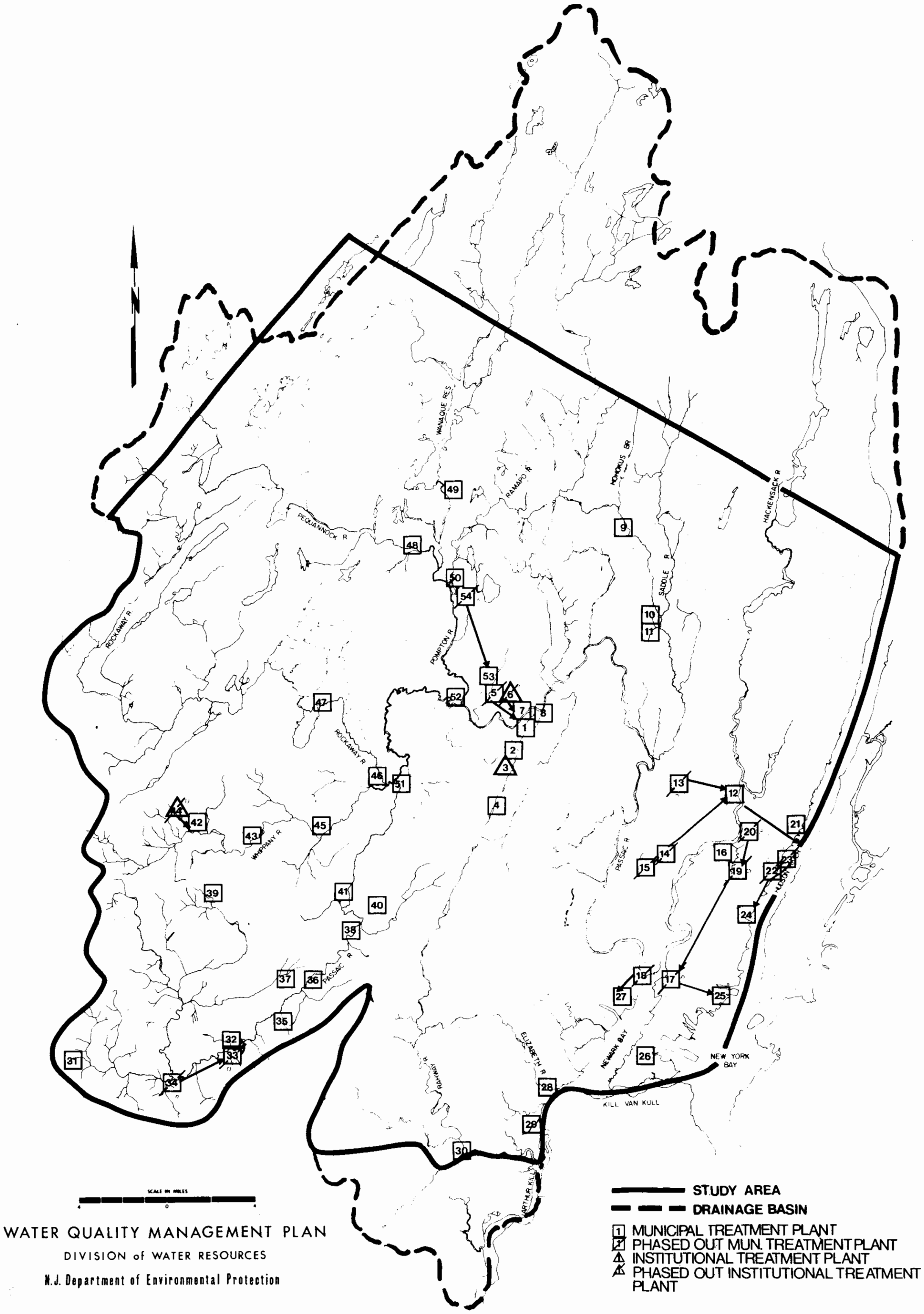
Table V-17 (Continued)

MUNICIPAL TREATMENT PLANTS

Map No.	Treatment Plant	Existing Conditions Capacity (MGD)	Existing Conditions 1976 Flow (MGD)	2000 Conditions Capacity[1] (MGD)	2000 Conditions Treatment Level	Recommended Action
43	Morristown	1.5	2.0	3.45	4	Expand and Upgrade
44	Greystone Hospital	1.4	0.32	-	-	Phase out to Morris-Butterworth
45	Hanover	3.0	1.8	3.1	4	Upgrade and Expand
46	Parsippany-Troy Hills	16.0	5.5	16.0	4+ denitrification	Upgrade
47	RVRSA	9.0	6.6	12.0	5+ denitirfication	Expand and Upgrade
Pompton/Mid-Passaic Sub-Basin						
48	Butler-Bloomingdale	1.4	2.25	-	4	Upgrade
49	Wanaque	-	-	2.5	4	New Plant
50	Pompton Lakes	1.2	0.71	-	4	Expand and Upgrade
51	Caldwell	4.5	3.8	6.1	4	Expand and Upgrade
52	Pequannock, Lincoln Park and Fairfield	-	-	7.5	4	New Plant
53	Wayne-Mountain View	4.0	-	13.5	4+ denitrification	Expand and Upgrade
54	Wayne-Sheffield Hills	-	-	-	-	Phase out to Mountain View

1 - Where a 2000 Design Capacity is not presented, the capacity will be determined through the facilities and continuing planning processes.

Fig. V-11 POINT SOURCE CONTROL PLAN



Mid-Passaic Sub-Basin

There are four treatment plants in the Mid-Passaic Sub-Basin Totowa-Riverview, Totowa-West End, West Paterson and the North Jersey Training School. The original recommendation was to phase out three of the facilities to a regional plant at Riverview. However, that alternative required encroachment upon the floodplain which would not be allowed by DEP. The new recommendation is therefore to phase out the West End and Training School facilities to Riverview, which would remain in operation along with West Paterson's plant. Both plants will be required to upgrade from secondary treatment to treatment level 1. The Riverview plant will be expanded from 1.0 to 2.1 MGD, while West Paterson will expand their facility from 0.8 to 2.2 MGD.

Saddle River Sub-Basin

The three treatment plants in the Saddle River Sub-Basin are Northwest Bergen County Utilities Authority (NWBCUA), Ridgewood and Fair Lawn. The NWBCUA plant will remain in operation and be upgraded to treatment level 3. The year 2000 design capacity will be determined through the facilities and continuing planning processes.

It had been recommended that the Ridgewood and Fair Lawn plants be phased out to the PVSC facility. However, there is insufficient capacity in the PVSC interceptor to accept the flow from Ridgewood and Fair Lawn. Therefore, both plants will remain in operation but must be upgraded to treatment level 3. Ridgewood's plant has a design capacity of 5.0 MGD but may only need 2.9 MGD of advanced treatment capacity. The design capacity may have to be revised depending upon the results of the infiltration and inflow analysis being conducted in the facilities plan. The Fair Lawn facility has a design capacity of 3.5 MGD but requires only 2.4 MGD of treatment level 3 capacity.

Hackensack River-Newark Bay Sub-Basin

There are nine treatment plants in the sub-basin of which six or seven will be phased out to regional facilities. The facilities that will remain in operation are the Bergen County Utilities Authority (BCUA), Secaucus and possibly North Arlington-Lyndhurst.

The BCUA is currently expanding its 50 MGD secondary facility to 75 MGD. A final decision has not been made on whether the outfall should be moved from the Hackensack River to the Hudson River or if the plant should be upgraded to treatment level 3. The preliminary cost-effective analysis indicates it would be economical to discharge to the Hudson. However, a detailed cost-effective analysis and a feasibility study must be performed in the facilities plan for this project before the final decision is made. Therefore, it is recommended that this study be initiated and if it is shown that the Hudson River discharge is the cost-effective alternative that the BCUA outfall be relocated to the Hudson. Under this recommendation the BCUA plant would also serve the municipalities connected to the Wood Ridge, Tri-Boro Joint Meeting and North Arlington-Lyndhurst Joint Meeting facilities. The BCUA facility would need to be expanded to 82.6 MGD in order to handle the flow from these facilities.

If, however, the above recommendation does not prove feasible or cost-effective, the BCUA plant will be upgraded to treatment level 3. The Wood Ridge facility will be connected to the BCUA plant under this option also, along with either all or part of the Tri-Boro area. A decision on the service areas and design capacities of the BCUA and North Arlington-Lyndhurst facilities will be made in continuing planning if necessary, and will depend on the status of the development in the Hackensack Meadowlands.

The remainder of the treatment plants in the sub-basin are located in Hudson County and are under the jurisdiction of the Hudson County Sewerage Authority (HCSA) for facilities planning. HCSA is divided into three areas for the purpose of this planning, with Area I (Central Hudson) covering the treatment plants that discharge to Hackensack. The recommendations of the HCSA facilities plan are being incorporated into this plan since their analysis indicated that a more cost-effective approach than the Basin Plan's recommendation was possible.

The Secaucus plant will remain in operation at 2.25 MGD but will be upgraded to treatment level 1. Treatment level 1 is being allowed due to the limited flow and greater assimilative capacity of the Hackensack at the point of discharge. Any flows in excess of 2.25 MGD will be conveyed through Jersey City West to the Jersey City East facility.

The North Bergen Central and Northern facilities will be phased out to Jersey City West, which will convey its entire flow to Jersey City East. The design capacity and treatment level for the Jersey City East plant are discussed in the Hudson River Sub-Basin section.

Kearny's facility will be phased out to PVSC. With implementation of this recommendation Kearny will be totally connected to PVSC. The design capacity and treatment level for PVSC are discussed in the section on the Upper New York Bay sub-basin.

Hudson River Sub-Basin

The Hudson River sub-basin has five treatment plants, three of which will remain in operation. With the exception of Edgewater all the plants are in the HSCA planning area. The Hoboken, West New York and North Bergen - Guttenberg plants are in Area III, while Jersey City East is in Area I.

The Edgewater plant will be upgraded and expanded from a 3.0 MGD primary plant to a 3.3 MGD secondary plant.

The North Bergen-Guttenberg and West New York plants in Area III will be phased out to the Hoboken facility, as recommended in the facilities plan for this area. The Hoboken plant will be upgraded and expanded from a 20.8 MGD primary facility to a secondary facility with a design capacity of 21.1 MGD.

As mentioned in the Hackensack River Sub-Basin analysis the Jersey City East plant will remain in operation but will serve those areas currently sewered to North Bergen North and Central, and Jersey City West along with the flows from Secaucus greater than 2.25 MGD. The 46.6 MGD primary facility at Jersey City East will be upgraded and expanded to a 56.3 MGD secondary plant.

Kill Van Kull Sub-Basin

The only treatment plant in the Kill Van Kull sub-basin is the Bayonne facility which is in Area II of the HCSA facilities planning area. This plant will remain in operation but will be upgraded to secondary treatment. The capacity of the secondary facility will be 10.1 MGD rather than the existing 21.0 MGD primary capacity.

Upper New York Bay Sub-Basin

The Passaic Valley Sewerage Commissioners (PVSC) operate the only facility that discharges to the Upper New York Bay sub-basin. Their treatment plant is being upgraded from primary to secondary treatment and is being expanded from 225 to 300 MGD. Upon completion of those activities the PVSC facility will not require further expansion or upgrading.

Arthur Kill Sub-Basin

The three treatment plants, Joint Meeting of Essex and Union County, Linden-Roselle Swerage Authority and Rahway Valley Sewerage Authority, in the Arthur Kill sub-basin will remain in operation and have upgraded or are in the process of upgrading to secondary treatment. The Joint Meeting facility is being upgraded from primary treatment at its existing capacity of 75 MGD. Linden-Roselle's secondary plant is also under construction and is being expanded from 7.5 to 19 MGD. The Rahway plant has already been upgraded to secondary treatment at 35 MGD, which should be sufficient to the year 2000.

Upper Passaic Sub-Basin

There are twelve treatment plants in the Upper Passaic Sub-Basin, nine of which will remain in operation, but at higher levels of treatment. The Reheis Chemical Company is also required to upgrade its discharge to treatment level 4. The municipal dischargers that will remain in operation are discussed below.

The Bernards Sewerage Authority operates a 1.2 MGD secondary facility which will remain in operation and serve the Lyons Veterans Hospital. The plant will be upgraded to level 4 treatment and expanded to 2.3 MGD.

Passaic Township has a 0.65 MGD secondary plant (Stirling) that will be expanded to 1.7 MGD in order to serve the Warren Stage I & II and IV plants. The expanded facility will also have to upgrade to treatment level 4.

The Berkeley Heights treatment plant will be expanded from a 1.5 MGD secondary facility to a 3.1 MGD plant utilizing treatment level 4.

New Providence operates a 2.8 MGD secondary plant that is used to treat excess flows that cannot be pumped to the Joint Meeting of Essex and Union County. The plant will be upgraded to treatment level 3, with the advanced units having a capacity of 1.0 MGD.

The Chatham Township (Highland) plant provides secondary treatment and has a capacity of 0.75 MGD. The facility will be upgraded to level 4 treatment, with a capacity of 1.0 MGD.

The Madison-Chatham Joint Meeting facility will be upgraded from a secondary plant to one providing treatment level 4. The advanced units will only require a capacity of 3.5 MGD rather than the 4.0 MGD capacity of the existing secondary plant.

The Morris Township (Woodland) facility provides secondary treatment and has a capacity of 2.0 MGD. The facility will also require 2.0 MGD of capacity for the advanced units, which must meet the treatment level 4 requirements with phosphate removal.

All of the above plants are in the Upper Passaic facilities planning area while the remaining two plants are in the Livingston-Florham Park facilities planning area. Both municipalities operate their own facilities and will continue to do so in the future.

Livingston's plant will be upgraded from a secondary facility to a plant providing treatment level 4. The design capacity of the plant will be determined through the facilities and continuing planning processes.

The Florham Park plant has a design capacity of 1.0 MGD and provides secondary treatment. The facility will be upgraded to level 4 treatment, with the design capacity being determined as discussed above.

Whippany/Rockaway Sub-Basin

Five of the six treatment plants in the Whippany/Rockaway sub-basin will remain in operation but will be expanded and upgraded. There are also three industrial or institutional dischargers, Picatinny Arsenal, Whippany Paperboard and Esso Research, that will be required to upgrade to treatment level 4 or in the case of Picatinny Arsenal connect to the Rockaway Valley Regional Sewage Authority (RVRSA). The municipal dischargers in the sub-basin are discussed below.

The Morris Township (Butterworth) plant has a capacity of 2.0 MGD and provides secondary treatment. The facility will be expanded to 3.3 MGD, including the Greystone Hospital, while providing treatment level 4. It had been recommended that the Butterworth plant provide phosphate removal since the discharge was located above Speedwell and Pocahontas Lakes. However, the Whippany River facilities plan has determined that it would be more cost-effective to move the discharge below the lakes rather than provide phosphate removal. Therefore, it is required that the discharge be moved and the Butterworth facility does not have to provide phosphate removal.

Morristown's plant provides secondary treatment and has a capacity of 1.5 MGD. The facility will be expanded to 3.45 MGD while providing treatment level 4.

The Hanover facility has a capacity of 3.0 MGD and provides secondary treatment. It had been recommended that the facility serve East Hanover. However, since there will be available capacity at the Parsippany-Troy Hills plant, East Hanover will be sewered to that facility. Therefore, the Hanover plant will need to be expanded to 3.1 MGD. Like the Morris and Morristown plants, Hanover's facility will be upgraded to treatment level 4.

The above dischargers are in the Whippany River facilities planning area while the Parsippany-Troy Hills and RVRSA plants each serve their individual facilities planning areas. Both of these facilities will be required to provide denitrifacation along with their required treatment level. This has been determined necessary through analyses conducted by the DEP and EPA.

The Parsippany-Troy Hills plant has been expanded to its future design capacity of 16.0 MGD. The facility will be upgraded to level 4 treatment with denitrification in the near future.

The RVRSA facility will be expanded from a 9.0 MGD secondary plant to a 12.0 MGD facility providing treatment level 5 and denitrification.

Pompton/Mid-Passaic Sub-Basin

The Pompton/Mid-Passaic Sub-Basin incorporates those discharges above Little Falls but below the confluence of the Whippany and Passaic Rivers. The discharges on the Pompton, Pequannock and Wanaque River are included in this analysis. The plants that will remain in operation are discussed below.

The Butler-Bloomingdale plant has a capacity of 1.4 MGD and provides secondary treatment. The facility will be upgraded to treatment level 4, while the design capacity will be determined through coordinated efforts of facilities planning and continuing planning. The discharge point will be changed from the existing location on the Pequannock River to the confluence of the Pequannock and Wanaque Rivers.

Wanaque operates a small (0.3 MGD) secondary plant which will be phased out to a new 2.5 MGD plant to be located above Lake Inez. The facility will provide treatment level 4 with a discharge to the confluence of the Pequannock and Wanaque Rivers.

Pompton Lakes operates a 1.2 MGD secondary plant that will be upgraded to level 4 treatment. The design capacity will be determined during the facilities plan that is necessary for this area in coordination with the continuing planning process.

The Caldwell treatment plant will be upgraded and expanded from a 4.0 MGD secondary facility to a 6.1 MGD plant providing treatment level 4.

Pequannock, Lincoln Park and Fairfield are constructing a new 7.5 MGD facility in Lincoln Park. The plant will provide treatment level 4 and discharge to the Pompton River near the confluence with the Passaic River.

The Wayne Township (Mountain View) plant will be expanded from 4.0 to 13.5 MGD. The Sheffield Hills plant will be phased out to the expanded Mountain View facility. Mountain View will also be upgraded from secondary treatment to treatment level 4 along with denitrification, which has been determined necessary through analyses conducted by DEP and EPA.

c. Industrial Discharge Analysis The majority of industries within the study area discharge their wastes to municipal sewer systems. These industries must comply with the treatment plant authority, EPA and DEP requirements for industrial pretreatment. These organizations are in the process of implementing pretreatment requirements and will continue to do so. Therefore, no specific recommendations need to be made in this study. The Office of Sludge Management and Industrial Pretreatment in the DEP is responsible for reviewing pretreatment standards and recommending revisions. This Office will continue these tasks and function as the DEP management agency for industrial pretreatment.

A comparison, by river segment, of the biochemical oxygen demand (BOD) and suspended solids (SS) loadings from the municipal-institutional and industrial dischargers is presented in Table V-18. As can be seen from this table the municipal-institutional dischargers contribute the vast majority of the point source BOD and SS loads for the entire study area. In addition, those segments with both municipal and industrial dischargers, the municipal loads dominate those contributed by industries. Based on this analysis it was determined that for those industries discharging wastewater directly to a receiving stream, the minimum treatment requirements will be the BPT, BAT or BCT limitations as defined by EPA (see Section V.B.4). In a few instances waste load allocations more stringent than the EPA requirements have been specified and have been discussed above. During the continuing planning process waste load allocations more stringent than the minimum requirements may be developed for other industries by utilizing the waste load allocation process described in Section V.B.4.

Table V-18

Municipal and Industrial Point Source Loadings

Segment	BOD (lb/yr) Municipal	BOD (lb/yr) Industrial	SS (lb/yr) Municipal	SS (lb/yr) Industrial
Arthur Kill	38,854,000	7,009,000	18,064,000	5,066,000
Elizabeth	0	465,000	0	6,000
Hackensack	12,851,000	69,000	10,284,000	124,000
Hudson	27,446,000	456,000	22,456,000	79,000
Kill Van Kull	3,387,000	3,000	3,187,000	20,000
Lower Mid-Passaic	167,000	17,000	717,000	20,000
Lower Passaic	0	1,000	0	540,000
Newark Bay	7,227,000	42,000	3,507,000	465,000
Peckman	609,000	0	350,000	0
Pequannock	291,000	0	264,000	30,000
Pompton	393,000	0	334,000	4,000
Rahway	0	74,000	0	12,713,000
Ramapo	16,000	0	17,000	0
Rockaway	166,000	0	100,000	15,000
Saddle	237,000	0	268,000	0
Upper Mid-Passaic	1,043,000	1,000	928,000	2,000
Upper New York Bay	300,620,000	592,000	188,690,000	87,000
Upper Passaic	723,000	29,000	841,000	29,856,000
Wanaque	49,000	0	61,000	1,000
Whippany	987,000	238,000	779,000	379,000
TOTAL	395,066,000	8,996,000	250,847,000	49,407,000

V.B.6. Development of A Statewide Industrial Pretreatment Strategy and Program

(To be prepared for Final Plan)

V.B.7. Development of a Statewide Sludge Management Strategy and Program

(To be prepared for Final Plan)

V.B.8 Project Priority List

The Project Priority List presented in Table V-24 is intended to show the state's expected order for funding wastewater facilities projects during fiscal year 1978-1979. The table lists the projects for the entire state, with those projects in the study area being identified with a *.

The methodology utilized in developing the priority list is contained in Appendix V-2, Construction Grant Priority System for Fiscal Year 1978-1979. Briefly, the methodology includes a segment rank and a discharger rank, which are summed to determine the priority rank of each wastewater treatment project in the State. The segment ranking considers population, need for high quality waters and severity of pollution, while the discharge ranking considers violations of water quality standards, areawide public health hazards caused by extensive malfunctioning of septic systems, nature of project, population density and land based sludge disposal projects in its criteria.

The methodology for developing the project priority list is currently being reviewed by DEP. The Water Quality Management Planning Program recommends that the number of segments in the state be greatly expanded from the existing 26. Modification of the criteria in the segment and discharger list is also being considered, as well as modifications of the method of determining the final ranking. The specific change to the priority list methodology will be developed in continuing planning for use in developing future project priority lists.

TABLE V-24

PRELIMINARY

8-9-79

Fiscal Year 1979 Project Priority List

Priority No.	ID No.	Applicant	Project Step	Project Description (**)	Eligible Cost	Fiscal Year Funds
1.0	707-01	State Operator Training Ctr. Rutgers U.	III	B	$ 333,000	79
* 2.0	625-02	West New York Town	II	H	60,000	79
	625-03	West New York Town	III	H	857,000	79
* 3.0	686-02	Joint Mtg.-Essex & Union	II	H	2,000,000	79
	686-03	Joint Mtg.-Essex & Union	III	H	18,000,000	79
4.0	387-01	Cape May County MUA	I		2,000,000	79
	732-01	Cape May County MUA (Wildwood)	II	B,C,D,E	3,598,000	80 or later
	732-02	Cape May County MUA (Wildwood)	III	B,C,D,E	89,330,000	80 or later
4.1	664-01	Wildwood City	II	G	165,600	80 or later
	664-02	Wildwood City	III	G	2,305,400	80 or later
4.2	663-01	No. Wildwood City	II	G	116,000	80 or later
	663-02	No. Wildwood City	III	G	1,495,000	80 or later
4.3	719-01	Wildwood Crest	II	G	81,300	80 or later
	719-02	Wildwood Crest	III	G	1,002,700	80 or later
4.4	626-01	West Wildwood Borough	I		30,000	80 or later
	626-02	West Wildwood Borough	II	F	130,000	80 or later
	626-03	West Wildwood Borough	III	F	642,000	80 or later
* 5.0	399-02	Hudson County S.A.	II	B,C,D,E,G	23,000,000	79
	399-03	Hudson County S.A.	III	B,C,D,E,G	230,000,000	80 or later
* 5.1	652-01	No. Bergen Township	III	C,D,F	2,000,000	79
* 6.0	683-02	Passaic Valley S.C.	II	H	751,656	Certified
	683-03	Passaic Valley S.C.	II	H	2,000,000	79
	683-04	Passaic Valley S.C.	III	H	28,570,000	79
7.0	387-02	Cape May County MUA-Ocean City	II	B,C,D,E,	633,000	Certified
	387-03	Cape May County MUA-Ocean City	III	C,D,E	8,983,497	79
	387-04	Cape May County MUA-Ocean City	III	B	16,294,640	79
	387-05	Cape May County MUA-Ocean City	III	B	14,700,000	79
7.1	730-01	Ocean City	II	G	7,400	79
	730-02	Ocean City	III	G	29,600	79
* 8.0	687-02	Bergen County U.A.	II	H	2,000,000	79
	687-03	Bergen County U.A.	III	H	28,750,000	79
9.0	377-01	So. Monmouth Reg. S.A.	PREVIOUSLY FUNDED			
9.1	622-01	Wall Township SE	I		64,000	Certified
	622-02	Wall Township SE	II	F	380,000	79
	622-03	Wall Township SE	III	F	3,800,000	80 or later
10.0	412-02	Ocean Township S.A. (Asb.Pk.)	II	B,C	645,000	79
	412-03	Ocean Township S.A. (Asb.Pk.)	III	B,C	10,842,000	80 or later
10.1	374-01	Deal Borough	III	D,E	182,000	79

(**) B - Wastewater Treatment Plant
C - Interceptor Sewers
D - Pump Stations
E - Force Mains
F - Collection System
G - Sewer System Rehabiliation
H - Land-based Sludge Disposal
I - Septic Tank Pretreatment

*Step II & III shown without cost. Scope and cost will be included when facilities planning is sufficiently complete to identify future steps.

TABLE V-24 (Continued)

Priority No.	ID No.	Applicant	Project Step	Project Description (**)	Eligible Cost	Fiscal Year Funds
10.2	750-01	Ocean Twp. S.A.	I		$ 21,200	79
	750-02	Ocean Twp. S.A.	II	F	46,600	80 or later
	750-03	Ocean Twp. S.A.	III	F	1,161,800	80 or later
*11.0	681-02	Rahway Valley S.A.	II	H	1,000,000	79
	681-03	Rahway Valley S.A.	III	H	12,000,000	79
	547-01	Rahway Valley S.A.	I		700,000	79
12.0	379-01	Ocean County S.A.-South	PREVIOUSLY FUNDED			
12.1	585-02	Stafford MUA	II	F	404,771	79
	585-03	Stafford MUA	III	F	6,315,100	79
12.2	579-02	Little Egg Harbor MUA	II	F	362,000	79
	579-03	Little Egg Harbor MUA	III	F	1,635,000	80 or later
12.3	589-02	Eagleswood Township	II	F	350,000	79
13.0	356-01	Ocean County S.A.-North	PREVIOUSLY FUNDED			
13.1	609-01	Jackson Township MUA	I		10,000	79
	609-02	Jackson Township MUA	II	D,E	20,000	80 or later
	609-03	Jackson Township MUA	III	D,E	200,000	80 or later
13.2	714-01	Ocean County S.A.	I	H	600,000	79
	714-02	Ocean County S.A.	II	H	*	80 or later
	714-03	Ocean County S.A.	III	H	*	80 or later
13.3	641-01	Jackson Township MUA	I		80,000	79
	641-02	Jackson Township MUA	II	F	200,000	80 or later
	641-03	Jackson Township MUA	III	F	1,500,000	80 or later
13.4	746-01	Howell Township	I		75,000	79
	746-02	Howell Township	II	F	20,000	80 or later
	746-03	Howell Township	III	F	375,000	80 or later
* 14.0	586-01	Paterson City	II	C	550,000	79
	586-02	Paterson City	III	C	6,600,000	80 or later
15.0	680-02	Middlesex County S.A.	II	H	5,000,000	79
	680-03	Middlesex County S.A.	III	H	80,000,000	79
16.0	344-01	Atlantic County S.A.-Coastal	PREVIOUSLY FUNDED			
	344-02	Atlantic County S.A.	II	G	847,000	79
	344-03	Atlantic County S.A.	III	G	1,900,000	79
16.1	442-01	Brigantine City	III	F,G	675,000	79
16.2	562-03	Galloway Township MUA	II	F	239,000	79
	562-04	Galloway Township MUA	III	F	5,100,000	79
16.3	618-01	Somers Point S.A.	III	F	130,000	79
16.4	665-01	Longport Borough	III	G	360,000	79
16.5	666-01	Margate City	III	G	765,000	79
16.6	667-01	Ventnor City	III	G	1,035,000	79
17.0	661-01	Cape May Co. MUA-Seven Mile	II	B,C,D,E	3,414,000	79
	661-02	Cape May Co. MUA-Seven Mile	III	B,C,D,E	81,506,000	80 or later
17.1	659-01	Sea Isle City	II	G	32,600	79
	659-02	Sea Isle City	III	G	321,400	80 or later
17.2	619-01	Upper Township (Strathmere)	I		27,000	79
	619-02	Upper Township (Strathmere)	II	F	130,000	80 or later
	619-03	Upper Township (Strathmere)	III	F	1,521,000	80 or later
17.3	691-01	Middle Township (Del Haven)	I		23,000	79
	691-02	Middle Township (Del Haven)	II	F	210,000	80 or later
	691-03	Middle Township (Del Haven)	III	F	2,340,000	80 or later
17.4	691-04	Middle Township	III	G	64,000	79
17.5	720-01	Middle Township (Avalon Manor)	I		6,000	79
	720-02	Middle Township (Avalon Manor)	II	F	60,000	80 or later
	720-03	Middle Township (Avalon Manor)	III	F	600,000	80 or later

TABLE V-24 (Continued)

Priority No.	ID No.	Applicant	Project Step	Project Description (**)	Eligible Cost	Fiscal Year Funds
17.6	721-01	Avalon Borough	II	G	$ 58,100	79
	721-02	Avalon Borough	III	G	676,900	79
17.7	722-01	Stone Harbor	II	G	39,400	79
	722-02	Stone Harbor	III	G	441,600	79
*18.0	695-01	Passaic Valley S.C.	I		3,000,000	79
	369-04	Passaic Valley S.C.	III	B,C	90,000,000	80 or later
*18.1	486-02	No. Haledon Borough	II	C,D,E,F	550,000	79
	486-03	No. Haledon Borough	III	C,D,E,F	14,640,000	80 or later
*18.2	651-01	Haledon Borough	III	F	150,000	79
*19.0	376-01	Morristown Town	III	B	7,000,000	Certified
20.0	660-01	Cape May Co. MUA-Cape May	II	B,C,D,E	576,269	Certified
	660-02	Cape May Co. MUA-Cape May	III	B,C,D,E	20,274,000	79
20.1	624-01	West Cape May Borough	I		27,000	79
	624-02	West Cape May Borough	II	F	11,000	80 or later
	624-03	West Cape May Borough	III	F	151,000	80 or later
	624-04	West Cape May Borough	III	G	133,000	79
20.2	598-01	Cape May Point Borough	I		44,800	Certified
	598-02	Cape May Point Borough	II	F	120,000	79
	598-03	Cape May Point Borough	III	F	1,200,000	80 or later
20.3	662-01	Cape May City	II	G	138,600	79
	662-02	Cape May City	III	G	1,994,400	80 or later
21.0	372-02	Ocean County S.A.-Central	PREVIOUSLY FUNDED			
	372-07	Ocean County S.A.-Central	III	C	991,398	79
21.1	549-01	So. Toms River Borough	III	F	3,464,600	79
21.2	505-01	Pine Beach Borough	III	D,E,F	1,054,000	79
21.3	542-02	Ocean Gate Borough	II	F	534,000	Certified
	542-03	Ocean Gate Borough	III	F	1,430,000	79
21.4	620-02	Barnegat Township	III	F	1,238,000	79
21.5	650-01	Manchester Township	I		84,000	79
	650-02	Manchester Township	II	*	*	80 or later
	650-03	Manchester Township	III	*	*	80 or later
*22.0	426-02	No. Arlington/Lyndhurst	II	B	703,000	79
*23.0	715-01	Madison-Chatham Jt. Mtg.	II	B	1,100,000	79
	715-02	Madison-Chatham Jt. Mtg.	III	B	9,000,000	80 or later
*24.0	474-02	New Providence Borough	II	B	360,000	79
	474-03	New Providence Borough	III	B	3,280,000	80 or later
25.0	640-01	Camden County MUA (Atl.)	I	*	*	79
	640-02	Camden County MUA (Atl.)	II	*	*	80 or later
	640-03	Camden County MUA (Atl.)	III	*	*	80 or later
	708-01	Camden County MUA (Del.#1)	II	B,C,D,H	15,000,000	79
	708-02	Camden County MUA (Del.#1)	III	B,C,D,H	200,000,000	80 or later
	524-01	Camden County MUA (Del.#2)	I		120,000	Certified
	524-02	Camden County MUA (Del.#2)	II	B,C,D,H	4,500,000	79
	524-03	Camden County MUA (Del#2)	III	B,C,D,H	28,000,000	80 or later
*26.0	460-02	Totowa-W. Paterson	II	B,C,D	1,430,000	79
	460-03	Totowa-W. Paterson	III	B,C,D	15,000,000	80 or later
*27.0	386-01	Bergen County U.A.	PREVIOUSLY FUNDED			
	386-02	Bergen County U.A.	I		667,000	Certified
	386-04	Bergen County U.A.	II	*	633,000	80 or later
	386-05	Bergen County U.A.	III	*	5,175,000	80 or later
	424-01	Bergen County U.A.	II	C,D,E	1,902,000	79
	424-02	Bergen County U.A.	III	C,D,E	5,270,000	80 or later
	386-06	Bergen County U.A. (Aux.)	II	B	650,000	79
	386-07	Bergen County U.A. (Aux.)	III	B	5,200,000	80 or later

TABLE V-24 (Continued)

Priority No.	ID No.	Applicant	Project Step	Project Description (**)	Eligible Cost	Fiscal Year Funds
*27.1	613-01	Ordell Borough	III	C,D,E	$ 246,000	79
*27.2	517-01	Fairview Borough	III	G	915,000	80 or later
*27.3	705-01	Carlstadt S.A.	I		134,000	79
	490-01	Carlstadt S.A.	II	D	185,000	Certified
	490-02	Carlstadt S.A.	III	D	1,200,000	79
*27.4	584-02	Old Tappan Borough	II	D,E,F	300,000	79
	584-03	Old Tappan Borough	III	D,E,F	3,800,000	80 or later
*27.5	512-01	Hackensack City	I		150,000	79
	512-02	Hackensack City	II	G	1,468,000	80 or later
	512-03	Hackensack City	III	G	10,108,000	80 or later
	512-04	Hackensack City	III	G	5,267,000	80 or later
*27.6	728-01	River Edge Borough	III	G	160,000	79
*28.0	523-02	Caldwell Borough	II	B	1,500,000	79
	523-03	Caldwell Borough	III	B	16,000,000	80 or later
*28.1	353-01	W. Caldwell Borough	III	D,E	880,000	79
29.0	416-04	Trenton City	III	B,C	26,200,000	79
	416-05	Trenton City	III	G	300,000	79
*30.0	639-02	Ridgewood/Fair Lawn	II	B	800,000	79
	639-03	Ridgewood/Fair Lawn	III	B	8,000,000	80 or later
*31.0	389-02	Rockaway Valley Reg. S.A.	II	B,C	4,280,000	Certified
	389-03	Rockaway Valley Reg. S.A.	III	B,C	60,500,000	80 or later
*31.1	478-02	Rockaway Township	II	D,E,F	292,000	79
	478-03	Rockaway Township	III	D,E,F	2,504,000	80 or later
*31.2	489-01	Wharton S.A.	III	F	401,000	79
*31.3	466-02	Denville Township	II	F	683,000	79
	466-03	Denville Township	III	F	12,000,000	80 or later
*31.4	498-01	Mine Hill Township	III	D,E,F	1,742,000	79
*31.5	632-02	Randolph Township MUA	II	C,D,E,F	440,000	79
	632-03	Randolph Township MUA	III	C,D,E,F	5,221,000	79
*31.6	696-01	Jefferson Township	I	C,D,E,F	78,000	79
	696-02	Jefferson Township	II	C,D,E,F	555,000	80 or later
	696-03	Jefferson Township	III	C,D,E,F	9,075,000	80 or later
*32.0	587-02	Parsippany-Troy Hills Township	PREVIOUSLY FUNDED			
*32.1	467-02	Montville Twp. MUA	II	C,D,E,F	1,700,000	79
	467-03	Montville Twp. MUA	III	C,D,E,F	22,500,000	80 or later
*33.0	636-01	Pompton Lakes MUA	I		200,000	79
	636-02	Pompton Lakes MUA	II	B,C,D,E	600,000	80 or later
	636-03	Pompton Lakes MUA	III	B,C,D,E	10,000,000	80 or later
*33.1	418-01	Oakland Borough	III	C,F	5,710,000	79
	418-02	Oakland Borough	III	C,F	8,538,000	80 or later
*33.2	473-01	Riverdale Borough	III	C,D,E,F	2,910,000	79
*34.0	385-01	Berkeley Heights Township	III	B	12,900,000	79
*35.0	393-03	Wayne Township	III	B	16,000,000	80 or later
	365-03	Wayne Township	II	C,D,E,F,G	1,440,000	80 or later
	365-04	Wayne Township	III	C,D,E,F,G	23,057,000	80 or later
36.0	398-02	Manasquan River Reg. S.A.	II	B,C,D	2,174,000	80 or later
	398-03	Manasquan River Reg. S.A.	III	C	6,428,000	80 or later
	398-04	Manasquan River Reg. S.A.	III	B,C,D	24,447,000	80 or later
36.1	603-02	Farmingdale Borough	II	F	316,000	80 or later
	603-03	Farmingdale Borough	III	F	1,137,000	80 or later
37.0	435-02	Perth Amboy City	II	D,E	600,000	80 or later
	435-03	Perth Amboy City	III	D,E	2,000,000	80 or later

TABLE V-24 (Continued)

Priority No.	ID No.	Applicant	Project Step	Project Description (**)	Eligible Cost	Fiscal Year Funds
*38.0	703-01	Livingston/Florham Park S.A.	I		$ 267,000	79
	703-02	Livingston/Florham Park S.A.	II	B	1,145,000	80 or later
	703-03	Livingston/Florham Park S.A.	III	B	11,451,000	80 or later
*38.1	675-01	Florham Park Borough	III	F	175,000	80 or later
*39.0	388-02	Hanover Township S.A.	II	B	1,700,000	80 or later
	388-03	Hanover Township S.A.	III	B	15,700,000	80 or later
	727-01	Hanover Township S.A.	I		40,000	80 or later
	727-02	Hanover Township S.A.	II	C	75,000	80 or later
	727-03	Hanover Township S.A.	III	C	1,200,000	80 or later
*39.1	427-01	E. Hanover Township - I	III	C,D,E,F	6,800,000	80 or later
	427-02	E. Hanover Township - II&III	II	C,D,E,F	310,000	80 or later
	427-03	E. Hanover Township - II&III	III	C,D,E,F	4,900,000	80 or later
*40.0	459-01	Pequannock River S.A.	I		289,600	80 or later
	459-02	Pequannock River S.A.	II	B,C,D,E	1,394,000	80 or later
	459-03	Pequannock River S.A.	III	B,C,D,E	12,598,000	80 or later
*40.1	487-02	Kinnelon Borough	III	D,E,F	3,511,000	80 or later
*40.2	634-02	Bloomingdale Borough	II	D,E,F	138,000	80 or later
	634-03	Bloomingdale Borough	III	D,E,F	2,223,000	80 or later
*40.3	729-01	Riverdale Borough	III	D,E,F	1,000,000	80 or later
*41.0	354-01	Pequannock, Lincoln Park & Fairfield S.A.	PREVIOUSLY FUNDED			
	354-03	Pequannock, Lincoln Park & Fairfield S.A.	III	C,D,E	3,800,000	80 or later
*41.1	480-01	Pequannock Township	III	F	16,663,000	80 or later
*41.2	594-02	Lincoln Park Borough	III	D,E,F	1,296,000	80 or later
*42.0	533-01	Peckman River Committee	II	B	1,591,000	80 or later
	533-02	Peckman River Committee	III	B	11,803,000	80 or later
*43.0	723-01	Morris Twp. - Butterworth	II	B,C	1,183,000	80 or later
	723-02	Morris Twp. - Butterworth	III	B,C	11,830,000	80 or later
	724-01	Morris Twp. - Woodland	II	B	900,000	80 or later
	724-02	Morris Twp. - Woodland	III	B	7,700,000	80 or later
*43.1	748-01	Morris Township	II	H	690,750	79
	748-02	Morris Township	III	H	5,475,000	80 or later
*44.0	716-01	Little Falls MUA	II	B	370,000	80 or later
	716-02	Little Falls MUA	III	B	4,400,000	80 or later
*45.0	700-01	Northwest Bergen Co.S.A.	I		160,000	80 or later
	700-02	Northwest Bergen Co.S.A.	II	B,H	150,000	80 or later
	700-03	Northwest Bergen Co.S.A.	III	B,H	2,500,000	80 or later
*46.0	403-01	Chatham Township	II	B,C,F	725,000	80 or later
	403-02	Chatham Township	III	B,C,F	12,300,000	80 or later
47.0	684-02	Northeast Monmouth Reg. S.A.	II	H	150,000	79
	684-03	Northeast Monmouth Reg. S.A.	III	H	2,143,000	80 or later
*48.0	390-03	Wanaque Valley Reg. S.A.	II	B,C,D,E	2,200,000	79
	390-04	Wanaque Valley Reg. S.A.	III	B,C,D,E	32,800,000	80 or later
*48.1	434-01	Wanaque Borough MUA	III	F	4,506,000	80 or later
*48.2	483-01	Ringwood Borough	II	F	500,000	79
	483-02	Ringwood Borough	III	F	7,500,000	79
*48.3	701-01	W. Milford MUA	I		150,000	80 or later
	701-02	W. Milford MUA	II	D,E,F	455,000	80 or later
	701-03	W. Milford MUA	III	D,E,F	4,550,000	80 or later
*49.0	404-01	Passaic Twp./Warren Twp.S.A.	II	B,C	1,100,000	80 or later
	404-02	Passaic Twp./Warren Twp.S.A.	III	B,C	10,300,000	80 or later
*50.0	382-01	Bernards Township S.A.	III	B,C,D,E	20,036,000	80 or later

TABLE V-24 (Continued)

Priority No.	ID No.	Applicant	Project Step	Project Description (**)	Eligible Cost	Fiscal Year Funds
51.0	380-03	Western Monmouth U.A.	II	B	$ 300,000	80 or later
	380-04	Western Monmouth U.A.	III	B	3,200,000	80 or later
*52.0	717-01	Cedar Grove Borough	II	B	361,000	80 or later
	717-02	Cedar Grove Borough	III	B	2,316,000	80 or later
53.0	470-01	No. Plainfield Borough	III	C,F	2,000,000	79
53.1	475-01	Watchung Borough	III	C,F	1,120,000	Certified
53.2	617-01	Plainfield City	III	G	68,000	80 or later
54.0	685-02	Middletown Township S.A.	II	H	48,000	Certified
	685-03	Middletown Township S.A.	III	H	686,000	80 or later
55.0	405-02	Atlantic County S.A. (Lower Great Egg)	II	B	1,467,000	80 or later
	405-03	Atlantic County S.A. (Lower Great Egg)	III	B	11,300,000	80 or later
56.0	433-02	Woodbridge Township	II	C,D,E	1,200,000	79
	433-03	Woodbridge Township	III	C,D,E	13,000,000	80 or later
57.0	519-02	Atlantic Highlands-Highlands S.A.	I		400,000	80 or later
	519-03	Atlantic Highlands-Highlands S.A.	II	B,D,E	250,000	80 or later
	519-04	Atlantic Highlands-Highlands S.A.	III	B,D,E	3,717,000	80 or later
58.0	704-01	Stony Brook Reg. S.A.	I		100,000	79
	704-02	Stony Brook Reg. S.A.	II	B,C,D,E	500,000	79
	704-03	Stony Brook Reg. S.A.	III	B,C,D,E	5,000,000	80 or later
58.1	656-01	Princeton Sewer Oper. Comm.	II	G	400,000	80 or later
	656-02	Princeton Sewer Oper. Comm.	III	G	2,139,000	80 or later
58.2	751-01	Princeton Twp.	I		23,500	80 or later
	751-02	Princeton Twp.	II	F	23,500	80 or later
	751-03	Princeton Twp.	III	F	235,000	80 or later
59.0	326-02	Sayreville/So. Amboy	II	C,D,E	915,000	80 or later
	326-03	Sayreville/So. Amboy	III	C,D,E	7,600,000	80 or later
60.0	536-02	Upper Millstone Group	II	*	500,000	79
	536-03	Upper Millstone Group	III	*	4,000,000	80 or later
61.0	381-01	Roxbury Township	I	*	200,000	79
	381-02	Roxbury Township	II	*	300,000	80 or later
	381-03	Roxbury Township	III	*	2,000,000	80 or later
62.0	537-02	Mt. Olive/Washington	II	*	400,000	80 or later
	537-03	Mt. Olive/Washington	III	*	3,000,000	80 or later
63.0	644-02	Sussex Co. MUA-Pequest	II	B,C,D,E,H	500,000	80 or later
	644-03	Sussex Co. MUA-Pequest	III	B,C,D,E,H	5,000,000	80 or later
63.1	734-01	Andover Township	I		30,000	80 or later
	734-02	Andover Township	II	F	150,000	80 or later
	734-03	Andover Township	III	F	1,200,000	80 or later
63.2	735-01	Andover Borough	I		30,000	80 or later
	735-02	Andover Borough	II	F	40,000	80 or later
	735-03	Andover Borough	III	F	240,000	80 or later
63.3	736-01	Byram Township	I		30,000	80 or later
	736-02	Byram Township	II	F	200,000	80 or later
	736-03	Byram Township	III	F	1,500,000	80 or later
*64.0	682-02	Linden-Roselle S.A.	II	H	750,000	79
	682-03	Linden-Roselle S.A.	III	H	10,714,000	80 or later
*65.0	443-01	Edgewater/Cliffside Park	I		1,000,000	79
	443-02	Edgewater/Cliffside Park	II	B	520,000	80 or later
	443-03	Edgewater/Cliffside Park	III	B	4,200,000	80 or later

TABLE V-24 (Continued)

Priority No.	ID No.	Applicant	Project Step	Project Description (* *)	Eligible Cost	Fiscal Year Funds
66.0	485-02	Raritan Township Reg. U.A .	II	B,C,D,E	$ 300,000	79
	485-03	Raritan Township Reg. U.A .	III	B,C,D,E	7,800,000	80 or later
66.1	440-01	Flemington Borough	II	G	100,000	80 or later
	440-02	Flemington Borough	III	G	324,000	80 or later
66.2	577-03	Readington Township (Three Bridges)	III	F	450,000	80 or later
67.0	706-01	Warren Co.-Pohatcong Creek S.A.	I		87,000	80 or later
	706-02	Warren Co.-Pohatcong C reek S.A .	II	B,C,H	480,000	80 or later
	706-03	Warren Co.-Pohatcong Creek S.A.	III	B,C,H	8,000,000	80 or later
*68.0	464-01	Northwest Bergen Co. S.A.	III	C,D,E	8,574,000	79
*68.1	592-02	Mahwah Township	II	F	315,000	80 or later
	592-03	Mahwah Township	III	F	4,017,000	80 or later
*68.2	737-01	Mahwah Township	III	I	120,000	80 or later
*68.3	482-02	Wyckoff Township	III	C,D,E,F	1,653,000	80 or later
	738-01	Wyckoff Township	II	F	650,000	80 or later
	738-02	Wyckoff Township	III	F	6,160,000	80 or later
	739-01	Wyckoff Township	II	D,E,F	470,000	80 or later
	739-02	Wyckoff Township	III	D,E,F	5,470,000	80 or later
69.0	384-02	Musconetcong S.A.	II	B, C,H	1,800,000	80 or later
	384-03	Musconetcong S.A.	III	B,C,H	18,000,000	80 or later
69.1	541-01	Mount Arlington Borough	I		25,000	80 or later
	541-02	Mount Arlington Borough	II	F	221,000	80 or later
	541-03	Mount Arlington Borough	III	F	2,210,000	80 or later
69.2	548-02	Roxbury Twp.-Landing Shore	III	F	3,498,000	80 or later
69.3	488-01	Hopatcong Borough	I		25,000	80 or later
	488-02	Hopatcong Borough	II	F	250,000	80 or later
	488-03	Hopatcong Borough	III	F	2,496,000	80 or later
69.4	747-01	Jefferson Twp.	I		75,000	80 or later
	747-02	Jefferson Twp.	II	F	200,000	80 or later
	747-03	Jefferson Twp.	III	F	750,000	80 or later
70.0	637-01	Middlesex County S.A..	PREVIO USLY FUNDED			
	699-01	Middlesex County S.A.	I		250,000	80 or later
	699-02	Middlesex County S.A.	II	C(o utfall)	600,000	80 or later
	699-03	Middlesex County S.A	III	C(outfall)	240,000,000	80 or later
70.1	437-01	New Brunswick City	III	F	150,000	80 or later
70.2	451-02	Carteret Borough	II	D ,E	500,000	80 or later
	451-03	Carteret Borough	III	D, E	2,000,000	80 or later
70.3	672-01	Old Bridge S.A.	II	D,E	300,000	79
	672-02	Old Bridge S.A .	III	D,E	4,000,000	80 or later
70.4	423-01	Monroe Township MUA	III	C,D,E,F	6,500,000	79
70.5	605-01	Helmetta Borough	I		50,000	80 or later
	605-02	Helmetta Borough	II	F	70,000	80 or later
	605-03	Helmetta Borough	III	F	800,000	80 or later
70.6	428-01	Edison Township	II	C,D	300,000	80 or later
	428-02	Edison Township	III	C,D	2,800,000	80 or later
71.0	462-01	Bayshore Regional S.A.	PREVIOUSLY FUNDED			
71.1	697-01	Aberdeen Twp. MUA	I		200,000	79
	697-02	Aberdeen Twp. MUA	II	*	200,000	80 or later
	697-03	Aberdeen Twp. MUA	III	*	4,000,000	80 or later
72.0	530-02	No. Hunterdon Jt. Sewer Assem.	II	B, C	350,000	80 or later
	530-03	No. Hunterdon Jt. Sewer Assem.	III	B, C	3,500,000	80 or later
73.0	535-01	Readington-Lebanon S.A.	II	B,C	750,000	79
	535-02	Readington-Lebanon S.A.	III	B, C	4,000,000	80 or later
73.1	577-01	Readington/White House	II	F	200,000	80 or later
	577-02	Readington/White House	III	F	1,350,000	80 or later

TABLE V-24 (Continued)

Priority No.	ID No.	Applicant	Project Step	Project Description (**)	Eligible Cost	Fiscal Year Funds
73.2	509-01	Lebanon Borough	III	F	700,000	80 or later
74.0	550-02	Cumberland Co. S.A.	PREVIO USLY FUNDED			
	550-03	Cumberland Co. S.A.	II	C	454,000	80 or later
	550-04	Cumberland Co. S.A.	III	C	7,100,000	80 or later
74.1	570-02	Upper Deerfield Twp.	II	F	267,000	80 or later
	570-03	Upper Deerfield Twp.	III	F	1,900,000	80 or later
75.0	578-02	Manville Borough	II	B,D,E,G	350,000	80 or later
	578-03	Manville Borough	III	B,D,E,G	5,400,000	80 or later
76.0	673-01	Cranford Township	III	F	288,000	80 or later
77.0	453-01	Warren Co.-Paulins Kill S.A.	I		48,000	80 or later
	453-02	Warren Co.-Paulins Kill S.A.	II	B,C,H	200,000	80 or later
	453-03	Warren Co.-Paulins Kill S.A.	III	B,C,H	2,200,000	80 or later
77.1	568-01	Blairstown Township	III	F	588,000	80 or later
78.0	567-01	Allentown Borough	I		16,000	Certified
	567-02	Allentown Borough	II	B, C ,H	400,000	80 or later
	567-03	Allentown Borough	III	B,C, H	3,000,000	80 or later
79.0	383-02	Hamilton Twp. (Mercer)	PREVIOUSLY FUNDED			
	383-04	Hamilton Twp. (Mercer)	III	C,D,E	5,000,000	80 or later
79.1	508-01	Washington Twp. MUA	II	C	37,500	80 or later
	508-02	Washington Twp. MUA	III	C	170,000	80 or later
80.0	529-02	Somerset-Raritan Valley S.A.	PREVIO USLY FUNDED			
	529-03	Somerset-Raritan Valley S.A.	I		60,000	80 or later
	529-04	Somerset-Raritan Valley S.A.	II	B	600,000	80 or later
	529-05	Somerset-Raritan Valley S.A	III	B	5,920,000	80 or later
80.1	597-02	Bridgewater Twp.	III	C	5,500,000	79
	638-01	Bridgewater Twp.	II	F	260,000	79
	638-02	Bridgewater Twp.	III	F	3,720,000	80 or later
80.2	469-01	Warren Township S.A.	III	C,F	3,520,000	80 or later
80.3	604-01	Green Brook Township	III	F	1,300,000	80 or later
80.4	575-01	Hillsborough Twp. MUA	III	F	4,305,000	80 or later
80.5	456-01	Branchburg Township	III	C,F	1,800,000	80 or later
81.0	607-02	No. Burlington Co.Reg.S.A.	II	B,C,D,E,F,H	2,265,000	80 or later
	607-03	No. Burlington Co.Reg.S.A.	III	B,C,D,E,F,H	22,265,000	80 or later
82.0	251-01	Mount Holly S.A.	PREVIOUSLY FUNDED			
	711-01	Mount Holly S.A.	III	G	400,000	80 or later
83.0	461-02	Landis S.A.	III	B, C	15,000,000	79
	610-03	Landis S.A. 77-System II	I		40,000	80 or later
	610-04	Landis S.A. 77-System II	II	C,D,F	200,000	80 or later
	610-05	Landis S.A. 77-System II	III	C,D,F	5,039,000	80 or later
84.0	391-03	Ewing-Lawrence S.A.	III	B,C,D,E,G	19,432,000	79
84.1	648-02	Hopewell Twp. MUA	II	F	640,000	80 or later
	648-03	Hopewell Twp. MUA	III	F	6,400,000	80 or later
85.0	463-02	Evesham Twp. MUA	II	B,C,D,E,F,H	2,500,000	80 or later
	463-03	Evesham Twp. MUA	III	B,C,D,E,F,H	25,000,000	80 or later
85.1	629-02	Evesham Twp. (Pine Grove)	II	F	70,000	80 or later
	629-03	Evesham Twp. (Pine Grove)	III	F	720,000	80 or later
86.0	409-02	Mt. Laurel Twp. MUA	II	B,C,D	1,200,000	80 or later
	409-03	Mt. Laurel Twp. MUA	III	B, C ,D	7,600,000	80 or later
87.0	712-01	Burlington Township	I		250,000	80 or later
	712-02	Burlington Township	II	B, C ,D,E,F,H	1,000,000	80 or later
	712-03	Burlington Township	III	B,C,D,E,F,H	8,000,000	80 or later
88.0	628-01	Woodstown S.A.	I		54,000	80 or later
	628-02	Woodstown S.A.	II	B	209,000	80 or later
	628-03	Woodstown S.A.	III	B	1,000,000	80 or later

TABLE V-24 (Continued)

Priority No.	ID No.	Applicant	Project Step	Project Description (**)	Eligible Cost	Fiscal Year Funds
89.0	710-01	Moorestown Township	I		$ 300,000	80 or later
	710-02	Moorestown Township	II	B,C,H	700,000	80 or later
	710-03	Moorestown Township	III	B,C,H	7,500,000	80 or later
90.0	580-02	Warren Co.-Lopatcong S.A.	II	B	390,000	80 or later
	580-03	Warren Co.-Lopatcong S.A .	III	B	5,675,000	80 or later
91.0	406-03	Sussex Co. MUA-Wallkill	III	B, C,D,E,H	29,800,000	80 or later
91.1	572-02	Ogdensburg Borough	II	F	125,000	80 or later
	572-03	Ogdensburg Borough	III	F	1,452,000	80 or later
91.2	569-02	Byram Township	II	F	300,000	80 or later
	569-03	Byram Township	III	F	3,400,000	80 or later
91.3	515-02	Hamburg Borough	III	F	2,017,000	80 or later
91.4	495-02	Sparta Township	II	F	1,000,000	80 or later
	495-03	Sparta Township	III	F	15,000,000	80 or later
91.5	511-02	Franklin Borough	II	F	295,000	80 or later
	511-03	Franklin Borough	III	F	5,490,000	80 or later
92.0	454-02	Warren Co.-Pequest Reg. S.A.	III	B,C,D	3,300,000	Certified
92.1	513-01	Belvidere Town	III	F	1,842,000	Certified
93.0	449-02	Sussex Co. MUA -Paulins Kill	II	B,C,D,E,H	500,000	80 or later
	449-03	Sussex C o. MUA-Paulins Kill	III	B,C,D,E,H	10,000,000	80 or later
93.1	740-01	Branchville Borough	I		30,000	80 or later
	740-02	Branchville Bo rough	II	F	45,000	80 or later
	740-03	Branchville Boro ugh	III	F	260,000	80 or later
93.2	741-01	Hampton Township	I		30,000	80 or later
	741-02	Hampton Township	II	F	100,000	80 or later
	741-03	Hampton Township	III	F	750,000	80 or later
93.3	407-01	Newton Town	II	G	5,000	80 or later
	407-02	Newton Town	III	G	100,000	80 or later
93.4	742-01	Frankford Township	I		30,000	80 or later
	742-02	Frankford Township	II	F	145,000	80 or later
	742-03	Frankford Township	III	F	1,000,000	80 or later
93.5	743-01	Stillwater Township	I		30,000	80 or later
	743-02	Stillwater Township	II	F	175,000	80 or later
	743-03	Stillwater Township	III	F	800,000	80 or later
94.0	573-01	Sussex C o. M U A-L ower Wallkill	I		89,040	80 or later
	573-02	Sussex Co. MUA-Lower Wallkill	II	B, C,D,E,H	800,000	80 or later
	573-03	Sussex Co. MUA -Lower Wallkill	III	B, C,D,E,H	10,000,000	80 or later
94.1	744-01	Sussex Borough	II	G	5,000	80 or later
	744-02	Sussex Borough	III	G	100,000	80 or later
95.0	527-02	Lambertville S.A.	II	B, C,H	250,000	80 or later
	527-03	Lambertville S.A.	III	B, C,H	3,900,000	80 or later
*96.0	447-02	Elizabeth City	II	G	2,700,000	80 or later
	447-03	Elizabeth City	III	G	27,380,000	80 or later
97.0	494-01	Clinton Township- Area 2	III	F	540,000	80 or later
98.0	649-02	Pemberton Twp. MUA	II	F	100,000	80 or later
	649-03	Pemberton Twp. MUA	III	F	1,200,000	80 or later
99.0	627-01	Woodbine MUA	I		20,000	80 or later
	627-02	Woodbine MUA	II	F	145,000	80 or later
	627-03	Woodbine MUA	III	F	1,451,000	80 or later
100.0	611-02	Middletown Twp. S.A.	II	F	60,000	80 or later
	611-03	Middletown Twp. S.A .	III	F	300,000	80 or later

TABLE V-24 (Continued)

Priority No.	ID No.	Applicant	Project Step	Project Description (* *)	Eligible Cost	Fiscal Year Funds
101.0	503-02	Sussex Co. MUA-Pochuck	II	B,C,D,E,H	$ 600,000	80 or later
	503-03	Sussex Co. MUA-Pochuck	III	B,C,D,E,H	10,000,000	80 or later
101.1	745-01	Vernon Township	I		30,000	80 or later
	745-02	Vernon Township	II	F	300,000	80 or later
	745-03	Vernon Township	III	F	2,000,000	80 or later
102.0	545-02	Glassboro Borough	II	F	150,000	80 or later
	545-03	Glassboro Borough	III	F	1,900,000	80 or later
103.0	642-01	Rumson Borough	II	F	110,000	80 or later
	642-02	Rumson Borough	III	F	1,200,000	80 or later
104.0	713-01	Weymouth Twp. MUA	III	G	225,000	80 or later
105.0	526-02	Gloucester County S.A.	II	B,C,G,H	1,825,000	80 or later
	526-03	Gloucester County S.A.	III	B, C,G,H	21,700,000	80 or later
106.0	566-01	Upper Penns Neck S.A.	I		1,000	80 or later
	566-02	Upper Penns Neck S.A.	II	F	15,000	80 or later
	566-03	Upper Penns Neck S.A	III	F	150,000	80 or later

CHAPTER V

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VI NON-POINT SOURCE CONTROL PLAN

VI. NON-POINT SOURCE CONTROL PLAN

Introduction

All sources of water pollution that do not enter receiving water bodies as regular flows through a pipe are classified as non-point or intermittent point sources. Some examples of non-point pollution are runoff from streets, leachate from landfills, and erosion from construction sites. Intermittent point sources include combined sewer and storm water overflows and sanitary sewer bypasses.

Unlike point sources of pollution, non-point source pollutants enter surface and ground water under highly variable conditions, depending on the degree and type of land use in the area, and duration and intensity of precipitation. Land uses and related environmental conditions therefore determine the type, location, and concentration of these pollutants within a given watershed.

The purpose of this chapter is to analyze the effects of pollutants from non-point sources and intermittent point sources (NPS/IPS) on water quality, as compared to point sources, and to suggest appropriate control measures. Before determining actual control measures, it is necessary to understand the pollutants that are contributed by NPS/IPS. Thus, the first portion of this chapter describes the potential sources of non-point pollution in the area. Some forms of non-point pollution are generated as a result of broad categories of land use, and thus occur over large areas. An example of this is urban storm runoff. The relationship between non-point source pollution and land use is presented, in an initial discussion, including estimates of pollutant loadings from various land uses. Following this discussion is an inventory of non-point sources, describing specific land uses and activities, such as landfills and contruction, and the non-point source pollutants that may be generated by each.

The initial section, along with the Water Quality Assessment (Chapter III) and land use data in Chapter IV (Population, Land Use and Economics) is the basis for the analysis of non-point source loadings in the second portion of the chapter. The magnitude of non-point source loads is analyzed for the river segments and the entire study area. These non-point source loads are compared to the point source loads presented in the preceding chapter (Point Source Control), for the purpose of reviewing waste load allocations and identifying areas where non-point source controls are necessary.

The remainder of the chapter describes the Management Practices that will be utilized to control non-point source pollution. The discussion of management practices is divided into urban stormwater, land disturbance activities (agriculture, silviculture, construction and surface mining), and landfills.

VI.A. Sources of Non-Point Pollution

The relationship between non-point source pollution and land use is described in this section, including pollutant loading factors for various land uses. A description of the various non-point sources is also included.

VI.A.1. Relationship Between Non-Point Source Pollution and Land Use

Water quality analyses have demonstrated that all forms of land use exert some impact on the quality of water through the generation of non-point source pollution. This pollution can take the form of suspended solids, oxygen-demanding organic matter, nutrients, heavy metals, and/or toxic substances. Residential, commerical, industrial, and undeveloped lands generate unrecorded pollution loadings which vary in regard to their intensity and type. ("Unrecorded pollution describes all sources of pollution except those from recorded sewage systems and industrial discharges). Generalized loading values, based on a wide range of study areas, for pollutants resulting from various land uses have been developed by the USEPA and are presented in Table VI-1. Loading values developed for the counties of Mercer, Camden, Burlington and Gloucester by the Delaware Valley Regional Planning Commission are shown in Tables VI-2 -VI-3.

As can be seen from these tables, the more intensified land uses produce greater amounts of non-point source pollutants. The undeveloped land uses, such as forests and pastures, contribute small amounts of nutrients, sediments and biochemical oxygen demand (BOD). As these land uses are intensified into agricultural and urban/suburban uses, the loadings of these pollutants increase. This is especially true of sediment where the loadings from agriculture and urban/ suburban lands can be ten times greater than the loads from forests. This is caused by increasing the erosive potential of water on soils by increasing the amount of water flowing over the lands and by making the land surface more susceptible to soil erosion through alteration of vegetative cover. Associated with the increase in the above pollutants from agricultural and urban/suburban land uses is a contribution of pesticides, heavy metals and toxic and hazardous materials. These chemicals can enter waterways due to improper application or if they are not stored properly. They are often carried into the waterways by sediment, thus increasing the seriousness of the problem of sediment pollution caused by non-point sources.

VI.A.2. Inventory of Non-Point Sources

Since most land uses are potential non-point sources of pollution, an inventory of potential non-point sources

Table VI-1

RUNOFF AREAL LOADING RATE - POUNDS/SQUARE MILE/DAY
(Average Range)

Land Use	Total Nitrogen	Total Phosphorus	BOD_5	TSS	Total Coliform
Agriculture	15 (1.9-58)	1.0 (0.05-3.9)	40 (6.3-57)	2,500 (449-6,594)	-
Forest	4 (1.3-16)	0.25 (0.01-1.4)	8 (6.3-11)	400 (71-620)	-
Pasture	8 (3.9-13.3)	0.5 (0.4-1.0)	17 (9.4-27)	670 (19-1,320)	-
Feedlots	1,700 (1,080-2,290)	370 (200-610)	-	-	-
Landfill	1,250[a] (50-2,500)	-	15,000 (80-33,100)	-	-
Urban	8 (3.3-28)	1.3 (0.4-7.9)	70 (20-129)	3,400 (306-7,526)	1,000[b] (1,000-24,000)

[a] Runoff concentration in mg/l

[b] Runoff concentration in numbers/100 ml

Source: U.S. Environmental Protection Agency, Areawide Assessment Procedures Manual Volume I, EPA-600/9-76-014, July 1976.

Table VI-2

AVERAGE POLLUTANT CONCENTRATIONS ASSOCIATED
WITH URBAN/SUBURBAN AGRICULTURE
AND FOREST LAND USE

	AVERAGE POLLUTANT CONCENTRATION (mg/l)				
Land Use Type	TSS	BOD	TOTAL PHOSPHOROUS	NO_3-N	LEAD
Urban/Suburban	25 - 220	6 - 10	0.05 - 0.30	1 - 10	0.05 - 0.08
Agriculture	80 - 220	3.5 - 6	0.15 - 0.85	0.3.- 2	-
Forest	20	3	0.10	1	-

Source: Delaware Valley Regional Planning Commission, Working Paper 5.02-2, Extent of NPS Problems, April 1977.

Table VI-3

ANNUAL UNIT POLLUTANT LOADS RESULTING FROM STORM RUNOFF (lb/ACRE/YEAR)

LAND USE TYPE	BOD	ANNUAL LOAD TOTAL PHOSPHOROUS	LEAD
URBAN	21	0.6	.12
AGRICULTURE	2.4	0.3	0
FOREST	1.5	0.05	0
MIXED	8	0.3	.04
URBAN-AGRICULTURE	12	0.45	.06
URBAN-FOREST	10	0.3	.06
AGRICULTURE-FOREST	2	0.15	0

Source: Delaware Valley Regional Planning Commission, Working Paper 5.02-2, Extent of NPS Problems, April 1977.

is essentially an inventory of land use. The following is a short description of various contributors to non-point source pollution in the Northeast area.

a. Urban/Suburban Runoff and Combined Sewer Overflows
Urban/suburban runoff is by far the most significant and perplexing non-point source in the study area, due to the large amount of land devoted to these uses. A point that cannot be overstated with regard to storm runoff is that it is highly variable, because of its relation to season, location, frequency, duration and intensity of precipitation. Approximately 50 percent of annual precipitation runs off, either as overland flow or as soil/ground water discharge to waterways. However, in the densely populated sections of the urban area, this figure may approach 100 percent.

The development of previously vegetated areas reduces the land's capacity for filtering and absorbing runoff; increased concentration of human activity results in increased deposition of a large number of pollutants on the land. As a result, urban land has increased runoff which contains significant amounts of pollutants especially sediment that accumulates on impervious surfaces. Streets also accumulate auto-related materials such as oil and grease, road salt and residual particulates from tires and brakes, as well as animal wastes, household and commercial refuse awaiting collection, and fertilizers and pesticides used in lawn care.

Urban/suburban runoff problems relate to two types of discharges, combined sewer overflows, or surface runoff either collected separately or occuring as direct overland flow. Many municipalities in the urban portion of the study area are either partially or wholly served by combined sewers, which carry both raw sewage and stormwater. During periods of heavy rain the combined sewers discharge excess untreated sewage along with urban stormwater and its associated pollutants. Since numerous industries discharge into combined sewer systems an overflow from these systems can also add toxic and hazardous materials to the NPS/IPS load. Most municipalities in the suburban portion of the study area have storm sewers to remove the runoff that occurs during periods of rainfall. These sewers carry the pollutants that accumulate on the streets and lawns in the area to the nearest waterway.

b. Construction Much of the land in the study area has already been developed, with new development continuing on the fringe areas and in specific locations, such as the Hackensack Meadowlands. Associated with this construction is the generation of pollution caused by the disturbance of surface soils or underlying geologic material. The prime factors involved in non-point pollution from construction activities include erosion, sediment or runoff damages.

When building sites are excavated, the vegetative cover is removed and surface areas are exposed. Sediments transporting potential pollutants such as petroluem products, pesticides, fertilizers, metals, and other miscellaneous wastes from construction debris are readily transported to nearby waterways via storm runoff. Stream channel erosion is another major problem associated with construction activities, and is most prevalent in urbanizing areas, where a large increase in runoff coupled with construction encroachment into floodplains results in massive channel degradation and increased siltation.

Nitrogen, phosphorus, and potassium are the major plant nutrients used for successful establishment of vegetation in disturbed soils on construction sites. Heavy use of fertilizers can result in transport of these materials to water bodies where they may accelerate eutrophication.

Offsite damages often are difficult to trace to their source and on-site damages are not readily apparent until excess quantities of sediment or other pollutants have been transported from the site in runoff.

c. Spills Spills are accidential discharges of an oil base material or hazardous material on land or into a water course. Spilled into rivers, streams, coastal waters, estuaries, and lakes, oil is carried away in a matter of minutes by natural forces such as wind, tides, and currents. Hazardous materials are generally soluble in water, and are often even more difficult than oils to clean up.

Spills are random and cannot be well predicted, but past records indicate certain areas and activities are more prone than others to spills. The Northeast New Jersey Area is especially prone to spillages because of the high degree of industrialization and urban development.

In 1977, a total of 1,281 spills were recorded in New Jersey. Of these, 662 occured in the study area. Although most of these spills were negligible, a total of 180 were over 50 gallons, while 186 were of unknown volume. Records indicate that a large percentage of these spills occured in Bergen and Union Counties, where heavily trafficked highways and high industrial densities are prevalent. Most of the spills involved gasoline, home heating fuels, other petroleum products and miscellaneous chemicals with a petroleum base.

d. Sanitary Landfills Sanitary landfilling is an engineered method of disposing of solid wastes on land by spreading them in thin layers, compacting them to the smallest practical volume, and covering them with soil each working day in a manner that protects the environment. However, the sanitary landfill has been proven in many instances to be environmentally unacceptable due to poor design or uncooperative users.

Rainwater or ground water moving through a landfill may acquire heavy concentrations of pollutants. This leachate may be transported by overland flow to nearby streams or percolate down to contaminate the ground water, which in turn may contaminate surface water. The characteristics of the leachate may vary widely, reflecting the range of materials placed in the landfill. High concentrations of BOD, nutrients and bacteria are associated with domestic wastes, sludges from treatment plants and septic tanks, and food processing wastes. In the study area, where manufacturing wastes are prevalent, hazardous constituents such as cyanide, cadmium, PCB's, etc. are often present in the leachate. The particular makeup of the leachate is dependent upon the type of industry using the landfill or dump.

The landfills in the study area are listed in Table VI-4 and shown on the map in Figure VI-1. Table VI-5 presents a directory of these landfills and contains information on the location, type of waste accepted, size, and quantity of solid waste received for each landfill. The table also includes the operating status of each landfill and an estimate of runoff for nitrogen and biochemical oxygen demand.

e. Septic Systems Septic systems, when designed, installed and operated properly, can be very effective for disposal of wastewater. However, improper location or operation may result in inadequate filtration of the effluent by the soil and/or surface overflow of the wastes. Effluent from malfunctioning septic systems contains solids, nitrogen, phosphorus, bacteria and viruses. These pollutants may contaminate surface or ground waters and endanger public health.

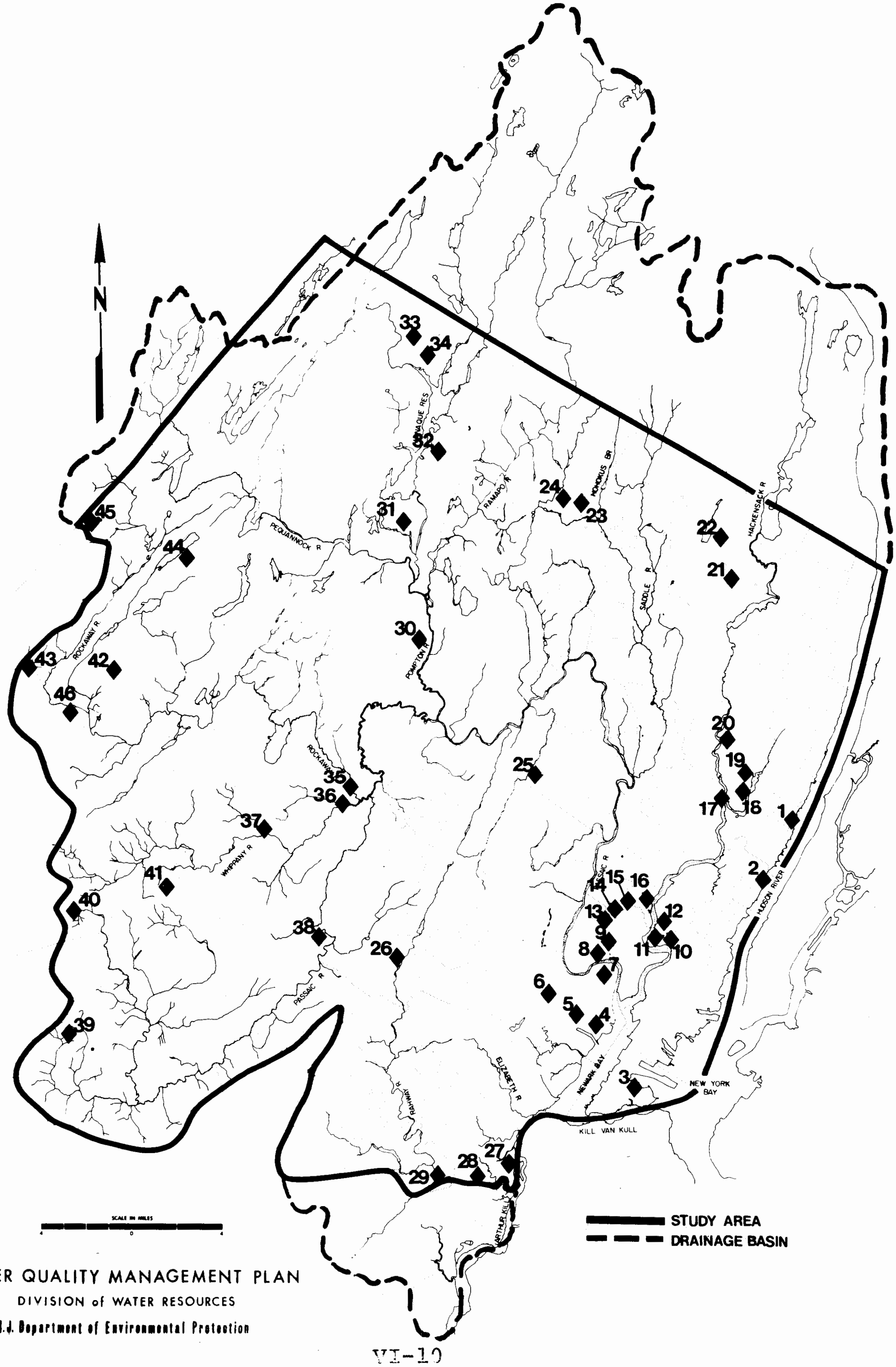
The portions of the study area currently utilizing septic systems are the lower density developments located in Bergen, Morris, Passaic and Somerset Counties. The 201 facilities plans for these areas are examining or will examine the problem of malfunctioning septic systems and will recommend appropriate corrective measures.

Table VI-4

NORTHEAST STUDY AREA LANDFILLS

Map No.	Code No.	Landfill
1.	0213A	Edgewater Boro SWDA
2.	0908A	Thomas Heagney SWDA;
	0908B	North Hudson Hospital Assoc.
3.	0901A	City of Bayonne Landfill
4.	0714E	R. Devino SWDA
5.	0714F	T & J Landfill
6.	0714C	D & J Trucking & Waste Co.
7.	0714D	V. Ottilio & Sons
8.	0907C	Kearny Town-Site ID
9.	0907A	Kearny Town-Site I-A
10.	0909A	Mall Landfill
11.	0909B	1947 Corp.
12.	0907D	Kearny Site
13.	0907B	Kearny Town-Site I-C
14.	0239A	P & M Sanitation SWDA
15.	0239B	C. Egan & Sons Sanitary Landfill Inc.
16.	0232A	Avon Landfill Corp.;
	0232B	Kingsland Park Disposal Area;
	0232C	Kingsland Park Landfill Extension;
	0232D	Sawmill Park Landfill Extension
17.	0230A	Esposito Construction SWDA-R&M Recloration
18.	0250A	Village of Ridgefield Park
19.	0229A	Bergen County SWDA
20.	0260B	Pomander Walk
21.	0267A	Borough of Westwood
22.	0227A	Hillsdale Borough SWDA
23.	0233B	Zuidema SWDA
24.	0233A	George Hauck Inc.
25.	1605A	Montclair State College
26.	0712B	South Mountain Reservation
27.	2009D	American Cyanamid Co.
28.	2009A	City of Linden Sanitary Landfill
29.	2013A	Rahway City
30.	1431A	Pio Costa Enterprises
31.	1613A	Union Ave. Dump
32.	1611A	V. Ottilio & Sons
33.	1611B	Cannon Mine SWDA
34.	1611C	Borough of Ringwood
35.	1412A	Whippany Paper Board, Inc.
36.	1410B	M. Deskovick SWDA
37.	1412A	Whippany Paper Board Co., Inc. Landfill
38.	1411A	Passaic Ave. Landfill
39.	1802A	Bernards Township Sanitary Landfill;
	1803A	Sanitary Landfill Bernardsville
40.	1418A	Mendham Sanitary Landfill
41.	1422A	Villa Walsh SWDA
42.	1435B	Lavin Bros., Inc. SWDA
43.	1426A	Mt. Arlington Landfill
44.	1435A	Jacobs Road Dump
45.	1414A	Jefferson Twp. Landfill
46.	1439B	Wharton Borough SWDA

Fig. VI-1
Landfill Locations



WATER QUALITY MANAGEMENT PLAN

DIVISION of WATER RESOURCES

N.J. Department of Environmental Protection

Table VI -5

NORTHEAST STUDY AREA SANITARY LANDFILL DIRECTORY

BERGEN COUNTY

Code No.[1]	Facility Name and Address	Longitude	Latitude	Type Waste[3] Accepted	Size (Acres)	Quantity[2] Tons/Yr.	Most Recent Status 3/28/78	Runoff Areal[4] Loading Rate Total Nitrogen mg/l annually	Runoff Areal[4] Loading Rate BOD_5 lbs/year
0213A	Edgewater Boro SWDA River Rd. Edgewater Boro	73 58'21"	40 49'55"	10, 20, 22, 24	-	(1974) 1775	Operating	-	-
0227A	Hillsdale Boro SWDA Lincoln Rd. Hillsdale Boro	74 02'00"	40 02'55"	10, 13, 28	9.05	260	Operating	6,452	77,420
0229A	Bergen County SWDA Fort Lee Road Leonia Boro	74 00'40"	40 51'25"	10, 11, 13, 20, 21, 22, 24, 27	45.46	(1975) 95,493	Terminated	32,408	388,896
0230A	Esposito Construction SWDA, North Washington Ave. Little Ferry Boro	74 02'07"	40 50'52"	10, 13, 22, 24	9		Terminated	6,416	76,992
0232A	Avon Landfill Corp. East End of Valleybrook Ave. Lyndhurst Twp.	74 06'22"	40 47'50"	10, 13, 23, 27	90	(1976) 965,602	Operating	64,160	769,922
0232B	Kingsland Park Disposal Area Foot of Valleybrook Ave., Lyndhurst Township	70 06'40"	40 47'30"	(1976) - 10 (1975) - 10, 13, 14, 22, 24	400	(1976) 1,568,080	Operating	285,156	3,421,875

[1] Bureau of Solid Waste
[2] Dates indicate most recent records available

[3] See Table VI-6
[4] EPA Areawide Assessment Manual, Vol. 1, July 1975

Table VI-5a

NORTHEAST STUDY AREA SANITARY LANDFILL DIRECTORY

BERGEN COUNTY (continued)

Code No.[1]	Facility Name and Address	Longitude	Latitude	Type Waste[3] Accepted	Size (Acres)	Quantity[2] Tons/Yr.	Most Recent Status 3/28/78	Runoff Areal[4] Loading Rate Total Nitrogen mg/l annually	Runoff Areal[4] Loading Rate BOD_5 lbs/year
0232C	Kingsland Park Landfill Extension Valleybrook Ave. Extension, Lyndhurst Township	74 06'50"	40 47'35"	10, 13, 14, 22, 24, 27	60	(1975) 814,000	Not Open Yet	42,773	513,281
0232D	Sawmill Park Landfill Extension Belleville Turnpike Lyndhurst Twp.	74 06'49"	40 46'30"	10, 13, 14, 22, 24	27	(1975) 833,400	Not Open Yet	19,248	230,977
0233A	George Hauk, Inc. West Crescent Ave. Mahwah Township	74 09'10"	41 02'10"	73, 29	8	1,3000,000 gal/yr	Operating	5,703	68,438
0233B	Zuidema SWDA South of Forest Rd. Mahwah Township	74 10'10"	41 02'30"	73, 29	13	780,000 gal/yr	Operating	9,268	111,211
0239A	P & M Sanitation SWDA, Belleville Turnpike, North Arlington Boro	74 07'08"	40 46'37"	(1976) - 10 (1975) - 10, 13, 14, 20, 21, 22, 24, 27	10	(1976) 932,694	Operating	7,129	85,547
0239B	C. Egan & Sons Sanitary Landfill Inc., Belleville Turnpike, North Arlington Boro	74 06'40"	40 46'37"	10, 27, 14	80		Operating	57,031	684,375

1 Bureau of Solid Waste
2 Dates indicate most recent records available
3 See Table VI-6
4 EPA Areawide Assessment Manual, Vol. 1, July 1975

Table VI- 5b

NORTHEAST STUDY AREA SANITARY LANDFILL DIRECTORY

BERGEN COUNTY (continued)

Code No.[1]	Facility Name and Address	Longitude	Latitude	Type Waste[3] Accepted	Size (Acres)	Quantity[2] Tons/Yr	Most Recent Status 3/28/78	Runoff Areal[4] Loading Rate Total Nitrogen mg/l annually	Runoff Areal[4] Loading Rate BOD_5 lbs/year
0250A	Village of Ridgefield Park, Route 46, Ridgefield Park Township	74 00'47"	40 50'53"	10, 13, 14	45, 46	(1976) 9308	Operating	32,408	388,896
0260B	Pomander Walk Teaneck Township	74 02'07"	40 53'20"	(1976) 13,23 (1975) 22,24	9.4	(1976) 15,150	Terminated	6,701	80,414
0267A	Borough of Westwood Harrington Ave. Westwood Boro	74 01'10"	41 00'20"	10, 13, 28	9.05		Operating	6,452	77,420

1 Bureau of Solid Waste
2 Dates indicate most recent records available
3 See Table VI-6
4 EPA Areawide Assessment Manual, Vol. 1, July 1975

Table VI-5c

NORTHEAST STUDY AREA SANITARY LANDFILL DIRECTORY

ESSEX COUNTY

Code No.[1]	Facility Name and Address	Longitude	Latitude	Type Waste Accepted[3]	Size (Acres)	Quantity[2] Tons/Yr.	Most Recent Status 3/28/78	Runoff Areal Loading Rate Total Nitrogen mg/l annually[4]	Runoff Areal Loading Rate BOD_5 lbs/year[4]
0712B	South Mountain Reservation, South Orange Avenue Millburn Township	74°17'50"	40°44'56"	(1976) - 10, 13, 23 (1975) - 10, 14, 23, 24	1.6	(1975) - 10,000	Operating	1,141	13,688
0714C	D & J Trucking & Waste Co., Avenue A and Pioneer St. Newark	74°10'45"	40°43'50"	10, 14, 60% 31	13	42,120	Terminated	9,268	111,211
0714D	V. Ottilio & Sons Blanehard St. Newark	74°08'35"	40°44'07"	14	3.5	(1975) 28,000	Operating	2,495	29,941
0714E	R. Devino SWDA 845 Doremus St. Newark	74°08'39"	40°42'18"	14	-	(1975) 100	Operating	-	-
0714F	T & J Landfill 70 Port St. Newark	74°09'05"	40°42'24"	14	10		Operating	7,129	85,547

[1] Bureau of Solid Waste
[2] Dates indicate most recent records available
[3] See Table VI-6
[4] EPA Areawide Assessment Manual, Vol. 1, July 1975

Table VI- 5d

NORTHEAST STUDY AREA SANITARY LANDFILL DIRECTORY

HUDSON COUNTY

Code No.[1]	Facility Name and Address	Longitude	Latitude	Type Waste[3] Accepted	Size (Acres)	Quantity[2] Tons/Yr.	Most Recent Status 3/28/78	Runoff Areal[4] Loading Rate Total Nitrogen mg/l annually	Runoff Areal[4] Loading Rate BOD_5 lbs/year
0901A	City of Bayonne Landfill, Hook Rd., Bayonne City	74° 06'10"	40° 39'46"	10, 12, 14, 21, 22	62	50,700	Operating	44,199	530,391
0907A	Kearny Town MSLA Site (I-A)(2) Harrison Ave. Kearny Town	74 06'30"	40 45'00"	10-27	57	154,960	Not Operating	40,635	487,617
0907B	Kearny Town-MSLA Site I-C(3) Belleville Turnpike Kearny Town	74 07'40"	40 44'50"	10-27	210	992,970	Operating	149,707	1,796,484
0907C	Kearny Town Site (I-D) Harrison Ave. Kearny Town	-	-	10-27	83	(1976) 752,550	Operating	59,170	710,039
0907D	Kearny Site Belleville Turnpike Kearny Town	74 07'50"	40 45'03"	10, 11, 13, 14, 21, 22, 24, 26	Lot 10 (200) Block 149	(1975) 152,239	Operating	59,170	710,039
0908A	Thomas Heagney SWDA 7800 River Rd. North Bergen Twp.	73 59'41"	40 47'50"	10	35	-	-	24,951	299,414
0908B	North Hudson Hosp. Assoc., 7600 River Rd. No. Bergen Twp.	73 59'41"	40 47'50"	14	7.1	-	Operating	5,062	60,738

[1]Bureau of Solid Waste
[2]Dates indicate most recent records available
[3]See Table VI-6
[4]EPA Areawide Assessment Manual, Vol. 1, July 1975

Table VI-5e

NORTHEAST STUDY AREA SANITARY LANDFILL DIRECTORY

HUDSON COUNTY (continued)

Code No. [1]	Facility Name and Address	Longitude	Latitude	Type Waste Accepted [3]	Size (Acres)	Quantity [2] Tons/Yr.	Most Recent Status 3/28/78	Runoff Areal Loading Rate Total Nitrogen mg/l annually [4]	Runoff Areal Loading Rate BOD_5 lbs/year [4]
0909A	Mall Landfill Foot of New Country Rd., Secaucus Twp.	74°04'46"	40°45'26"	10, 11, 13, 28	65	178,000	Operating	46,338	556,055
0909B	1947 Corp. Foot of Country Ave Secaucus Town	74 05'00"	40 46'00'	30	59	88,400	Not Operating	42,061	504,727

[1]Bureau of Solid Waste
[2]Dates indicate most recent records available
[3]See Table VI-6
[4]EPA Areawide Assessment Manual, Vol. 1, July 1975

Table VI-5f

NORTHEAST STUDY AREA SANITARY LANDFILL DIRECTORY

MORRIS COUNTY

Code No.[1]	Facility Name and Address	Longitude	Latitude	Type Waste[2,3] Accepted	Size (Acres)	Quantity[2] Tons/Yr.	Most Recent Status 3/28/78	Runoff Areal[4] Loading Rate Total Nitrogen mg/l annually	Runoff Areal[4] Loading Rate BOD_5 lbs/year
1410B	M. Deskovick SWDA End of Khager Rd. (Lot 96) Block 5 East Hanover Twp.	74°24'00"	40°48'04"	10, 13, 14, 22, 23, 24	13.5	-	Operating	9,624	115,488
1411A	Passaic Ave. Landfill, Passaic Ave. Florham Park Boro	74°22'10"	40°45'07"	22	7.9	(1975) 500	Terminated	5,632	67,582
1412A	Whippany Paper Board Co. Inc. Parsippany Rd. Hanover Twp.	74°25'20"	40°49'40"	(1976)- 13, 27 (1975)- 13, 20, 22, 27	50	(1976) 18,824	Operating	35,645	427,734
1414A	Jefferson Twp. Landfill Weldon Rd Jefferson Twp.	74°34'50"	41°00'45"	10, 13, 20, 21, 28	13.15	10,400	Operating	9,375	112,494
1418A	Mendham Sanitary Landfill,73Ironia Rd. Mendham Boro	74°37'14"	40°46'36"	(1976) 10, 12, 13, 23 (1975) 50, 51, 52, 54	14.834	(1976)131	Operating	10,574	126,900
1422A	Villa Walsh SWDA Western Ave. Morris Twp.	74°30'31"	40°47'05"	14, 24	-	(1973) 12,000	Terminated	-	-
1426A	Mount Arlington Landfill, Berkshire Ave. Mt. Arlintong Boro	74°37'21"	40°55'52"	(1976) 10 (1975) 10, 14, 20, 24 (1974) 10, 20, 22, 24	9	(1976) 2,000	Operating	6,416	76,992

[1] Bureau of Solid Waste
[2] Dates indicate most recent records available
[3] See Table VI-6
[4] EPA Areawide Assessment Manual, Vol.1, July 1975

Table VI-5g

NORTHEAST STUDY AREA SANITARY LANDFILL DIRECTORY

MORRIS COUNTY (Continued)

Code No.[1]	Facility Name and Address	Longitude	Latitude	Type Waste[2,3] Accepted	Size (Acres)	Quantity[2] Tons/Yr.	Most Recent Status 3/28/78	Runoff Areal[4] Loading Rate Total Nitrogen mg/l annually	Runoff Areal[4] Loading Rate BOD_5 lbs/year
1431A	Pio Costa Enter-prizes. Irving St. Pequannock Twp.	74°17'28"	40°56'15"	14, 24	152	-	Terminated	108,359	1,300,313
1435A	Jacobs Rd. Dump Rockaway Twp.	74°28'30" 74°28'30"	41°00'15" 41°00'15"	1976- 13 1975- 13, 20, 22, 24	260	(1976) 13	Operating	185,352	2,224,219
1435B	Lavin Brothers Inc. SWDA, Lavin Rd. Rockaway Twp.	74°32'50"	40°55'18"	19, 24, open wastes	10	-	Not Operating	7,129	85,547
1439B	Wharton Borough SWDA, Fern Ave. Wharton Boro	74°34'40"	40°53'30"	1976 - 10, 13, 55 1975 - 10, 13, 22	16.56	(1976) 12,480	Operating	11,805	141,666

[1]Bureau of Solid Waste
[2]Dates indicate most recent records available
[3]See Table VI-6
[4]EPA Areawide Assessment Manual, Vol. 1, July 1975

Table VI-5h

NORTHEAST STUDY AREA SANITARY LANDFILL DIRECTORY

SOMERSET COUNTY AND UNION COUNTY

Code No.[1]	Facility Name and Address	Longitude	Latitude	Type Waste[2,3] Accepted	Size (Acres)	Quantity[2] Tons/Yr.	Most Recent Status 3/28/78	Runoff Areal[4] Loading Rate Total Nitrogen mg/l annually	Runoff Areal[4] Loading Rate BOD_5 lbs/year
Somerset									
1802A	Bernards Township Sanitary Pill Hill Road Bernards Township	74°35'10"	40°42'00"	10, 13, 20, 22, 24	32.48	(1975) 13,930	Operating	23,155	277,856
1803A	Sanitary Landfill Bernardsville Pill Hill Road Bernardsville Boro	74°35'10"	40°42'00"	10, 12, 22, 74	8.1	(1976) 4,450	Operating	5,774	69,293
Union									
2009A	City of Linden Sanitary Landfill 1811 Lower Road to Rahway, Linden City	74°14'38"	40°36'40"	10, 13, 23	14.8	(1976 126,396	Operating	10,551	126,609
2009D	American Cyanamid Wood Avenue Linden City	74°12'30"	40°36'40"	13, 14, 16 17 (in metal containers)	-	(1975) 715 Tons 2700 gals.	Unregistered		
2013A	Rahway City SWDA 999 Hart St. Rahway City	74°15'42"	40°36'05"		10	20,280	Operating	7,129	85,547

[1]Bureau of Solid Waste
[2]Dates indicate most recent records available
[3]See Table VI-6
[4]EPA Areawide Assessment Manual, Vol. 1, July 1975

Table VI-5i

NORTHEAST STUDY AREA SANITARY LANDFILL DIRECTORY

PASSAIC COUNTY

Code No.[1]	Facility Name and Address	Longitude	Latitude	Type Waste[3] Accepted	Size (Acres)	Quantity[2] Tons/yr	Most Recent Status 3/28/78	Runoff Areal[4] Loading Rate Total Nitrogen mg/l annually	Runoff Areal[4] Loading Rate BOD_5 lbs/year
1611B	Cannon Mine SWDA Cannon Mine Road Ringwood Boro	74°18'26"	41°07'47"	13	11.6	10,400	Not Operating	8,270	99,234
1605A	Montclair State College, Clove Rd. Little Falls Twp.	74°11'51"	40°51'52"	10, 11, 14, 21, 22	9 9		Not open yet	6,416	76,992
1611A	V. Ottilio & Sons Ringwood Ave. Ringwood Boro			14, 27	6	(1974) 42,000	Terminated	4,277	51,328
1611C	Borough of Ringwood, Peyers Mine Rd., Ringwood Boro	74°18'30"	41°07'50"	10, 12, 13, 14, 22	10	(1975) 12,670	Terminated	7,129	85,547
1613A	Union Ave. Dump (Wanaque) Wanaque Boro			11, 28	26	(1975) 20	Operating	18,535	222,422
							TOTAL	1,645,181	19,742,029

[1]Bureau of Solid Waste
[2]Dates indicate most recent records available

[3]See Table VI-6
[4]EPA Areawide Assessment Manual, Vol. 1, July 1975

Table VI-6

CODE IDENTIFICATION

Solid Wastes	Liquid Wastes
10 Municipal (household, commercial)	70 Waste Oil
11 Institutional	71 Semi-Solid Waste Oils & Sludges
12 Dry Sewage Sludge	72 Bulk Liquid and Semi-Liquids
13 Bulky Waste	73 Septic Tank Clean-Out Wastes
14 Construction and Demolition	74 Liquid Sewage Sludge
15 Pesticides - Dry	75 Pesticide Liquids
16 Hazardous Waste Containers	76 Hazardous Waste Liquids
17 Hazardous Waste-Dry	77 Chemical Waste Liquids
18 Chemical Waste Dry-Non-Hazardous	
19 Junked Autos	
20 Tires	
21 Dead Animals	
22 Leaves and Chopped Tree Waste	
23 Agriculture Vegetative Waste	
24 Tree Stumps	
25 Food Processing Wastes	
26 Oil Spill Clean-Up Wastes	
27 Industrial (non-chemical)	

Source: Working Paper #18 Delaware Valley Regional Planning Commission, October 1976

f. Salt Water Intrusion Salt water intrusion can pose serious threats to drinking water supplies from ground water. The extent of the problem is normally dependent on the intensity of urban and industrial development with its attendant withdrawal of water and failure to replace it.

High chloride concentrations are the primary result of salt water intrusion. Optimal and tolerable salinity concentrations will be different for such uses as: public water supplies, industrial process water and agricultural uses.

Intrusion of saline water usually occurs at a fairly slow rate and the process normally takes decades to occur. In the study area this problem has only shown up in a few instances. Salt water intrusion has occurred in the Rahway area due to heavy ground water withdrawal through inland wells. The Essex County area has some salt water intrusion east and northeast of Newark. The ground water along the Passaic and Hackensack River is farily salty; in 1950, a well in Harrison had a chloride content of 1,800 mg/l at a depth of 362 feet in Brunswick shale.

g. Hydrographic Modifications Non-point sources of pollution from hydrographic modifications occur from channel impoundments, stream impoundments and dredging. Flood control and wetland drainage are the primary purposes of these modifications. With these modifications hydraulic efficiency is increased and channel roughness is reduced significantly. As a result, flow is increased and erosion and scouring action occur. This in turn allows for transport of sediment loads at much higher quantities. Activities associated with flood control projects probably have the worst effect on water quality arising from hydrographic changes.

In the Northeast region stream encroachment is common, with 262 permits issued by DEP in 1977.

h. Forest Water pollutant concentrations associated with forests generally represent the natural background levels. ("Background levels" refers to the amount of pollutants coming from natural conditions, i.e., undisturbed ground, rocks and vegetation). The protection by the forest canopy against erosive forces of rain, the efficient nutrient recycling system, and the role of tree roots in stabilizing soil all contribute to make forests the smallest pollutant contributor per acre unit of the categories of land cover. However, if forestry is practiced the non-point source loadings of sediment and nutrients can increase significantly from the background levels.

The largest tracts of forest land in the study area are found in Morris (150,000 acres) and Passaic Counties (50,000 acres). In Passaic much of this land is associated with reservoir systems in the northern portion of the county. Forestry activities are not extensive in the study area, therefore the non-point source contribution from forest land is not significant.

i. Highway Deicing Salts Roadways and other paved surfaces constitute a significant percentage of the land area in Northeast New Jersey. In winter, substantial quantities of deicers and abrasives, about 200,000 tons per year, are used to keep these roadways clear.

The use of deicers can result in pollution from runoff over deiced roadways. Uncovered or inadequately covered salt storage sites can also be a source of contaminants.

Recent studies in Milwaukee have shown daily chloride loads (indicative of salt content) in municipal sewage to be three times higher than normal loads recorded in summer months. Additional reports have indicated that sodium from road salts can cause overgrowth of blue-green algae in waterways. Under certain conditions, added salts could lead to sodium and calcium ion exchange, bringing toxic heavy metals deposited in the sediment on the bottom of a waterway into the fresh water flow.

j. Mining Non-point pollutants can be generated by active and inactive or abandoned mining facilities. Mining operations generally occur in one of two forms: surface or underground. Degradation of water supplies arises because hydrologic characteristics of surface and subsurface runoff may be altered when the ground is disturbed to gain access to mineral deposits.

The mines in the study area consist primarily of stone quarries and sand and gravel pits; however, mining is not practiced extensively in the area. The most serious pollutants associate with mining operations are mine drainage contaminants and sediment. Other contaminants that may be generated through mining include acids, alkali, flouride, cyanide, metals, and radioactive contaminants.

k. Agricultural Areas Farming was once a major land use in the study area, but today it is almost non-existent. Only 4,700 acres, or about 0.7 percent of the total study area is currently devoted to farming. The major pollutants which may result from agricultural practices include sediments, fertilizers, salts, pesticides, and organic wastes (animal wastes, crop residues and food processing wastes). Although there may be localized problems, the total loads of pollutants from agriculture in the Northeast area are low, because farming is relatively rare.

VI.B. Non-Point and Intermittent Point Source Assessment

This section compares the relative magnitude of the NPS/IPS pollutant loadings to point source loadings for the major basins in the Northeast. This analysis, where applicable is used in Chapter III, Water Quality Analysis, to determine causes of water quality problems. The analyses focus on where non-point loadings are generated and on whether reductions may be necessary to improve water quality. The appropriate management practices that could be used to achieve such reductions are summarized in Section VI.C., Best Management Practices.

Included in this section is a discussion of the methodology used in determining the NPS/IPS loadings, an assessment of non-point source loadings by river basin and a discussion of the conclusions from the analysis.

VI.B.1. Methodology for Estimating NPS/IPS Loadings

a. Methodology In order to focus attention on the water quality problems in the study area and begin to provide data so that subsequent studies can be directed at priority areas, the average annual NPS/IPS wastewater loadings were estimated. The USEPA Storm Water Management Model was utilized in determining these loadings.

The model quantifies the NPS/IPS pollutant loadings as a function of land use, population density, type of sewer system (separate or combined), precipitation and street sweeping frequency. The land use information presented in Table VI-7 and population density information were derived from the Northeast New Jersey Water Quality Management Study (1976). The type of sewer system for each facilities planning area is discusses in Section V.B.1, Existing and Future 201 Facilities Planning Areas.

Precipitation in the study area was assumed to be approximately 47 inches per year. Street sweeping frequency was assumed to be minimal, occurring less than once ever twenty days. The estimated non-point source loadings derived from the above information for the land uses and pollutants being considered are presented in Tables VI-8 - VI-11. The loading factors utilized in determinig the non-point source loadings are shown in Table VI-12.

TABLE VI-7

LAND USE (ACRES) BY SEGMENT

Segment	Residential		Commercial		Industrial		Other		Total
	Area	% of Total	Area	% of Total	Area	% of Total	Area	% of Total	
Upper Passaic	24,314	27	890	1	1,887	2	61,563	70	88,654
Whippany	13,232	28	722	2	2,154	4	31,142	66	47,250
Rockaway	14,300	16	525	1	2,574	3	73,538	80	90,937
Wanaque	4,395	9	374	<1	375	<1	43,993	89	49,137
Pequannock	4,218	8	347	<1	300	<1	48,057	90	52,922
Ramapo	6,126	20	453	1	1,490	5	22,459	74	30,528
Pompton	3,982	26	619	4	513	3	10,475	67	15,589
Mid-Passaic (above Little Falls)	6,017	27	565	2	798	4	15,107	67	22,487
Peckman	3,007	47	129	2	224	3	3,107	48	6,467
Mid-Passaic (below Little Falls)	11,225	46	1,375	5	2,003	8	10,025	41	24,628
*Separate Sewers	8,838	46	876	5	1,190	6	8,412	43	19,316
*Combined Sewers	2,387	45	499	10	813	15	1,613	30	5,312
Saddle River	15,479	42	1,407	4	840	2	18,934	52	36,660
Lower Passaic	17,638	51	1,684	5	4,324	12	10,981	32	34,627
*Separate Sewers	14,407	56	1,048	4	2,013	8	8,447	32	25,915
*Combined Sewers	3,231	37	636	7	2,311	27	2,534	29	8,712
Hackensack	29,375	32	3,404	4	8,547	10	48,528	54	89,854
*Separate Sewers	24,970	36	2,248	3	4,151	6	37,934	55	69,303
*Combined Sewers	4,405	21	1,156	6	4,396	21	10,594	52	20,551
Newark Bay	1,942	14	254	2	7,640	53	4,394	31	14,230
*Separate Sewers	922	12	51	<1	4,600	60	2,075	27	7,648
*Combined Sewers	1,020	16	203	3	3,040	46	2,319	35	6,582
Hudson	1,587	22	391	6	1,069	15	4,056	57	7,103
*Separate Sewers	619	15	148	4	224	6	3,032	75	4,023
*Combined Sewers	968	31	243	8	845	28	1,024	33	3,080
**New York Bay	1,563	21	565	8	2,671	36	2,532	35	7,331
Elizabeth	8,926	38	1,197	5	3,719	16	9,543	41	23,385
*Separate Sewers	4,575	47	595	6	1,002	10	3,567	37	9,739
*Combined Sewers	4,351	32	602	4	2,717	20	5,976	44	13,646
Rahway	18,728	48	1,001	3	1,375	4	17,898	45	39,002
TOTALS	186,054	27	15,902	3	42,503	6	436,332	64	680,791

*Not included in total

**Segment entirely served by combined sewer

TABLE VI-8
COMPARISON OF POINT TO NON-POINT BOD_5 LOADINGS

Segment	NON-POINT SOURCE LOADINGS: Residential Loading (lb/yr)	Residential % of Total	Commercial Loading (lb/yr)	Commercial % of Total	Industrial Loading (lb/yr)	Industrial % of Total	Other Loading (lb/yr)	Other % of Total	Total (lb/yr)	Total Point Source Loading (lb/yr)	PS/NPS Ratio
Upper Passaic	412,122	59	133,856	19	107,314	15	46,419	7	699,711	752,103	1.07
Whippany	239,102	48	108,589	22	122,498	25	23,481	5	493,670	1,224,878	2.48
Rockaway	213,928	43	78,960	16	146,383	30	55,448	11	494,719	166,598	.34
Wanaque	52,432	32	56,250	35	21,326	13	33,171	20	163,179	49,172	.30
Pequannock	46,482	31	52,189	34	17,061	11	36,235	24	151,967	290,952	1.91
Ramapo	99,425	37	68,131	25	84,736	32	16,934	6	269,226	16,203	.06
Pompton	78,047	37	93,098	45	29,174	14	7,898	4	208,217	392,678	1.89
Mid-Passaic (Above Little Falls)	121,243	46	84,976	32	45,382	17	11,391	5	262,992	1,044,602	3.97
Peckman	83,955	71	19,402	16	12,739	11	2,343	2	118,439	609,253	5.14
Mid-Passaic (Below Little Falls)	785,952	52	441,330	30	258,730	17	11,371	< 1	1,497,383	183,911	.12
*Separate Sewers	253,651		131,750		67,675		6,343		459,419		
*Combined Sewers	532,301		309,580		191,055		5,028		1,037,964		
Saddle River	475,205	64	211,613	28	47,771	6	14,276	2	748,865	236,869	.32
Lower Passaic	1,419,382	53	552,193	21	657,564	25	14,267	< 1	2,643,406	684	.0003
*Separate Sewers	672,375		157,619		114,479		6,369		950,842		
*Combined Sewers	747,007		394,574		543,085		7,898		1,692,564		
Hackensack	1,274,970	35	1,055,281	29	1,269,127	34	61,623	2	3,661,001	12,920,172	3.53
*Separate Sewers	666,199		388,099		236,067		28,602		1,268,967		
*Combined Sewers	608,771		717,182		1,033,060		33,021		2,392,034		
Newark Bay	193,167	15	133,611	10	976,002	7	8,793	< 1	1,311,573	7,269,096	5.54
*Separate Sewers	33,404		7,670		261,602		1,565		304,241		
*Combined Sewers	159,763		125,941		714,400		7,228		1,007,332		
Hudson	296,285	43	173,016	25	211,314	31	5,478	< 1	686,093	27,902,430	40.67
*Separate Sewers	24,141		22,259		12,739		2,286		61,425		
*Combined Sewers	272,144		150,757		198,575		3,192		624,668		
New York Bay	377,839	28	350,526	25	627,685	46	7,892	< 1	1,363,942	304,601,986	223.32
*Separate Sewers	-		-				-		-		
*Combined Sewers	377,839		350,526		627,685		7,892		1,362,942		
Elizabeth	823,880	42	462,969	23	695,479	35	21,317	< 1	2,003,645	465,562	.23
*Separate Sewers	182,543		89,488		56,984		2,690		331,705		
*Combined Sewers	641,337		373,481		638,495		18,627		1,671,940		
Rahway	497,602	67	150,550	20	78,196	11	13,495	2	739,843	73,715	.10
TOTALS	7,491,018	43	4,226,540	24	5,408,481	31	391,832	2	17,517,871	358,200,864	20.44

*Not included in total

TABLE VI-9

COMPARISON OF POINT TO NON-POINT SUSPENDED SOLIDS LOADINGS

Segment	NON-POINT SOURCE LOADINGS									Total Point Source Loading (lb/yr)	PS/NPS Ratio
	Residential		Commercial		Industrial		Other		Total (lb/yr)		
	Loading (lb/yr)	% of Total	Loading (lb/yr)	% of Total	Loading (lb/yr)	% of Total	Loading (lb/yr)	% of Total			
Upper Passaic	8,410,213	64	928,626	7	2,580,850	20	1,108,134	9	13,027,823	30,696,880	2.36
Whippany	4,877,183	54	753,335	8	2,946,026	32	560,556	6	9,137,100	1,157,935	.13
Rockaway	4,364,074	45	547,785	6	3,520,460	36	1,323,684	13	9,756,003	114,694	.01
Wanaque	1,069,348	39	390,232	14	512,888	18	791,874	24	2,764,342	61,677	.02
Pequannock	948,586	37	362,060	14	410,310	16	865,026	33	2,585,982	294,834	.11
Ramapo	2,028,074	41	472,660	10	2,037,873	41	404,262	8	4,942,869	17,013	.003
Pompton	1,592,800	51	645,865	21	701,630	22	188,550	6	3,128,845	337,964	.11
Mid-Passaic (Above Little Falls)	2,473,288	56	589,521	13	1,091,425	25	271,926	6	4,426,160	930,310	.21
Peckman	1,713,990	77	134,599	6	306,365	14	55,926	3	2,210,880	350,099	.16
Mid-Passaic (Below Little Falls)	16,051,853	63	3,067,003	12	6,212,883	24	270,907	1	25,602,646	716,670	.03
*Separate Sewers	5,179,068		914,018		1,627,563		151,416		7,872,065		
*Combined Sewers	10,872,785		2.152,985		4,585,320		119,491		17,730,581		
Saddle River	9.688,306	77	1,468,064	12	1,148,868	9	340,812	2	12,646,050	268,257	.02
Lower Passaic	28,972,246	59	3,837,569	8	15,787,220	32	339,765	< 1	48,936,800	540,341	.01
*Separate Sewers	13,715,464		1,093,483		2,753,180		152,046		17,714,173		
*Combined Sewers	15,256,782		2,744,086		13,034,040		187,719		31,222,627		
Hackensack	26,026,310	40	7,333,241	11	30,470,762	47	1,467,616	2	65,297,929	10,407,288	.16
*Separate Sewers	13,591,171		2,345,563		5,677,322		682,812		22,296,868		
*Combined Sewers	12,435,139		4,987,678		24,793,440		784,804		43,001,061		
Newark Bay	3,944,338	14	929,077	3	23,437,020	82	209,142	< 1	28,519,577	3,972,209	.14
*Separate Sewers	681,358		53,213		6,291,420		37,350		7,063,341		
*Combined Sewers	3,262,980		875,864		17,145,600		171,792		21,456,236		
Hudson	6,052,156	48	1,202,871	10	5,072,165	41	130,434	1	12,457,626	22,535,304	1.80
*Separate Sewers	493,900		154,423		306,365		64,576		1,009,264		
*Combined Sewers	5,558,256		1,048,448		4,765,800		75,858		11,448,362		
New York Bay	7,718,094	30	2,437,749	10	15,064,440	59	187,571	< 1	25,407,854	191,983,571	7.56
*Separate Sewers	-		-		-		-		-		
*Combined Sewers	7,718,094		2,437,749		15,064,440		187,571		25,407,854		
Elizabeth	16,824,453	45	3,218,212	9	16,694,315	45	506,908	1	37,243,888	5,967	.0002
*Separate Sewers	3,723,592		620,823		1,370,435		64,206		5,779,056		
*Combined Sewers	13,100,861		2,597,389		15,323,880		442,702		31,464,832		
Rahway	10,150,576	76	1,044,443	8	1,880,588	14	322,164	2	13,397,771	12,713,314	.95
TOTALS	152,905,888	48	29,362,912	9	129,876,088	40	9,345,257	3	321,490,145	277,104,327	.86

*Not included in Total

TABLE VI-10
COMPARISON OF POINT TO NON-POINT NITROGEN LOADINGS

Segment	NON-POINT SOURCE LOADINGS: Residential Loading (lb/yr)	Residential % of Total	Commercial Loading (lb/yr)	Commercial % of Total	Industrial Loading (lb/yr)	Industrial % of Total	Other Loading (lb/yr)	Other % of Total	Total (lb/yr)	Total Point Source Loading (lb/yr)	PS/NPS Ratio
Upper Passaic	67,593	52	12,371	10	24,531	19	24,871	19	129,366	1,036,258	8.01
Whippany	39,167	44	10,036	11	28,002	31	12,581	14	89,786	1,029,576	11.47
Rockaway	35,035	33	7,298	7	33,462	32	29,709	28	105,504	634,147	6.01
Wanaque	8,614	24	5,199	14	4,875	13	17,773	49	36,461	51,050	1.40
Pequannock	7,635	21	4,823	14	3,900	11	19,415	54	35,773	212,326	5.94
Ramapo	16,296	32	6,297	12	19,370	38	9,073	18	51,036	25,991	.51
Pompton	12,822	40	8,604	27	6,669	20	4,232	13	32,327	259,449	8.03
Mid-Passaic (Above Little Falls)	19,916	45	7,854	18	10,374	23	6,103	14	44,247	893,322	20.19
Peckman	13,772	70	1,793	9	2,912	15	1,255	6	19,732	538,806	27.30
Mid-Passaic (Below Little Falls)	128,903	55	40,789	17	59,031	25	6,090	3	234,813	242,554	1.03
*Separate Sewers	41,539		12,176		15,470		3,398		72,583		
*Combined Sewers	87,364		28,613		43,561		2,692		162,230		
Saddle River	77859	67	19,557	17	10,920	9	7,649	7	115,985	916,700	8.10
Lower Passaic	232,974	53	51,035	11	149,992	34	7,642	2	441,643	-	-
*Separate Sewers	110,358		14,567		26,169		3,413		154,507		
*Combined Sewers	122,616		36,468		123,823		4,229		287,136		
Hackensack	209,273	33	97,532	16	289,501	46	33,006	5	629,312	6,655,956	10.58
*Separate Sewers	109,368		31,247		53,963		15,325		209,903		
*Combined Sewers	99,905		66,285		235,538		17,681		419,409		
Newark Bay	31,701	12	12,349	4	222,683	82	4,708	2	271,441	2,380,791	8.77
*Separate Sewers	5,477		709		59,800		838		66,824		
*Combined Sewers	26,224		11,640		162,883		3,870		204,617		
Hudson	48,638	42	15,991	14	48,187	42	2,934	2	115,750	5,817,276	50.25
*Separate Sewers	3,974		2,057		2,912		1,225		10,168		
*Combined Sewers	44,664		13,934		45,275		1,709		105,582		
New York Bay	62,020	26	32,397	13	143,112	59	4,224	2	241,753	24,657,210	101.99
*Separate Sewers	-		-		-		-		-		
*Combined Sewers	62,020		32,397		143,112		4,224		241,753		
Elizabeth	135,032	39	42,790	12	158,603	46	11,415	3	347,840	6,082	.02
*Separate Sewers	29,738		8,271		13,026		1,441		52,476		
*Combined Sewers	105,294		34,519		145,577		9,974		295,364		
Rahway	81,654	68	13,914	11	17,875	15	7,231	6	120,674	-	-
TOTALS	1,228,904	40	390,629	13	1,233,999	40	209,911	7	3,063,443	45,357,494	14.81

*Not included in Totals

TABLE VI-11

COMPARISON OF POINT TO NON-POINT PHOSPHATE LOADINGS

Segment	NON-POINT SOURCE LOADINGS								Total (lb/yr)	Total Point Source Loading (lb/yr)	PS/NPS Ratio
	Residential		Commercial		Industrial		Other				
	Loading (lb/yr)	% of Total	Loading (lb/yr)	% of Total	Loading (lb/yr)	% of Total	Loading (lb/yr)	% of Total			
Upper Passaic	17,336	56	3,168	11	6,252	20	4,063	13	30,819	345,419	11.21
Whippany	10,056	46	2,570	12	7,136	32	2,055	10	21,817	343,192	15.73
Rockaway	8,995	37	1,869	8	8,528	35	4,854	20	24,246	211,382	8.72
Wanaque	2,206	29	1,331	17	1,242	16	2,904	38	7,683	17,016	2.21
Pequannock	1,940	26	1,235	17	994	14	3,172	43	7,341	70,775	9.64
Ramapo	4,184	34	1,613	13	4,936	41	1,482	12	12,215	8,664	.71
Pompton	3,285	42	2,204	28	1,700	21	691	9	7,880	86,483	10.98
Mid-Passaic (Above Little Falls)	5,102	47	2,011	19	2,644	25	997	9	10,754	297,774	27.69
Peckman	3,578	72	459	9	742	15	205	4	4,984	179,602	36.04
Mid-Passaic (Below Little Falls)	33,092	56	10,407	17	15,064	25	997	2	59,560	80,851	1.36
*Separate Sewers	10,606		3,087		3,942		555		18,190		
*Combined Sewers	22,486		7,320		11,122		442		41,370		
Saddle River	19,968	69	5,009	17	2,783	10	1,250	4	29,010	305,566	10.53
Lower Passaic	59,805	53	13,061	12	38,283	34	1,252	1	112,401	-	-
*Separate Sewers	28,238		3,731		6,669		558		39,196		
*Combined Sewers	31,567		9,330		31,614		694		73,205		
Hackensack	53,691	34	24,962	16	73,889	47	5,407	3	157,949	2,218,652	14.05
*Separate Sewers	27,966		8,003		13,752		2,504		52,225		
*Combined Sewers	25,725		16,959		60,137		2,903		105,724		
Newark Bay	8,153	12	3,160	5	56,827	82	773	1	68,913	793,597	11.52
*Separate Sewers	1,401		182		15,240		137		16,960		
*Combined Sewers	6,752		2,978		41,587		636		51,953		
Hudson	12,521	42	4,092	14	12,302	42	481	2	29,396	1,939,108	65.96
*Separate Sewers	1,021		527		742		200		2,490		
*Combined Sewers	11,500		3,565		11,560		281		26,906		
New York Bay	15,958	26	8,289	13	36,539	60	694	1	61,480	8,219,070	133.69
*Separate Sewers	-		-		-		-		-		
*Combined Sewers	15,958		8,289		36,539		694		61,480		
Elizabeth	34,793	39	10,949	13	40,489	46	1,872	2	88,103	-	-
*Separate Sewers	7,686		2,118		3,320		235		13,359		
*Combined Sewers	27,107		8,831		37,169		1,637		74,744		
Rahway	20,975	69	3,564	12	4,555	15	1,181	4	30,275	-	-
TOTALS	315,638	41	99,953	13	314,905	41	34,330	5	764,826	15,117,151	19.77

*Not included in Total

Table VI-12

NORTHEAST STUDY AREA ESTIMATED NON-POINT SOURCE POLLUTION LOADINGS

PARAMETER		Type of Land Use: Residential		Commercial		Industrial		Other	
		Type of Sewer System: Separate*	Combined *	Separate	Combined	Separate	Combined	Separate	Combined
BOD_5	$\frac{\text{lbs}}{\text{acre/year}}$	11.1-46.7	84.1-281.1	150.4	620.4	56.9	235.0	0.75	3.2
Suspended Solids	$\frac{\text{lbs}}{\text{acre/year}}$	224.9-952.0	1717-5742	1043.4	4314.6	1367.7	5640.0	18.0	74.1
Total Phosphate	$\frac{\text{lbs}}{\text{acre/year}}$	0.46-1.96	3.55-11.9	3.6	14.7	3.3	13.7	0.07	0.27
Total Nitrogen	$\frac{\text{lbs}}{\text{acre/year}}$	1.81-7.7	13.8-46.1	13.9	57.3	13.0	53.9	0.4	1.67

*Range employed in this Land Use category is reflective of differing segment population densities.

With the NPS/IPS loadings determined, the loads contributed from the point sources in each basin were calculated for comparison. The point source loadings were determined from the data in the Inventory of Existing Dischargers, Working Paper 4.1 and the self monitoring reports submitted by municipal dischargers. Where suspended solids and BOD information was lacking for municipal-institutional dischargers, loadings were estimated by assuming that the EPA criteria for secondary treatment were being discharged (30 mg/l of SS and BOD). Data for phosphate and nitrogen were lacking for the municipal-institutional dischargers; therefore, after reviewing information from self monitoring reports, DEP inspection reports, New York City continuous discharge surveys, and DEP Toxics Sampling, estimates of 10 mg/l for phosphate and 30 mg/l for nitrogen, were developed, as representative of municipal-instutional discharges in the study area. The point source loadings and the ratio of point to non-point source loadings are presented in Tables VI-8 - VI-11.

b. Limitations of the Model The Storm Water Management Model was developed for urban/suburban areas but was not calibrated for the study area. This could lead to inaccurate results, since the non-point source loading rates utilized in the model were based on national averages and may not be correct for the Northeast. Another possible cause of error in the model is the limited range of population densities considered. For basins such as the Pequannock and New York Bay, where densities are lower or higher than those considered in the model, the extrapolated residential loading factors may not be accurate. Some additional limitations associated with the model are the land use data utilized and the status of development within each basin.

The land use data utilized in the assessment was from 1970, which is somewhat out of date. However, since growth in the study area has not been significant during the past eight years, it was felt that the 1970 data would be sufficient. In the basins that experienced continued growth during the past decade, however, the non-point source loading estimates could be low, as more land has been developed since 1970.

The status of development that is currently underway within each basin would also result in deviation from the non-point loadings predicted by the model. Developing basins are likely to contribute more non-point pollutants, especially sediment, than basins not experiencing development; thus the non-point loadings predicted in the model may be low for the basins currently undergoing development.

Despite the above constraints on applying the Storm Water Management Model to the Northeast Study Area, the model can be utilized in determining where non-point sources may be resulting in potential water quality degradation. In evaluating the impact of non-point and intermittent point sources on water quality, it is necessary to consider some specific conditions in addition to the overall assessment of non-point source loadings. These sources are likely to be most degrading at a certain critical flow and time of year, as well as in certain portions of a waterway. These factors are very important, but because limited analyses have been conducted, they have not been determined for the study area.

The non-point source loadings presented in the following section are estimated for an entire year, however, the effect on water quality depends on when and where the pollutants enter streams. The magnitude of the flow of the receiving stream is very important, as it determines how much pollution the stream can assimilate. Higher flows can dilute more pollutants than lower flows. For this reason all point source waste load allocations are based on a specific low flow for each waterway. A corresponding critical flow for all non-point pollution analyses has not been determined, and is unlikely to be determined in the near future.

However, since NPS/IPS pollutants are associated with precipitation and the first flush from a storm contains the majority of the pollutants, the greatest water quality impact from non-point sources may occur after an extended dry period. As a result, the flow in the stream would be low and the NPS/IPS load heavy. If it is assumed that non-point sources of pollution have their greatest water quality impact following periods of low stream flow, the critical time of year would be during the summer and early fall. This is the dryest part of the year and is associated with periods of heavy rain, which will result in non-point source pollution. Streams where low flow conditions dominate, tend to have less assimilative capacity and therefore may be most significantly affected by non-point source pollution. Another question concerning NPS/IPS pollution is where the water quality impact will be felt. Non-point pollutants can affect water quality as they enter the receiving stream or can be transported downstream where the pollutants can settle and result in benthic deposits. These benthic deposits can consume oxygen, thus degrading water quality. It is likely that non-point pollutants contribute to water quality problems in both ways, but which of these factors will cause the more severe effect is dependent on the characteristics of the stream.

In order to determine some of the effects on water quality from periods of rainfall, water quality data (Northeast New Jersey Water Quality Management Study, 1976) was analyzed for daily DO measurements for periods of rainfall in May through October which resulted in stream flows greater than the annual average flow at Little Falls. Three representative examples are shown in Figure VI-2. As illustrated by these graphs, after a storm there is an initial decline or slight increase in DO which suggests the influence of the first flush. This is followed by a substantial increase in DO which can be explained by the higher reaeration rates associated with high flows and the lower concentrations of pollutants. Another significant feature is that DO usually continues to decline below pre-storm levels reaching a minimum value four to nine days after the maximum stream flow. As the stream flow drops, reaeration rates would also decline, thereby decreasing DO. In addition, levels of BOD would most likely be higher than pre-storm levels due to runoff and resuspension of benthic material. An implication of this is that the "critical conditions" for the waterway, traditionally interpreted in water quality analysis to mean low flow conditions, may also include conditions occurring after storms. to mean low flow conditions, may also include conditions occurring after storms.

There is no detailed description of typical stormwater characteristics, because the contaminants in runoff are extremely variable with respect to season, land use, conditions preceding a storm, and frequency, duration and intensity of precipitation. Table VI-13 illustrates the general concentration ranges of the wastewater constituents listed for combined sewer overflows and urban stormwater runoff. The extreme variability of all parameters should be noted. It has been observed that concentrations of most non-point pollutants are higher under the following conditions: the early stages of a storm (first flush) in the more densely populated and industrialized areas, following intense rainfall periods, after prolonged dry periods, in areas where construction is taking place, and during the day for areas served by combined sewers.

The questions concerning when and where non-point pollutants contribute to water quality problems will require further analyses before being completely answered. The initial analysis conducted in this plan is designed to determine the magnitude of the non-point source problem compared to point sources, but not to specify a definite cause and effect relationship between NPS/IPS and specific water quality problems.

FIGURE VI-2

PASSAIC RIVER STORM EVENTS

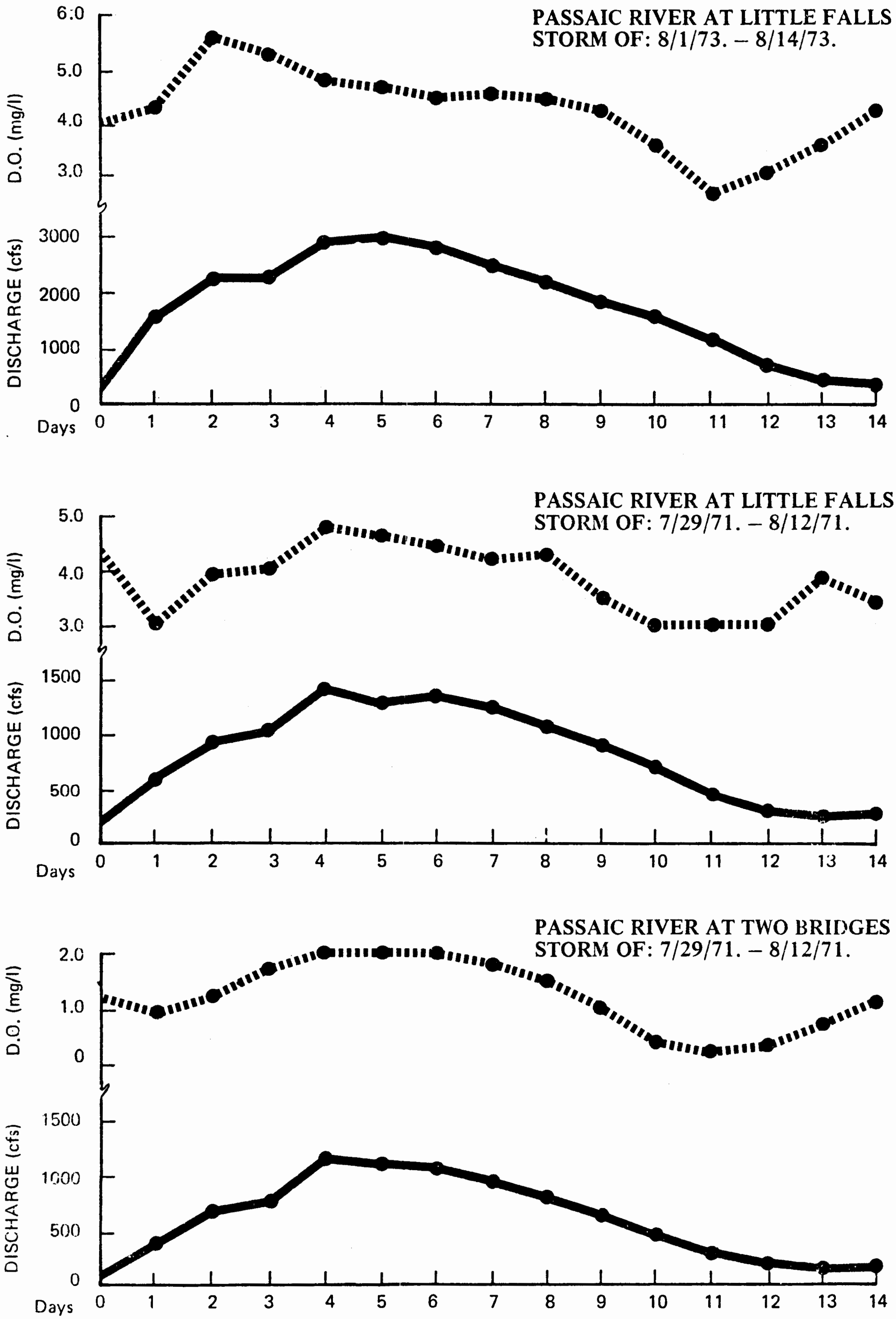


TABLE VI-13

CHARACTERISTICS OF COMBINED SEWER OVERFLOWS* (FIELD & STRUZESKI, 1972)

Characteristic	Range of Values
BOD (mg/l)	30 - 600
TSS (mg/l)	20 - 1,700
TS (mg/l)	150 - 2,300
Volatile TS (mg/l)	15 - 820
pH	4.9 - 8.7
Settleable solids (mg/l)	2 - 1,550
Organic N (mg/l)	1.5 - 33.1
NH_3-N (mg/l)	0.1 - 12.5
Soluble PO4 (mg/l)	0.1 - 6.2
Total coliforms (no./100 ml)	20,000 - 90 x 10^6
Fecal coliforms (no./100 ml)	20,000 - 17 x 10^6
Fecal streptococci (no./100 ml)	20,000 - 2 x 10^6

* Selected data.

CHARACTERISTICS OF URBAN STORMWATER* (FIELD & STRUZESKI, 1972)

Characteristic	Range of Values
BOD5 (mg/l)	1 - 700
COD (mg/l)	5 - 3,100
TSS (mg/l)	2 - 11,300
TS (mg/l)	450 - 14,600
Volatile TS (mg/l)	12 - 1,600
Settleable solids (mg/l)	0.5 - 5,400
Organic N (mg/l)	0.1 - 16
NH_3N (mg/l)	0.1 - 25
Soluble PO4 (mg/l)	0.1 - 10
Total PO4 (mg/l)	0.1 - 125
Chlorides (mg/l)	2 - 25,000[t]
Oils (mg/l)	0 - 110
Phenols (mg/l)	0 - 0.2
Lead (mg/l)	0 - 1.9
Total coliforms (no./100 ml)	200 - 146 x 10^6
Fecal coliforms (no./100 ml)	55 - 112 x 10^6
Fecal streptococci (no./100 ml)	200 - 1.2 x 10^6

* Selected data.

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VI.B.2. Assessment of Non-Point Source Loadings

The approach utilized in this section is to discuss each river basin in descending order of watershed location, beginning with the headwaters of the Passaic River. Each basin assessment includes a brief discussion of the land uses and water quality problems associated with the basin. Water quality problems due to suspended solids have not been substantiated due to a lack of data. However, suspended solids are considered in the assessment because they may be a direct cause of water quality degradation or carry other pollutants with them, such as BOD, fertilizers, or heavy metals. The remainder of each assessment compares the non-point to the point source loads and makes recommendations as to the controls needed in each basin in order to improve water quality.

a. Upper Passaic Basin - The Upper Passaic basin includes those areas that drain to the Passaic River from its headwaters to the confluence of the Whippany/Rockaway Rivers. The land use in the basin is comprised of 70 percent undeveloped, 27 percent residential, and 3 percent commercial/industrial. The developed area is characterized by suburban sprawl with nodes of high density. None of the municipalities in the Upper Passaic are served by combined sewers.

BOD concentrations were found to increase in a downstream direction, while DO values generally dropped below State standards. The major reason for the low DO levels in the Passaic is the BOD contributions from point and non-point sources, 752,000 lbs/yr and 700,000 lbs/yr respectively. The unrecorded loadings may be conservative due to additional BOD loads from organic soils and swamps found in the watershed. In contrast to many of the other basins, continuous point source discharges of suspended solids (31,000,000 lbs/yr) were much greater than that from non-point sources (13,000,000 lbs/yr). The residential sector generated 65 percent of the total non-point source suspended solids load, while the industrial sector generated 20 percent.

Phosphates discharged from treatment facilities were more than 10 times greater than phosphates from non-point sources. Point source nitrogen was also found to be 8 times greater than nitrogen from non-point sources. Residential land uses were the major non-point source contributor of both nutrients.

Other than BOD, point dischargers appear to be the dominant source of water degradation in the Upper Passaic. Thus, implementing the point source control plan in conjunction with controlling unrecorded BOD from developed areas, would most likely result in an improvement in water quality. However, natural non-point sources, such as those from the Great Swamp may play a greater role in water quality than originally anticipated. Further studies are necessary to determine the exact origin and magnitude of these loadings.

b. Whippany Basin - The Whippany River watershed can be described as being generally suburban. Approximately 66 percent of the basin is primarily undeveloped, with 24 percent of this being preserved for conservation/recreational use. The developed portion is 28 percent residential and 6 percent commercial/industrial. Residential and sporadic industrial development encroach upon the shoreline in Morristown and vicinity. The Water Quality Analysis found overall water quality in the Whippany River basin to be poor with several parameters violating State or recommended standards.

Point source BOD was estimated to be more than twice as large as BOD from non-point sources, although it is suspected that natural non-point loadings emanating from the swamps may add more BOD, reducing the proportion of point to non-point loadings. The commercial/industrial land uses contribute 47 percent of the unrecorded BOD load.

Non-point source suspended solids were almost 9 times greater than continuous point dischargers. In actuality, this figure may be greater than that, because residential growth is taking place within the basin. Fifty-four percent of the non-point suspended solids were generated on the residential lands, while the industrial sector contributed 32 percent.

Nutrient loadings from domestic plants far outweighed non-point loadings. Again, this proportion may in actuality be lower, due to continuing residential development and larger natural nutrient loadings than were estimated.

Initial estimates indicate that water quality degradation in the watershed is largely a point source problem. However, large unrecorded loadings of suspended solids from developed (and developing) lands in addition to unassessed natural loadings, and benthic deposits, may play a significant role. Investigations to confirm this are necessary. If found to be a major source, management practices to control unrecorded suspended solids from the industrial and residential sectors should be instituted. These measures, along with upgrading treatment plants, should help in alleviating water quality problems in the segment.

c. Rockaway Basin - Development within the Rockaway River watershed is primarily concentrated in the middle and lower reaches. Eighty percent of the basin is generally undeveloped; residential land makes up 16 percent; and commercial/industrial makes up the remaining 4 percent. Development has encroached upon the Rockaway from Dover downstream to the Boonton Reservoir. Downstream of the reservoir, land uses consist of open land, with the exception of Lake Hiawatha where residential development borders the river.

Non-point source BOD loadings were estimated to be almost 3 times greater than point dischargers. 43 percent of the non-point BOD comes from the residential sector, while the industrial sector contributes 30 percent.

Suspended solids from non-point sources were 85 times greater than from continuous point dischargers. Although the commercial/industrial sector comprises only 4 percent of the total basin, it generates 42 percent of total unrecorded suspended solids. The residential district makes up 16 percent of the basin, but supplies 45 percent of suspended material.

Phosphates from point sources were estimated to be 9 times greater than non-point sources. Nitrogen from point sources was estimated to be more than 5 times greater than the non-point annual loadings. Unrecorded nitrogen contributions may be greater as a consequence of septic systems, vegetative decay, or the overuse of fertilizer.

The Rockaway experiences water quality degradation below Boonton Reservoir attributed to both point and non-point sources. However, as the Rockaway Valley Regional Sewerage Authority (RVRSA) has a more concentrated effect than non-point loadings (which are more widespread in location and time), it has been found that the RVRSA discharge dominates and advanced treatment is necessary to meet water quality standards. Upgrading RVRSA and controlling non-point source contributions of BOD and suspended solids would result in major improvements of water quality. Due to the limited aerial extent of the industrial sector in relation to its contribution of non-point pollutants, implementing management practices for this sector would be most effective in controlling non-point pollution loadings. Septic systems and natural non-point loadings also appear to warrant research to determine their contributions to the basin's receiving waters.

d. Wanaque Basin - The Wanaque basin is one of the least developed in the study area with 89 percent of the land being undeveloped. Residential land comprises 9 percent of the basin, while less than 2 percent is utilized for commerical/industrial activities. Limited by restricted transportation and hilly terrain, the densest populations are found in the vicinity of Greenwood, Pinecliff, Cupsaw, Erskine and Inez lakes, and the Wanaque Reservoir. The basin is served by either packaged plants or septic systems.

Due to the limited development, the non-point source loadings were found to be among the lowest in the Northeast. Even though non-point source BOD loadings were estimated to be more than 3 times greater than point source loadings, the water quality analysis indicated that BOD levels encountered throughout the basin denoted healthy streams. Elevated DO values complemented this.

Non-point source suspended solids were estimated to be 45 times greater than point source discharges. The commercial/indistrial sector generated 33 percent of the unrecorded suspended solids, while the residential sector generates 39 percent.

Nutrient levels, even though generally within State standards, were found to be of potential significance for the numerous lakes and the reservoir in the watershed. Phosphates discharged from treatment plants were comparable with those from non-point sources. It was estimated that point source nitrogen loadings were somewhat greater than from non-point sources. Because of the eutrophic condition of the lakes in the area, additional phosphorus loadings to the streams in the Wanaque basin should be limited through controls on new or expanded domestic facilities.

e. Pequannock Basin - Almost 90 percent of the Pequannock River watershed is undeveloped, with the City of Newark holding almost 73 percent of the land in the basin for water supply purposes. The Pequannock is the most sparcely populated segment in the study area. Bloomingdale, Riverdale and Butler are the only densely developed communities in the basin. Residential land uses comprise 8 percent of the total watershed, while commercial/industrial land uses make up less than 2 percent. The one dense population center is served by a domestic treatment plant, with the remainder of the basin served by packaged plants and septic systems.

With its abundant open space, proximity to urban centers, and recreational lands, the basin is presently experiencing growth pressures, including a proposal by the City of Newark to develop portions of its land holdings.

Domestic treatment plants discharge almost twice the BOD loads generated by non-point sources. Of the non-point source loadings, the commercial sector generated 34 percent, the residential sector 31 percent, and the generally undeveloped lands 24 percent.

Non-point source suspended solids generated in the Pequannock watershed were 9 times greater than loadings from domestic and industrial dischargers. The unrecorded loading is generated mostly by residential land uses (37 percent) and undeveloped land (33 percent).

Nutrient loadings were estimated to be much greater from domestic discharges than from non-point sources. Treatment plants discharged 10 times more phosphates, and 6 times more nitrogen than estimated for non-point sources. The large portion of land which is undeveloped contributes most of the nutrients that enter the waterway from unrecorded sources.

There is generally high quality water throughout the Pequannock basin. The largest single factor degrading stream quality is the effluent discharged from the Butler-Bloomingdale facility. The recommended upgrading of this plant should help improve the minor water quality infractions. Non-point suspended solids loadings, though estimated to be many times larger than point discharges, appear to be small enough to be assimilated by the river, but may compound downstream degradation.

f. Ramapo Basin - The Ramapo River watershed in New Jersey is 73 percent undeveloped.* Residential land use, which generally occurs in clusters, comprises 20 percent of the basin, while the commercial/industrial sectors make up 6 percent. The basin is currently served by packaged plants and individual septic systems. However, efforts are underway to sewer portions of the basin to the Northwest Bergen County Utilities Authority facility in Waldwick.

Non-point source BOD was estimated to make up 94 percent of the total BOD loading. Of the unrecorded BOD total, 57 percent was generated in the commercial/industrial sector, and 37 percent originated on the residential land.

Suspended solids introduced into the river were estimated to be almost entirely of non-point origin (99 percent). The commercial/industrial sector generated 51 percent of this load while 41 percent originated from the residential sector.

*Land use and wastewater loadings data were only available for the New Jersey portion of the basin (roughly one-third of the total watershed). Therefore, pollution loadings were utilized discreetly since the New York portion has been developed extensively in the Suffern area.

The non-point source contribution of phosphate was estimated to represent 59 percent of the total phosphate loading. Of the non-point loading, 54 percent was contributed by the commerical/industrial sector and 34 percent from residential lands. Non-point nitrogen was found to be 66 percent of the total loading. As with phosphate the commercial/industrial sector generated 50 percent, while the residential fraction contributed 32 percent.

Water quality problems are minor, and appear to be of both point and non-point origin. Phosphorus and ammonia were found to exceed recommended EPA standards. These are assumed to result from both packaged plant effluent and non-point source contributions. Ambient surface water investigations may be needed to determine further pollution abatement strategies.

g. Pompton Basin - The Pompton River flows through the generally suburban municipalities of Pequannock, Wayne, and Lincoln Park. Residential land use comprise 26 percent of the basin and the commercial/industrial sector makes up 7 percent. The latter form of development is generally highway-oriented, such as shopping centers and research and office establishments. The largest land use in the basin is primarily undeveloped lands, making up 67 percent of the drainage area. Approximately 30 percent of the Pompton segment is sewered, while the remainder is served by packaged plants or individual septic systems.

Domestic point sources discharged almost twice as much BOD as non-point sources. The commercial sector makes up only 4 percent of the total land area, yet supplies 45 percent of the non-point BOD loading; the residential sector generates 37 percent.

Non-point suspended solids were estimated to be eleven times greater than suspended solids from point sources. Of the unrecorded loading 51 percent has its origin in the residential sector.

Domestic discharges of phosphate were estimated to be 11 times greater than loadings from non-point sources. The residential sector supplied 42 percent and the commercial/industrial sector generated 49 percent of the total unrecorded phosphate loading. Municipal plants discharged 8 times more nitrogen than non-point sources. The residential sector generated 40 percent of the non-point nitrogen loading, while the commercial/industrial sector contributed 47 percent.

Water quality problems in the segment are minor, and appear to be attributable primarily to point sources. Therefore, phasing out the Sheffield Hills facility to Mountain View and upgrading the Pompton Lakes plant as recommended in Chapter V, should result in water quality improvement. However, the non-point source contributions of suspended solids and nutrients deserve further investigation.

h. Mid-Passaic Basin - (Above Little Falls) - The Mid-Passaic basin includes the area that drains the Passaic River from its confluence with the Whippany/Rockaway Rivers to Little Falls and is made up of predominantly suburban communities. Of the total area in the basin, 67 percent is generally undeveloped, 27 percent is residential, and 6 percent is made up of commercial/industrial land uses. All sewered areas are served by separate sewers. Swampland and marshy areas such as Hatfield Swamp and Great Piece Meadows are common.

It was estimated that point sources discharged four times more BOD than non-point sources. Of the non-point BOD, 46 percent originated in the residential sector, while 32 percent was generated on commercial land. The large amount of swampland may have a seasonal influence on the unrecorded loadings, reducing BOD by using organic matter for production during the growing season and generating BOD during other parts of the year, when plants in the swamp decompose.

Non-point suspended solids were estimated to be more than 20 times greater than point source loadings. Of the non-point loading, 56 percent had its inception in the residential sector and 25 percent in the industrial sector.

Based on estimates of point and non-point loadings, nutrients introduced into the segment were overwhelmingly from point dischargers. It was estimated that point source phosphate loadings were 28 times greater, and point source nitrogen loadings 20 times greater, than their respective non-point source loadings.

Other than problems from suspended solids, water quality degradation resulting from sources within the basin is from point dischargers. Poor quality water entering from the Upper Passaic, Rockaway, and Whippany rivers compound the problem. However, unrecorded sources of suspended solids may effect water quality and controls may be necessary. The industrial sector comprises only 4 percent of the segment, yet contributes significant unrecorded pollution loadings. Economies of scale would thus indicate that this sector would be the most feasible sector to implement non-structural controls to reduce non-point suspended solids loads.

i. Peckman Basin - The Peckman River basin communities have experienced extensive growth in the past two decades, however, patches of fairly rugged terrain have prevented the area from being completely developed, especially in Cedar Grove. The basin is for the most part comprised of undeveloped (48 percent) and residential (47 percent) lands. The commercial/industrial sector comprises only 5 percent of the land. All of the developed portions of the basin are separately sewered.

Municipal and institutional treatment plants were estimated to discharge 5 times more BOD than non-point sources. The residential district generated approximately 71 percent of the non-point source loading.

In contrast to the above, non-point contributions of suspended solids were more than 6 times the contributions by domestic discharges. The residential sector again was the major contributor, producing 71 percent of the total non-point loading.

It was estimated that municipal facilities discharge 36 times more phosphate, and 27 times more nitrogen than non-point sources. The residential sector contributed the largest non-point nutrient loading.

Other than suspended solids, domestic dischargers appear to be the major cause for water quality degradation in the Peckman River. Upgrading the sewage treatment facilities along with application of management practices for suspended solids from the residential district would result in improved water quality.

j. Mid-Passaic Basin - (Below Little Falls) - This portion of the Passaic River encompasses the area from Little Falls to Dundee Dam and flows through a heavily urbanized area. Approximately 46 percent of the basin is residential, (mostly single family) 13 percent is commercial/industrial, and 41 percent is generally undeveloped (largely vacant). The City of Paterson (28 percent of the basin) is served by combined sewers.

Non-point BOD was estimated to be more than 8 times greater than from the treatment facilities. The residential lands generate 52 percent of the unrecorded loading, while the commercial/industrial districts contribute 47 percent.

Suspended solids from non-point sources were 36 times greater than point dischargers, many of which are overloaded. The City of Paterson contributes almost 70 percent of the non-point total, with residential, commercial/industrial lands contributing the majority of the unrecorded suspended solids.

Nutrients discharged into the basin's receiving waters via treatment plants were somewhat comparable with those generated from non-point sources. Paterson again was the main contributor, introducing 69 percent of the unrecorded phosphate and nitrogen.

Probable causes of the basin's water quality degradation include high pollution (point and non-point) loadings from upstream sources, heavy non-point loadings from within the basin, point source loadings from within the basin, and benthic deposits along the stream bed, which depress dissolved oxygen. Reductions of suspended solids would partially enhance the quality of water in the Mid-Passaic. This would, in turn, reduce the BOD, nutrients, heavy metals, and toxics reaching the waterway. Management practices may be needed in the residential and commercial/industrial sectors of Paterson since the analysis found that the combined sewer area contributed substantial non-point loadings.

k. Saddle River Basin - The Saddle River basin is predominantly suburban with clusters of dense residential development throughout. The residential sector makes up 42 percent of the watershed, the commercial/industrial sector 6 percent, and undeveloped (largely vacant lands) 52 percent. The southern portion of the basin consists of older more densely populated and industrialized municipalities. Density of development and industrialization increases in a downstream direction.

Non-point BOD loadings were found to be 3 times greater than domestic sewage loadings. The land use responsible for the greatest non-point BOD loading is the residential section, which generates 64 percent. The smaller commercial fraction supplies 28 percent.

Domestic treatment plants discharged only 2 percent of the estimated total suspended solids loading. The residential sector supplied 77 percent of the total unrecorded loading.

The introduction of nutrients into receiving waters was primarily from point dischargers. Point loadings of phosphates were 11 times greater, and point loadings of nitrogen 8 times greater, than their respective non-point loadings. The residential sector was the major non-point contributor of nutrients.

It appears that water quality problems in the Saddle River are the result of both point and non-point sources. Therefore, upgrading existing treatment plants in conjunction with controlling non-point source pollution could have a very positive effect. The largest contributor of unrecorded pollutants is the residential sector, which consumes 42 percent of the total basin. Management practices on residential lands would have to be employed in order to significantly reduce the non-point pollution load.

1. Lower Passaic Basin - Land use within the Lower Passaic is characterized by intense urbanization. Residential land use comprises 51 percent of the total, commerical 5 percent, industrial 12 percent, and undeveloped 32 percent (largely publicly owned lands). The basin is partially served (25 percent) by combined sewers.

The intense urbanization and industrialization contribute to the poor water quality in the basin. There are no municipal plants and only a few minor industrial dischargers in the basin, however, there are numerous combined sewer overflows.

Non-point BOD loadings were estimated to make up over 99 percent of the total. Of the total BOD load, 53 percent was generated in the residential sector and 25 percent in the industrial sector. Most of the industrial contribution (84 percent) had its origin in the portion that is served by combined sewers, an area that consumes less than 9 percent of the basin.

As with BOD, around 99 percent of the suspended solids loadings were estimated to be derived from non-point sources. Of this figure, 59 percent was generated on residential lands and 32 percent in the industrial sector. Of the total, 27 percent was generated in the industrial area served by combined sewers.

None of the industries in the Lower Passaic discharge phosphates or nitrogen, so any nutrients generated are from non-point sources. As expected, the residential and industrial sectors were the major contributors.

Pollution problems in the basin can be summarized as resulting from substantial loadings from upstream sources, benthic deposits, upstream diversions which reduce the river's assimilative capacity, and heavy non-point loadings, including combined sewer overflows. These problems can be partially alleviated by reducing upstream pollution and controlling unrecorded pollution from the basin. Controlling suspended solids from the industrial area served by combined sewer facilities could be both a practical and economical alternative to enhance the water quality in the basin.

m. Hackensack Basin - The Hackensack River basin is the second most densely populated basin in the study area. Residential development comprises 32 percent of the land use in the basin, generally as single family dwellings. Commercial/industrial uses cover 14 percent and the remaining 54 percent is generally undeveloped.

Development is concentrated downstream of the Oradell Reservoir. Many of the municipalities in the downstream area are served by combined sewers. Intensive encroachment of the river has taken place in the form of housing developments, industrial parks, oil storage facilities, and landfills. The lower reach of the river is encompassed by the Hackensack Meadowlands, where large scale development is underway. The water quality reflects these land use patterns. The freshwater reaches of the Hackensack meet all standards except fecal coliform and phosphorus. Since most of municipalities in the upper reaches in New Jersey are served by sewers, it appears likely that these problems are the result of non-point sources of pollution which may include contributions from water fowl populations, leakage from sewers, or contaminants generated in New York State. The tidal Hackensack exhibits poor quality water.

Even though NPS/IPS BOD, phosphate, and nitrogen loadings were estimated to be quite substantial throughout the basin, point source discharges appear to be the cause of the problems in the lower reaches. BOD was found to be 3 times greater, phosphate 14 times greater, and nitrogen 10 times greater from point sources* than from non-point sources. The Bergen County Utilities Authority (BCUA) was by far the largest contributor of the point source loadings.

*These figures pertain only to wastewaters generated within the New Jersey portion of the watershed. New York land use and point source data were unavailable. Even though unaccountable, it must be emphasized that the New York portion of the watershed is only a small portion of the total basin and is primarily rural and suburban; thus, contributions of pollution will be minor in comparison to the urban areas in New Jersey.

Contributions of suspended solids from non-point sources were estimated to be more than 6 times those from point dischargers. The industrial sector comprises 10 percent of the total land area, but contributes 47 percent of the non-point source suspended solids loadings. The residential sector makes up 32 percent of the watershed land and generates 40 percent of the non-point source suspended solids.

Thus, there are two probable causes of water quality degradation in the Hackensack River, the BCUA and other point sources and substantial suspended solids loadings from NPS/IPS. Assuming that the alternative of moving the BCUA outfall to the Hudson River, as discussed in Chapter V, proves cost-effective and technically feasible, a significant improvement in the tidal Hackensack's water quality should be realized. Based on this analysis, water quality can be further improved by implementing management practices for controlling non-point source suspended solids, first in the industrial sector, and secondly, on residential lands. In the upper basin, controls on sediment and an educational program for homeowners on use of fertilizers would aid in improving the water quality. More site specific investigations might look into the impact of contributions from benthic deposits and landfills.

n. Newark Bay Basin - Newark Bay is an 8.35 square mile estuary encompassed by numerous industries. The Bay contains the ports of Elizabeth and Newark, and is bordered by heavily concentrated petro-chemical facilities and Newark Airport. 53 percent of the basin is industrial lands, while 2 percent is commercial, 14 percent is residential, and 31 percent is generally undeveloped. Almost half the segment is served by combined sewers.

More than 7 million pounds of BOD are discharged into Newark Bay annually by industries, in comparison to 1.3 million pounds from non-point sources. This difference will further increase with the construction of an additional PVSC outfall to Newark Bay to handle wet weather flows. Of the non-point BOD, 74 percent has its origin on the industrial lands, especially in the area served by combined sewers.

Annual non-point suspended solids loadings were more than 7 times greater than from continuous point sources. The industrial sector generated 82 percent of total unrecorded suspended solids.

Domestic plants discharge 794,000 pounds of phosphate and 2,381,000 pounds of nitrogen into Newark Bay annually. This is compared to non-point loadings of 69,000 and 271,000 pounds of phosphate and nitrogen, respectively. The industrial sector, especially the portion served by combined sewer, was again the major non-point nutrient contributor.

Water quality problems in Newark Bay seem to be attributable to heavy loadings from upstream sources, upstream freshwater diversions reducing the assimilative capacity, heavy point source loading from within the basin, accumulated benthic deposits from point and non-point sources, heavy non-point suspended solids loadings and combined sewer overflows.

Upgrading the basin's treatment plants, including correcting overflow problems, and reducing upstream pollution should enhance Newark Bay's water quality. Management practices for unrecorded suspended solids, especially from the industrial sector, could also result in water quality improvement. However, Bay sediments are anaerobic and contain as much as ten percent oil and grease, suggesting that even if the point and non-point problems were solved, the benthic problem would persist until the sludge bed is dissipated or dispersed.

o. Hudson Basin - The Hudson River basin is the most densely populated in the study area. Multiple-density residential development comprises 22 percent of the total land area. A good deal of the high-rise development occurs along the Hudson River waterfront. Commercial/industrial land uses make up 21 percent of the basin, while undeveloped lands, largely in the form of parks and vacant space, make up the remaining 57 percent. The segment is predominantly served (77 percent) by combined sewers.

Treatment plants in the basin discharge the second largest point BOD loading in the study area and are estimated to be 40 times greater than annual non-point BOD loadings. The residential sector generates 43 percent of the unrecorded loading while industrial lands supply 31 percent.

Suspended solids discharged from treatment plants were almost twice as great as from non-point sources. The residential and industrial land uses generated 89 percent of the non-point suspended solids.

It was estimated that 65 times more phosphate was discharged into the Hudson River from point discharges than from non-point sources. Nitrogen loadings were similar, with 50 times more being discharged from treatment facilities. The residential and industrial sectors were again the primary areas where unrecorded nutrients were generated.

Except for suspended solids, point source contributions were far more significant than non-point sources. Upgrading existing treatment plants will have a positive impact on reducing New Jersey's pollutant load to the Hudson River.

p. New York Bay Basin - The New Jersey side of the New York Bay basin is among the most densely populated in the study areas, with a population density of 32 persons per acre. The basin is comprised of 21 percent residential, 44 percent commercial/industrial land, and 35 percent generally undeveloped lands (largely vacant or publicly owned). The New York Bay Basin is entirely served by combined sewers.

More than 300 million pounds of BOD is discharged into the Bay annually from New Jersey, with approximately 99 percent of it coming from the Passaic Valley Sewerage Commissioners' facility. Unrecorded BOD loadings were estimated to be 1.4 million pounds per year. The industrial lands generated 46 percent of the unrecorded loading.

Point source loadings of supsended solids were found to be more than 7 times greater than non-point sources. PVSC contributed over 98 percent of the point loading. The industrial sector contributed the greatest proportion of unrecorded suspended solids, introducing 67 percent.

As with the other parameters, continuous point dischargers contributed more nutrients into the estuary than non-point sources. Point source phosphates were estimated to be 134 times greater, while point source nitrogen was 102 times greater than non-point loadings. The industrial sector generated the bulk of the unrecorded nutrients, while PVSC supplied most of the point source contribution.

Poor quality water in New York Bay is primarily attributed to heavy point source loadings originating in New Jersey and New York. Therefore, management practices for non-point sources are not warranted at this time in New Jersey.

q. Elizabeth Basin - The Elizabeth River watershed is predominantly developed, with 38 percent of the basin residential, 5 percent commercial, 16 percent industrial, and 41 percent generally undeveloped, largely recreational and vacant.

An estimated 77 percent of all BOD introduced into the watershed was of a non-point origin. Residential and industrial land uses generate most of the unrecorded BOD loadings, contributing 42 and 35 percent respectively.

Suspended solids discharged into the Elizabeth River were almost entirely contributed by non-point sources (99 percent). The industrial and residential sectors each contributed 45 percent of the unrecorded loadings. In the residential sector, the majority of this loading occurs in the area served by combined sewers.

No treatment plants discharge phosphate. Of the non-point phosphate loadings, the industrial sector is responsible for 46 percent and the residential sector 39 percent. Unrecorded nitrogen loadings are approximately 57 times greater than nitrogen from point discharges. The industrial and residential sectors are the primary contributors, especially in the areas with combined sewers.

The Elizabeth River basin is unique in the sense that there are no large point dischargers and, thus, most water quality problems are due largely to non-point sources. The industrial sector makes up 16 percent of the basin, yet contributes approximately 45 percent of all suspended solids. Industry is also a major contributor of non-point BOD and nutrients. Accordingly, applying management practices to this area would most likely result in improving the poor water quality. Controls for combined sewer overflows are warranted.

r. Rahway Basin - The Rahway River basin is made up of low-density, single family homes with some highly urbanized areas in the downstream portion. Residential land uses comprise 48 percent of the entire basin, commercial/industrial lands 7 percent, and generally undeveloped lands (recreational and vacant) 45 percent. The entire area is served by separate sewers.

Unrecorded BOD was estimated to be 10 times greater than BOD from waste treatment plants. Of the unrecorded BOD, 67 percent is generated on residential lands.

Point and non-point suspended solids estimates indicated only slight differences in total loadings. Of the non-point suspended solids, 76 percent were generated on residential lands.

There are no point dischargers of nutrients in the basin. Non-point phosphate loadings were estimated to be 30,000 pounds per year, while nitrogen was estimated at 121,000.

From this analysis, controls on NPS/IPS may be necessary to attain water quality standards. There is one major treatment plant on the river, discharging approximately half of all suspended solids. Reducing this loading in conjunction with managing suspended solids from the residential sector could relieve existing water quality problems.

VI.B.3 Summary and Conclusions

The preceding sections of this chapter presented the quantities, qualities, and loadings of non-point sources of pollution. The main concern in a water quality management study is the impact of these pollutants on receiving waters. Although the cause and effect relationship between non-point pollution and stream quality has not been established, the NPS/IPS assessment indicates where non-point sources of pollution may be affecting water quality. This section summarizes the results of the NPS/IPS assessment for the entire study area and makes some general conclusions regarding non-point pollution in the Northeast. As the upgrading of existing treatment facilities is completed in the Northeast, further analysis of the impact of non-point sources on water quality will have to be made to determine a future course of action.

Suspended Solids - Suspended solids were the most significant non-point source pollutant analyzed in the assessment. For the study area unrecorded suspended solids accounted for 54 percent of the total suspended solids loadings. This proportion is not representative of each segment, due to the unparalleled contribution from the Passaic Valley Sewage Commissioners (PVSC) facility. The point to non-point source loading ratio for the basins ranged from .0002 to 7.56. Fifteen of the eighteen segments had much greater non-point generation of suspended solids than from domestic and industrial point sources. Once the upgrading of the PVSC facility is completed, unrecorded sources of suspended solids are expected to contribute approximately 80 percent of all suspended solids generated within the study area. The significance of suspended solids is accentuated by the fact that the highest concentrations of other contaminants are generally found in waters with the highest sediment loads.

The non-point suspended solids were generated mostly in the residential sector (48 percent), while 40 percent were generated in the industrial sector. Residential land uses are capable of introducing substantial amounts of other pollutants in connection with the suspended solids, primarily nutrients, pesticides and BOD, while suspended solids from the industrial sector may contain heavy metals, hydrocarbons, and halogenated organics, as well as nutrients, pesticides, and BOD.

The industrial sector comprises 6 percent of the total study area, and much of these industrial lands are served by combined sewers. The presence of toxics, in addition to economies of scale, indicate that Stormwater Management Practices, as outlined in Section VI.C.1., could be put to best use in controlling sediments from the industrial sector especially when served by combined sewers. However, due to the lack of data, detailed recommendations for structural abatement measures cannot be justified at this time. Nevertheless, some general comments can be made that will be useful in the interim. Non-structural considerations, especially management practices for improving the quality of storm runoff should be encouraged as they seem to offer the most cost-effective approach without adverse construction impacts. Additionally, municipalities should be encouraged to implement land use controls which preserve or protect environmentally sensitive areas as well as non-structural methods of non-point source control. The erosion and sediment reports being prepared by the Soil Conservation Service and Soil Conservation Districts may be utilized in determining more specific control measures. Erosion and sediment reports for portions of Bergen, Morris and Passaic Counties will be completed in early 1979, while a statewide inventory of soil erosion, sediment and animal waste should be initiated during 1979 (see Section VI.C.2).

Other Parameters - In the study area, domestic and industrial dischargers were estimated to generate more than 20 times the annual non-point BOD loads. As was the case with suspended solids, this ratio is not representative of all segments due to the influence of the massive loadings from the PVSC. This assessment indicates that the implementation of the point source plan (Section V.B.5) is necessary to substantially reduce the BOD load to the streams and improve water quality. However, it should be noted that oxygen-demanding materials are closely linked to particulate matter. Investigations of stormwater characteristics have indicated that oxygen-demanding materials can be as much as 10 percent of the total suspended solids load. If this estimate is correct, the amount of BOD settling out with particulate matter in the area streams could amount fo approximately 60 million pounds annually. Although this is only an approximation, it is possible that suspended solids play a greater role in producing water quality problems than previously considered. Further assessment of the non-point problem is necessary, especially in those segments served by combined sewers.

Point dischargers introduce 27 times more phosphate, and 15 times more nitrogen than the non-point sources of pollution. Four segments indicated greater unrecorded loadings of phosphate than that from point sources, however, three of these segments contained no discharges of phosphate. Unrecorded phosphate loadings in the Ramapo segment were found to make up approximately 59 percent of total phosphate loadings. The same was true of nitrogen loadings in this segment, with unrecorded nitrogen making up 67 percent of the total. The Elizabeth River was the only other segment having larger non-point source nitrogen loadings than point source loadings. From this analysis, the nutrient problems identified in Chapter III would seem to be a result of point source dischargers.

VI C. Best Management Practices

The first part of this Chapter described the potential non-point source problems in the Northeast Study Area. The remainder of the Chapter presents management practices for the control of pollution from non-point sources.

VI.C.1. Stormwater Management

When rain falls on a watershed it picks up many substances enroute to the regions waterways. This stormwater is not just "rain water," but rather water which can contain substantial amounts of contaminants. Management Practices used to control contamination from stormwater will depend upon land cover characteristics, institutional and regulatory practices, geology and physiography, as well as water quality characteristics of a particular area (including the identification of particular types of pollutants, how much reduction of these are needed, and the costs to achieve such reduction). All of these factors are interrelated, and in turn affect the degree to which stormwater quality problems are addressed in the broader perspective of water quality planning and management.

It is the purpose of this section to address the following elements of a comprehensive stormwater management program:

1. Statewide Stormwater Management Policy - this sets the framework for management programs by establishing statewide goals and policy.

2. Implementation Strategy of the Statewide Stormwater Management Policy - this states in more detail, elements which will be included in a stormwater program in the continuing planning process, based on the identification of existing problems, future problems, alternative control measures, regulatory programs and institutional/ management arrangements.

a. Statewide Stormwater Management Policy The Division of Water Resources has developed a Statewide Stormwater Management Policy which contains general goals and policies for stormwater programs throughout the State. This policy was developed because stormwater control is incorporated in programs instituted at several levels of government (local, county, regional, and state), and also in programs which can either conflict with each other or only address one problem associated with stormwater. The policy attempts to incorporate the issues of flood control, ground water recharge, and water quality in a comprehensive approach to stormwater management in the State. It is designed to achieve goals of reducing flooding and soil erosion, sustaining ground water recharge, minimizing pollution from stormwater runoff to natural or near natural levels, and reversing adverse effects of stormwater on lakes, ponds and reservoirs. Under the policy, certain general practices are encouraged, including the preservation of floodplains and wetlands, the retention of indigenous vegetation to the extent practicable in construction and land disturbing activities, land use planning to protect and preserve aquifer recharge areas, and cooperation of municipal, county, and state agencies for instituting street cleaning and litter removal programs. Besides these recommendations, the policy also states that DEP will assist counties and municipalities by providing guidelines on developing local stormwater management ordinances. The full policy is included in Appendix VI-1.

b. <u>Implementation of a Stormwater Management Program</u> The Statewide Stormwater Management Policy establishes a framework in New Jersey for initiating stormwater programs which consider the Best Management Practices for a particular area. Management Practices can be initiated before development has occurred in an area as preventive measures, or they can be used to remedy ongoing problems which have been identified through a nonpoint source assessment. Both preventive and remedial perspectives must be considered for controlling stormwater-related pollution. Implementation of a program for WQM planning consists of the following elements:

i. Problem Identification - The distinguishing factor between water quality assessments and non-point source assessments is the identification of a source other than a point source discharging wastewater which causes pollution problems. The steps needed to determine a stormwater-related problem vary, depending upon the purpose of control, either preventive or remedial.

The prevention of stormwater pollution can be attained by determining the potential sources of pollution which are associated with land cover/land use in a particular area or drainage basin. Because stormwater problems can be traced back to land cover characteristics, these must be determined first. For site specific planning, future land cover/uses can be determined by master plans, zoning, and subdivision controls. From this, anticipated problems can largely be identified and prevented by obtaining information on the extent of pollution attributable to various land covers; this can be obtained from the literature which analyzes the relationship of land cover/land use to stormwater. Section V1.A.1 discusses this relationship and references are noted in that element of the Plan.

The origin of existing problems can be related to land cover or the collection system. Information on the type of land cover can be obtained from land use surveys of the planning area or existing reports.

The existing collection system can intensify stormwater-related problems, e.g. storm sewers can be clogged with debris, not constructed for a certain capacity, or problems may be due to combined sewer overflows.

After the origin of the problem can be determined, attention can be given to the extent of water quality degradation resulting from stormwater in an area. A benchmark for determining degradation would be New Jersey Surface Water Quality Standards. Levels above these would be considered degrading.

Existing pollution problems can be identified by a variety of methods including storm sampling, literature reviews, simulation modeling, and statistical modeling. The choice of a particular methodology will largely be dependent upon the type of information available (e.g. existing studies for the particular area under review, land use, amount of impervious space, physiography, presence of combined sewers, etc.) cost, and time restrictions.

ii. Examination of Alternative Control Measures - By studying various solutions or practices to solve the problem of pollution due to stormwater runoff and the source of stormwater-related problems, it is possible to determine potential Management Practices. Any practice examined must be viewed in a context of controlling stormwater impacts on flooding, water quality, and recharge for a total basin, rather than for a stream segment or municipality.

Preventive methods of control are most associated with source control of stormwater. These are actions which are initiated within the drainage basin before runoff enters a sewer system or waterway and can be structural, non-structural or a combination of the two.

Structural measures are those which require physical modifications in an area before development. These can include on-site storage, e.g. retention basins for long term storage, porous pavements which allow for infiltration such as dutch drains or precast concrete lattice blocks and bricks, overland flow modifications e.g. terraces, diversions, runoff spreaders, and techniques for solids separation, e.g. sediment basin traps. Treatment methods can also be employed at an on-site storage facility.

Recently, much attention has been given to the use of detention and retention basins for stormwater control. Detention basins can be used to prevent flooding by delaying runoff to the receiving stream. Retention basins are designed to store runoff through ground water infiltration. By slowing the rate of runoff into the stream, or in the case of retention basins by eliminating runoff, these basins may allow for a significant reduction in the size of required storm sewers. However, their effectiveness in removing pollutants is still under investigation, although preliminary studies of detention ponds have shown that the amount of BOD and suspended solids removed was similar to that of primary treatment (Young, 1975). Also, use of these basins must be first examined for the impacts on a whole watershed, as added flooding may occur down stream if water is discharged at an inopportune time.

Non-structural measures of controlling stormwater-related pollution at the source include urban development planning, use of natural drainage, street cleaning programs, animal control programs, and air pollution abatement planning. As indicated in the Statewide Stormwater Management Policy, the preservation of flood plains and wetlands, the retention of indigenous vegetation, and land use planning are non-stuctural measures which are recommended or encouraged by DEP. Restrictive development controls for environmentally sensitive areas such as aquifer recharge areas, wetlands, floodplain vegetation or buffers and steep slopes can be included as non-structural source control techniques because of the important roles these areas play in influencing ground and surface water quality. Recharge areas help to regulate surface flow by absorbing water during wet periods; wetlands filter out silt and other pollutants; maintenance of flood plain vegetation can prevent increased thermal pollution of streams; and development on steep slopes can increase soil erosion. A more detailed examination of the impacts on water quality by environmentally sensitive areas is discussed in Section IV.B.2.

Principal advantages of source control measures are that they can reduce the total volume of runoff from paved areas, or potentially paved areas, thereby reducing the potential for flooding and pollution, and permitting recharge of aquifers. However, potential ground water pollution must also be considered when using such techniques. If source controls are to be considered as Best Management Practices, local physiographic characteristics, e.g. soils, slope, vegetative cover, depth to water table, must be considered for their practicality.

Control of erosion can also be considered as a source control for urban areas although its principal use in New Jersey occurs with agricultural and silvicultural land uses, and with sites undergoing construction. A detailed description of these practices is included in Section VI.C.2.

Source control measures, both structural and non-structural can easily be implemented as preventive measures for controlling stormwater pollution, because they can be instituted before development begins in an area. For this reason, a major focus of continuing planning will be on determining and using stormwater source control techniques as Best Management Practices.

Remedial controls can include source controls, but also consist of collection system, storage, and treatment controls for water quality protection. As a source control for existing stormwater pollution, street cleaning programs can have a significant effect on the quantity of pollutants emanating from urban areas. However, different techniques have been found to have varying degrees of effectiveness. With conventional broom sweepers, only 50% of dry weight solids are picked up, as compared to over 90% removal by more advanced techniques such as vacuum sweepers (Sartor and Boyd, 1972; Shaheen, 1975). The use of street cleaning techniqes is most suitable for high density or urbanized areas rather than low density suburban areas. Detention or retention basins can also be used as techniques to improve existing water quality, as well as to prevent flooding and allow for recharge.

Collection system controls are stormwater pollution abatement controls which are concerned with wastewater interception and transport. The principal emphasis of this type of practice is on using existing facilities to the greatest extent possible. Examples of collection system controls include:

- catch basins - these remove solids before entering a sewerage system; however studies have shown catch basins to be relatively ineffective because of their small size in relation to the drainage area (Larger, Smith, and Techobanoglous, 1977).

- sewer-related controls - because solids deposition in combined sewer lines is a constant nemesis to effective maintenance and pollution control, techniques to remove solids must be initiated. Examples of such techniques can include flushing, polymeric injections to increase flow capacity, and controls to prevent infiltration due to leaky pipes.

- flow regulators - These are apparatus for governing the rate of flow through a specific portion of the collection system. An example of this includes a swirl flow regulator/solids-liquid separator. This yields a low-flow concentrate which is diverted to a sanitary sewerage system for further treatment.

- flow routing - these techniques make maximum use of existing interceptors and sewer line capacities.

Storage facilities are useful for reducing pollution which occurs from combined sewer overflows. Stormwater is kept in a holding-tank or basin, and then gradually released during low-flow conditions. Although storage facilities can be regarded as techniques employed for the future protection of water quality, they are largely used with existing sewer systems to abate existing stormwater-generated pollution problems.

Various treatment methods employ physical/chemical, biological, and disinfection processes or combinations thereof. Treatment can occur at source control facilities, collection systems, or storage facilities. The degree of treatment selected will be dependent upon overall goals of water quality protection and expected indirect treatment, resulting from the combined use of one of the other techniques mentioned previously. It may also be necessary to consider the disposal of residual solids or semi-solids after treatment.

Several sources of information are available which offer detailed descriptions of specific techniques. As examples, Water Resources Protection Measures in Land Development - A Handbook, Joachim Tourbier and Richard Westmacott, and Urban Runoff Pollution Control Technology Overview, Richard Field, Anthony Tafuri, and Hugh Masters, cite several techniques and their applicability to different stormwater-related pollution needs. These reports are referenced in the bibliography following this section.

Choosing a particular classification of control, i.e. source, collection system, storage, or treatment, will be dependent upon the origin and nature of the problem. A planning area which is anticipated to have significant development in the future can best be served by source control measures, whereas an area which is already developed and has a problem with combined sewer overflow would best be served by collection system or storage facility techniques. Selection of the techniques to be actually used will be dependent on several features: local physiographic features, land uses or the availability of open space (this would be considered for such techniques as retention basins), the need to control specific pollutants (based on the problem identification), maintenance requirements, and cost.

A major problem that must be recognized is the fact that the impact of some of the control techniques on water quality is still not fully known. As techniques are developed and analyzed, they will be reviewed for their applicability to problems in New Jersey.

iii. Analysis of Alternative Regulatory Programs - As indicated in the Statewide Stormwater Management Policy, several programs at different levels of government are concerned with stormwater management, although each focuses on a particular aspect of the stormwater problem. Existing regulations must be examined in terms of their control of existing problems, as well as with future or anticipated problems. Principal aspects of an analysis will address the adequacy of authorities established under particular regulations, including a description of the programs, and an evaluation of their legal, technical, and financial effectiveness. Some of these issues are to be addressed in Chapter VII. After alternatives have been examined, a regulatory framework can be selected or new one proposed which is suitable for stormwater control needs of a particular area. Municipal ordinances can also be developed which will be applicable to the pollution problems of a specific area or watershed.

iv. Analysis of Alternative Institutional Arrangements - An agency should be examined in terms of its current effectiveness in carrying out regulatory mandates, administration and staffing needs, and maintenance capability of stormwater control measures. Certain agencies indicated in the Statewide Stormwater Management Policy may have regulatory or planning capabilities, but not necessarily management capabilities. Likewise, a multi-faceted problem such as stormwater, may not be effectively handled by a single purpose agency. Most responsibilities lie with county or municipal offices; within New Jersey, counties must approve all subdivisions and where required, grant approval prior to approval by the appropriate local municipal authority. They must also protect all drainageways within their boundaries. Based upon the fact that county and municipal governments have broad planning and management responsibilities over many services (e.g. environmental quality, socio-economic, health), continuing planning will concentrate on their capacities to manage stormwater-related pollution General guidance for these governmental levels can also be found in the State Development Guide Plan and can be obtained from the Soil Conservation Districts, which can offer extensive assistance for management programs.

Several alternative funding approaches are available for implementation and enforcement activities concerning stormwater management, including general revenue funding, user charges, fines and penalties, and grants. Each of these funding methods has value for particular situations and must be selected on a case by case basis, or used for a certain stage of implementation. For example, cost share grants under the New Jersey Green Acres

Program might be used to acquire land for multiple benefits of recreation, flood control and water quality protection. However, maintenance and monitoring for a project may be funded by general revenue funds or user charges. User charges would not always be justifiable, since stormwater control projects can directly or indirectly benefit municipalities or counties other than those that apply the techniques (for example, controls applied in one community may alleviate the flooding problems of communities downstream.) Therefore user charges shall not be given an extensive review in continuing planning.

A major role in decision making for stormwater management is continuous cooperation with the "public", be it a specified PAC, municipal representatives, county agencies, environmental or economic interest groups or the public at large. Because of the public's familiarity with local conditions and also because of the fact that they will be the beneficiaries of the management program, public input will be sought throughout the continuing planning process. DEP and/or the management agency will reciprocate in like manner by offering guidance to counties and municipalities on using Best Management Practices which are necessary or desirable for the watershed or area as a whole. Because of overlapping responsibilities, a cooperative management program between local governments and the management agency is essential for water quality protection; neither can plan independently of the other to achieve this goal.

c. Summary and Conclusions The key to establishing Best Management Practices for stormwater is a holistic approach to management planning. The Statewide Stormwater Management Policy has provided the needed framework by establishing statewide goals of water quantity, quality and aquifer recharge protection. From this statewide perspective, areawide stormwater management programs can be instituted to serve the particular needs of the planning area. By themselves, techniques do not constitute Best Management Practices without considering proper problem identification, regulatory and institutional considerations. Also, a management program cannot be developed for a small area such as a municipality, but rather must be established in a comprehensive manner, for an entire watershed or aquifer recharge zone. Through the continuing planning process stormwater pollution problems may be identified and solutions recommended.

Even though much research must still be performed in assessing the impacts of techniques on water quality, certain groups of practices can be recommended, among these, preventive measures of source control including nonstructural techniques of protecting environmentally sensitive areas, maintaining indigenous floodplain vegetation, comprehensive land use planning and street cleaning programs. The use of other techniques, such as detention basins, for water quality protection must still be examined and further analyzed for their effects on potential flooding and ground water recharge. As techniques are developed and analyzed, they will be reviewed for their applicability to problems in New Jersey.

Counties and municipalities will play increasingly important roles in stormwater management; continuing water quality planning should concentrate on their abilities to manage programs for their areas.

VI.C.2 Best Management Practices for Agriculture, Silviculture, Construction, and Surface Mining

a. Introduction - Agriculture, silviculture, construction, and surface mining are all potential generators of non-point pollution, in part because each tends to disturb land cover and can result in sedimentation. These sources are addressed together in this section because of this similarity.

Pollution controls for these activities must be applied to the site where they are generated. The controls take the form of management practices, applied through site-specific planning, which takes account of the land user's and public's needs. Factors to be considered in selecting management practices include water quality impacts, economics, variations in land conditions and the nature of the operations on the land. Considering these factors, the Best Management Practices (BMPs) for an individual site and situation may be selected.

This section presents Management Practices for agriculture, silviculture, construction, and surface mining developed in initial planning by the Water Quality Management Program, in cooperation with the Bureau of Forestry in the N.J. Department of Environmental Protection and the State Soil Conservation Committee in the N.J. Department of Agriculture. It also outlines the process through which they will be implemented and refined in continuing planning. The Management Practices were selected from the March 1978 Draft of "Best Management Practices", the May 1978 Draft of Silviculture BMPs, and the July 1978 Working Paper Draft (Element 5.5) of BMPs, through appropriate public participation statewide. The Management Practices were chosen as those presently feasible to provide nonpoint source controls based upon the problems indicated in Chapter III and potential nonpoint sources described in Section VI.B.

Processes to better identify specific nonpoint sources of pollution, such as soil erosion, sediment, and agricultural animal waste inventories, correlated with related pollution and land use activities studies, are being developed for continuing planning. More accurate problem identification will lead to specific priorities in the form of critical areas for Management Practices implementation. These critical areas will be defined by pollutant categories and/or geographic areas where application of Management Practices will significantly contribute to water quality goals.

Methods will be devised in continuing planning so that the State water quality goals and standards can be better related to nonpoint pollution problems in general, and specifically to the effectiveness of Management Practices in meeting those goals. The Management Practices will be refined in continuing planning through better problem identification, revised control programs, assessment of the effectiveness of the Management Practices, and modifications of the Practices as necessary to attain water quality goals.

b. Management Practices - The Management Practices listed in the Guides for Selecting Best Management Practices (Tables VI-14 through VI-17)are the specific resource conservation and management measures which may be used to control land use related pollution sources. (In construction and surface mining activities, they are primarily soil erosion and sediment control techniques.) Detailed descriptions of these Management Practices, including specifications and standards and the planning process leading to their selection, are included in the July, May and March 1978 "BMPs" working papers cited above in section a.

When two or more of these Management Practices are combined, they form a resource management system, a complete strategy for managing the land/water resources in a specific situation. Management Practices must be planned and applied site-specifically according to needs of land users and the public at large. They must be implemented according to sound technical, social, and economical considerations. Management Practices may be vegetative, managerial, and/or structural measures, and temporary or permanent in nature.

A voluntary planning process allows farmers and woodland operators to seek assistance from local Soil Conservation Districts (SCDs) for selection and application of Management Practices where needed. For construction activities, planning and implementation are regulatory. Standards for soil erosion and sediment control promulgated by the State Soil Conservation Committee (SSCC) must be incorporated in plans that are certified by SCDs. Developers, their professional planners, and the SCDs cooperate to select and apply Management Practices where needed. Authority for regulation by the SCDs is derived from the Soil Conservation Act of 1937 and the Soil Erosion and Sediment Control Act of 1975 and subsequent amendments to both (NJSA 4:24-1 et. seq.).

Individual land user's goals, objectives, and operations may change over the years. Thus, the planning process for each activity and site must be continuing and flexible to meet the land user's and society's needs. A distinction may be made between farming and forestry operations, which involve land disturbances year after year, and construction, which generally involves a severe initial disturbance of the land surface followed by a more or less stabilized situation. Another distinction is that in farming and forestry the land users rely on the soil as a basic resource for their operations. Extensive soil losses will be as damaging to them economically as they will be degrading to the waterways. The construction industry does not rely as directly on the soil resource. Professional planners and technicians (of the Soil Conservation Districts, Agricultural Stabilization and Conservation Service, Bureau of Forestry, Cooperative Extension Service, Soil Conservation Service, consultants, and others) consider these factors when providing technical assistance.

Guides for Selecting Best Management Practices, including the Silvicultural measures presented in Table VI-14 below, summarize the process of selecting Management Practices. In the Guides, pollutants, sources, and land uses are linked to the applicable Management Practices for New Jersey. For example, if sediment was recognized as a pollutant due to water erosion of cropland, there are numerous practices which might be site-specifically selected to be the Best Management Practices. A system for managing erosion from cropland might include conservation cropping (No.5), cover crops (No.8), strip cropping (No.41) and filter strips (No.63). More than one such system might be proposed by local technical experts as alternative approaches to the problem. The system selected by the farmer (like the one above) would be made up of the Best Management Practices for his cropland. The Practices shown in the Guides represent the present state of the art. Different combinations may be used as needed. Modifications may be made in the future through continuing planning.

TABLE VI-14
SILVICULTURE BEST MANAGEMENT PRACTICES

- Improved Harvesting
- Seeding and Planting
- Timber Stand Improvement
- Prescribed Burning
- Biological Insect Control
- Chemical Insect Control
- Protection from Livestock

Table VI- 15

THE GUIDE FOR SELECTING AGRICULTURAL BEST MANAGEMENT PRACTICES

CATEGORY	POLLUTANT	SOURCES		MANAGEMENT PRACTICES APPLICABILITY
AGRICULTURE	SEDIMENT	WATER EROSION	CROPLAND	1,2,4,5,6,8,9,10,11,12,13,16, 18,19,20,21,22,23,24,25,26, 27,29,30,31,32,33,38,40,41, 42,43,44,45,53,58,63,64
			ORCHARDS VINEYARDS BUSH FRUITS	1,4,5,7,8,9,11,12,13,16,18, 19,22,23,24,25,26,27,29,30, 31,38,40,42,43,44,45,63,73
			PASTURELAND	1,2,3,4,6,9,11,12,13,15,18 19,26,27,28,31,32,33,34,35, 36,38,39,40,42,43,44,47,72,74
			OTHER LAND	1,9,11,12,15,16,18,19,27,28, 30,37,40,46,53,55,56,57,58, 63,75,76,77
		WIND EROSION	CROPLAND	1,5,8,9,10,14,17,20,21,22 23,24,25,29,30,41,54,58,75
			ORCHARDS VINEYARDS BUSH FRUITS	1,5,8,9,14,17,21,22,23,24 25,29,30,54,58,75
	PLANT NUTRIENTS	SEDIMENT		Same as Sediment-Related Information Above
		SOLUBLE		63,65,69,70,71
	PESTICIDES	SEDIMENT		Same as Sediment-Related Information Above
		SOLUBLE		59,60.61,62.63,64,65,67
	ANIMAL WASTES	PASTURED		1,9,11,12,15,19,23,25,32,35 36,39,41,42,43,44,47,48,49,50 51,52,63,66,68,72,73,75
		CONFINEMENT		9,11,12,15,30,42,43,44,47,48 49,50,51,52,63,65,66,68,72,75

Table VI-16

GUIDE FOR SELECTING SURFACE MINING BEST MANAGEMENT PRACTICES

Category	Pollutant	Source	Management Practices Applicability
SURFACE MINING	Sediment	Water Erosion	60,78,79,80,81,82,83,85, 87,88,89,90,91,92,93,94 95,96,97,98,99,100
		Wind Erosion	78,79,80,81,85,95,96,97

LEGEND

60. Structure for Water Control
78. Temporary Vegetative Cover
79. Permanent Vegetative Cover
80. Stabilization with Mulch Only
81. Permanent Stabilization with Sod
82. Topsoiling
83. Maintaining Vegetation
85. Trees, Shrubs and Vines
87. Land Grading
88. Diversions
89. Grassed Waterway or Outlet
90. Sediment Basins
91. Slope Protection Structures
92. Channel Stabilization
93. Floodwater Retarding Structure
94. Subsurface Drainage
95. Traffic Control
96. Dust Control
97. Filter Strips
98. Slow Release Fertilizer
99. Straw Bale Dike
100. Conduit Outlet Protection

Table VI-17

GUIDE FOR SELECTING CONSTRUCTION BEST MANAGEMENT PRACTICES

Category	Pollutant	Sources	Management Practices Applicability
CONSTRUCTION	Sediment	Water Erosion	78,79,80,81,82,83,84,85, 86,87,88,89,90,91,92,93, 94,95,97,98,99,100
		Wind Erosion	78,79,80,81,85,95,96,97

LEGEND

78. Temporary Vegetative Cover
79. Permanent Vegetative Cover
80. Stabilization with Mulch Only
81. Permanent Stabilization with Sod
82. Topsoiling
83. Maintaining Vegetation
84. Dune Stabilization
85. Trees, Shrubs and Vines
86. Protecting Trees During Construction
87. Land Grading
88. Diversions
89. Grassed Waterway or Outlet
90. Sediment Basins
91 Slope Protection Structures
92. Channel Stabilization
93. Floodwater Retarding Structure
94. Subsurface Drainage
95. Traffic Control
96. Dust Control
97. Filter Strips*
98. Slow Release Fertilizer*
99. Straw Bale Dike*
100. Conduit Outlet Protection*
101. Floculating Materials*
65. Land Absorption Area and Use* of Natural Wetland Systems

*Currently not included in "Standards for Soil Erosion and Sediment Control in New Jersey"

Table VI-18

LEGEND

1. Access Road
2. Bedding
3. Brush Management
4. Chiseling and Subsoiling
5. Conservation Cropping System
6. Contour Farming
7. Contour Orchard and Other Fruit Area
8. Cover and Green Manure Crop
9. Critical Area Planting
10. Crop Residue Use
11. Debris Basin
12. Diversion
13 Drainage Land Grading
14. Farmstead and Feedlot Windbreak
15. Fencing
16. Field Border
17. Field Windbreak
18. Grade Stabilization Structure
19. Grassed Waterway or Outlet
20. Grasses and Legumes in Rotation
21. Hedgerow Planting
22. Irrigation Pit
23. Irrigation System, Sprinkler
24. Irrigation Water Management
25. Irrigation Water Conveyance
26. Land Smoothing
27. Lined Waterway or Outlet
28. Livestock Exclusion
29. Minimum Tillage
30. Mulching
31. Open Channel
32. Pasture and Hayland Management
33. Pasture and Hayland Planting
34. Pipeline
35. Pond
36. Pond Sealings or Lining
37. Prescribed Burning
38. Pumping Plant for Water Control
39. Spring Development
40. Streambank Protection
41. Stripcropping
42. Structure for Water Control
43. Subsurface Drain
44. Surface Drain
45. Terrace
46. Tree Planting
47. Trough or Tank
48. Waste Management System
49. Waste Storage Pond
50. Waste Storage Structure
51. Waste Treatment Lagoon
52. Waste Utilization
53. Wildlife Upland Habitat Management
54. Windbreak Renovation
55. Woodland Improved Harvesting
56. Woodland Improvement
57. Woodland Site Preparation
58. Artificial Barriers
59. Biological Control of Pests
60. Correct Pesticide Container Disposal
61. Correct Usage of Pesticides
62. Cultural Practices Effect on Pests
63. Filter Strips
64. Insect Attractants
65. Land Absorption Area and Use of Natural Wetland Systems
66. Shade Areas
67. Resistant Crop Varieties
68. Salt, Mineral and Feed Supplement Site Location
69. Slow Release Fertilizer
70. Soil Testing and Plant Analysis
71. Timing and Placement of Fertilizers
72. Water Supply Dispersal
73. Dike
74. Fishpond Management
75. Heavy Use Area Protection
76. Recreation Land Grading and Shaping
77. Recreation Trail and Walkway

c. Management Practices Implementation - It is recommended that the Soil Conservation Districts be designated as interim management agencies for control of nonpoint pollution related to land disturbances in agriculture, silviculture, construction, and surface mining. The State Soil Conservation Committee will continue to serve as the State level agency to coordinate the implementation of local District programs and perform related State level administrative functions. The Bergen, Hudson-Essex-Passaic, Morris, and Somerset-Union Soil Conservation Districts should be responsible for the actual implementation of the Management Practices in the Northeast Study Area. The conservation districts for New Jersey are shown in Figure VI-3 and their addresses given in Table VI-19.

Voluntary implementation of Management Practices will be employed for agriculture and silviculture, while a regulatory program (Chapter 251, P.L. 1975, The Soil Erosion and Sediment Control Act, NJSA 4:24-39 et. seq.) will be used for construction activities. Although no regulatory program currently exists for surface mining, it appears that the potential for pollution in this industry merits a regulatory approach. The SCDs at the local level and the SSCC at the State level should have responsibility to assist the other management agencies responsible for control of nonpoint pollution in urban runoff and residual wastes.

Site-specific planning and application will be done at the local level. Land users will select and apply appropriate Management Practices from comprehensive "shopping lists" (e.g. the Guides provided in this Plan), with assistance from well-trained planners and technicians who are familiar with their area.

The Soil Conservation Districts are local units of government through which Federal, State, and local technical expertise and cost-sharing is provided to assist in selection and application of Management Practices. The U.S. Agricultural Stabilization and Conservation Service (ASCS), N.J. Bureau of Forestry (BF), Cooperative Extension Service (CES), U.S. Soil Conservation Service (SCS), and other resource agencies cooperate with SCDs to make a broad range of services available, including cost-sharing, as shown in Figure VI-4.

SCDs, assisted by the State Soil Conservation Committee and the above agencies, are existing public offices with established programs and specific authority to provide technical assistance for land disturbance, nonpoint pollution-related problems in agriculture, silviculture, construction, and surface mining.

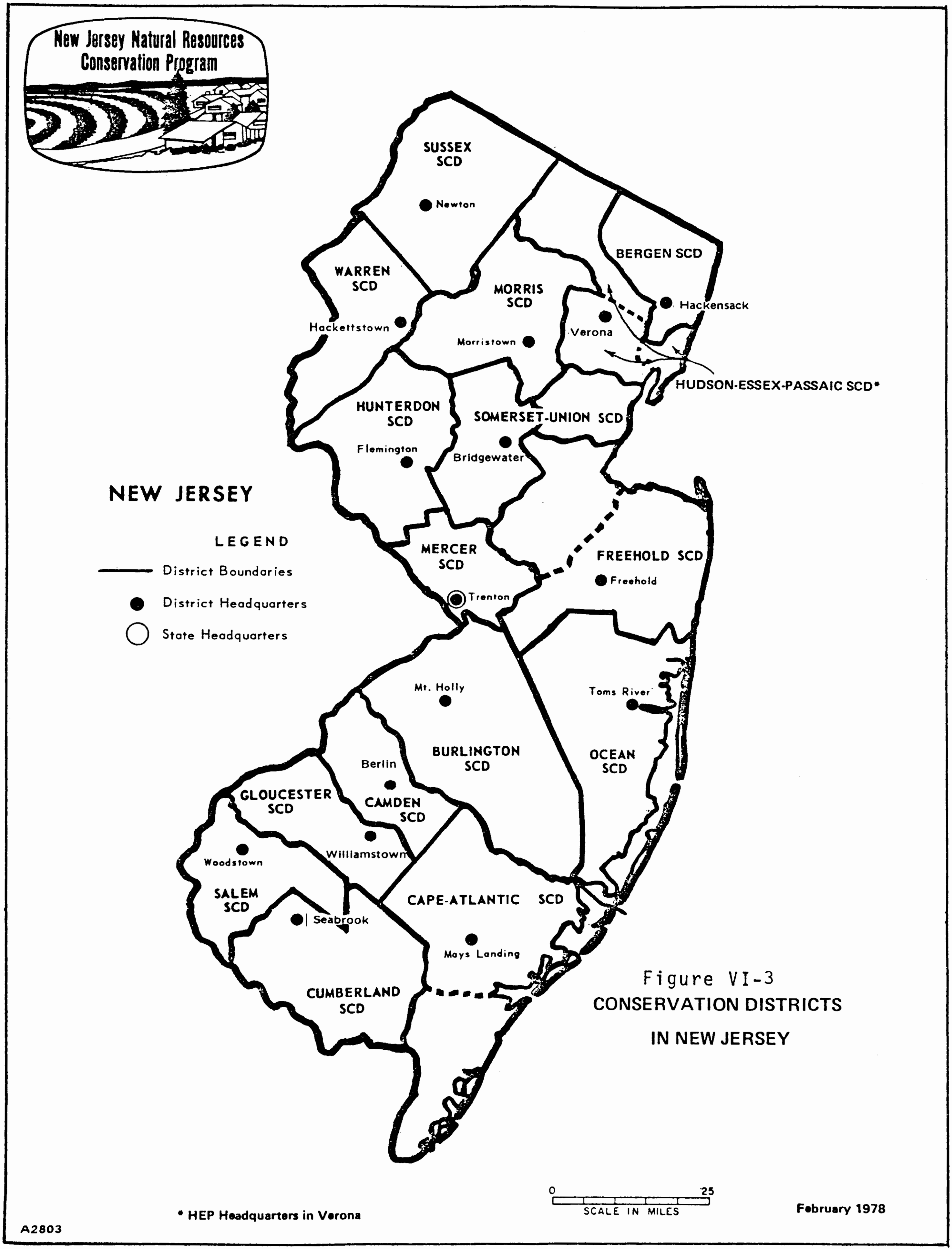


Figure VI-3
CONSERVATION DISTRICTS
IN NEW JERSEY

Table VI-19

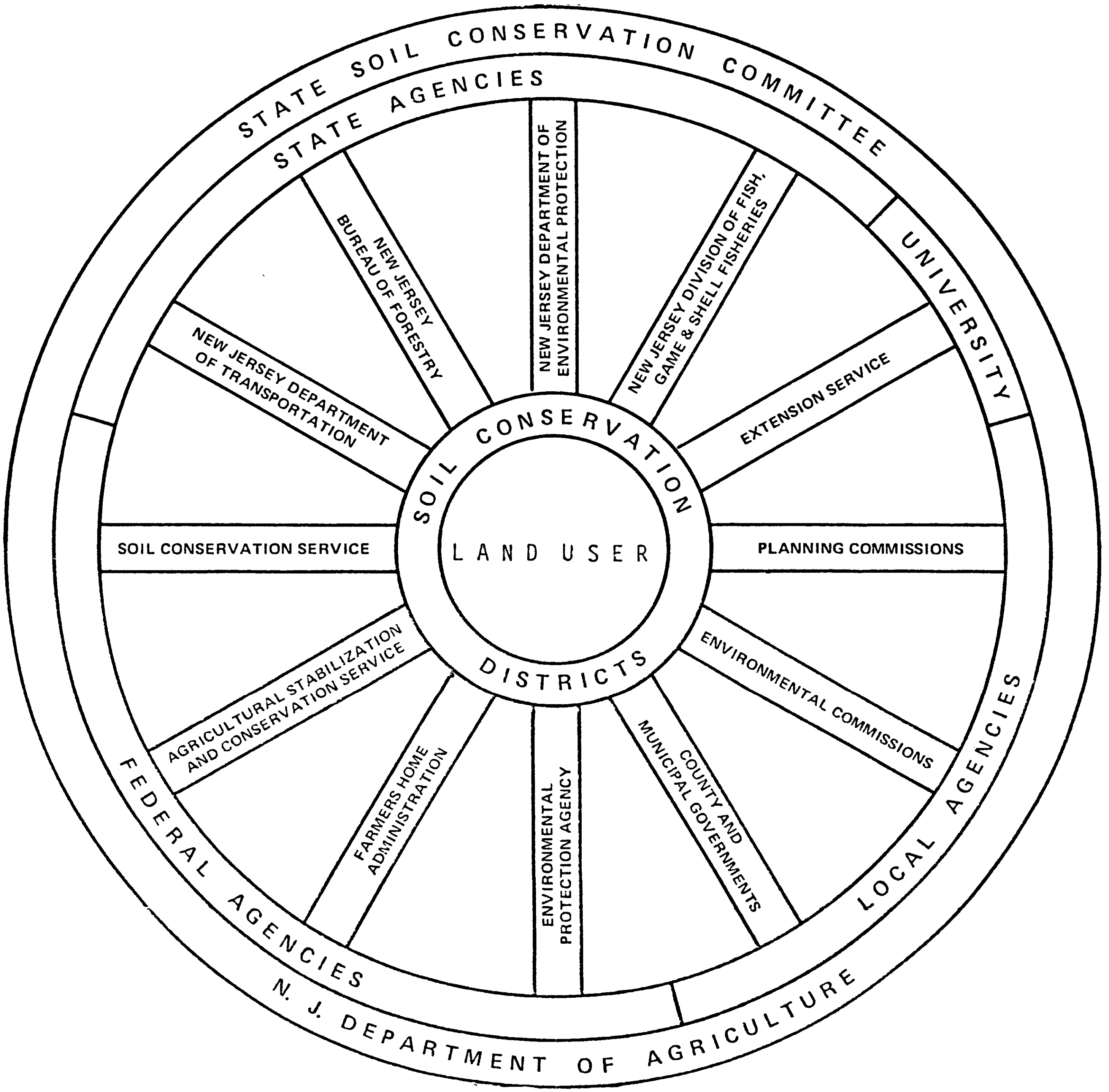
CONSERVATION DISTRICTS IN NEW JERSEY

NAME	ADDRESS	TELEPHONE NO.
Bergen SCD	389 Main Street Hackensack 07601	201-489-7777 or 538-1552
Burlington SCD	Cramer Building Rt. 38, Mt. Holly 08060	609-267-7410
Camden SCD	Municipal Building 59 S. White Horse Berlin 08009	609-767-6299 or 767-3977 784-1001
Cape-Atlantic SCD	Atlantic Co. Office Bldg. 1200 W. Harding Highway Mays Landing 08330	609-625-9400 or 625-2203
Cumberland SCD	P.O. Box 148, Rt. 77 Seabrook 08302	609-451-2144
Freehold SCD (Mon. & Midsex. Co.)	20 Court Street Freehold 07728	201-431-3850 or 462-1079
Gloucester SCD	P.O. Box L N. Blackhorse Pike Williamstown 08094	609-629-0147 or 629-2010
Hudson, Essex & Passaic SCD	201 Bloomfield Avenue Verona 07044	201-239-1886 or 239-1939 or 538-1552
Hunterdon SCD	Route 6, Box 49 Flemington 08822	201-782-3915
Mercer SCD	930 Spruce Street Trenton 08648	609-695-5415 or 989-6847
Morris SCD	Court House Morristown 07960 (Location-W. Hanover Ave. Morris Twp.)	201-285-6110 or 538-1552
Ocean SCD	Ocean County Agric. Center Whitesville Road Toms River 08753	201-244-7048 or 349-1007
Salem SCD	1000 East, Rt. 40, Box 47 Woodstown 08098	609-769-1124
Somerset-Union SCD	308 Milltown Rd. Somerset County 4-H Center Bridgewater 08807	201-526-2701 or 725-3848
Sussex SCD	R.D. 1, Box 13 Route 206 South Newton 07860	201-383-7315 or 383-3800
Warren SCD	Stiger Street Hackettstown 07840	201-852-2579 or 852-5450

STATE SOIL CONSERVATION COMMITTEE
P.O. Box 1888, Trenton, New Jersey
Tel: 609-292-5540

FIGURE VI - 4

SOIL CONSERVATION DISTRICTS AND COOPERATING AGENCIES



SCDs and the Committee conduct training, public participation, and incentive programs. The 16 SCDs cover all of New Jersey's 21 Counties, each governed by a board of five Supervisors who are appointed by the SSCC. Staff capabilities include locally directed, technical and administrative personnel with additional professional, technical and scientific experts.

No regulatory programs are deemed necessary for nonpoint pollution control in agriculture and silviculture, since the State cannot yet document that a cause-effect relationship between water quality problems and these sources exists at a level requiring a regulatory approach, or is likely to reach such a level in the future.

A regulatory approach should be taken for both construction and surface mining. Legislative modifications to the construction program are underway (Senate Bill No. 1263, Introduced July 27, 1978), and are expected to be completed during the first two years of continuing planning, to include roads, utility lines, and other government agency projects, including schools.

Other legislative modifications will be needed to include surface mining in a regulatory program. The potential impacts on water quality from the surface mining industry are severe enough to merit a regulatory program. Urban, suburban, and industrial development is likely to displace rural land uses such as agriculture and silviculture in some areas in the future. Along with the construction will come potential adverse water quality impacts; thus these changes in the Soil Erosion and Sediment Control Act are needed to protect the water quality of the developing areas.

The SCDs and SSCC are linking their conservation programs to water quality management goals through extensive public participation efforts and new programs which were further supported in 1977 by the Federal Soil and Water Resources Conservation Act (RCA) and the Clean Water Act Amendments. Through the RCA, the public's input is sought in (1) assessing local and statewide, soil and related natural resource problems, (2) developing Federal, State and local programs to combat those problems, and (3) prioritizing problem categories and/or geographic areas locally and statewide for BMPs planning and application. The Clean Water Act establishes the concept of Rural Clean Water Program (RCWP) project areas, where agricultural nonpoint pollution problems are identified. Here Federal funds, beyond existing programs, are to be earmarked to aid farmers on a voluntary, long term contractual basis.

d. Strategy for Application and Refinement of Management Practices - The Strategy for Nonpoint Source Pollution Control in Agriculture, Silviculture, Construction, and Surface Mining, Table VI-20 shows to what extent the SCDs and the Committee will be responsible for nonpoint source pollution control in the future. An assessment of the effectiveness of the Management Practices prescribed in this plan for control of water pollution will begin in the continuing planning process (Strategy, No. 8). Likewise, the process of prioritizing the critical problem categories and/or geographic areas for Management Practices application will begin in the Spring of 1979 (Strategy, No. 7). Evaluations and future modifications of the Management Practices may therefore be made in concert with prioritization efforts in continuing planning. As Management Practices are applied to the prioritized critical areas, further assessment may be done on their effectiveness.

As better water quality problem identification for nonpoint pollution is accomplished in continuing planning (Strategy, Nos. 2,3, and 4), prioritization will become possible. As levels of desired control for nonpoint pollution are established by the State (Strategy No. 5), the Management Practices effectiveness for water quality management may be measured in the prioritized areas (like the Rural Clean Water Program projects). This sequence of events is reflected in the Strategy and will be included as part of the State/EPA Agreement, for the continuing planning process.

By Spring 1979, County Soil Erosion and Sediment Inventories underway in this study area will have shown where soil erosion and potential sedimentation is a problem on a watershed and land use basis. These studies will have provided the initial information needed to enable SCDs and the State to prioritize critical areas for intensive, coordinated Management Practices application. Controlling soil erosion where it occurs provides sedimentation control and some degree of control of the movement of related pollutants into surface waters.

Studies of greater depth will also be done (Strategy, No. 2). To more accurately show where soil erosion is excessive and to more specifically predict where waterway sedimentation may be a problem, comprehensive County Soil Erosion and Sediment Inventories are scheduled for completion Statewide in the first two years of continuing planning. The depth of these studies will be useful for prediction of sedimentation problems in local waterways. Correlation of the DEP water sampling program with these studies of erosion from the land

Table VI-20

Strategy for Nonpoint Source Pollution Control
in Agriculture, Silviculture, Construction, and Surface Mining

	Activities	Needs	Agencies	Time	Cost/Source
1.	Conduct comprehensive public information and education program.	To keep public aware of water quality management demands.	DEP ASCS PAC BF SCD CES SSCC SCS	Continuing	No additional/ Internal
2.	Conduct comprehensive soil erosion, sediment, and agricultural animal waste inventories.	To know where soil erosion and sedimentation, etc. in waters is excessive.	DEP ASCS PAC BF SCD CES SSCC SCS	2 Years	$500,000,SCS DEP EPA SSCC
3.	Conduct land use activities inventories.	To know specifics of land use activities that might adversely affect surface waters.	DEP ASCS PAC BF SCD CES SSCC SCS	6 Months	?/DEP
4.	Correlate above inventories of sediment (and related pollutants) (2) to land use activities (3).	To know where land use activities, soil erosion, etc, singularly or together adversely affect surface waters and to what extent or nature.	DEP PAC SCD SSCC	2 Years	?/DEP
5.	Revise and quantify State water quality goals and standards criteria sufficiently to better identify NPS pollution problems.	To know how to assess BMPs effectiveness for water quality control in New Jersey.	DEP PAC SCD SSCC	2 Years	?/DEP
6.	Inventory BMPs application to the land.	To know how may BMPs have been planned, how many of them have been applied, and how many need to be yet applied.	DEP ASCS PAC BF SCD CES SSCC SCS	6 Months	?/DEP

Table VI-20 (Continued)

Strategy for Nonpoint Source Pollution Control in Agriculture, Silviculture, Construction, and Surface Mining

	Activities	Needs	Agencies	Time	Cost/Source
7.	Prioritize problem pollution categories and/or geographic areas for BMP implementation.	To provide water quality control where the most critical problems exist or have potential to develop.	DEP ASCS PAC BF SCD CES SSCC SCS	Continuing	-
8.	Inventory BMPs effectiveness on water quality control in RCWP project areas and other selected locations.	To know where to further develop and modify BMPs.	DEP ASCS PAC BF SCD CES SSCC SCS	3 Years	?/EPA DEP
9.	Inventory financial and staff resources of the Districts and the Committee.	To determine where more money and/or people are needed to implement the voluntary and regulatory programs.	DEP PAC SCD SSCC	1 Year	?/DEP SSCC
10.	Develop timetable to achieve nonpoint pollution water quality goals. (See 5 above.)	To determine a practical period of time to achieve the desired controls.	DEP ASCS PAC BF SCD CES SSCC SCS	3 Years	-
11.	Modify the Ch. 251 regulatory program.	To make clear the inclusion of roads, utility lines, and other government agency projects.	DEP PAC SCD SSCC	2 Years	-
12.	Develop agency and activity costs in 5-year increments to achieve water quality control (goals).	To determine funds needed to achieve water quality goals via the timetable in 10 above.	DEP ASCS PAC BF SCD CES SSCC SCS	3 Years	?/DEP
13.	Prepare annual report for EPA on BMPs applied and agency resources commited.	To keep the Regional Administrator aware of water quality improvement.	DEP PAC SCD SSCC	Continuing	?/DEP

will give an overall perspective of the sedimentation problems. It is not enough to know where sediment loads are degrading a waterway. With knowledge of both the sources on the land and the problems in the waterway, the need for special applications of Management Practices can be assessed. Management Practices must be applied on the land for the sources where problems are identified.

The land and water studies above, correlated with an understanding of land use activities (Strategy, No. 3), will not only show where nonpoint pollution from soil erosion occurs, but where it is likely to occur at any time given like circumstances. If agriculture was determined to be a major source of nonpoint pollution in an area, it would be necessary to know what kind of farming operations exist in that area (i.e. cash-grain, dairy, truck-garden, etc.), and how the land is affected by the activities therein (e.g. tillage, grazing, etc.). Since the emphasis in future planning for nonpoint source management will be preventative as well as remedial, the studies above must be accomplished in order to (1) prioritize present critical areas for treating the worst areas first with Management Practices (Rural Clean Water Program project areas and otherwise) and (2) predict and plan for future critical areas where Management Practices will have to be established to prevent water quality problems.

VI.C.3. Best Management Practices for Land Disposal of Solid Waste

Land disposal of solid waste in the study area poses a potential problem because of the possibility of ground water pollution from leachate. In order to control this site-specific non-point source, Management Practices must be incorporated into planning for both existing and future land disposal practices and problems, and must be prioritized in relation to areawide water quality problems and needs. Within New Jersey, primary responsibility for management of solid waste disposal lies with the Solid Waste Administration (SWA) of DEP, with further planning responsibilities lying within the domain of the State's twenty-two solid waste management districts (twenty-one counties plus the Hackensack Meadowlands District).

This section identifies problems in the study area, indicates needs for further problem identification and analysis, indicates solutions which help assure water quality protection, and discusses the roles of agencies in the State in management and planning of solid waste control.

The steps involved in controlling water pollution due to land disposal of waste include problem identification, development of alternative solutions and determination of the management system for implementing the most satisfactory solutions.

a. Problem Identification - A key issue that must be resolved is that of sampling. Under the rules of the Solid Waste Administration, ground water sampling is performed at 1) all new sanitary landfills; 2) any solid waste facility permitted to accept pesticides, hazardous wastes, chemical wastes, bulk liquids or semi-liquids; or 3) any facility which the Department believes poses a real or potential threat to the ground waters of the State. No specific provisions are included, however, for the number of monitoring wells needed. Surface water sampling is also very important because many landfills in the study area are located near surface waters.

b. Alternative Solutions - Two preventive measures can be very useful in reducing or eliminating leachate contamination. The first, and possibly ultimate, solution for solving solid waste problems is to reduce the total volume of wastes disposed. This task is a primary goal of the New Jersey Solid Waste Administration and the Federal Resource Conservation and Recovery Act of 1976, as well as the New Jersey Department of Energy. Reduction of disposed materials can result from waste reduction programs, recycling programs, and utilization of the materials for energy production. These types of programs are currently in operation in different parts of the State and are encouraged by DEP. Shredding of wastes to reduce the volume of refuse by increasing its density may have the undesirable effect of increasing the volume of leachate if wastes are given a daily cover (Ham, 1976). Therefore, the benefits accrued from this type of practice may be offset by costs or damage to the quality of water in the hydrologic system.

The second preventive measure involves proper site selection and proper design of sanitary landfills. These two factors can reduce the possibility of leachate contamination of surface and ground waters. The Rules of the Solid Waste Administration include requirements such as:

- New landfills in areas where solid waste would be in contact with surface or ground waters are prohibited. (certain landfills which receive inert materials such as gravel and glass are permitted.)
- Existing sanitary landfills may not deposit wastes that will contact surface or ground waters.
- Waste materials must be covered daily.
- Wastewater residuals cannot be lagooned. They must either be mixed with garbage and refuse, sealed in a closed subterranean system, converted into an inert non-leaching solid substance, or discharged into a sewage treatment plant.
- Hazardous wastes disposal sites must install leachate collection and treatment systems.

Other site selection criteria for use by both district and joint district planning agencies specify that adequate distance must exist between the seasonal high water table and the waste, (adequate distance being site specific), that soil characteristics must be considered, and that the operation be compatible with surrounding land uses.

In addition to these preventive measures, treatment measures may also be utilized for particular types of wastes. Treatment methods and management practices for sewage sludge are addressed in Section V.B.7, Development of a Statewide Sludge Management Strategy and Program.

c. Management Agencies - As mentioned previously, the major regulatory and management responsibilities regarding waste disposal in New Jersey lie with the Solid Waste Administration and the State Management Districts. Additional related responsibilities lie within DEP agencies (Water Resources, Coastal Zone Management, Air Pollution, Hazardous Waste Control) and also with the Department of Energy and the Public Utilities Commission.

District plans in the study area dealing with all aspects of waste disposal, and not limited to land disposal, are in the process of being developed. Included in these plans will be management arrangements for the environmentally sound disposal of wastes for a ten-year period.

Coordination of sampling, between the Solid Waste Administration, the Division of Water Resources, and the Bureau of Hazardous and Chemical Wastes is recommended in this WQM Plan. Although certain landfills are required to submit quarterly ground water monitoring results to SWA, the other agencies listed above also perform periodic ground water and/or surface water sampling. Cooperation between agencies can be extremely useful for future identification of problem areas and allow for better use of staff resources.

EPA also plays a role in waste disposal management, by administering the Resource Conservation and Recovery Act of 1976 (RCRA). DEP receives funds from EPA through this Act for Solid Waste Management. As stated previously, a primary focus of this Act is waste reduction and energy conservation. In addition, under the Act EPA is establishing minimum criteria for determining which solid waste land disposal facilities shall be classified as posing no reasonable probability of adverse effects on health or the environment. Legislative and regulatory programs are further covered in Chapter VII, Implementation: Legal, Institutional and Financial Considerations.

d. Recommendations - Certain steps need to be taken for the identification of problems. These steps include institution of specific provisions in the Solid Waste Administration Rules regarding the number and placement of monitoring wells necessary at a sanitary landfill, and the necessity for surface water sampling near a landfill.

Monitoring wells at landfills must be of sufficient number and placed in the proper positions in order to obtain a true indication of the ground water quality at the site. Early detection of ground water pollution and prompt implementation of Management Practices to correct the problem is essential to minimize the extent of the pollution.

Surface water sampling should also be required for the detection of problems caused by the sanitary landfill. In some instances, the potential for this type of problem may be more severe than the potential for ground water pollution.

Complete water quality data will help to ensure that the Best Management Practices to control pollution are selected and applied for each waste disposal site.

VI.C.4. Management Practices for Hazardous Wastes

The incidence of spills of oil and other potentially hazardous substances has increased six fold in New Jersey over the period 1972-1977. However the effects of these spills on water quality are not fully known. Therefore, the DEP has developed rules concerning the prevention of discharges of petroleum and other hazardous substances. The major elements of these regulations include: 1) a notification of spills to the Office of Hazardous Substances Control, that would threaten lands, waters or natural resources; 2) guidelines and procedures for discharge response and clean-up; and 3) plans for the design and maintenance of major facilities which prevent the discharge of petroleum or other hazardous substances.

The area of prime concern is methods and practices to prevent hazardous materials from entering surface and ground waters through illegal discharges or spills. All major facilities (a major facility being one having a total combined capacity of 400,000 gallons or more of a toxic or hazardous substance) are to be registered with the Division and the Office of Hazardous Substances Control. Each major facility must also prepare a Discharge Prevention Containment or Countermeasure (DPCC) Plan and a Discharge Cleanup and Removal (DCR) Plan by September 1, 1979. Within a DPCC Plan, each major facility must be designed to contain the largest probable spill, plus a "normal" rainfall accumulation, thereby preventing hazardous substances from entering the water. This will be accomplished with secondary containment structures and/or diversionary structures such as dikes, berms or retaining walls, curbing, weirs, diversion pools, holding tanks, drip pans, or any other means as approved by the DEP. All components of a system must be made of, or lined with, impermeable materials to prevent ground water contamination, and also must not drain directly or indirectly into a watercourse or public sewage treatment plant without precautionary provisions to protect surface waters. Proper maintenance and housekeeping is required for all sites.

If a major facility does not have a detection system, e.g. gauges or an automatic leak detection system, observation wells to the depth of the water table are to be installed at points which would most likely detect any spills. Wells are to number one per acre, or at each potential source, and are sampled quarterly.

The DCR Plan will contain information concerning all spill cleanup and removal equipment, trained personnel and contractors to handle the clean up and procedures for mobilizing needed equipment and personnel.

All DPCC and DCR Plans are to be reviewed and evaluated every three years by the owner or operator of a facility. If new technology is more effective and economically justifiable at the time of a plan review, the plan will be amended to include this new technology.

The above regulations are an attempt to alleviate the growing problem of hazardous substance spills in New Jersey. The success of this program will also depend upon the timely cooperation from the private sector, and the enforcement ability of the DEP.

CHAPTER VI

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VII IMPLEMENTATION: LEGAL, INSTITUTIONAL, AND FINANCIAL CONSIDERATIONS

VII. IMPLEMENTATION: LEGAL, INSTITUTIONAL, AND FINANCIAL CONSIDERATIONS

Overview

Water resources management planning, to meet the goals of the Clean Water Act, must not only analyze and identify technical solutions to water quality and water use problems, but must also engage or develop management programs to put these recommended solutions into action. The organization of an effective and coordinated series of management agencies to oversee the successful implementation of these programs is a fundamental goal of the WQM Program. Additional stages of legal, institutional, and financial analysis and the formal designation of management agencies are required to implement management programs for point and nonpoint sources of water pollution. These additional stages distinguish the WQM Plan from most other plans.

The management program, to meet the requirements of the WQM Program, would not only need to be comprehensive with respect to the range of water resource management needs encountered, but would need to be built upon a sound framework of legal support; be balanced in terms of the responsibilities delegated to State, regional, and local governments; and be accountable to government officials and to the public at large. To this end, the WQM Program is conducting continuing analysis of the existing authorities and institutions relevant to specific water resource management issues in the study area. For situations in which the existing authorities and/or institutions appear through the analysis to be inadequate to implement a specific water management program within the study area, the creation of new authorities and institutions, or the alteration of existing ones, may be recommended by the WQM Program as a part of the overall management program for the control of both point and nonpoint sources of water pollution.

This chapter describes the criteria used by the WQM Program to evaluate authorities and institutions which may be applied to specific water resource management issues, and the process by which management responsibilities are delegated through the designation of management agencies. The complete legal, institutional, and financial analysis prepared for each water resource management issue will be made available under separate cover as working papers of the WQM Program.

VII.A. Legal, Institutional, and Financial Analysis

The implementation of a WQM Plan is dependent upon individual agencies, which must each carry out a number of related functions within a management program. Each agency must be prepared through adequate authority, resources, and organization to carry out the function. Institutions and legal authorities which may be applied to water quality management issues encountered within the study area are being analyzed by the WQM Program in a manner designed to satisfy both the general requirements of the Clean Water Act and the specific needs of the study area. Once a water resource management issue has been defined, the process of analysis consists of both an inventory and an evaluation of each law, agency, and program and a discussion of potential laws, agencies, and programs which may be used to implement the recommended water resource management programs identified earlier in the WQM Plan.

VII.A.1 Clean Water Act Requirements

Federal requirements produced under the Clean Water Act state, in essence, that if any type of water pollution is found to be a problem in the study area, the WQM Program must design and implement a management program to control that type of pollution. Such programs should take full advantage of existing management programs based on existing legislative authorities and administrative capabilities, although new management programs may be developed.

For existing State or local management programs to be utilized, the WQM Program is required to describe in detail the manner in which each management program is to be applied to carry out the WQM Plan, the statutory and regulatory basis for each program, and the relevant administrative and financial considerations which may influence the performance of each program. If additional programs are found to be necessary, the WQM Program must provide a description of the manner in which each proposed program is expected to implement specified portions of the WQM Plan, a description of any new legislation necessary to carry out the functions of the proposed program, and an outline of anticipated administrative and financial requirements for the proposed program.

VII.A.2 Methodology

The process of analysis developed by the WQM Program is described in detail in Working Paper 8.1/8.2, "Methodology for the Inventory and Analysis of Institutions and Authorities Applicable to Water Quality Management Issues in New Jersey". The process is initiated by the description of a water resource management problem in the area. As technical solutions to the problem are developed by the WQM Program, a statement clearly describing the nature of the problem and the specific legal, institutional, and financial issues associated with the management of the problem is also prepared. These statements provide guidance to the process by focusing the analysis upon those legal, institutional, and financial considerations of specific relevance to the technical solutions being examined for each water resource management issue. In this manner, technical solutions are developed in conjunction with the authorities and institutional arrangements necessary to implement them. Table VII-1 presents a list of the water resource management issues of concern to the study area. The WQM Program has developed a statement describing each of these issues for the purposes of the legal, institutional, and financial analysis; these statements are included in Working Paper 8.1/8.2 and in the working papers presenting the results of the analysis for each issue.

a. Inventory - Once a water resource management issue has been defined, the first task of the analysis is to identify the existing legal authority, financing, and institutional structure which may be applied to address the specific issue. At present, the emphasis of the WQM Program is on the compilation of an inventory of Federal and State laws applicable to the various water resource management issues. The legal inventory includes, at a minimum, descriptions of the following:

(1) Federal legislation for Federal administration,
(2) Federal legislation for State administration,
(3) State legislation for State administration,
(4) State enabling legislation for counties, and
(5) State enabling legislation for municipalities.

For each law, the currently established management programs that relate to the water resource management issue are described. This description includes the name of the program; the institution(s) or agency(ies) responsible for the administration of the program; the focus and extent of the regulations, guidelines, and policies formulated under the program; and the level of funding authorized and appropriated for each program over recent fiscal years.

b. Analysis - Programs and legal authorities identified in the inventory which may be applied to the given water resource management issue are then evaluated with respect to their effectiveness in attaining their own stated goals and to their anticipated effectiveness in meeting the needs identified within the issue statement. This evaluation states, at a minimum, whether legal, technical, financial, or administrative problems have been encountered in the administration of each program and/or law. Elements of this evaluation may be subjective, based upon the accounts of the analyst, but opinions are clearly identified as such. Important facts such as court cases and other sources demonstrating any of the above types of problems are cited wherever possible.

Table VII-2 presents specific questions which have been prepared jointly by both the WQM Program and the Office of Regulatory Affairs of the DEP's Division of Water Resources. These questions are designed to reveal any significant problem of a legal, technical, financial, or administrative nature which may prove to compromise the ability of an agency or program in carrying out management responsibilities which may be formally delegated to it through the WQM Program.

Table VII-1
Water Resource Management Issues
Being Examined by the
Water Quality Management Program

Adoption and Revision of Water Quality Standards
Routine and Emergency Monitoring and Assessment of Water Quality
   a. Surface Water
   b. Ground Water
Protection of Drinking Water Quality
Protection of Potable Water Supplies
   a. Treatment of Sewage Effluent
   b. Location Controls
Technical/Financial Assistance for Municipal Wastewater Treatment
Technical/Financial Assistance for Industrial Wastewater Treatment
Monitoring and Inspection of Treatment Facilities and Discharges
Control of Sewer and Pipeline Leakage and Infiltration
Sludge Management

Management of Toxic and Hazardous Substances
   a. Use and Disposal
   b. Spill Prevention and Cleanup
Management of Dredge Spoil and Other Residual Wastes
Management of Sanitary Landfills: Siting, Operation and Maintenace
Management of Waste Lagoons: Siting, Operation, and Maintenance
Septic Tank Management
Management of Surface Application of Wastewater
Management of Ocean Disposal of Wastes
Management of Marine Sanitation Practices
Allocation of Point Source Discharges
Management of Surface Water Diversions and Withdrawals
Management of Ground Water Withdrawals and the
   Drilling and Sealing of Wells
Water Conservation/Management of Drought Period Water Use

Protection and Management of Environmentally Sensitive Areas
Management of Inland and Coastal Wetlands
Restoration of Lakes
Management of Waters for Recreational Use
Management of Fish, Shellfish, and Wildlife Resources

Control of Soil Erosion and Sedimentation
Management of Use of Fertilizers and Soil Conditioners
Management of Modifications to Natural Drainage and
   Channel Structure
Stormwater Management

Establishment and Maintenance of Public Participation
   Programs
Establishment and Maintenance of Interagency Review Programs

Table VII-2

Evaluation Criteria For Management Agencies and Programs

LEGAL

1. Where specific regulatory authority or powers are required by various sections of Federal or State law to implement a particular portion of a plan, does the management program satisfy these regulations?

2. Does the program or agency allow for coordination with other management agencies through administrative, regulatory, or policy channels?

3. Does the agency have exclusive jurisdiction over the management of the problem within an area?

4. Does the program give the legal authority to management agencies to require other agencies to comply with the policies of the management program, to monitor the activities of these other agencies, and/or to finance and control the budgets of these other agencies?

5. Is the management authority of the program directly related to and responsive to the planning authority? Is the management agency directly related to and responsive to the planning agency?

6. Does the program provide mechanisms of due process for individuals directly affected by decisions under the program?

TECHNICAL

1. Does the agency possess the technical expertise to carry out its program responsibilities; can it compete in the market for skilled technical staff or contract for consultants if necessary?

2. Does the program provide adequate procedures for reporting, data management, and interagency communications?

FINANCIAL

1. Does the program possess its own source of funding for carrying out its existing and/or potential responsibilities?

2. Is the program able to receive funds from direct or indirect tax revenues?

Table VII-2 (Cont'd)

3. Does the program possess the financial capability and legal authority to receive funds by grant or other means of compensation?

4. Does the program possess sufficient funding to carry out its responsibilities toward its stated goals?

5. Is the program or agency capable of incurring short or long-term indebtedness?

ADMINISTRATIVE

1. Does the jurisdiction of the program or agency correspond to the geographic boundaries of the problem?

2. Does the agency have sufficient personnel to carry out its program responsibilities?

3. Have additional legislation, regulations, enforcement tools, funding, or administrative or other capabilities for the program or agency been identified as needed, or been proposed or planned for?

4. Does the program provide for public participation through representation on decision-making boards, through public hearings or meetings, through participation of professional or organized interest groups, or through public disclosure?

5. Does the program provide for administrative review of major decisions by agencies of related responsibilities under the program?

6. Is the program accountable to publicly elected officials?

7. Does the performance record of the agency demonstrate the ability of the agency, given its available resources, to organize and administer an efficient and effective program to respond to economic, environmental, and social concerns?

c. Recommendations - From this evaluation, the WQM Program is able to develop recommended courses of action to implement the technical solutions for water resource management problems identified in the Plan. For situations in which existing programs and legal authorities are determined by the evaluation to be insufficient to effectively implement these technical solutions, necessary changes in the present legal, institutional, and financial structure are to be recommended.

i. If the existing legal authority to carry out a proposed management program is insufficient the WQM Program should either:

(a) ensure that, for existing DEP programs for which adequate statutory authority already exists, any new regulations necessary to implement the management program have been adopted by DEP; or

(b) specify the content of new legislation (or regulations which may be adopted by other agencies) that would be supported by DEP in the interest of enabling the management program to be implemented.

ii. If the existing institutional structure is considered through the analysis to be incapable of effectively implementing and administering the management program, the WQM Program should describe the changes to this structure which need to be effected; such recommendations may include detailed proposals for the creation of new management agencies, as well as recommended changes to the internal structure of, and interrelationships among, existing agencies.

iii. If the existing financial capability of an agency is insufficient to implement the management program, the WQM Program should either, depending upon the results of the legal, institutional, and financial analysis:

(a) prepare an estimate of the budget necessary to be allocated to the agency to implement the management program, by which proposed budgets of the agency would subsequently be evaluated with respect to financial capability; or,

(b) identify and describe the legal authority necessary for the agency to raise additional revenue for the purposes of implementing the management program.

On the basis of these recommendations developed through the legal, institutional, and financial analysis, the WQM Program is able to assign the responsibilities of implementing the WQM Plan through the formal designation of management agencies.

VII.B. The Management Agency Designation Process

Management agencies are the institutions responsible for implementing the technical and management measures necessary to correct the existing and future water quality problems identified by the WQM Plan. (see Chapter VII.C.3 concerning designation of management agencies for existing programs). The formal designation of a management agency entitles the agency to carry out detailed responsibilities and to be eligible for technical and financial assistance in accordance with the terms of the WQM Plan and the Clean Water Act. According to the New Jersey Water Quality Planning Act, it is not necessary for management agencies to be formally designated for the provisions of an approved Plan, certified by the Governor, to be in effect under State law; for example, the Commissioner of the DEP is specifically prohibited from issuing grants or permits for activities which conflict with the Plan.

In order to ensure consistency in the selection and designation of management agencies, the DEP has developed a formal policy to define the procedure by which management agencies will be selected and designated and to define the substantive criteria by which proposals for such designations will be reviewed. The full text of this policy is presented in Appendix VII-1, "Policy and Procedures for the Designation of Management Agencies to Implement Water Quality Management Plans". A brief summary of the elements of this policy is presented below.

VII.B.1. Selection of Management Agencies

Each selected management agency, whether existing or proposed, to be a candidate for formal designation, must be shown to have the adequate authority and capability to carry out specified responsibilities for implementing the WQM Plan. The legal, institutional, and financial analysis described above is expected to provide the main documentation for this requirement. The management agency, to be formally designated, will also be required to meet tests of institutional compatability which include considerations of existing jurisdiction, program integration, and public and intergovernmental participation.

VII.B.2. Forms of Designation

A management agency may be formally designated by the DEP in one of two ways: final and interim.

For those portions of the Plan in which the water quality management problems have been identified, technical and regulatory solutions proposed, the authorities and capabilities of the prospective management agencies thoroughly analyzed and reviewed, and all alternatives to the proposed designation fully examined, a final management agency designation may be made, subject to acceptance of the designation by the management agency and certification by the Governor.

A management agency so designated will receive the full responsibility, in coordination with the WQM Program, for implementing the elements of the WQM Plan(s) through the specific tasks assigned to the agency in detail by the WQM Program, and will be eligible for Federal funding assistance as provided by the Clean Water Act and its amendments.

For those water quality management problems identified within the Plan which have not received the complete and thorough analysis necessary for a final designation of a management agency or agencies, an interim designation may be made by the Commissioner of DEP without being subject to certification by the Governor.

An interim designation is not intended to have legal force under Federal law; rather, the intent is to give advance notice to all interested parties that an agency is being seriously considered for final designation in the future, and that, based on available information, there is no other agency better qualified to carry out the specified portions of the Plan. Experience has shown that a flexible mechanism of this kind is needed to reassure or inform potential management agencies of their prospective final designation and to focus the attention of the planning program on such agencies. Some of the circumstances in which interim designations might be made include:

(1) When an agency is known by DEP to have the authority to implement a portion of the Plan, but such authority has not been formally documented; and,

(2) When it is known which agency will implement the basic thrust of a given program recommended in the Plan, but where the technical aspects of the program are still being refined.

Agencies designated as Interim Management Agencies will be expected to participate in the WQM Program to an extent similar to that of agencies awarded final designation; Interim Management Agencies may also be requested to assist the DEP in completing the related planning tasks for the relevant portion of the plan in such a manner as to expedite a final management agency designation.

An interim designation is further conditioned by the fact that this form of designation does not in itself promise a final designation of the same agency for the tasks assigned. Rather, the interim designation serves as an indication of eligibility for future final designation and as a vehicle by which the implementation of the Plan recommendations may be effected. Should further analysis indicate that another agency would be best qualified to carry out the responsibilities assigned in the designation, the DEP may designate this second agency, rather than the interim agency, as the final management agency for these tasks.

For those functional areas of the Plan which have not progressed sufficiently for the WQM Program to consider the selection of a management agency, no management agency will be designated.

VII.B.3 Acceptance of Designation by Management Agency

For final designation to be certified, the designated management agency must be willing to formally accept the responsibilities assigned to it. This acceptance should come after consultation with the WQM Program, and prior to the formal designation.

VII.B.4 Period of Designation

Interim or final designation of a management agency will remain in effect on a continuing basis, subject to an annual performance evaluation conducted by the WQM Program. Interim or final designations are subject to withdrawal under such conditions as the elimination of assigned responsibilities through adopted revisions to the WQM Plan, the loss of pre-existing authority or capability to carry out assigned responsibilities (e.g. the repeal of enabling legislation), or ineffectiveness in carrying out the assigned responsibilities as determined by the above mentioned evaluation conducted by the WQM Program. Interim designations will remain in effect until either withdrawn or elevated to a final designation.

VII.B.5 Recommendations

Agencies willing to be considered for designation are invited to contact the WQM Program; information provided by the agency which may be used to expedite the legal, institutional, and financial analysis will facilitate the designation of the appropriate agencies. Public comments on the perceived effectiveness of the prospective management agencies will be welcomed by the Program.

VII.C. Status Report on Plan Implementation

The implementation of a WQM Plan is a continuing process, which is in turn subject to the continuing development of the technical solutions to water pollution control problems. This section summarizes the results of the legal, institutional, and financial analysis for each water resource management issue examined to date by the WQM Program, and identifies the management agencies which this plan proposes to designate.

VII.C.1. Progress Report: Legal and Institutional Analysis

Table VII-3 presents the conclusions of the legal, institutional, and financial analyses prepared to the date of this report. Not all of the water resource management issues identified have been examined to the same degree; the

TABLE VII-3

Conclusions of the Legal, Institutional, and Financial Analyses
Conducted by the Water Quality Management Program

ISSUE	INVENTORY	ANALYSIS	RECOMMENDATIONS
Adoption and Revision of Water Quality Standards	Explicit authority for surface water standards adoption and review under Federal Clean Water Act and NJ Water Pollution Control Act; surface water standards revision under NJ Water Quality Planning Act. Explicit authority for ground water quality standards under NJ Water Pollution Control Act, authority implicit in Section 208 of Clean Water Act. Authority in USEPA and DEP Division of Water Resources.	Incomplete. Standards adoption and revision complicated by difficulties in establishing jurisdiction and coordinating Federal and State programs.	None to date
Protection of Drinking Water Quality Disinfection of Raw Water Supply	The federal and state Safe Drinking Waters Acts and regulations provide for a comprehensive program for the protection of drinking water.	Regulations soon to be adopted pursuant to New Jersey Safe Drinking Water Act will make it possible for the State to assume primary enforcement responsibility for the drinking water program.	The Bureau of Potable Water of the DEP should continue drafting regulations and taking the administrative steps necessary to take over primary enforcement responsibility for drinking water quality.
Routine and Emergency Monitoring and Assessment of Water Quality	Incomplete	None to date	None to date
Technical/Financial Assistance for Municipal Wastewater Treatment	None to date	None to date	None to date
Technical/Financial Assistance for Industrial Wastewater Treatment	None to date	None to date	None to date

TABLE VII-3

(Continued)

ISSUE	INVENTORY	ANALYSIS	RECOMMENDATIONS
Monitoring and Assessment of Treatment Facilities and Discharges	None to date	None to date	None to date
Control of Sewer and Pipeline Leakage and Infiltration	None to date	None to date	None to date
Sludge Management	None to date	None to date	None to date
Management of Toxic and Hazardous Substances	NJ Spill Compensation and Control Act is primary authority for DEP. DEP regulations under this Act generally consistent with U.S.E.P.A. regulations, but broader in scope. State Act provides control over storage and transfer of hazardous substances, provides liability for any damage sustained as a result of any discharge except that under existing NPDES or NJPDES permits, creates a fund for the compensation of those damaged by such discharges, and requires a system of prompt removal of any such substances discharged.	Federal regulations do not address pollution of ground water as a result of spills, and EPA has not used its authority to control spills other than of oil. DEP requires spill control plans of all facilities handling toxic and hazardous wastes except sludge; Federal regulations require such plans only after a spill has occurred, and therefore many spills would not be anticipated and prevented.	Incomplete. DEP to revise Spill Compensation and Control Act and DEP regulations to provide for more efficient administration in the light of existing State and Federal requirements. Specific recommendations still under development.
Management of Dredge Spoil	None to date	None to date	None to date

TABLE VII-3

(Continued)

ISSUE	INVENTORY	ANALYSIS	RECOMMENDATIONS
Management of Sanitary Landfills: Siting, Operation, and Maintenance	State power to regulate sanitary landfills is broad and well integrated with the planning and management aspects of the problem. The statutory structure envisions a Statewide solid waste management plan under DEP's regulatory, supervisory, and enforcement control, with local solid waste management districts developing and administering their own solid waste management plans with DEP guidance and approval.	Development of an effective regulatory framework is the key to successful implementation of the statutory scheme. Coordination of planning under Solid Waste Management and Resource Conservation and Recovery Acts should be helpful in limiting overlap and providing financial and technical assistance possibilities. Prompt State action is desirable in areas such as hazardous wastes with possible later review and/or revision to comply with federal guidelines.	Incomplete. Major planning goal should be effective implementation of a Statewide management strategy and program. High priority should be given to water quality protection in the regulation development and implementation process.
Management of Waste Lagoons: Siting, Operation, and Maintenance	None to date	None to date	None to date
Septic Tank Management	Management authority widely distributed under various New Jersey statutes for sewerage authorities, municipal utility authorities, municipal planning and zoning under the Municipal Land Use Law, local boards of health, and county boards of health.	Incomplete. Existing laws provide limitations on the ability of any agency to establish septic system management controls either because such authority does not exist or must be implied. Certain geographic areas are without any available institutions to implement such functions even if authority could be implied from existing law. Further analysis of existing authority is required.	Incomplete. New legislation may need to be developed and proposed to clearly define authorities at present only implied. Responsibilities of individual agencies need to be specified to eliminate duplication of effort. Concept of Septic Tank Management District requires additional examination.

TABLE VII-3

(Continued)

ISSUE	INVENTORY	ANALYSIS	RECOMMENDATIONS
Management of Fish, Shellfish and Wildlife Resources	None to date	None to date	None to date
Control of Soil Erosion and Sedimentation	Authority presently exists to control soil erosion and sedimentation for the vast majority of land uses throughout the State. Several statutes create powers and duties for the State Soil Conservation Committee of the N.J. Dept. of Agriculture to respond to this issue.	Incomplete. Soil Conservation Districts appear to an effective institution through which to implement management strategies in response to this issue.	No regulatory approach is recommended at present for agricultural and silvacultural activities. Regulation of construction activity should be extended. Legislation providing for such is pending. A program of inspection for conformance to Soil Erosion and Sedimentation Plans is recommended to be undertaken by SCD's or municipalities. Regulation of surface mining activity is recommended. Amendment to existing law or new legislation would be required to accomplish this. SCD's should be designated as management agencies for soil erosion and sedimentation.
Management of Use of Fertilizers and Soil Conditioners	None to date	None to date	None to date

TABLE VII-3

(Continued)

ISSUE	INVENTORY	ANALYSIS	RECOMMENDATIONS
Protection and Management of Environmentally Sensitive Areas	Incomplete. Authority at the municipal level under NJ Municipal Land Use Law and miscellaneous New Jersey statutes. Extensive case law exists.	Incomplete	Incomplete. Model ordinances and standarized guidelines for preparing municipal Natural Resources Inventories should be developed based on further analysis.
Management of Inland and Coastal Wetlands	Specific State and Federal authority exists to require environmental degradation in New Jersey coastal wetlands; however, authority for managing inland areas rests on Federal wetlands regulations and piecemeal State legislation and regulations.	Adequate statutory authority to protect coastal or tidal wetlands exists primarily through the N.J. Wetlands Act. Specific State inlands wetlands legislation and a delegation of the Army Corps of Engineers Section 404 permit program could bring together various controls. New Jersey Water Pollution Control Act is probably not applicable to inland wetlands management.	Incomplete. New legislation for the protection and management of inland wetlands should be developed.
Restoration of Lakes	Section 314 of the Clean Water Act provides Federal funding assistance to assess lake water pollution and to apply management and restoration techniques to fresh-water lakes. There is little direct authority under New Jersey law.	Incomplete	None to date
Management of Water for Recreational Use	None to date	None to date	None to date

TABLE VII-3

(Continued)

ISSUE	INVENTORY	ANALYSIS	RECOMMENDATIONS
Management of Surface Application of Wastewater	The federal Clean Water Act recognizes surface application as a viable alternative wastewater treatment system, and provides technical and financial assistance for the construction of such systems, given certain requirements for influent quality, cost-effectiveness, etc. No applicable State laws; draft guidelines have been developed by DEP.	No State law specifically prohibits this treatment method. NJ Realty Improvement Sewerage and Facilities Act requires certain factors to be considered in the design of any wastewater treatment system. Present draft of DEP guidelines requires revision in response to new Federal requirements and advancements in the state of the art for this method.	Incomplete. Regulations must be developed and adopted by DEP.
Management of Ocean Disposal of Wastes	None to date	None to date	None to date
Management of Marine Sanitation Practices	None to date	None to date	None to date
Allocation of Point Source Discharges	None to date	None to date	None to date
Management of Surface Water Diversions and Withdrawals	None to date	None to date	None to date
Management of Ground Water Withdrawals and the Drilling and Sealing of Wells	None to date	None to date	None to date
Water Conservation/Management of Drought Period Water Use	None to date	None to date	None to date

TABLE VII-3

(Continued)

ISSUE	INVENTORY	ANALYSIS	RECOMMENDATIONS
Management of Modifications to Natural Drainage and Channel Structure	None to date	None to date	None to date
Stormwater Management	None to date	None to date	None to date
Establishment and Maintenance of Public Participation Programs	None to date	None to date	None to date
Establishment and Maintenance of Interagency Review Programs	None to date	None to date	None to date

process of analysis has not yet begun for certain of these issues. Consequently, the synopsis presented in the table is divided into the stages of inventory, analysis, and recommendations described earlier in this chapter.

The full text of the analyses prepared to date are available as working papers.

VII.C.2. Designation of Agencies to Implement Plan Recommendations

As described in the above discussion of the management agency designation process, management agencies may be designated by the Governor or by the Commissioner of the DEP to implement portions of the WQM Plan. Final designations are made by the Governor upon his approval of the portions of the Plan to be implemented by the management agency; therefore, such designations may only be proposals prior to the submission of the Plan to the Governor. Interim designations, may however, be made at any time, and are not contingent upon a full documentation of the authority and the capability of the agency to carry out its anticipated responsibilities.

Appendix VII-2 lists the agencies proposed for interim designation as management agencies, identifies the responsibilities to be carried out by such agencies in accordance with Plan recommendations, lists work tasks necessary to fulfill these responsibilities (where such tasks can be identified as this time), and references analyses carried out regarding authority and capability of the agencies to undertake the recommended responsibilities.

VIII.C.3 Designation of Agencies Responsible for Existing Programs

Interim designations of certain management agencies are proposed in Appendix VII-2. It is necessary to clarify that these management agency designations are only made where the Plan has given a general or specific recommendation of the actions to be implemented by that agency. In order for such actions to be recommended, it is necessary that the Plan identify the water quality problem to be resolved by the action and evaluate and recommend appropriate solutions (see Chapter I for a general discussion of the process followed in developing the Plan).

Since the Plan focuses primarily on water quality problems that have not been dealt with through existing programs, more of the Plan's recommendations concern development of new programs or changes and additions to existing programs and activities carried out by DEP and other agencies concerned with management of water resources. Therefore, if existing programs are generally adequate to deal with particular water quality problems, the Plan does not make a recommendation concerning these programs. Consequently, no management agency designations are made at this time concerning these programs. Nevertheless, a WQM Plan should integrate existing programs with the establishment of any additional programs needed to resolve water quality problems. It is therefore necessary to evaluate existing programs and make recommendations as to how these programs should be managed in concert with new programs recommended by the Plan. The task of evaluating existing programs and needed program changes is one of the functions of the State/EPA Agreement which is described in Chapter VIII. Management agencies for existing programs will be designated based on the result of the State/EPA Agreement (which may call for modification of existing program responsibilities). Until the Agreement is further developed, it should be assumed that existing agency programs to which changes are not recommended in this Plan should remain in effect.

VIII CONTINUING PLANNING

VIII. CONTINUING PLANNING

VIII.A. Steps for Completion of Initial Plan

This document is a draft, subject to review and comment by government agencies and the general public. During the review period, public comments will be received through Policy Advisory Committee meetings. At the same time, the WQM Program will receive detailed comments from State agencies and EPA.

After a few months, this draft will be revised based on comments, and a second draft will be published. One month after publication of the second draft, a public hearing will be held. The record will remain open for comments for one month after the hearing; a final plan and certification document will be submitted to the Commissioner of DEP approximately one month after the record is closed. The initial phase of WQM Planning will conclude when this Plan is certified by the Commissioner.

VIII.B. Relationship of Initial Plan to Continuing Planning

The initial WQM plans for the entire State are scheduled for completion in 1979. However, in most, if not all of these areas, further work will still be necessary to develop complete programs to solve water quality problems. Such work will be undertaken by designated agencies and DEP in the future through continuing planning.

The certification document to be prepared by DEP will evaluate which portions of the plan meet the requirements for WQM Plans, and which sections will need additional work. In developing this certification document, the WQM Program will consider public and agency comments, the criteria for plan review described in Policy and Procedures for Review of Water Quality Management Plans (Division of Water Resources Policy Memorandum No. 3.01, May 1978), and a statewide framework for continuing planning. The requirements for WQM Plans, and the WQM Program's initial analysis of how this draft plan meets those requirements, are outlined in the Introduction of this Plan (Section I.C.).

In some areas of the State, there will still be extensive work needed to develop comprehensive water quality strategies. Therefore, the certification documents will indicate priority tasks to be undertaken in continuing planning. The priorities will be established through the procedure described in Section VIII.E., below. (For the Mercer, Middlesex and Tri-County Plans, which have been or are in the process of being conditionally certified, the certification documents represents the first attempt to set continuing planning priorities. Refinements to these priorities will be developed through the process described in VIII.E. The certification conditions for these areas were developed without the benefit of a statewide framework for continuing planning. The opportunity is now available to consider such a framework, thereby preventing duplication of efforts in future planning.)

VIII.C Relationship of State/EPA Agreement WQM Planning

From September 1978 to February 1979, DEP and EPA will be developing an agreement on the direction of all water programs for the next five years. The scope of the State/EPA Agreement will cover all programs, including monitoring, enforcement, construction grants, research, and planning.

The Agreement is of particular importance to WQM planning, because it will determine the direction of continuing planning and define the roles of all related planning programs. (Details of the process of direction-setting for WQM Planning are outlined in sections VIII.D. and VIII.E.) In addition to WQM Planning, water-related planning programs to be covered in the Agreement include the Water Supply Master Plan, Sludge Management, Solid Waste Management, Coastal Zone Management, and others.

In the initial phase, WQM Plans studied all water quality problems and attempted to develop solutions. However, where there are existing programs for management of problems identified, it was generally assumed that these programs should be continued. Recommended changes in programs generally took the form of either new programs and new responsibilities or policy for existing programs. Recommendations for major changes in existing programs were generally not undertaken in WQM planning.

The State/EPA Agreement is aimed at taking a fresh look at all water programs in New Jersey, to ensure that the highest priority environmental problems are being adequately addressed and that duplication of efforts is prevented. The objective is to develop an integrated strategy to solve the State's most important water problems. Programs may be reoriented, consolidated, eliminated, or created. It is important to emphasize that the WQM program has concerned itself with only a limited number of water resource issues - mostly those problems for which programs do not presently exist. By contrast, the State/EPA Agreement will be concerned with management of existing water resource programs, modification of these programs based on new policies growing out of planning programs such as the WQM Program, and possible creation of new programs based on WQM and other planning recommendations.

VIII.D. Principles for Directing Future Planning

In setting direction for continuing planning it is important to assess the results of the initial planning period. Initially, WQM programs were mandated to develop plans to resolve all types and sources of problems affecting ground and surface water quality in order to meet the goals specified in the Federal Water Pollution Control Act. Areawide agencies were responsible for identifying problems, developing specific technical solutions, and developing a scheme to implement those solutions, including establishment of needed legislation, funding, and responsible institutions. Given the broad nature of the initial planning, it has become clear that all requirements of P.L.92-500 could not be met within the mandated time frame. Lack of data, the time required to examine the alternatives and identify specific technical measures for point and non-point source control, and the time frame needed to develop and implement the regulatory, legislative and institutional mechanisms have contributed to problems of completing many water quality planning tasks.

There is a need therefore, to direct the water quality planning program toward resolution of remaining water quality problems based upon an assessment of total needs, available resources (including data), available authority, and legislative and political support. The program should recognize which planning elements can be implemented within the above constraints. Three overall principles will be applied in managing the program.

- <u>Specialization</u> Each planning agency has initiated an investigation of all types and sources of pollution. This has led to a situation where, in addition to duplication of effort, implementable plans could not be developed. There is a need for each planning agency to develop priorities and to focus upon the technical and legal aspects of a particular water resource management problem (including site specific problems where relevant), in sufficient detail to develop implementable plans.

- <u>Coordination</u> Since many of the water quality problems in different areas of the State have common features, it is important to solve these problems in the most efficient manner possible. In developing a new program, there is a need to define the basic goals, outline technical approaches that will be used to deal with the problem, investigate the legal, institutional, and financial means for implementing the program, and recommend management agencies to implement the program. These general needs may be met by one agency on behalf of the other agencies in the State. The concept of specialization is not intended to preempt the role of designated agencies in developing a total plan for the area, but rather to avoid duplication of basic research and policy development.

- Management There is a need for DEP upper level management involvement in setting priorities for continuing planning. In the past, the WQM program attempted to investigate so many issues that DEP management could not be involved in setting policies and priorities. Selection of planning priorities should be made with top management review to ensure that DEP's priorities, e.g. Pine Barrens, are being included in the program.

  Upper management involvement would also ensure coordination among the many DEP units, e.g., Division of Fish, Game, and Shellfisheries, Solid Waste Administration, and Division of Marine Services, that have planning and regulatory programs related to water quality.

VIII.E. Setting Priorities for Continuing Planning

The following steps are being taken to set priorities for continuing planning:

Step 1. Planning Agencies Set Priorities for Addressing Causes of Water Resource Problems

DEP and the six designated agencies will determine the priority planning needs for their planning area, by considering two basic factors: environmental need and the feasibility of solving each problem through planning. In order to clearly define these two aspects of priority setting, DEP has proposed that each planning agency establish the two priority lists outlined below.

a. Environmental Priority Listing - This list would be based upon the effect of pollutant sources on fishable/swimmable waters, potable water quality, surface water quality, and ground water quality and quantity. Sources of problems considered would range from industrial discharges and sewage treatment plants to vessel discharges, on-site disposal and flooding. Any source of problems may be included in this list. Thus, a potential source of problems, such as agriculture, would be assessed for its effect on each of the water resource goals stated above. In addition, the need to maintain high quality waters should be ranked in this list, since it competes with actual problems for funding and staff time. On the basis of this information, a list of priorities will be developed with the assistance of the Policy Advisory Committees.

b. Feasible Solution Priorities - This list will be established by each planning agency according to its perception of how effectively each problem may be dealt with during continuing planning. Water resource problems will be evaluated as to whether:

1) existing programs already effectively address the problem.

2) economically feasible technology is available to solve the problem at a reasonable cost.

3) the solutions will have public and political support.

4) the planning agency has the necessary staffing and technical capabilities to undertake the work.

5) the problem is so severe as to require immediate attention despite the lack of detailed data.

For each area, these two lists will be combined to determine overall priority of the problems in continuing planning.

Step 2. <u>Develop List of Statewide Program Development Needs</u>

Along with the priority lists submitted to DEP, the WQM agencies will indicate whether they are interested in taking leadership roles in developing aspects of programs that are common to some or all areas of the state. As mentioned above in section VIII.D., some water quality problems require the same solutions regardless of where they occur in the state. For example, for a program to solve urban stormwater problems, the technical solutions (Management Practices) and legal and financial analysis would be the same regardless of where they are needed.

To avoid duplication of efforts, it would be appropriate to select particular planning agencies to serve as the lead agencies in continuing planning for aspects of program development common to several areas. These aspects may include:

- definition of the problem, e.g. based on literature reviews and past experience.
- development of policy statements and goals.
- development of technical alternatives and criteria, e.g. based on literature reviews or on documenting the effectiveness of model applications of new technologies.
- analysis and recommendations regarding legal, institutional and financial alternatives and recommendations, e.g. through basic research on legal authorities, sources of financing and relationships between agencies.
- recommending management agencies, e.g. based on the legal and institutional studies, making general recommendations regarding the appropriate management agencies.

For each area, there may be more specific aspects of program development which would need to be performed after the basic work is completed. For example, the selection and designation of local management agencies might be undertaken by each planning agency.

To begin this type of statewide program development the planning agencies will indicate the programs and aspects for which they are interested in taking the lead role. DEP will review their indicated interests and develop a list of statewide program development needs.

Step 3. Aggregation of Priority Lists

With EPA assistance, DEP will aggregate the planning priorities of each area to develop State priorities. This will result in a new list, which will present a ranking of the problems of each area as the State and EPA judge the importance of these problems compared to problems of other areas of the State. Factors to be considered in this process include:

- relative environmental importance of the problem in each area.
- severity of the problems statewide.
- feasibility of resolving the problems.

These priorities will be incorporated in the State/EPA Agreement for the continuing planning program.

Step 4. State/EPA/WQM Agency Meetings and Discussions

DEP and EPA will meet individually with WQM agencies to discuss the lists. The purpose of the meetings will be to refine the future planning priorities for WQM agencies, in the light of previous State commitments, with a view toward increased specialization by each agency.

Step 5. EPA Approval of Priorities

EPA would approve the statewide priority list which incorporates the priorities of the various planning areas, and the selection of lead agencies to develop statewide programs.

Step 6. Work Plans Developed

Each water quality management planning agency which has completed its initial planning, or is prepared to undertake continuing planning, will develop work plans and determine the resources needed to address its approved priorities. The work plan will include basic public participation and administrative expenses, local priorities and the role of the agency in the statewide program. These work plans should be reviewed by Policy Advisory Committees prior to submission to DEP and EPA.

Step 7. State/EPA Review and Approval of Work Plans

This last step in the process will be undertaken prior to funding of continuing planning for any of the agencies.

VIII.F. Priorities for Continuing Planning

(This section will be prepared prior to completion of the final plan. It will be based on the outcome of the process described in section VIII.C, above, and will include the following:)

1. Environmental Priorities

   - General Objective (water quality management goal)
   - List of Priorities
   - Rationale for Priorities

2. Planning Program Priorities

   - List of Priorities
   - Rationale for Priorities
   - Statewide Program Development to be undertaken by by WQM Programs

IX ENVIRONMENTAL ASSESSMENT

IX. ENVIRONMENTAL ASSESSMENT

(TO BE PREPARED FOR FINAL PLAN)

APPENDICES

Appendix I-1

Glossary

Abbreviations

BAT - Best Available Technology
BCT - Best Conventional Pollutant Control Technology
BEA - Federal Bureau of Economic Analysis
BMP - Best Management Practice
BOD - Biochemical Oxygen Demand
BPCT - Best Practicable Control Technology
BPT - Best Practicable Technology
BPWTT - Best Practicable Waste Treatment Technology
CBOD - Carbonaceous BOD
CFS - Cubic feet per second
DEP - N.J. Department of Environmental Protection
DO - Dissolved Oxygen
DRBC - Delaware River Basin Commission
DVRPC - Delaware Valley Regional Planning Commission
EPA - U.S. Environmental Protection Agency
IPS - Intermittent Point Source
I/I - Infiltration and Inflow
MGD - million gallons per day
mg/l - milligrams per liter
NASA - National Aeronautics and Space Administration
NBOD - Nitrogenous BOD
NH_3-N - ammonia-nitrogen
NO_3-N - nitrate - nitrogen
NPDES - National Pollutant Discharge Elimination System
NPS - Nonpoint Source
NPS/IPS - Nonpoint Source/Intermittant Point Source
PAC - Policy Advisory Committee
P.L. 92-500 - Public Law 92-500, the 1972 Federal Water Pollution Control Act Amendments
PPM - parts per million
PPB - parts per billion
PUD - Planned Unit Development
RDG - Regional Development Guide
SCD - Soil Conservation District
SSCC - State Soil Conservation Committee
STP - Sewage Treatment Plant
TKN - Total Kjeldahl Nitrogen
TOC - Total Organic Carbon
TP - total phosphorus
TSS - total suspended solids
USGS - United States Geological Survey
WQMP - Water Quality Management Planning
WP - Working Paper
201 - Facilities planning, Section 201 of the Act
208 - Areawide Water Quality Planning, Section 208 of the Act
303(e) - Basin planning, Section 303(e) of the Act

Definitions:

The Act: The Federal Water Pollution Control Act Amendments of 1972 and 1977.

Activated Sludge - a wastewater treatment process in which wastewater is fed into an aeration chamber where microorganisms feed on the organic matter. The microorganisms are settled from the mixture in a final settling tank and returned to the aeration tank to continue the process.

Advanced Treatment - any process used to remove stubborn contaminants from wastewater, used either after conventional primary and secondary treatment or to replace or modify one or more processes.

Aerobic - A process that can only occur in the presence of oxygen.

Ambient - Surrounding.

Ammonia-Nitrogen - A nitrogen form which is an essential nutrient to plants and is a product of natural decomposition of feces, urea, and other animal protein.

Anadromous Fish - Those fish that swim upstream to spawn.

Aquifer - A subsurface water-bearing layer of rock or soil capable of yielding significant quantities of ground water to wells.

Assimilative capacity - The limit to which streams may absorb pollutants and biologically treat them.

Autotrophic - Self-nourishing, referring to all plants which carry on photosynthesis.

Base Level Technology - Minimum level of treatment required by the Act.

Basin - The area drained by a single stream system.

Benthal Deposits - Deposits of living, bottom dwelling organisms in a stream.

Best Available Technology (BAT) - The Act requires that point sources other than publicly owned treatment works, shall apply the best available technology economically achievable, as determined by the EPA Administrator, for pollutants other than those classified as "conventional" pollutants.

Best Conventional Pollutant Control Technology (BCT) - Amendments to the Act in 1977 require that point sources other than publicly owned treatment works, which discharge "conventional" pollutants shall require application of the best conventional pollutant control technology, as determined by the EPA Administrator, by July 1, 1984.

Best Management Practices (BMPs) - The most effective technical means of preventing or reducing the amount of pollution generated by a particular nonpoint source to a level compatible with water quality goals.

Best Practicable Control Technology (BPCT) or Best Practicable Technology (BPT) - The Act requires that point sources other than publicly owned treatment works shall apply the best practicable control technology currently available, as determined by the EPA Administrator, by July 1, 1977.

Biochemical Oxygen Demand (BOD)- A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water. Large amounts of organic waste use up large amounts of dissolved oxygen; thus the greater the degree of pollution, the greater the BOD.

BOD_5 - The amount of dissolved oxygen in a waterway consumed in five days by biological processes breaking down organic matter in an effluent. (See Biochemical Oxygen Demand, above).

Biota - The animal life and plant life of an area.

Caddis fly - A small, mothlike fly whose larvae live in cocoons buried in the bottom sediment of fresh water resources. Presence of the larvae indicates good water quality.

Carcinogenic - Cancer causing.

Chloride - A substance commonly found in water and wastewater. It frequently combines with sodium to form common salt. Chloride is a problem in water treatment because it is not easily removed through simple treatment technologies. At high concentrations, chlorides will give water an objectionable salty taste.

Chlorination - a process used in water treatment to disinfect potable water supplies. Potential problems are that carcinogens (chlorinated hydrocarbons) and toxics (trihalomethanes) may be formed which are dangerous to human health.

Chlorophyll 'a' - A substance which is present in all plants and is used as an indicator of photosynthetic activity.

Colloidal Solids - Those solids held in the water by their surface charge and extremely small size. These particles require special attention in water treatment because potentially dangerous microorganisms or toxic chemicals may be attached to them and evade conventional treatment processes.

Combined Sewer - A sewer intended to serve as a sanitary sewer and a storm sewer, or as an industrial sewer and a storm sewer.

Designated (Planning) Agency - Regional or county agency appointed by the governor, and approved by the EPA, to prepare a 208 plan for a specified planning area.

Dissolved Oxygen (DO) - The oxygen contained in solution in water. Adequate dissolved oxygen is necessary for sustaining plant and fish life and to prevent offensive odors. Low dissolved oxygen concentrations generally are due to discharges of excessive organic solids having high BOD, often the result of inadequate waste treatment.

Dissolved Solids - The total amount of dissolved material, organic and inorganic, contained in water and wastewater. These solids may present drinking suitability problems if present in high concentrations in drinking water supplies. They may also make the water unsuitable for industrial uses if the material is mostly mineral and in relatively high concentrations.

Diurnal - A daily occurrence.

Effluent Limitation - Any restriction established on quantities, rates, or concentrations of chemical, physical, biological, or other constitutents which are discharged from point sources into water bodies.

Effluent Limited Segments - Any segment of waterway where it is known that water quality is meeting and will continue to meet applicable water quality standards, or where there is adequate demonstration that water quality will meet applicable water quality standards after the application of the effluent limitations required by certain provisions of the Act.

Environmentally Sensitive Areas - Those areas of land which, due to their natural characteristics, require special consideration for management due to their critical relationship to the maintenance of water quality.

Epilimnion - The lighter, warmer, top layer of water in a lake with layers of different temperatures.

Estuary - That portion of the stream which, because of its proximity to the ocean, is affected by tidal action.

Eutrophication - Increased algal growth and other undesirable characteristics induced in a body of water by the excessive presence of nutrients.

Evapotranspiration - The combined effects of the various processes in which water is returned to the atmosphere.

Facilities Planning - Studies providing for cost-effective, environmentally sound and implementable treatment works which will meet applicable requirements of Section 201(g), 301 and 302 of the Act.

Fecal coliforms - A group of organisms which are common in the intestinal tract of man and animals. Their presence in water bodies indicates contamination by feces and the possibility of potentially dangerous viral and bacterial contamination.

Feedlot - A relatively small, confined land area for raising and fattening cattle.

Flow Rate - A quantity of water flowing past a specific point in a given time, expressed in cfs, MGD, etc.

Ground water - The supply of water underground.

Horizon, Soil - A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. The major horizons are:

O horizon - the layer or organic matter on the surface of a mineral soil.
A horizon - the mineral horizon at the surface or just below an O horizon.
B horizon - the mineral horizon below an A horizon.
C horizon - the weathered rock material immediately beneath the A and B horizons.

Hydrologic cycle - The continuous recycling of water as it goes through precipitation, evaporation, runoff and ground water flow.

Hypolimnion - The dark, cool, stagnant bottom layer of water in a lake with layers of different temperatures.

Indigenous species - Those species native to a region.

Infiltration - The water entering a sewer system, from the ground, through such means, as, but not limited to, defective pipes, pipe joints, connections, or manhole walls.

Infiltration/Inflow - The total quantity of water from both infiltration and inflow without distinguishing the source.

Inflow - The water discharged into a sewer system, from such sources as, but not limited to, roof leaders, cellar, yard, and area drains, foundation drains, cooling water discharges, drains from springs and swampy areas, manhole covers, cross connections from storm sewers and combined sewers, catch basins, storm waters, surface runoff, street wash waters, or drainage.

Jackson Turbidity Unit (JTU) - An approximate unit of measure for turbidity.

Kjeldahl nitrogen - The total amount of nitrogen found in the form of organic compounds and ammonia in a water sample. It is a parameter used in water analysis because it is easily measured and it indicates recent pollution as both forms of nitrogen are found in high concentration in most wastewater and low concentrations in natural waters.

Lagoon (wastewater) - A shallow pond, (usually manmade), in which sunlight, bacteria and oxygen interact to restore wastewater to a desired state of purity.

LANDSAT - A series of earth-orbiting satellites operated by NASA which record reflections of the earth's surface to be interpreted and analyzed by computer, to provide information on land cover and water quality.

Laterals - In water distribution and sewerage systems, the piping that branches off of the main pipes; in a septic tank system, the pipe leading from the distribution box into the leaching field.

Leachate - Liquids that have percolated through soil or other similar material and contain substances from the soil either in solution or suspension. Leachates from landfills are a common water pollution source.

Macroinvertebrates - Animal groups which do not have backbones and are visible to the naked eye.

Mass Balance - Use of the principle of conservation of matter (matter cannot be created or destroyed) to determine the concentration of various constituents in water and wastewater.

Maximum Daily Load - The maximum level of a pollutant that may be discharged into a water quality segment and still meet the quality criterion.

Modeling - The characterization of stream processes in mathematical terms which allows planners to determine the probable stream reaction to different situations, including variations in pollutant loads, stream flow, temperature and other variables.

Mottling (Soil) - Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage.

1985 Goal - National goal of the Act that the discharge of pollutants into waters be eliminated by 1985.

1983 Goal - National goal of the Act that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983.

Nitrate-Nitrogen - A compound of nitrogen and oxygen which is readily used by plants and results from the discharge of municipal and industrial waste, runoff from lawns and farms, and leachate from septic tanks and landfills. In high concentration in drinking water it can be dangerous to infants.

Nitrogen - The chemical element whose compounds include ammonia, nitrate, nitrite, and organic nitrogen. All four are components of the nitrogen cycle. The oxidation process of ammonia to nitrite to nitrate is called nitrification and has special significance in wastewater treatment.

Nonconventional Pollutants - Those pollutants which are non-toxic and which are not included in the EPA Administrator's published list of "conventional pollutants." (The conventional pollutant list includes biological oxygen demanding substances, suspended solids, fecal coliforms and pH.)

Non-Designated (Planning) Agency - The New Jersey Department of Environmental Protection which is responsible for 208 Planning in all areas not otherwise designated by the governor.

Nonpoint Source - Pollution which enters a water body from diffuse origins on the watershed.

Nutrients - Mineral elements essential as raw materials for plant growth. Examples include nitrogen, phosphorus and potassium.

On-site Disposal - Any system for treating and disposing of wastewater in the area near its source.

Organic Chemical - A chemical compound containing carbon.

Organic Load - Pollution from once-living material which, during its decomposition in a water body, causes a decline in dissolved oxygen.

Organic Matter - Once-living substances which will decompose in the natural environment.

Organic Pollutant - An organic chemcial which is discharged into the water or atmosphere.

Periphyton - Those organisms, including bacteria, protozoa and algae, which occur on the bottom of a waterway.

Permeability - The capacity of a rock or soil to transmit a fluid.

Permit - Written authorization for the discharge of any pollutant or pollutants into a waterway. Effluent quality must meet specified limitations.

pH: - A measure of acidity or alkalinity in water. pH is represented on a scale of 0 to 14; with 7 representing a neutral state, 4 or lower representing highly acid and 8.5 or higher representing highly alkaline water.

Phenol - A group of organic compounds that in very low concentrations produce taste and odor problems in water. In higher concentrations, they are toxic to aquatic life.

Phosphorus - A principal nutrient necessary for the growth or organisms; used in the form of phosphate (PO_4). It is largely responsible for the eutrophication of lakes and therefore advanced treatment is sometimes used for phosphorus removal before wastewater is released to the receiving waters.

Phytoplankton - Plants which float in the water. Important source of food for fish.

Planned Unit Development (P.U.D.) - An advanced form of land subdivision which permits a compatible mixture of land use types, (residential, commercial, industrial and open space), within a tract of land, in contrast to conventional zoning which requires conforming uses within a tract. The P.U.D. concept provides mechanisms for protecting environmentally sensitive areas within the tract while still permitting a large degree of land development.

Planned Residential Development - (P.R.D.) - A form of Planned Unit Development which is restricted in design exclusively to residential and open space land uses.

Point Source - Any discernible, confined, and discrete conveyance, such as a pipe or tunnel, from which pollutants are or may be discharged.

Pollutant - Any deleterious substance which is discharged into the water or atmosphere.

Porosity - The percentage of the total volume of a rock or sediment which consists of pore space.

Pretreatment - Treatment of wastewater by an industry, to remove high organic or inorganic loads prior to discharge to a municipal treatment plant.

Primary Treatment - In wastewater treatment, removal of solids from wastewater through settling.

Salt Water Intrusion - Encroachment of salt water on a fresh water resource, either ground or surface, which may lead to contamination of water supplies. Salty water requires expensive treatment.

Schedule of Compliance - A timetable set or approved by a regulatory agency for actions by a discharger leading to compliance with effluent limitations.

Secondary Treatment - Biological and bacteriological waste treatment which results in an effluent which meets specific criteria for biochemical oxygen demand, suspended solids, fecal coliform, and pH.

Sediment - Material deposited by water, wind, or ice.

Sedimentation - The process of the deposition of wind or water transported material, typically mineral grains or precipitates.

Septage - The mixed liquid and solid contents pumped from septic tanks and dry wells receiving domestic type sewage.

Seven Consecutive Day One In Ten Year Low Flow - The lowest average flow rate in a stream that occurs over a seven consecutive day period which occurs every 10 years on the average. This flow is used in determining wasteload allocations because it is indicative of some of the most severe conditions in a stream.

Sodium - A very chemically active element found only in combined form in nature, frequently with chloride to form common salt. A high sodium concentration in soil adversely affects permeability. Frequently a principle component of dissolved solids in water, its presence may be objectionable due to possible physiological effects or poor drinking suitability.

Soil Profile - A vertical section of the soil through all its horizons.

Standard - See "State Water Quality Standards."

State Water Quality Standards - Those State adopted and Federally approved uses and criteria that are legally applicable to the interstate and intrastate waters.

Step Aeration - A secondary wastewater treatment method which involves introducing flow at various points in an aeration chamber to produce a uniform oxygen demand throughout the chamber to match the oxygen supply.

Step I - Planning phase of 201 sewage facilities process.

Step II - Design phase of 201 sewage facilities process.

Step III - Construction phase of 201 sewage facilities process.

Storm Sewer - A sewer intended to carry only storm waters, surface runoff, street wash waters, and drainage.

Stream System - A main stream and all of its tributaries.

Suspended Solids (SS) - Small particles of solid matter in water and wastewater which contribute to turbidity and resist separation by conventional means. Suspended solids removal and BOD removal are the two main objectives of municipal treatment facilities.

Taxa - Classifications of groups of plants and animals.

Tertiary Treatment - An additional wastewater treatment process applied after primary and secondary treatment.

Toxic - Poisonous.

Tricking Filters - A secondary wastewater treatment process in which wastes are sprayed onto a bed of crushed rock covered with a film of bacteria which breaks down the wastes.

Turbidity - An optical property of water and wastewater which indicates its light-scattering and light-absorbing characteristics. It is used as a measure of the amount of colloidal and suspended solids in the water.

Unconsolidated Material - Loose soil.

Urban Runoff - Stormwater from city streets and gutters that usually contains a great deal of litter and organic and bacterial wastes.

Waste Load Allocation - The assignment of maximum loads to point sources of pollution to achieve water quality goals in the most effective manner.

Water Quality Limited Segment - A segment of a waterway where it is known that water quality does not meet applicable water quality standards, and is not expected to meet applicable water quality standards even after the application of the effluent limitations required by certain provisions of the Act. Therefore more stringent limitations may be needed.

Water Quality Management Planning - The broad term which encompasses the activities defined in, and referred to, in Section 208 of the Federal Water Pollution Control Act Amendments.

Watershed - The area drained by a given stream.

Water Table - The surface of body of ground water nearest to the ground surface.

Appendix I-2

Pollutants, Planning Objectives, and Feasible Solutions

Pollutants affect the intended uses of water. The sources and feasible abatement measures to control these pollutants may be diverse. In the case of suspended solids, the quality of surface waters for potable supply or recreational uses may be impaired.

The sources of suspended solids range from municipal and industrial treatment systems, to urban runoff, to soil erosion on land or stream banks. Control measures range from physical treatment, to stormwater detention, to Management Practices applied directly to the land. The following tables summarize the relation between pollutants, water uses, sources and abatement measures.

Planning Objectives and Feasible Pollution Abatement Measures

Alternative Planning Objectives:
- GW-P Protection of Groundwater as Potable Supply
- SW-P Protection of Surface Water as Potable Supply
- SW-Q Protection of Surface Water Quality for Fishing and Swimming

Pollution Parameters	Water Uses Affected	Feasible Sources of Pollutants	Feasible Abatement Measures
Microbiological Bacterial[2]	GW-P SW-P SW-Q	Municipal sewage, septic tanks, urban runoff, animal waste	Municipal sewage treatment, septic tank location requirements, septic tank performance inspection, treatment of stormwater, on-site detention and/or recharge of stormwater, waste lagoons
Viruses[3]	GW-P SW-P SW-Q	Municipal sewage, septic tanks, urban runoff, animal waste	Generally same as above but not nearly as reliable or effective
Temperature[1]	SW-P SW-Q	Any activity changing natural hydrologic regime by disturbing land surface and cover or directly using water for industrial, agricultural, or domestic supply	Protection streams, banks from devegetation, cooling ponds, towers for industrial cooling water, beneficial use for fishery production
pH[1, 2]	GW-P SW-P SW-Q	Mining activities, exposure of acid/or alkaline soils and substrata	Recontouring and vegetation of disturbed lands
Radioactivity[1, 2]	GW-P SW-P SW-Q	Spills of radioactive materials	Control of materials use and transport
BOD/DO[1, 2]	SW-Q	Municipal sewage, septic tanks, industrial wastes, urban runoff, animal waste, loss of organic matter through soil erosion	Physical, chemical, biological treatment for point sources, treatment or detention of stormwater, waste lagoons for animal wastes, soil conservation measures

1. Numerical State Water Quality Standards and/or State Potable Water Standards Apply.
2. EPA recommended criteria have been developed.
3. No current standards or recommended EPA criteria.

Pollution Parameters	Water Uses Affected	Feasible Sources of Pollutants	Feasible Abatement Measures
Dissolved Solids[1, 2]	GW-P SW-P SW-Q	Municipal and industrial point sources, use of salts in deicing, various activities causing erosion	Chemical treatment, controls on use of salt for deicing, protection of salt storage from precipitation, erosion, controls
Suspended Solids[2]	SW-P SW-Q	Municipal and industrial point sources, urban runoff, soil erosion from construction, agriculture, silviculture, stream bank erosion	Physical treatment, stormwater detention, erosion control practices such as revegetation, contour plowing, strip cropping, protection of natural stream corridors
Phosphorous[1, 2]	SW-Q	Municipal and certain industrial effluents, septic tanks, stormwater, animal wastes, fertilizer application in rural and suburban areas	Chemical treatment, septic tanks location and maintenance requirements, stormwater detention, detergent bans, erosion controls, better management of fertilizer application
Nitrogen as NO_3[1, 2]	GW-P SW-P SW-Q	Municipal and certain industrial effluents, septic tanks, stormwater, animal wastes, fertilizer application in rural and suburban areas	Chemical treatment, septic tanks location and maintenance requirements stormwater detention, detergent bans, erosion controls, better management of fertilizer application, denitrification
Inorganic Chemicals Chlorides	See dissolved solids		
Flourides[1, 2]	GW-P SW-P	Air Pollution	Air quality controls
Sulfates[1,2]	GW-P SW-P	Air Pollution	Air quality controls

1. Numerical State Water Quality Standards and/or State Potable Water Standards apply.
2. EPA Recommended criteria have been developed.

Pollution Parameters	Water Uses Affected	Possible Sources of Pollutants	Feasible Abatement Measures
Iron[1, 2]	SW-P SW-P	Municipal and certain industrial effluents, urban stormwater, rural runoff	Chemical treatment for point sources (very questionable need)
Oils, Petrochemicals	GW-P SW-P SW-Q	Municipal and certain industrial effluents, urban runoff, transportation corridors	Spill prevention and emergency cleanup measures, treatment or detention of stormwater, programs for recycling waste crankcase oil
Toxic materials and Heavy Metals[2], Especially Lead[2], Chromium[2] Mercury[2] Cadmium[2] Copper[1, 2] Zinc[1, 2] Arsenic[2] Cyanide[2] Asbestos	GW-P SW-P SW-Q SW-Q	Municipal and certain industrial effluents, landfills, spills, urban runoff (lead from automotive fuels, household cleaning agents, copper and zinc from batteries, chromium and cadmium from oxidation of plated metals, asbestos from roofing, paint residue, mercury used in paints and wood preservatives)	Pretreatment of industrial wastes discharging into municipal systems, chemical treatment of industrial effluent, prevention of industrial spills, reduction in use of toxic and heavy metals, stormwater treatment
Persistent Pesticides Herbicides Rodenticides[4]	GW-P SW-P SW-Q	Agricultural practices urban and suburban application, aquatic weed control	Restrictions on uses (may require federal regulations to control use)
Chlorinated Hydrocarbons Other organic chemicals[4]	GW-P SW-P SW-Q	Industrial processes, agricultural uses, spills	Restrictions on use or discharge in industrial processes, restrictions on agricultural uses, spill prevention programs (may require federal regulations to control use)

1. Numerical State Water Quality Standards and/or State Potable Water Standards Apply.
2. EPA recommended criteria have been developed.
4. EPA recommended criteria available for some of these parameters.

Appendix I-3

Working Papers

General Working Papers

Berger, Louis, and Associates, Inc. and Betz Environmental Engineers, Inc., Northeast New Jersey Water Quality Management Study - Appendices.

Berger, Louis, and Associates, Inc. and Betz Environmental Engineers, Inc., Northeast New Jersey Water Quality Management Study - Freshwater Area.

Berger, Louis, and Associates, Inc. and Betz Environmental Engineers, Inc., Northeast New Jersey Water Quality Management Study - Urban Area.

Berger, Louis, and Associates, Inc., and Betz Environmental Engineers, Inc., Section 303(e) Water Quality Management Basin Plan, Freshwater Passaic River Basin, December 1976.

Berger, Louis and Associates, Inc. and Betz Environmental Engineers, Inc., Section 303(e) Water Quality Management Basin Plan, Northeast New Jersey Urban Area, December 1976.

"Detailed Work Plan for Areawide Water Quality Management Plan, Northeast New Jersey," January 1977.

Field, Ralph M. and Associates and Planning Association of North Jersey, Northeast New Jersey Water Quality Management Study.

"Policy Memorandum No. 3.01 Policy and Procedures for Review of Water Quality Management Plans," May 1978.

"Synopsis of the Detailed Work Plan for Areawide Water Quality Management Planning, Northeast New Jersey," January, 1977.

Working Papers by Chapter

Chapter	Title	Work Plan Task No.
3	"Analysis of Nitrification in The Passaic Basin"	
3	"Characterization of Benthal Deposits of the Upper Passaic River," November, 1978	
3	"The Detection and Estimation of Suspected Carcinogens and General Water Quality Parameters in the Surface Waters of the Northeast 208 Area," September, 1978	
3	"Water Quality Analysis For The Ho-Ho-Kus Brook and Saddle River System," September 28, 1978	
3	"Organic Compounds and their Uses," December, 1978	3.1
3	"Description Of The Flowgen and Partlist Computer Progress, Computer Working Paper No. NE 001," December 1, 1976	3.1
3	"Description Of The Recan Computer Program, Computer Working Paper No. NE 007," July, 1977	3.1
3	"Description Of The TSNSMOD And Plot Computer Programs, Computer Working Paper No. NE 005," June 30, 1977	3.1
3	"Water Quality Parameters, Water Quality Working Paper No. NE 002," April 20, 1977	3.1
3	"Geology and Groundwater of Northeast New Jersey," November, 1978	3.1.1
3	"Water Quality Analysis for the Pequannock River Segment of the Passaic Basin," unpublished	3.1.2
3	"Water Quality Analysis for the Pompton River Segment of the Passaic Basin," unpublished	3.1.2

Working Papers by Chapter

Chapter	Title	Work Plan Task No.
3	"Water Quality Analysis for the Ramapo River Segment of the Passaic Basin," unpublished	3.1.2
3	"Water Quality Analysis for the Rockaway River Segment of the Passaic Basin," unpublished	3.1.2
3	"Water Quality Analysis for the Upper Passaic River Segment of the Passaic Basin," unpublished	3.1.2
3	Water Quality Analysis for the Wanaque River Segment of the Passaic Basin," unpublished	3.1.2
3	"Water Quality Analysis for the Whippany River Segment of the Passaic Basin," unpublished	3.1.2
3	"Table of Raw Data-Toxic Effluent - 24 Hr. Composite," unpublished	3.3.2
3	"Table - Surface Water Toxic Sampling Raw Data," unpublished	3.3.2
3	"Table - Toxic sampling, A Summary of Surface Water Toxic Sampling Raw Data by River Segment," unpublished	3.3.2
3	"Toxic Parameters and Their Uses (Industrial-Commercial)," unpublished	3.3.2
3	"Sampling Program for the Northeast New Jersey Area, Ground Water Working Paper No. NE 006 Task 6.2," June, 1977	6.2
4	"Documentation of Environmental Features, 7.0 Land Use Considerations Methodology Paper No. NE 001," May, 1977.	7.1.1
4	Population Forecasts, Northeast 208 Study Area, Task 7.2.1," January, 1978	7.2.1

Working Papers by Chapter

Chapter	Title	Work Plan Task No.
4	"Northeast 208 Areawide Water Quality Management Planning, Discussion Paper 7.2, Population Projections," October 19, 1977.	7.2.1
5	"Preliminary Report on Waste Load Allocations, Mid Passaic River Segment, Freshwater Passaic River System," December 1974	
5	"Preliminary Report On Waste Load Allocations, Upper Passaic River Basin," July, 1974	
5	"Preliminary Report On Waste Load Allocations for the Whippany and Rockaway River Basins," November, 1974	
5	Inventory of Existing Dischargers Northeast 208 Study Area, Task 4.1," October, 1978	4.1
5	"Inventory of Existing Dischargers Northeast 208 Study Area, Task 4.1," January, 1978	4.1
5	Delineation and Discussion of 201 Facility Planning Areas, Northeast 208 Study Area, Task 4.2," January 1978	4.2
5	"Wastewater Flow Projections Northeast 208 Study Area, Task 4.3," March 1978	4.3
5	"Septic System Management Legislation (not dated)	4.7
5	"Septic Tank Management Areas Methodology Paper" (not dated	4.7
6	"Non-Point Source Water Quality Segment Analysis of Northeast New Jersey," November, 1978	5.1+5.2
6	"Best Management Practices for Urban Areas," (not dated)	5.5
6	Initial Draft of Best Management Practices for Agriculture, Silviculture, Construction" March, 1978	5.5

Working Papers by Chapter

Chapter	Title	Work Plan Task No.
6	"Nondesignated 208 Study Areas, Areawide Water Quality Management Planning, Working Paper Element 5.5, Best Management Practices for New Jersey," July, 1978	5.5
6	"Description Of The Geology of Northeast New Jersey, Working Paper No. NE 004," March 22, 1977	6.0
7	"Legal and Institutional Inventory and Analysis for the Management of Sanitary Landfills, Siting, Operation, and Maintanence" November, 1978	7.3a, 8.1 & 8.2
7	"Legal and Institutional Inventory and Analysis For The Management of Use of Fertilizers and Soil Conditioners," November, 1978	8.1
7	"Legal Inventory for the Areawide Water Quality Management Planning Program"	8.1
7	"208 Areawide Water Quality Management Planning Working Paper, Legal and Institutional Inventory and Analysis For Control Of Soil Erosion and Sedimentation," November, 1978	8.1
7	"208 Areawide Water Quality Management Planning Working Paper, Legal and Institutional Inventory and Analysis For The Protection Of Drinking Water Quality," November, 1978	8.1
7	"Appendix VII-I, Description of Water Quality Management Issues for which Legal and Institutional Analysis Are Being Preformed"	8.2
7	"Legal and Institution Analysis Issue Statements," August 7, 1978, September 19, 1978, October 3, 1978 and October 5, 1978.	8.2
7	"Legal and Institutional Inventory and Analysis for "208" Water Quality Management Planning," May 18, 1978	8.2
7	"Submission of Legal/Institutional Analysis by O.R.A.," July 28, 1978	8.2

Working Papers by Chapter

Chapter	Title	Work Plan Task No.
7	"Submission of Legal/Institutional Analysis by O.R.A.," August 16, 1978	8.2
7	"Proposal for Priority Setting for Statewide Water Quality Program Needs," November 14, 1978	1.2
8	"Process for Setting Water Resources Planning Priorities," September 29, 1978	1.2
8	"Proposal for Specialization of Program Development Among Water Quality Management Planning Agencies," September 1978	1.2

Appendix I-4

USEPA Regulatory Requirements For WQM Plan

Pollution Program Components	Regulatory Reference
1. Problem Identification	131.11(b) (d)
2. Technical Solutions	131.11 (f-1)
3. Regulatory Solutions	131.11 (n)
4. Management Agency	131.11 (m) and (o)
Planning Information	
Planning Boundaries	131.11 (a)
Segment Classifications	131.11 (b)
Inventories and Projections	131.11 (c)
Water Quality Standards	131.11 (e)
Environmental, Social, Economic Impacts	131.11 (p)
Program Coordination and Public Involvement	
Coordination	130.34
Public Participation	105

Sources: 40 CFR 130.34 (November 1975)
40 CFR 131.11 (November 1975)
40 CFR 105 (August 1973)

Appendix II-1
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ROBERT WIELAND
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WANAQUE, N.J. 07465

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MORRISTOWN, N.J. 07960

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ALVIN ZACH
DEPT OF ENGINEERING
920 BROAD STREET
NEWARK,

Appendix II-2

PUBLIC PARTICIPATION MEETINGS-NORTHEAST BASIN

Date	Meeting	Place	Attendance
Aug. 11, 1976	First Public Participation (Statewide) Meeting	Div. Water Res. Trenton, NJ	21
Nov. 8, 1976	Upper Passaic, Whippany, Rockaway Sub-Area	Morris County Court House	56
Nov. 9, 1976	Hackensack-Saddle-Hudson Sub-Area	Hackensack, NJ	39
Nov. 22, 1976	Pompton-Wanaque-Pequannock-Ramapo Sub-Area	William Paterson College	28
Nov. 23, 1976	Lower Passaic-Rahway-Elizabeth Sub-Area	Montclair State College	30
Dec. 14, 1976	Policy Advisory Committee (PAC)	Clifton, N.J.	53
Feb. 1, 1977	Pompton-Wanaque-Pequannock-Ramapo Sub-Area	William Paterson College	15
Feb. 2, 1977	Hackensack-Saddle-Hudson Sub-Area	Hackensack, NJ	14
Feb. 2, 1977	Upper Passaic, Whippany, Rockaway Sub-Area	Morristown, NJ	26
Feb. 3, 1977	Lower Passaic-Rahway-Elizabeth Sub-Area	Westminister Hall	16
Feb. 10, 1977	Policy Advisory Committee (PAC)	Wayne, N.J.	50
May 11, 1977	Policy Advisory Committee (PAC)	Wayne, N.J.	42
Aug. 9, 1977	Policy Advisory Committee (PAC)	Wayne, N.J.	64
Aug. 9, 1977	Executive Technical Advisory Committee (TAC)(no minutes)	Wayne, N.J.	-
Aug. 18, 1977	Executive Technical Advisory Committee (TAC)	Passaic River Coalition Office	16
Sept. 8, 1977	Executive Technical Advisory Committee (TAC)	Passaic River Coalition Office	17
Sept.14, 1977	Policy Advisory Committee (PAC)	Wayne, N.J.	50
Oct. 19, 1977	Policy Advisory Committee (PAC)	Wayne, N.J.	36
Oct. 19, 1977	Executive Technical Advisory Committee (TAC) (no minutes)	Wayne, N.J.	-
Oct. 27, 1977	Chairman's Advisory Committee (CAC)	Passaic River Coalition Office	11
Nov. 1, 1977	Chairmans Advisory Committee (CAC)	Passaic River Coalition Office	10
Nov. 9, 1977	Policy Advisory Committee (PAC)	Wayne, N.J.	54
Nov. 16, 1977	Chairman's Advisory Committee (CAC)	Passaic River Coalition Office	8
Nov. 22, 1977	Executive Technical Advisory Committee (TAC)	Wayne, N.J.	15
Nov. 22, 1977	Education Sub-Committee (PAC)	Passaic River Coalition Office	6

Date	Meeting	Place	Attendance
Dec. 7, 1977	Policy Advisory Committee (PAC)	Wayne, N. J.	37
	Land Use Sub-Committee		
Dec. 15, 1977	Executive Technical Advisory Committee (TAC)	Passaic Valley Water Comm.	20
	Chairman's Advisory Committee (CAC)	Passaic River Coalition	8
Jan. 11, 1978	Policy Advisory Comm. (PAC)	Wayne, N.J.	39
Jan. 23, 1978	Land Use Sub-Committee		
Jan. 30, 1978	Land Use Sub-Committee		
Jan. 31, 1978	Chairman's Advisory Comm. (CAC)	Passaic River Coalition	5
Feb. 27, 1978	Land Use Sub-Committee		
Mar. 8, 1978	Policy Advisory Comm. (PAC)	Wayne, N.J.	50
Mar. 16, 1978	Executive Technical Advisory Committee (TAC)		
Mar. 21, 1978	Workshop	Bergen Cty. Ext. Service	
Mar. 22, 1978	Chairman's Advisory Comm. (CAC)	City Hall E. Orange	9
Mar. 27, 1978	Land Use Sub-Committee		
Mar. 30, 1978	Executive Technical Advisory Committee (TAC)	Passaic Valley Water Comm.	18
April 11, 1978	Workshop	Ramapo College	
April 13, 1978	Policy Advisory Comm. (PAC)	Wayne, N.J.	43
April 13, 1978	Land Use Sub-Committee	Wayne, N.J.	
April 13, 1978	Education Sub-Committee	Wayne, N.J.	3
April 13, 1978	Water Resource Sub-Committee	Wayne, N.J.	20
April 20, 1978	Executive Technical Advisory Committee (TAC)		
April 27, 1978	Executive Technical Advisory Committee (TAC)	Passaic Valley Water Comm.	11
May 1, 1978	Land Use Sub-Committee		
May 2, 1978	Land Use Sub-Committee		
May 4, 1978	Chairman's Advisory Committee (CAC)	City Hall, E. Orange	6
May 4, 1978	Education Sub-Committee		4
May 10, 1978	Policy Advisory Comm. (PAC)	Wayne, N.J.	43
May 25, 1978	Executive Technical Advisory Committee (TAC)		
June 8, 1978	Policy Advisory Comm. (PAC)	Wayne, N.J.	33
June 8, 1978	Land Use Sub-Committee	Wayne, N.J.	
June 10, 1978	Mayor's Conference	Upsala College	
June 19, 1978	Land Use Sub-Committee		
June 22, 1978	Chairman's Advisory Comm. (CAC)	E. Orange, N.J.	
July 12, 1978	Policy Advisory Comm. (PAC)	Wayne, N.J.	
Aug. 10, 1978	Policy Advisory Comm. (PAC)	Wayne, N.J.	
Aug. 10, 1978	Land Use Committee	Wayne, N.J.	
Aug. 15, 1978	Land Use Committee		
Aug. 17, 1978	Chairman's Advisory Comm.(CAC)	E. Orange, N.J.	

Date	Meeting	Place	Attendance
Sept. 12, 1978	Policy Advisory Comm. (PAC)	Wayne, N.J.	
Sept. 12, 1978	Land Use Sub-Committee	Wayne, N.J.	
Sept. 18, 1978	Land Use Sub-Committee		
Sept. 26, 1978	Chairman's Advisory Comm.(CAC)	E. Orange, N.J.	
Sept. 29, 1978	Land Use Sub-Committee/Dr. Widmer (Critical Areas Study)	Trenton, N.J.	
Oct. 18, 1978	Policy Advisory Comm. (PAC)	Little Falls, NJ	
Oct. 23, 1978	Land Use Sub-Committee	Boonton, N.J.	
Oct. 24, 1978	Chairman's Advisory Comm.(CAC)	E. Orange, N.J.	
Nov. 13, 1978	Land Use Sub-Committee	Boonton, N.J.	
Nov. 14, 1978	Policy Advisory Comm. (PAC)	Wayne, N.J.	
Nov. 28, 1978	Chairman's Advisory Comm.(CAC)	E. Orange, N.J.	
Nov. 30, 1978	Morris County Municipalities (Sole Sources Aquifer Meeting)	E. Orange, N.J.	

APPENDIX IV-1

POLICY AND PROCEDURES
FOR THE DEVELOPMENT AND REVIEW OF
POPULATION PROJECTIONS FOR
WATER QUALITY MANAGEMENT PLANNING

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Water Resources

POLICY AND PROCEDURES FOR THE DEVELOPMENT AND REVIEW OF POPULATION PROJECTIONS FOR WATER RESOURCES MANAGEMENT PLANNING

November 17, 1978

I. Scope

This policy and its associated procedures shall apply to all Division programs developing and reviewing population projections to be used in the development or implementation of programs for water resources management in New Jersey, in accordance with Areawide Water Quality Management Plans and the State Water Supply Master Plan. This includes 201 sewerage facilities planning.

II. Purpose

The purpose of this document is to set forth DEP policy and procedures for the development and review of population projections to be used for water resources management programs.

III. Authority

This policy is in response to Federal regulations for water quality management planning and the design of publicly-owned sewage treatment facilities, which require the preparation of population projections (40 CFR, Part 131.11 (c)(3)), provisions for public participation in the planning process (40 CFR, Part 130.10 (a)(1-3)), and the conformance of 201 facilities plan projections to those of areawide water quality management plans (40 CFR, Part 35, Subpart E Appendix A as amended: 43 FR 17697, at 17712). Authority also exists through the State Water Quality Planning Act (NJSA 58:11A); the enabling act for the DEP, which authorizes DEP to coordinate State, regional, and local plans and programs in accordance with unified Statewide plans (NJSA 13:1D-9(g)); and the New Jersey Water Pollution Control Act which gives the DEP power to impose conditions upon the construction or use of any sewer, drain, or sewerage system (NJSA 58:10A-1 et. seq.).

IV. Applicability

This policy applies to areawide water quality management planning and 201 facilities planning, including all unapproved facilities plans and those approved plans which have not yet reached the design phase (Step II). The policy also applies to 201 facilities plans which have entered the design phase, up to the construction phase (Step III), if the DEP finds in them a major inconsistency with respect to population projections developed as described in this policy. This policy also applies to the development of water demand projections prepared for the State Water Supply Master Plan.

V. Rationale

There currently is no official State policy to guide the development and review of population projections for water resources management. As a result, projections developed for individual sewerage facilities planning ("201") areas, for example, and for Areawide Water Quality Management Planning have not been related or reviewed in a systematic manner on a Statewide basis. Policy for the review of such projections has instead been effected on a case by case basis, which is recognized to be neither the most equitable nor the most efficient procedure.

Frequently, little or no consideration had been given to regional or state characteristics in the development of local population projections. For example, experience has shown that some assumptions used in 201 facilities planning, in total, would result in a projection greater than what is reasonable for the State as a whole.

The need to wisely use federal sewerage investment funds necessitates a consistent approach, with due consideration of State policies and regional and local attitudes. Thus, there is a need for uniform and equitable policies and procedures to be established for the development and review of population projections. As a part of the water quality management planning process, the Division of Water Resources is also required by USEPA regulations (40 CFR part 35 op. cit.) to develop population projections for the entire State, broken down to the facilities planning area level, in coordination with Areawide Water Quality Planning Agencies and other regional planning agencies.

VI. Policy and Procedures

A. Policy

Population projections shall be used by water resources management programs for planning purposes, including the estimation of future water demand and sewage flows and the forecasting of potential distributions of land and water uses. Population projections, together with these estimates, shall serve to indicate potential needs to develop additional water supplies, to construct or upgrade additional water or sewerage treatment facilities, and to institute special non-point source pollution control strategies.

The use of population projections for water resources management will not be to impose a direct limit on the growth of a municipality, but rather to place an upper limit on the sizing of sewage treatment facilities for which federal funds for planning and construction are used. This shall not constitute absolute limit on the size of these facilities, however, as additional capacity may still be added to a sewerage system according to current procedures (with 100% of the added costs paid by the local users), at the request of the applicant to the DEP, provided that wasteload allocation(s) and other DEP requirements are met.

Population projections used by the DEP for water resources management shall be consistent with the policy-based population projections approved by the Office of Policy and Planning of the Governor of the State of New Jersey, and with all policies and regulations applicable to New Jersey water resources management programs. Modifications of the policy-based projections may be proposed by the Commissioner of the DEP for approval by the Governor's Office of Policy and Planning for use in water resources management if, in the opinion of the Commissioner, the policy-based projections are themselves found to conflict with policies and regulations applicable to water resources management programs.

The Division of Water Resources shall possess the responsibility to develop and review population projections for water resources management, subject to the approval of these projections by the Commissioner of the DEP. The Division of Water Resources shall have the authority to propose to the Commissioner of the DEP modifications to the policy projections of the Governor's Office of Policy and Planning. The Commissioner of the DEP shall have the responsibility to act upon these proposed modifications in a timely and efficient manner.

As required under Federal regulations and existing DEP procedures, citizen involvement and adequate opportunity for public input, shall be provided by the State Water Supply Master Plan Program, the Statewide and Areawide Water Quality Management Planning Agencies, and by each "201" sewerage facilities planning area developing population projections.

B. Procedures

1. Development and Adoption of Statewide Population Projection

A single projection of the State's overall population growth, presented in five year intervals over at least a twenty-year period, shall be developed by the Division of Water Resources for water resources planning purposes. This projection shall be based upon the statewide policy projection approved by the Governor's Office of Policy and Planning. The statewide projection may differ from that of the Office of Policy and Planning, subject to the approval of that Office, if the difference in the projection is based on reasonably anticipated effects of policies and regulations applicable to New Jersey water resource management programs. After DEP requirements for public review and comment have been met, the Commissioner of the DEP shall adopt the resulting statewide projection. The specific exception to this procedure shall be the State Water Supply Master Plan, which shall be given the discretion to utilize a set of alternative statewide projections, provided that the projection adopted by the Commissioner shall be one such projection used.

2. Development and Adoption of County Population Projections

The statewide projection adopted by the Commissioner shall be disaggregated to provide population projections for each county, for five year intervals corresponding to the statewide projection. The county projections shall be based upon the county policy projections approved by the Governor's Office of Policy and Planning. The county projections may differ from those of the Office of Policy and Planning, subject to the approval of that Office, if the differences in the projections are based upon reasonably anticipated effects of policies and regulations applicable to New Jersey water resource management programs, and if the county projections sum to the adopted statewide projection determined according to the procedure described in VI.B.1. above. The Commissioner of the DEP shall adopt the county projections for use in water resources management programs following a period of public review, determined according to established procedures for Water Quality Management Planning, including review by Areawide Water Quality Planning Agencies.

Upon adoption of the county projections by the Commissioner, all future Areawide Water Quality Management Plans, as well as one series of the State Water Supply Master Plan projections, shall be consistent with them. The State Water Supply Master Plan Program shall disaggregate its alternative statewide projections to the county level.

3. Development and Adoption of Facilities Planning Area Population Projections

a. Preparation of Projections

Within six months of the adoption of the State and County population projections by the Commissioner, Areawide Water Quality Planning Agencies shall develop projections for all facilities planning areas (FPA's). Projections for areas outside of designated FPA's will also be developed by the Areawide Water Quality Planning Agencies. The sum of these projections within each county shall not exceed the appropriate county projections adopted by the Commissioner. The Division of Water Resources shall provide a methodology for this disaggregation, but shall also allow, at its discretion, the use of methodologies and alternative disaggregations of county projections proposed by Designated Areawide Planning Agencies, County Planning Boards, or regional planning agencies.

In addition, where necessary, facilities planning agencies shall develop seasonal projections. These seasonal projections shall be subject to review by the Areawide Water Quality Planning Agency(ies) and by the DEP, but will not be constrained by the County-wide projections.

b. Review of Facilities Planning Area Population Projections

The Division of Water Resources shall review all population projections for facilities planning areas in New Jersey to ensure consistency with the state-wide projection as well as to ensure utilization of a systematic methodology for attaining the FPA projections. Seasonal projections developed for FPAs shall also be reviewed for the utilization of a systematic methodology. The Division will make recommendations for changes in and/or adoption of the FPA projections by the Commissioner.

(1). Treatment Capacity Trade-offs

In areas where the adopted FPA projections are significantly lower or higher than previous projections used to determine the size of sewerage facilities completed or under construction, the Areawide Water Quality Planning Agencies may propose equitable ways subject to DEP review, by which to trade off surplus or deficit sewage treatment capacity among adjoining facilities planning areas. For example, if the capacity of an area had been projected unreasonably low in previous projections, the possibility of interconnection with other facilities with surplus capacities shall be explored. Consequently, where facilities have been constructed in excess of expected needs as determined by the FPA projections, the apparent overcapacity will not prohibit remaining parts of the region from obtaining the benefits of federal funding for sewerage facilities planning and construction.

(2). Relationship Between Treatment Capacity of Funded and Nonfunded Projects

If privately funded facilities have been built and have provided capacity for future growth in an area where publicly funded projects are being planned or designed, the 208 projections will be modified accordingly. The sewer service for future growth provided by private facilities will be evaluated in 201 plans for each area.

The population projections will also apply to DEP's review of privately funded projects to the extent that the sizing of these facilities can have an impact on the fiscal viability of publicly funded projects.

(3). Sewerage Service Area Population Projections

Projections dividing FPAs into sewered and un-sewered populations. Components shall be developed by the agencies responsible for preparing wastewater facilities ("201") plans. Proposed guidelines for developing such projections, in terms of determining areas of population not to be sewered, have been developed by the Division of Water Resources. See "DEP Guidelines for the Evaluation of Alternatives to Regional Sewage Treatment Systems in 201 Facilities Plans". The Division shall review thse projections for consistency with the above mentioned guidelines.

Sewerage service area projections may be developed by the Division of Water Resources to determine sewerage service needs for areas where facilities plans have not yet reached the Step I level of planning (40 CFR, Part 131.11 92 and 40 CFR 131.11h), as well as to indicate where facilities planning activities may be needed in the future.

4. Revisions to Projections

Projections developed as described above shall be reviewed periodically in accordance with EPA and State regulations, and with the needs identified through the continuing water quality planning process. The revision of a population projection may be proposed by any of the agencies involved in the steps outlined above for development of the initial projection, and will be subject to the corresponding review procedures identified above.

APPENDIX V-1

LEGAL AND INSTITUTIONAL INVENTORY AND ANALYSIS FOR SEPTIC SYSTEM MANAGEMENT PROGRAM IN NEW JERSEY

1. Statement of the Issue

Comprehensive management for septic systems has become a primary concern in the planning of sewerage facilities. Numerious regional central sewerage facilities have been constructed in New Jersey with federal grant funding and the experience over past years regarding the environmental impact of such systems and cost effectiveness analyses has indicated that other regional sewage treatment solutions may be more practicable. The 1977 Clean Water Act amended the sewerage construction grant program by requiring any potential grantee to analyze alternative treatment systems to determine whether central sewage treatment is the most environmentally sound and cost effective means of treatment. If the analysis shows the alternative treatment systems to be environmentally and economically preferable, the federal government will fund the construction of alternate systems.

Recognizing the federal policy of focusing upon alternative treatment systems and understanding the environmental issues and problems which have or may result from the numerous existing septic systems in the state, the water quality management program has analyzed the management structure required in order to undertake septic system management programs in the state.

2. Summary and Conclusions

The analysis completed as part of the water quality management program has revealed that there exist certain management institutions with the authority to regulate and administer certain aspects of a septic system management program. The two most notable examples of this authority are found in the sewerage authorities law (N.J.S.A. 40:14A-1 et seq.) and the municipal utilities law (N.J.S.A. 4014B-1 et seq.). Both of these agencies appear to have regulatory authority for the maintenance of septic systems and disposal of septage. However, a comprehensive management program would include controls over the location and design of systems as well as operation, maintenance, replacement, and enforcement activities. Other agencies currently exercise some of these functions. For example, local boards of health regulate and design and construction of systems, and municipal planning and zoning boards regulate land use densities which in turn dictate septic system densities.

Given the existing statutory structure, it is possible for septic system management programs to be undertaken in New Jersey. However, the piecemeal nature of these programs will make the development of a comprehensive septic management program very difficult. In addition, it may not be possible for such a program to be initiated as the area is not within a designated sewerage authority or municipal utilities authority service area. Because of this, the Department is recommending that specific legislation be introduced which will address these issues. In order to develop this legislation the Department is establishing a task force composted of members from the environmental community, sewage treatment agencies, engineers and planners. These tasks should be completed by the summer of 1979. In the interim, existing legislation will have to be utilized in order to undertake a septic system management program.

3. <u>Authority</u>

Some of the broadest authority in New Jersey for water pollution control is vested in sewerage authorities and municipal utility authorities. Sewerage authorities are authorized under N.J.S.A. 40:14A-1 et seq.

> "It is hereby declared to be in the public interest and to be the policy of the State to foster and promote by all reasonable means the relief of waters in or bordering the State for pollution and thus to reduce and ultimately abate the menance to the public health resulting from such pollution. It is the purpose and object of this act to further and implement such policy by
>
> (1) Authorizing counties, or municipalities either separately or in combination with other municipalities, by means and through the agency of a sewerage authority, to acquire, construct, maintain, operate or improve works for the collection, treatment, purification or disposal of sewage or other wastes, and, if necessary, works for the impounding, transportation and release of water for the replenishment in periods of drought or at other necessary times of all or a part of waters in or bordering the State diverted into a sewer, sewage treatment or sewage disposal system operated by the sewerage authority;
>
> (2) Authorizing service charges to occupants or owners of property for direct or indirect connection with and the use or services of such works, and providing for the establishment, collection and enforcement of such charges;
>
> (3) Creating as a body corporate and politic sewerage authorities to have full responsibility and powers with respect to such works and the establishment, collection, enforcement, use and disposition of all such service charges;
>
> (4) Providing for the financing of such works, for the issuance of bonds therefore, and for the payment and security of such bonds; and
>
> (5) In general, granting to counties and municipalities and to such sewerage authorities discretionary powers to provide for sewerage services designed to relieve pollution of such waters at the expense of the users of such services or of counties or municipalities or other persons contracting for or with respect to the same."

Sewage is defined as:

> (13) "Sewage" shall mean the water-carried wastes created in and carried, or to be carried, away from residences, hotels, apartments, schools, hospitals, industrial establishments, or any other public or private building, together with such surface or ground water and industrial wastes as may be present;

The above citations can be interpreted as permitting the establishment of septic system management districts by a sewerage authority and the management of the district by the authority. This position is further justified by examining the specified powers of an authority. (N.J.S.A. 40:14A-7)

> (4) In the name of the sewerage authority but for the local unit or units, to acquire, hold, use and dispose of other personal property for the purposes of the sewerage authority;
>
> (5) In the name of the sewerage authority but for the local unit or units, to acquire by purchase, gift, condemnation or otherwise, real property and easements therein, necessary or useful and convenient for the purposes of the sewerage authority, and subject to mortgages, deeds of trust or other liens, or otherwise, and to hold and to use the same, and to dispose of property so acquired no longer necessary for the purposes of the sewerage authority;
>
> ......
>
> (8) To enter on any lands, waters or premises for the purpose of making surveys, borings, soundings and examinations for the purposes of the sewerage authority;
>
> (9) To make and enforce bylaws or rules and regulations for the management and regulation of its business and affairs and for the use, maintenance and operation of the sewerage system and any other of its properties, and to amend the same;
>
> ......
>
> (11) To enter into any and all contracts, execute any and all instruments, and do and perform any and all acts or things necessary, convenient or desirable for the purposes of the sewerage authority or to carry out any power expressly given in this act subject to P.L. 1971, c. 198 "Local Public Contracts Law" (C.40A:11-1 et seq.).

An examination of the section pertaining to rates and service charges further illustrates the potential for sewerage authorities to become involved in septic system management. (N.J.S.A. 40:14A-8)

(a) Every sewerage authority is hereby authorized to charge and collect rents, rates, fees or other charges (in this act sometimes referred to as "service charges") for direct or indirect connection with, or the use of services of, the sewerage system. Such service charges may be charged to and collected from any person contracting for such connection or use or services or from the owner or occupant, or both of them, of any real property which directly or indirectly is or has been connected with the system or from or on which originates or has originated sewage or other wastes which directly or indirectly have entered or may enter the sewerage system, and the owner of any such real property shall be liable for and shall pay such service charges to the sewerage authority at the time when and place where such service charges are due and payable.

(b) Rents, rates, fees and charges, which may be payable periodically, being in the nature of use or service charges, shall as nearly as the sewerage authority shall deem practicable and equitable be uniform throughout the district for the same type, class and amount of use or service of the sewerage system.

.....

(d) Any county sewerage authority may establish sewerage regions in portions of the district. Rent, rates, fees and charges which may be payable periodically, being in the nature of use or service charges, shall as nearly as the sewerage authority shall deem practical and equitable, be uniform throughout the district for the same type, class and amount of use or service of the sewage systems and shall meet all other requirements of subsection (be) hereof.

These provision implicitly permit the establishment of septic system management districts and would provide the mechanism for the financing of such activities. As long as the septage would be disposed of by the sewerage authority it could charge the owners of septic systems for the expenses incurred in maintaining the system and disposing of its wastes.

Another statute which may be utilized in establishing septic system management districts is the "Municipal Utilities Authority Law" (N.J.S.A. 40:14B-1 et seq.) This statute is similar to the sewerage authorities law discussed above, however, this law permits municipalities and counties to establish utilities to provide for both sewage treatment and water purification and supply facilities. The policy of this law is: to foster and promote by all reasonable means the provision and distribution of an adequate supply of water for the public and private uses of waters in or bordering the State from pollution and thus the reduction and ultimate abatement of the menace to the public health resulting from such pollution. It is the purpose and object of this act to further and implement such policy by:

(1) Authorizing counties, or municipalities either separately or in combination with other municipalities, by means and through the agency of a municipal authority, to acquire, construct, maintain, operate or improve works for the accumulation, supply or distribution of water and works for the collection, treatment, purification of disposal of sewage or other wastes;

(2) Authorizing service charges to occupants or owners of property for direct or indirect connection with and the use, products or services of such works, and providing for the establishment, collection and enforcement of such charges;

(3) Creating as bodies corporate and politic municipal authorities to have full responsibility and powers with respect to such works and the establishment, collection, enforcement, use and disposition of all such service charges;

(4) Providing for the financing of such works, for the issuance of bonds therefore, and for the payment and security of such bonds; and

(5) In general, granting to counties and municipalities and to such municipal authorities discretionary powers to provide for utility services designed to provide or distribute such a supply of water or to relieve pollution of such waters in or bordering the State at the expense of the users of such services or of counties or municipalities or other persons contracting for or with respect to the same. (N.J.S.A. 40:14B-2)

This policy is further set forth in N.J.S.A. 40:14B-19:

(a) The purposes of every municipal authority shall be (1) the provision and distribution of an adequate supply of water for the public and private uses of the local units, and their inhabitants, within the district, and (2) the relief of waters in bordering the State from pollution arising from causes within the district and the relief of waters in, bordering or entering the district from pollution or threatened pollution, and the consequent improvement of conditions affecting the public health, (3) the provision of sewage collection and disposal service within or without the district, and (4) the provision of water supply and distribution service in such areas without the district as are permitted by the provisions of this act.

The language pertaining to sewage treatment service by a municipal utility authority is essentially identical with the powers of a sewerage authority as outlined above, and both statutes should be considered equally in assessing the potential for septic system management alternative under either law.

Another one of the most important issues to be faced in considerations pertaining to septic system management alternatives is what agencies can exercise over the location and densities of septic systems.

The agencies discussed above do not exercise such controls. In New Jersey, agencies responsible for the location and siting of facilities exist at the municipal level in the form of planning boards and zoning boards of adjustment. The Municipal Land Use Law (N.J.S.A. 40:55D-1 et seq.) sets forth the role and responsibilities of these agencies in the municipal land use planning process. The purposes of this Act illustrate this role:

> (a) To encourage municipal action to guide the appropriate use or development of all lands in this State, in a manner which will promote the public health, safety, morals, and general welfare;
>
> .....
>
> (d) To ensure that the development of individual municipalities does not conflict with the development and general welfare of neighboring municipalities, the county and the State as a whole;
>
> (e) To promote the establishment of appropriate population densities and concentrations that will contribute to the well-being of persons, neighborhoods, communities and regions and preservation of the environment.
>
> (f) To encourage the appropriate and efficient expenditure of public funds by the coordination of public development with land use policies;
>
> .....
>
> (j) To promote the conservation of open space and valuable natural resources and to prevent urban sprawl and degradation of the environment through improper use of land;
>
> .....
>
> (m) To encourage coordination of the various public and private procedures and activities shaping land development with a view of lessening the cost of such development and to the more efficient use of land. (N.J.S.A. 40:55D-2)

It would be appropriate for planning boards to incorporate location and density requirements for septic systems in its land use planning process. Adequate and detailed information to substantiate such a planning program will be necessary.

Zoning boards of adjustment are required under the Municipal Land Use Law to adopt zoning ordinances consistent with the master plan. This action will permit adequate control and regulation over septic systems and reinforce planning board objectives under the master plan, and will permit adequate control and regulation over septic systems and reinforce planning board objectives under the master plan.

Boards of health also exercise controls over septic systems. The authority for these agencies activities is found at N.J.S.A. 26:3-1 <u>et seq</u>. which authorizes the establishment of local and regional boards of health. Many of the powers of these boards directly relate to the activities under consideration as part of a septic system management program. These powers are found at N.J.S.A. 26:3-31:

> "The local board of health shall have power to pass, alter or amend ordinances and make rules and regulations in regard to the public health within its jurisdiction, for the following purposes:
>
> ....
>
> g. (1) To regulate the location, construction, maintenance, method of emptying or cleaning, and the frequency of cleaning of any privy or other place used for the reception or storage of human excrement, and to prohibit the construction or maintenance of any privy or other such place until a license therefore shall have been issued by the board, which license shall continue in force for 1 year from the date of issue.
>
> (2) To fix the fee, not exceeding $5.00, for such license, and to use the fees so collected in supervising and maintaining said privies or other places and in removing and disposing of the excrement therefrom.
>
> (3) To revoke such license at any time if the owner or tenant of the property on which any privy or other such place is located, maintains the same in violation of law, or of the State sanitary code, or any ordiance or rule of the board."

A 1965 court decision relative to this section found that a local board of health has the power to compel an owner or occupant of premises to keep the septic tank system in such condition of maintenance as required by State law or any properly adopted rule or requirement. (Itzen and Robertson, Inc. v. Board of Health of Borough of Oakland, 89 N.J. Super. 374, 215 A.2d 60 (1965).

Local boards of health are further authorized to take actions to abate nuisances. (N.J.S.A. 26:3-45 through 63) and the Realty Improvement Sewerage and Facilities Act (N.J.S.A. 58:11-23 et seq.) provides that septic systems constructed which are not in conformance to those regulations, constitute a nuisance. (Section 41) This provides an additional mechanism by which boards of health may enforce certain aspects of a septic system management program.

County boards of health are becoming increasingly active in regulating septic systems. Many counties now undertake septic system reviews under Chapter 199 for the municipalities in their jurisdiction. These agencies are authorized under N.J.S.A. 26:3A2-1 et seq. and have the authority to undertake certain activities pertaining to septic system controls. In addition, the recently enacted County Environmental Health Act (L. 1977, ch. 443) authorizes county boards of health and health departments to administer environmental health programs delegated to them by the Department of Environmental Protection, pertaining to, among other things, water pollution. The potential scope or extent of this legislation remains to be seen, however, it should be recognized as a viable approach to county control over water pollution issues relative to a septic system management program authorized by state law.

(4) Applicable Legislation

Federal

The Clean Water Act of 1977, (33 U.S.C. 1351 et seq.) requires the consideration of such a program pursuant to sections 201 and 208 thereunder.

State

The Sewerage Authority Law (N.J.S.A. 40:14A-1 et seq.)
The Municipal Utilities Law (N.J.S.A. 40:14B-1 et seq.)
Municipal Land Use Law (N.J.S.A. 40:55D-1 et seq.)
Local boards of health law (N.J.S.A. 26:3-1 et seq.)
Realty Improvement Sewerage and Facilities Act (N.J.S.A. 58:11-23 et seq.)
County boards of health (N.J.S.A. 26:3A2-1 et seq.)

APPENDIX V-2

CONSTRUCTION GRANT PRIORITY SYSTEM

FOR FISCAL YEAR 1978-79

(October 78 - September 79)

General

Both the Federal and State governments have limited financial and manpower resources in relation to the water pollution control needs. It is therefore essential that we develop a priority system and project list based on that system, so that these limited resources can be applied to our most urgent problems on a priority basis.

A vital ingredient of this process is identifying criteria that are used to establish priorities and subsequently in developing the following lists: (1) segment list, which differentiates geographic areas; (2) discharger list of potential sewerage facility construction projects; and (3) the project list, which through the combination of the above two listings represents the state's expected order for funding projects during fiscal year 1978-79.

1. SEGMENT PRIORITIES

An initial step in developing a project priority list is the delineation and ranking of geographic segments, which are defined in Federal regulations as "...a portion of a basin the surface waters of which have common hydrologic characteristics (or flow regulation patterns), common natural physical, chemical, and biological processes, and which have common reactions to external stresses, i.e. discharge of pollutants." This definition was found useful for segmenting for purposes of water quality modelling and waste load allocations. However, considering the nature of New Jersey's waterways and the heavy concentrations of development in major portions of the state, the following criteria were used to identify segments:

- Each segment should contain generally similar physical characteristics.
- Similar technical approaches should be applicable for managing water quality within a segment.
- Common needs for the preservation of high quality water should exist within a segment.

Using these criteria, the State's nine Section 303e planning areas were subdivided into 26 segments, as shown on Figure 1, Page which include the waterways and the surrounding land areas.

A point system was developed which reflected importance of each category and which was consistent with the State's assessment of its water quality problems.

Populations were assigned to segments based upon last U.S. Census (1970) data. In addition, estimated seasonal populations were added for those areas where they would have significant impacts on wastewater flows. These included the following segments: Raritan Bay Tributaries, New Jersey Coast North, New Jersey Coast South, and Delaware River Basin, Zone 1. Points were assigned at a ratio at 1 for every 10,000 population, up to a maximum of 100 points.

Under the category "need for the preservation of high quality waters," seven uses were identified which generally reflect the adopted water quality standards. These uses and the point values assigned to each are as follows:

	Uses	Point Value
(1)	Major Freshwater Water Supply	120
(2)	Shellfish Industry	100
(3)	Primary Contact Recreation	80
(4)	Water Supply, other than (1) above	70
(5)	Propagation of Fish	60
(6)	Secondary Contact Recreation	50
(7)	Maintenance of Fish	40

A segment received points for each of the above uses which exist in significant proportions in part of or the entire segment, except that every segment was credited with either (3) Primary contact recreation or (6) Secondary contact recreation, and either (5) Propagation of fish, or (7) Maintenance of fish. The higher use existing in significant proportions within a segment was assigned to the segment.

A distinction was made between the freshwater areas which provide the major portion of the State's present and future water supply needs and other water supply areas. In the former category were the following segments:

Freshwater Passaic River, above Little Falls; Raritan River, upstream of Calco Dam; Delaware River, Zone 1, mainstem; and Delaware River, Zone 1, tributaries.

The third category used was "severity of pollution problems" within each segment. Segments where water quality limited technology is required due to limitations in water body assimilative capacity received 100 points, while segments for which effluent limited technology is sufficient received 50 points. In addition, 30 points were assigned where sludge management is a pressing problem, and 20 points to those areas where combined sewers create pollution problems, during periods of heavy rainfall.

The points assigned to each segment under these three categories were then totalled as shown on Page

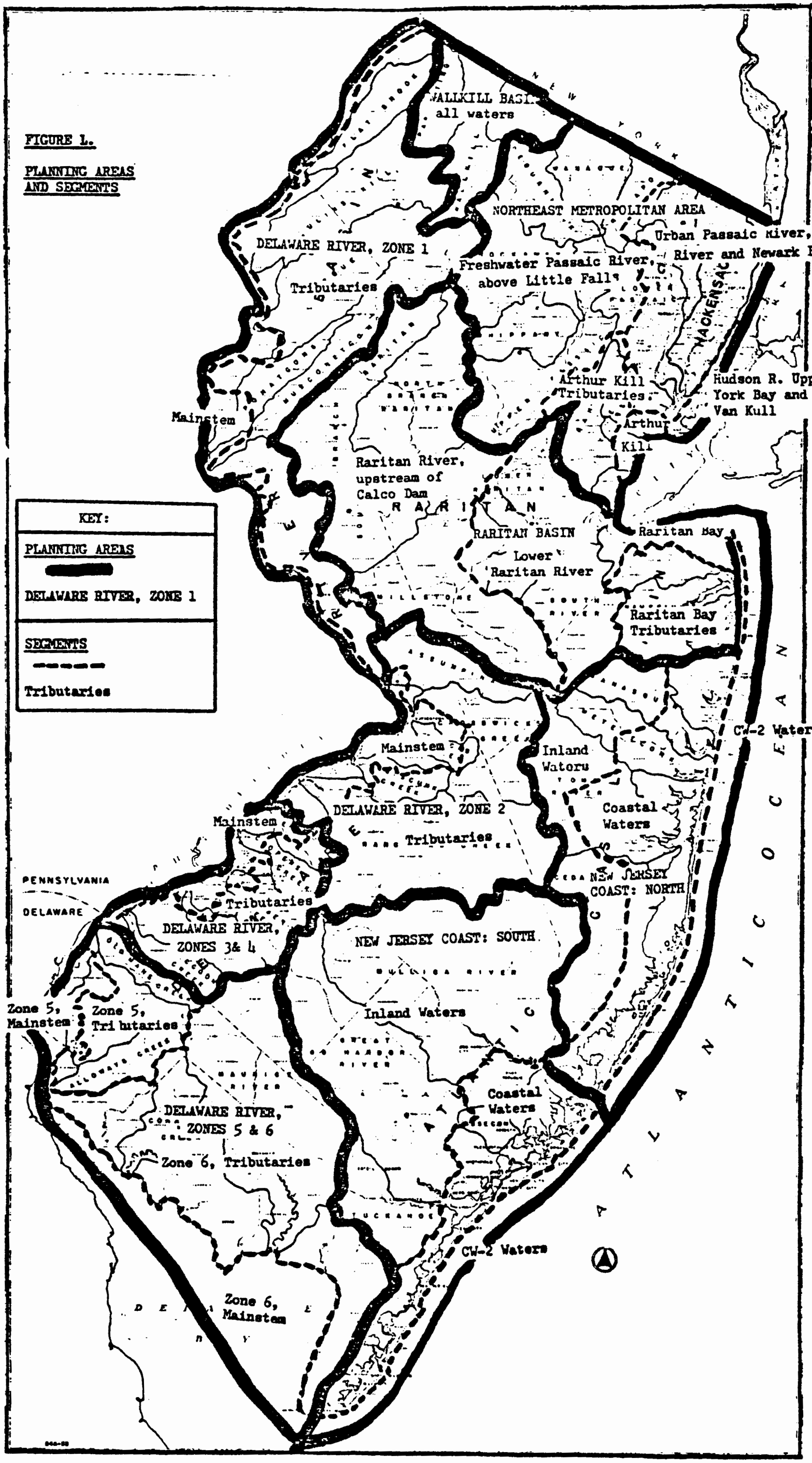


FIGURE 1.
PLANNING AREAS AND SEGMENTS
KEY:
PLANNING AREAS
DELAWARE RIVER, ZONE 1
SEGMENTS
Tributaries
WALLKILL BASIN all waters
NORTHEAST METROPOLITAN AREA
Urban Passaic River, Hackensack River and Newark Bay
Freshwater Passaic River, above Little Falls
DELAWARE RIVER, ZONE 1
Tributaries
Mainstem
HACKENSACK
Arthur Kill Tributaries
Hudson R. Upper New York Bay and Kill Van Kull
Arthur Kill
Raritan River, upstream of Calco Dam
RARITAN
RARITAN BASIN
Lower Raritan River
Raritan Bay
Raritan Bay Tributaries
Mainstem
Inland Waters
CW-2 Waters
DELAWARE RIVER, ZONE 2
Tributaries
Mainstem
Coastal Waters
NEW JERSEY COAST: NORTH
PENNSYLVANIA
DELAWARE
Tributaries
DELAWARE RIVER, ZONES 3& 4
NEW JERSEY COAST: SOUTH
Zone 5, Mainstem
Zone 5, Tributaries
Inland Waters
Coastal Waters
DELAWARE RIVER, ZONES 5 & 6
Zone 6, Tributaries
CW-2 Waters
ATLANTIC OCEAN
Zone 6, Mainstem
NEW YORK

STATE OF NEW JERSEY - DIVISION OF WATER RESOURCES

PRIORITY LIST OF SEGMENTS

PLANNING AREA & SEGMENT	CLASS.	POPULATION	Pts.	* NEED FOR HIGH QUALITY WATERS A	B	C	D	E	F	G	Pts.	** SEVERITY OF POLLUTION A	B	C	D	Pts.	TOTAL
NE. METROPOLITAN AREA																	
Freshwater Passaic	WQ	805,600	81	120		80		60			260	100				100	441
Urban Passaic, Hackensack R.	WQ	2,040,300	100			80	70	60			210		50	30	20	100	410
Hudson R. Upper NY Bay	EL	266,400	27					60	50		110		50	30	20	100	237
Arthur Kill	EL	177,200	18						50	40	90		50	30	20	100	208
Arthur Kill Tributaries	WQ	546.000	55			80	70	60			210		50	30	20	100	365
RARITAN BASIN																	
Upstream Raritan River	WQ/EL	236,200	24	120		80		60			260	100				100	384
Lower Raritan River	WQ/EL	675,000	67			80	70	60			210		50	30	20	100	377
Raritan Bay	EL	---	0			80		60			140		50			50	190
Raritan Bay Tributaries	WQ	204,900	20		100	80		60			240		50			50	310
N.J. COAST: NORTH																	
Coastal Waters	WQ	813,000	81		100	80	70	60			310		50			50	441
Inland Waters	WQ	65,000	6			80	70	60			210	100				100	316
CW-2 Waters	EL	---	0					60	50		110		50			50	160
N.J. COAST: SOUTH																	
Coastal Waters	WQ	607,300	61		100	80	70	60			310		50			50	421
Inland Waters	WQ	88,200	9			80	70	60			210	100				100	319
CW-2 Waters	EL	---	0					60	50		110		50			50	160
DELAWARE RIVER, ZONES 5 & 6																	
Zone 5, Mainstem	WQ	33,700	3					60	50		110	100				100	213
Zone 5, Tributaries	WQ	43,000	4			80	70	60			210	100				100	314
Zone 6, Mainstem	EL	---	0		100	80		60			240	100				100	340
Zone 6, Tributaries	WQ	146,100	15			80	70	60			210	100				100	325
DELAWARE RIVER, ZONES 3 & 4																	
Mainstem	WQ	342,700	34				70		50	40	160	100		30	20	150	344
Tributaries	WQ	259,800	26				70	60	50		180	100				100	306
DELAWARE RIVER, ZONE 2																	
Mainstem	WQ	262,300	26			80	70	60			210	100				100	336
Tributaries	WQ	206,200	21			80	70	60			210	100				100	331
DELAWARE RIVER, ZONE 1																	
Mainstem	EL	56,900	6	120		80		60			260		50			50	316
Tributaries	WQ	192,500	19	120		80		60			260	100				100	379
WALLKILL BASIN																	
All Waters	WQ	28,000	3			80	70	60			210	100				100	313

*code-Need for High Quality Waters:
- A Major Freshwater Water Supply
- B Shellfish Industry
- C Primary Contact Recreation
- D Water Supply (other than A)
- E Propogation of Fish
- F Secondary Contact Recreation
- G Maintenance of Fish

** code- Severity of Pollution
- A Water Quality Limited Technology Required
- B Effluent Limited Technology Required
- C Sludge Management
- D Combined Sewers

2. <u>DISCHARGER PRIORITIES</u>

A discharger list is an enumeration of all potential municipal construction projects in the State.

This discharger list is derived from unfunded projects from previous lists and from applicants for listing on the State's priority list. Dischargers used in developing the project list are assigned points on the basis of the criteria shown on Page . These points are totalled for each project. It should be noted that under the section heading "Nature of Project," although several point values may apply to a specific project, only the highest value which pertains is applied.

Under Category 1 in Discharge Criteria, a value of 60 points is assigned where known violations of Water Quality Standards exist, regardless of whether an abatement order has been issued or not. This represents the State's desire to assure funding of projects designed to combat its most severe cases of water quality standards contravention. Under Category 2, a value of 45 points is assigned on the basis of any documentary evidence of violations in the form of administrative orders, or other documentation indicating extensive areawide public health hazards caused by malfunctioning individual sewage disposal systems. <u>It is the obligation of the applicant to provide the necessary documentation that will qualify a project for this point classification</u>.

In addition to treatment facilities, points are assigned to non-discharge projects as well, including interceptors, programs to correct combined sewage overflows and collection systems. Two particulars of the system in this connection are: (1) the system puts a premium on regional waste management projects by features such as assigned extra points to an interceptor if it serves to eliminate an existing discharge; and (2) collection system projects, which are a part of a regional wastewater treatment system appearing on the priority list, or a regional system which has been previously funded and is presently under construction, will receive the same priority ranking as the regional system.

<u>DISCHARGE CRITERIA</u>

1.	Violations of Water Quality Standards	60
2.	Areawide Public Health Hazards Caused by Extensive Malfunctioning Individual Sewage Disposal Systems	45
3.	NATURE OF THE PROJECT	
	(a) Waste Treatment Projects	60
	(b) Projects to Develop Programs For the Correction of Combined Sewer Overflows	60
	(c) Interceptor Sewer Projects Which Eliminate An Existing Discharge Required by An Approved 201 Plan	40
	(d) Interceptor Sewer Projects Only For the Transmission of Wastes	30
	(e) Collection System Projects Which Are Not To Be Constructed Concurrently Part Of A Regional Waste Treatment Project	5
	(f) Collection Systems To Be Constructed Concurrently With A Regional Waste Management System Will Receive the Same Priority Ranking As The Regional System	
	NOTE: Waste treatment and interceptor projects which eliminate a primary discharge will receive an additonal 15 points	
4.	Population Density As Number of People Per Square Mile Based Upon Official 1970 U. S. Census (Note: Seasonal population included where applicable)	0-200
5.	Sludge-Land Based Alternative Projects	175

3. PROJECT LIST METHODOLOGY

Development of the final "Priority List," through the combination of the segment list (listing 26 segments) and the discharger list (listing projects), reflects the individual contribution of each of the two sets of criteria and also accounts explicitly for the main individual priority considerations promulgated in the EPA guidelines.

The actual method used to combine the lists is a simple addition of each projects' points from the segment and discharge lists. The projects are then ordered according to these combined totals, highest to lowest (with population used to discriminate between project with idential combined totals), to result in a final project priority ranking. This ranking reflects, in a comprehensive manner, the appropriate inputs of National Priorities, EPA Guidelines and overall State orientation.

Listing on the project priority list is the first prerequisite for receiving federal and state grants for planning, design, and construction of sewerage facilities. The applicant has the responsibility of submitting all the required application material in a timely manner. Additional information on the procedures for applying for a federal grant appear in Federal Regulations entitled "Construction Grants for Waste Treatment Work" (40 CFR 35, dated February 11, 1974) and Federal Regulations entitled "Construction Grants" (40 CFR 35, dated April 25, 1978).

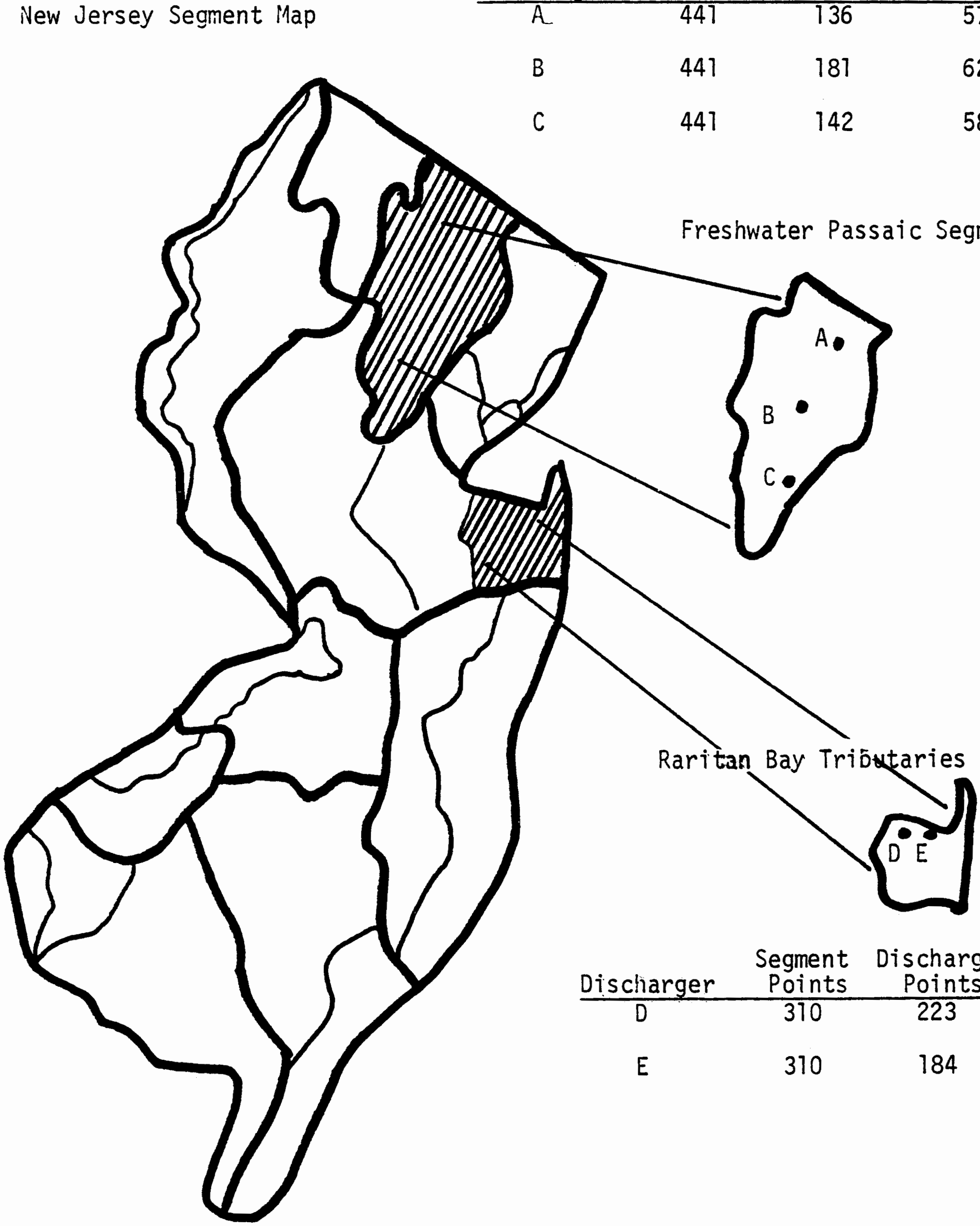
The FY-79 project list contains Step 1, 2 and 3 projects. Projects for which work is expected to be initiated during FY-79 are listed as 79 in the "Fiscal Year Funds" column.

Deferred segments of large projects, projects which will not be ready to initiate construction during FY-79 and projects beyond the estimated fundable range are listed for FY-80 or later funding.

The Fiscal Year 1979 Project Priority List is presented in Section V.B.8.

* FIGURE 2. SAMPLE CALCULATIONS TO OBTAIN FINAL PROJECT RANKING

Discharger	Segment Points	Discharge Points	Combined Points	Final Rank
A	441	136	577	38
B	441	181	622	18
C	441	142	583	32



Discharger	Segment Points	Discharge Points	Combined Points	Final Rank
D	310	223	533	57
E	310	184	494	73

*(FOR ILLUSTRATIVE PURPOSES ONLY)

4. BASIS FOR CONTINUING EVALUATION OF PROJECT STATUS

The DEP will conduct a quarterly review of the progress of projects on the priority list within the fundable range. If DEP concludes at the end of the first or second quarter of the fiscal year that the project will not progress sufficiently to receive a federal grant for construction by the end of the fiscal year (September 30), funding for the project will be deferred to FY-80 or later.

When it can be determined that a project may be deferred from funding in the current fiscal year, the applicant will be so notified.

The quarterly review must establish that all appropriate documents for a complete grant application submission will be received by June 1 in order for the project to remain on the priority list for funding in FY-79.

The funds released through the quarterly evaluation will be utilized to fund deferred segments of segmented projects within the fundable range or to fund projects below the current fundable range on the priority list.

5. RESERVE FUNDS

Reserve funds have been set aside according to the following proposed schedule for FY-79 funding:

	% of FY-79 Allotment
Grant Increases	10 %
Step I, Step 2 Projects not in the fundable Range	10 %
State Management Assistance Grants	2 %
Innovative & Alternative Technology Projects	2 %
Alternative Systems for Small Communities	2 %

Appendix VI-1

POLICY MEMORANDUM NO. WR 3.02
CONCERNING STATEWIDE STORMWATER MANAGEMENT

Scope: This policy concerns statewide stormwater management which incorporates existing policies of the Division and ongoing water supply, flood plain and water quality planning programs throughout the state.

Purpose: The purpose of this policy is to set forth direction for existing and future programs dealing with the management of stormwater runoff, both direct overland runoff to streams, lakes and impoundments, and through urban/suburban storm drains and sewer discharges. This policy will direct and coordinate existing state programs involved in stormwater management and provide the framework for future planning, facilities construction, monitoring and enforcement programs at the local and state level.

This policy is designed to achieve the following goals:

- Prevent, reduce flood damage including damage to life and property and erosion of stream channels.

- Prevent, control, reduce soil erosion from land including farms, private and public construction projects and resulting sedimentation in stream beds, impoundments (lakes, ponds, reservoirs), and other waterways.

- Promote, sustain ground water recharge to predevelopment level to the extent possible.

- Prevent, minimize control nonpoint sources of pollution from stormwater runoff (urban, suburban and rural) to natural levels or near natural levels.

- Promote restoration and clean up of lakes, ponds and reservoirs from adverse stormwater effects.

Authority: Under Title 13:1D-9 of the New Jersey statutes which establishes the powers of the department, DEP has the power to prepare plans and programs concerning conservation and environmental protection in accordance with a unified statewide environmental plan.

Policy: A. Background

Stormwater runoff is a pervasive pollution problem in both urban and rural watersheds. Stormwater runoff may be laden with sediment, pesticides, fertilizers, soil, chemicals, trash, garbage, oil and debris. This runoff adversely affects the quality of receiving streams, lakes, reservoirs and eventually larger rivers and estuaries.

There are three basic problems of stormwater runoff associated with land disturbance and development: (1) increased pollution load; (2) increased rates of runoff and sedimentation; and (3) decreased rates of infiltration of rainwater into aquifers.

Urban and suburban land development generally reduces the amount of porous surface for ground water recharge and increases runoff rates. The result is loss of ground water supply and increased flooding.

The traditional approaches for stormwater management largely assume that stormwater is clean water and that the principal problem is flooding. Solutions to flooding have often dealt with the symptoms of the problem (increased flood peaks) by construction of stream channels, flood walls, dams, and impoundments rather than the causes of increased flooding. While a certain amount of flooding is natural, increased flood peaks result from loss of recharge area and increased runoff rates. Accelerated runoff also means decreased rates of ground water recharge, and often soil erosion.

Stormwater management programs should be sensitive to all aspects of runoff problems and take a balanced approach considering pollution, flooding and recharge.

The following are some of the current programs affecting stormwater management:

Federal (HUD) - Flood Insurance Program

This program makes federally subsidized flood insurance available to residents in participating communities which agree to abide by federal/state guidelines and standards for flood plain delineation and restrictions on further development of land so delineated.

Federal (Agriculture) - Soil Conservation Service Programs

These voluntary programs assist the farmers in carrying out sound agricultural practices which result in soil conservation and prevention of accelerated soil erosion and sedimentation.

Federal-State Areawide Planning Programs

Under Section 208 of P.L. 92-500, federal funding is available to state and designated agencies within a state. Part of the plan must identify nonpoint sources of pollution, including urban runoff, and set forth procedures and methods for their control.

State (DEP)- Flood Plain Management Program

DEP, Division of Water Resources, administers a flood plain delineation effort in cooperation with the HUD Flood Insurance Program and an encroachment permit program to regulate all types of construction activities in the floodways.

State (Agriculture) Soil Erosion and Sediment Control Act

Under this Act, any development of over 5,000 square feet which requires a construction permit must have a plan for soil erosion and sediment control. This plan is approved by the appropriate Soil Conservation District. Single family units not part of a development are excluded.

State (Community Affairs) Municipal Land Use Law

Among the elements that must be included in a municipal plan is a utility service plan which must analyze the need for and location of drainage and flood control facilities.

County Government - Review of Site Plans for Drainage

Site plans for major developments are submitted to county governments for review in relation to such problems as traffic control, stormwater drainage, compatibility with regional plans, etc.

Other programs related to stormwater control include the Army Corps of Engineers' projects, U.S.D.A. Water Resources Development projects, and Resources Conservation and Development Areas.

These programs are separately directed towards protection from flooding, erosion control, or pollution control. However, the current programs do not address these problems comprehensively.

B. Policies

To meet those goals mentioned above DEP will follow the policies below in administering its programs concerned with stormwater management:

- Encourage preservation of flood plains and wetlands where possible (both tidal and fresh water) in a natural condition to act as buffers against pollution and flooding.

- Promote/sustain/maintain ground water recharge through land use policies and structural measures.

- Maintain stream channels in a natural condition. Discourage straightening or alteration of stream beds.

- Seek controlled use of pesticides and fertilizers by farms and households through voluntary programs and public education.

- Encourage retention of indigenous vegetation to the extent practicable in construction and land disturbing activities.

- Sustain predevelopment quantities and rates of stormwater runoff to the extent technically and economically feasible.

- Encourage land use planning to protect and preserve aquifer recharge areas and discourage incompatible land uses on aquifer recharge areas to protect ground water quality.

- Discourage storage of chemicals, fertilizers, and other toxic substances in the open where they could be flushed into streams and impoundments by stormwater.

- Seek cooperation of State agencies including the Departments of Agriculture and Transportation in instituting a program of soil conservation (prevention of soil erosion and sedimentation), and to cooperate in the implementation of the Soil Erosion and Sediment Control Act.

- Seek cooperation of municipal, county and state agencies to institute better street cleanup and litter/trash removal programs to prevent such material from being flushed into storm sewers, streams and impoundments.

- Make maximum use of county and municipal agencies for implementation of stormwater management programs through existing site plan review procedures and master plans.

- Institute adequate monitoring programs to further assess the quality problems resulting from stormwater runoff.

DEP's Water Quality Management Program (under Section 208 of the Federal Water Pollution Control Act Amendments of 1972) will carry out the evaluation of existing and needed programs and coordinate parallel efforts undertaken by designated 208 planning agencies. The water quality management program will carry out the following analysis:

(1) identify the nature and extent of stormwater management problems.

(2) evaluate alternative control measures and recommend best management practices for existing and future stormwater discharges per drainage basin and their impact on flood control, water quality protection, and recharge.

(3) analyze alternative regulatory schemes to carry out the control measures and recommend a preferred regulatory system (including new legislation if appropriate).

(4) analyze alternative institutional arrangements for carrying out needed stormwater management programs and recommend management agencies to undertake the programs. Guidelines will be established which can be used at the local level for stormwater management ordinances.

In order to implement these policies, DEP will undertake a comprehensive review of its existing programs to determine the extent to which existing State programs can incorporate comprehensive stormwater management practices. At the same time DEP will evaluate the need for additional legislation to require stormwater management and assess the capability of local, county, regional and State agencies to undertake new planning and implementation programs.

DATED: 10-2-78

Jeff Zelikson

Jeff Zelikson, P.E.
Acting Director
Division of Water Resources

APPENDIX VII-1

DRAFT
POLICY MEMORANDUM NO. * * *
POLICY AND PROCEDURES FOR
THE DESIGNATION OF MANAGEMENT AGENCIES
TO IMPLEMENT WATER QUALITY MANAGEMENT PLANS

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
TRENTON, NEW JERSEY 08625

JEFF ZELIKSON, ACTING DIRECTOR

DRAFT: September 1978

DRAFT
POLICY MEMORANDUM NO. * * *
POLICY AND PROCEDURES FOR THE DESIGNATION
OF MANAGEMENT AGENCIES
TO IMPLEMENT WATER QUALITY MANAGEMENT PLANS

I. Scope and Purpose

The purpose of this document is to set forth DEP policy and procedures for the development of recommendations to the Governor for his designation of waste treatment management agencies (or, more simply, "management agencies") pursuant to Section 208(c) of the federal Clean Water Act and to 40 CFR Part 130.15. Review criteria for management agency recommendations that have already been included in the DEP Policy Memorandum 3.01, Policy and Procedures for Review of Water Quality Management Plans, are noted and referenced.

II. Authority

The specific authority for DEP to carry out this policy is contained in the New Jersey Water Quality Planning Act (N.J.S.A. 58:11A-1 *et seq.*) which states that...

> "the Department of Environmental Protection shall establish a continuing planning process which will encourage, direct, supervise and aid areawide planning and which will incorporate water quality management plans into a comprehensive and cohesive statewide program directed toward the achievement of water quality objectives; that the Department of Environmental Protection, through the continuing planning process and the planning agencies, through the areawide planning process, shall coordinate and integrate water quality management plans with related federal, state, regional and local comprehensive land use, functional, and other relevant planning activities, programs and policies. . . "

III. Policy

A. Background

Water quality management plans (also known as "Areawide Waste Treatment Management Plans") are being developed by six designated areawide planning agencies and by DEP for adoption by the Governor and approval by EPA. Federal law [Section 208(c)(1)] requires the Governor to designate management agencies to carry out the plan at the time a plan is submitted to EPA. There is no parallel requirement for management agency designation in the New Jersey Water Quality Planning Act. Once a designation is approved by EPA to construct treatment works, EPA will not grant 201 funds to any other agency for such works. By statute, Section 208(j) cost-sharing for rural best management practices requires designation of a 208(c) management agency.

The formal designation of management agencies is the culmination of a process which begins with the initial plans submitted by the areawide agencies and DEP to the Governor. This process is as follows:

1. A water quality management plan submitted to the Governor must identify those agencies recommended for designation by the Governor to carry out each of the provisions of the plan [131.11(o)]. Depending upon an agency's assigned responsibilities under the plan, such agencies must have the adequate authority and capability to perform various functions specified in 131.11(o)(2), quoted below (see Section III.B.1.b.2 Federal Regulations). This authority and capability must be documented in the plan, either directly or by clear reference to supporting documents, so that the Governor can certify the plan.

2. The Governor must certify that the plan "provides (an) adequate basis" for the selection of management agencies [131.20(f)(1)(iv)], adopt the plan as an official water quality management plan of the State, and submit the adopted plan to the EPA Regional Administrator [131.20(h)].

3. Upon the submission of a water quality management plan to EPA, the Governor must designate management agencies to carry out its provisions [130.15]. EPA may approve these designations, or may conditionally approve or disapprove those designations which fail to meet the requirements of 131.11(o)(2).

Questions have arisen concerning the process of management agency designation. It is important for DEP to clarify its interpretation of the process so that designation may proceed on a consistent Statewide basis without unnecessary delay.

B. Policy

In order to ensure consistency in the designation of management agencies, DEP has established a uniform policy concerning (1) the process by which proposals for designation of management agencies will be reviewed, (2) the substantive criteria by which such proposals will be judged in terms of their acceptability in meeting the requirements of Federal and State law, and (3) the formal manner in which the Goveror's designation will be presented.

The policy distinguishes between final and interim designations.

A final designation will be made when:

1) the management agency is assigned to implement a specified portion of a water quality management plan

which otherwise meets all the applicable substantive requirements for water quality management plans, and which therefore can be adopted by the Governor; and

2) The adopted plan has documented (as it must to be adopted) that the management agency has the authority and capability to carry out its assigned responsibilities, and therefore meets the applicable requirements of Section 208(c) and 131.11(o)(2).

An interim designation of a management agency will be made by the Commissioner of the DEP to identify that, although there is a good prospect for final designation, one or more of the requirements for final designation have not yet been met. An interim designation is not intended to have legal force under Federal law; rather, the intent is to give advance notice to all interested parties that an agency or political subdivision is being seriously considered for final designation in the future, and that, based on available information, there is no other agency better qualified to carry out the specified portions of the plan. Experience has shown that a flexible mechanism of this kind is needed to reassure or inform potential management agencies of their prospective final designation and to focus the attention of the planning program on such agencies. Some of the circumstances in which interim designations might be made are:

1) When an agency is known by DEP to have the authority to implement a portion of a plan but such authority has not been formally documented.

2) When it is known which agency will implement the basic thrust of a given program recommended in the plan, but where the technical aspects of the proposed program are still being refined.

Because of the differences between final designations made by the Governor, on the one hand, and interim "designations" made by the DEP Commissioner, on the other, each form of designation is discussed separately below:

1. Final Designations

a. Review Process

Final designations will not be made unless corresponding portions of a water quality management plan, i.e. those sections meeting the applicable requirements of 131.11(a-m) and (p), have been fully certified and adopted by the State. This is consistent with, and must be read in concert with, statements in the DEP Policy Memorandum 3.01 specifying that recommendations for management plans cannot be adopted without the corresponding identification in the plan of water quality problems, technical solutions, regulatory or other management programs, and documentation of the authority and capability of the management agencies. It is not necessary for interim designation to have preceded final designation, nor is it necessary that the final designated agency be the same agency as the interim designated agency.

Whenever possible, the review process for the designation of management agencies should be closely coordinated with the review process for water quality management plans (DEP Policy Memorandum 3.01). The development of draft plan certification statements should be accompanied by the development of draft management agency designation statements to be used by the Governor, and these statements should be circulated and reviewed together during the process of plan certification, as described in DEP Policy Memorandum 3.01.

A key additional requirement is that, prior to the Commissoner's recommendation to the Governor for plan certification, the Commissioner should be assured that the planning agency has notified representatives of the proposed management agency of the final designation proposal. Individual meetings with proposed designees should be held upon request. Participation by proposed designees at this stage of the process is in addition to, not a substitute for, advance consultation with eligible management agencies during the preparation of the plan by areawide agencies and DEP. Every attempt should be made by the planning agency to obtain the proposed management agency's written concurrence with the designation proposal.

DEP reserves the right, in special cases, to recommend the adoption of a specific portion of a plan without simultaneous interim or final designation of a management agency. This is based on the following considerations:

1. Pursuant to the New Jersey Water Quality Planning Act, the Governor may adopt a water quality management plan, having full status under State law, without 208(c)-type designation of management agencies. So far as State law is concerned, such plans do not require EPA approval. Of course, such an action would not remove the Governor's obligation under federal law to submit a water quality management plan (together with the designation of management

agencies) to EPA; however, this fact would not render the State-adopted plan invalid under State law. While it is generally undesirable to distinguish the State and federal legislation in this manner, occasions may arise where such action will be necessary. For example, DEP may be empowered under State law to implement the provisions of a water quality management plan; to await formal 208(c) documentation of DEP as the interim management agency as a condition for State implementation of the plan would impose an unnecessary burden under State law.

2) It is possible to interpret the Governor's responsibility under Section 208(b) to submit a plan as separate from his responsibility under Section 208(c) to designate management agencies. That is, it may be possible for EPA to approve a submitted plan even if the Governor has not designated management agencies. Again, of course, this would not remove the Governor's legal responsibility to designate management agencies, but again this need not render the submitted plan invalid.

3) EPA regulations have attempted to consolidate the provisions of Section 208 and Section 303(e) of the Clean Water Act. While this is desirable on administrative and other grounds, there are some doubts about whether such consolidation can be legally enforced. For example, it may be possible for the State to adopt portions of a water quality management plan (e.g., effluent limitations) pursuant to Section 303(e) rather than Section 208, in which case Section 208(c) may have no applicability.

If a final designation of a management agency is proposed before the corresponding portions of a water quality management plan have been adopted, such proposals shall be reviewed by the same process as for a water quality management plan.

b. Review Criteria

1) General

Federal regulations [40 CFR Part 131.11(o)] provide a definition of the required authority and capabilities of management agencies.

These pertain primarily to the individual components of a water quality management plan. However, as explained in DEP Policy Memorandum 3.01, there are other, additional requirements for approval of recommendations for management agencies derived from the need for conformance with the State Continuing Planning Process, as required by the New Jersey Water Quality Planning Act and 40 CFR Part 130.

2) <u>Federal Regulations</u>

The text of 131.11(o) is as follows:

> "(o) Management agencies. (1) The identification of those agencies recommended for designation by the Governor pursuant to §130.15 of this Chapter to carry out each of the provisions of the water quality management plan. The identification shall include those agencies necessary to construct, operate and maintain all treatment works identified in the plan and those agencies necessary to implement the regulatory programs described in § 131.11(n).
>
> "(2) Depending upon an agency's assigned responsibilities under the plan, the agency must have adequate authority and capability:
>
>> "(i) To carry out its assigned portions of an approved State water quality management plan(s) (including the plans developed for areawide planning areas designated pursuant to Section 208(a)(2), (3), or (4) of the Act) developed under this part;
>>
>> "(ii) To effectively manage waste treatment works and related point and nonpoint source facilities and practices serving such area in conformance with the approved plan;
>>
>> "(iii) Directly or by contract, to design and construct new works, and to operate and maintain new and existing works as required by any approved water quality management plan developed under this part;

"(iv) To accept and utilize grants or other funds from any source for waste treatment management or nonpoint source control purposes;
"(v) To raise revenues, including the assessment of user charges;

"(vi) To incur short and long term indebtedness;

"(vii) To assure, in implementation of an approved water quality management plan, that each participating community pays its proportionate share of related costs;

"(viii) To refuse to receive any wastes from a municipality or subdivision thereof, which does not comply with any provision of an approved water quality management plan applicable to such areas; and

"(ix) To accept for treatment industrial wastes."

The following points of interpretation are in order:

a) Definition of "treatment works": This term is used directly or by reference several times above and in Section 208(c). The term is very broadly defined in Section 212 of the federal Clean Water Act and addresses not only, for example, collection systems as well as actual treatment facilities, and municipal solid waste and stormwater as well as sewage, but also ". . . any other method or system for preventing, abating, reducing, storing, treating, separating, or disposing of municipal waste . . . or industrial waste." The term "construction" has a correspondingly broad meaning.

b) The relation of assigned responsibilities of management agencies to the applicability of individual provisions of 131.11(o):

The individual provisions of Section 208(c)(2) and 131.11(o) apply to an individual management agency only insofar as they reasonably relate to that agency's assigned responsibilities under the plan. For example, if an individual management agency has no conceivable responsibility to "accept industrial wastes", then it need not have the authority and capability to do so. It is clear that a management agency must have the authority, at a minimum, "to carry out its assigned portions of an approved State water quality management plan." The obvious implication of this is that a management agency cannot be formally designated in the absence of a corresponding portion of an approved State plan; as discussed in DEP Policy Memorandum 3.01, this means that the designation of management agencies is therefore contingent upon the identification of water quality problems, technical solutions, and regulatory and other management programs, and upon the documentation of adequate legal authority and financial administrative capability.

The Governor has the legal responsibility to designate management agencies that, in the aggregate, meet the complete requirements of Section 208(c) and 131.11(o). However, pursuant to 130.15(c), the Governor may designate specific agencies to begin implementation of approved portions of a water quality management plan prior to completion and approval of the entire plan.

c) <u>Authority and capability to refuse to receive any wastes from a municipality or subdivision thereof which does not comply with any provision of an approved water quality management plan applicable to such areas [130.11(o)(2)(viii), derived from 208(c)(2)(H)]</u>:

This has been identified as probably the single most difficult provision to meet, especially where existing franchise areas, contracts, and bonds are involved. The text of the Clean Water Act indicates that a management agency cannot be designated to "receive wastes" from municipalities unless it has the authority to refuse to receive those wastes. The language in the attendant regulations is more ambiguous, since it adds the phrase "depending upon an agency's assigned responsibilities under the plan"; the implication could be that if the potential refusal to receive wastes is not one of the agency's "assigned responsibilities", then 131.11(o)(2) (viii) has no application.

Further analysis of this issue may be necessary. However, DEP will assume that it is reasonable to designate management agencies absent the authority specified in Section 208(c)(2)(H), unless the portions of the water quality management plan to be implemented by such an agency are clearly dependent upon such powers (e.g. pretreatment and staging of treatment works).

3) <u>Consistency with the State's Water Resources Program</u>

As discussed in DEP Policy Memorandum 3.01, recommendations for designation of management agencies must meet certain tests of institutional compatibility regarding existing state, regional, county, and local jurisdiction, program integration, and public and governmental participation.

4) <u>Evaluation</u>

In summary, if a proposed management agency meets <u>all</u> of the above criteria it may receive <u>final</u> designation. No management agency will receive final designation whose authority and capability to carry out its assigned responsibility has not been documented in an adopted water quality management plan or which has not recieved adequate notice of an opportunity to comment on the proposed designation.

c. <u>Outline of the Governor's Designation</u>

The Governor's designation of management agencies will consist of the following parts:

1) <u>Designation letter</u>

The designation letter will name specific agency or agencies and state that they have been designated as management agencies to carry out provisions of an adopted water quality management plan, as identified in an enclosed document, pursuant to Section 208(c) of the Clean Water Act. This letter is distinct from the letter certifying the water quality management plan.

2) Enclosed document

a) Introduction

b) Final designation statement

This statement will address the requirement of 40 CFR Part 130.15 which require the Governor to designate agencies to carry out each of the State-adopted provisions of water quality management plans. This will generally consist of a list of designated agencies and accompanying text. This list of agencies will be in the following order:

Federal
State
Interstate
Regional
County
Municipal

The accompanying text will include:

i. An official contact for each agency.

ii. Identification of the following:

(A) The specific place in the plan where designation of the agency was recommended,

(B) The specific place in the plan in which the assigned responsibilities of that agency was identified; and

(C) A brief summary of these assigned responsibilities.

It would be advantageous for the plan to be written such that all or most of this material is presented together.

d. Period of Designation

Final designation will remain in effect for an indeterminate period of time. 208 planning staff of the Division of Water Resources will review final designations on an annual basis. Proposals to amend or rescind final designation will be reviewed in the same manner as proposals for new final designations; final recommendations concerning such actions will be made to the Governor also in the same manner.

e. <u>Withdrawal of Final Designation</u>

Final designations may be withdrawn by the Governor at any time provided that all interested parties are notified of the proposed withdrawal, and that the reasons for this action are explicitly stated. A public hearing will be held if there is a substantial demand for such a hearing.

Potential reasons for withdrawal include, but are not limited to:

1) Elimination of assigned responsibilities through adopted revisions to the water quality management plan;

2) Loss of pre-existing authority or capability to carry out assigned responsibilities (e.g., repeal of enabling legislation); or

3) Ineffectiveness in carrying out assigned responsibilities.

2. <u>Interim Designation</u>

a. <u>Review Process</u>

There are no legal requirements governing interim designation. Interim designations may therefore be made before corresponding water quality management plans have been certified and adopted by the Governor. Designations will be proposed by 208 program staff of the Division of Water Resources, these proposals will then be reviewed by the Executive Staff of the Division of Water Resources, the Interdepartmental 208 Review Committee, <u>the proposed management agency</u>, the areawide planning agency (if different from DEP), and EPA. The Division of Water Resources or, if appropriate, areawide planning agency staff will notify the 208 program advisory committees.

The Commissioner of DEP will then make the actual designation.

b. <u>Review Criteria</u>

Although there are no strict review criteria that proposals for interim designation must meet, there should be some discussion in the interim designation document of the relationship of the proposed designation to the review criteria established above for final designation. The basis for this discussion can be documents prepared by DEP or areawide planning agency staff, or it can be new papers written for this purpose by DEP staff.

c. Outline of the Interim Designation

The format for interim designation will be more flexible than the format for final designation, and will depend upon individual circumstances for the level of detail. The designation will generally consist of the following parts:

1) Letter of Prospective Designation

The letter of prospective designation will name a specific agency (or agencies), and state that the agency(ies) are being seriously considered for interim designation as a 208 management agency(ies) for reasons described in an enclosed document. The letter will clearly state that the letter and document are not a draft of a formal designation statement; the letter will state that its purpose is strictly to notify interested parties of the prospective designation in order to receive comments well in advance of any formal action.

2) Enclosed Document

The documentation should identify, in as specific terms as practical, the proposed responsibilities of the agency, and why it is thought that the agency should be designated to carry out those responsibilities. If documents such as draft plans or relevant working papers are available, these should be referenced. It may be useful to identify in the document needs for further documentation that may be necessary for the agency to receive Final designation. It is anticipated that upon interim designation such agencies will be asked to assist DEP or the areawide planning agency staff in completing the process toward final designation. An official contact for the agency should be identified.

It may be appropriate to designate on an interim basis a related class of agencies (e.g., sewage collection agencies) in a single letter and document. In such cases, the letter and document should name the individual agencies in the class, and the review process should still include consideration of the individual agencies.

d. Period of Designation

The interim designation will remain in effect for an indeterminate period of time. Interim designations will terminate upon the final designation of an agency to assume corresponding responsibilities. 208 planning staff of the Division of Water Resources will review all interim designations on an annual basis. Proposals to change interim designations will be reviewed in the same manner as proposals for new interim designations.

e. Withdrawal of Interim Designation

Interim designations may be withdrawn at any time by the DEP Commissioner. Reasons may include, but may not be limited to, those listed above for withdrawal of final designation. All interested parties should be notified in advance of such an action and the reasons for the action.

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES

This appendix identifies the agencies proposed for interim designation as management agencies. The appendix is organized into two sections. Section A is described below while a description of Section B follows the presentation of proposed management agencies in Section A.

Section A

Section A, following, contains tables which list the proposed management agencies other than agencies responsible for sewerage facilities, identify the responsibilities to be carried out by such agencies in accordance with Plan recommendations, list the work tasks necessary to fulfill these responsibilities (where such work tasks can be identified at this time), and reference analyses carried out regarding authority and capability of the proposed agencies to undertake the recommended responsibilities. A (+) accompanied by a specific reference in the appropriate column indicates documentation of authority and capability has been completed. In many instances, documentation of authority and capability is incomplete and is indicated by a (-) in the appropriate column.

It is noted that the proposed interim designations presented in this appendix apply only to those programs for which recommendations have been made in this WQM Plan and are not intended to apply to the other ongoing responsibilities of those programs. For the purpose of completeness, all other water programs outlined in the annual Water Resources Program Plan for which no recommendations have been made in this WQM Plan are considered to be designated for continuation of the responsibilities defined in the annual Program Plan until the WQM Program makes specific recommendations on modifications to those programs.

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Section A

INTERIM DESIGNATICN OF PROPOSED MANAGEMENT AGENCY

Agency: New Jersey Department of Environmental Protection, Division of Water Resources, Water Resources Planning and Management Element
Address: 1474 Prospect Street, P.O. Box CN-029, Trenton, New Jersey 08625

Contact: Douglas M. Clark, Assistant Director
Telephone: (609) 292-0666

GENERAL RESPONSIBILITY Water Quality Standards				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1. Review and Revise Water Quality Standards as necessary but at least once every three years.	III.B.5	A. Specify (where possible) appropriate uses which, at a minimum, are consistent with the fishable/swimmable goals of the Clean Water Act.	III.B.5	303(c)(1) of the Federal Water Pollution Control Act of 1977	-	-
	III.B.5	B. Specify (where possible) appropriate water quality criteria (especially toxic substances) which are necessary to support the water uses identified in paragraph one above.	III.B.5	New Jersey Water Pollution Contol Act of 1977.		

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Section A

INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCY

Agency: New Jersey Department of Environmental Protection, Division of Water Resources, Bureau of Potable Water
Address: 1474 Prospect Street, P.O. Box CN-029, Trenton, New Jersey 08625

Contact: Raymond Barg, Acting Chief
Telephone: (609) 292-6296

GENERAL RESPONSIBILITY Protection of Drinking Water Quality				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Draft new regulations allowing alternative methods of disinfection in addition to chlorination.	III.B.5.b.	To be developed		-	-	-
2) Primary enforcement responsibility in the event of EPA promulgation of regulations requiring Granulated Activated Carbon use in water treatment.	III.B.5.b.	To be developed		-	-	-

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCY

Agency: New Jersey Department of Environmental Protection, Division of Water Resources, Public Wastewater Facilities Element
Address: 1474 Prospect Street, P.O. Box CN-029, Trenton, New Jersey 08625

Contact: Anthony Ricigliano, Assistant Director
Telephone: (609) 292-0959

GENERAL RESPONSIBILITY Review and Certification of Plans for the Design and Construction of Sewerage Systems and Wastewater Treatment Plants				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Promulgate new regulations allowing alternative methods of disinfection of wastewater in addition to chlorination.	III.B.5.b.	To be developed		-	-	-
2) Review of facility plans to determine if new wastewater treatment plants have provided for chlorine optimization where chlorination is proposed as the method of disinfection.	III.B.5.b.	To be developed		-	-	-

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Section A

INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCY

Agency: New Jersey Department of Environmental Protection, Division of Water Resources, Water Resources Planning and Management Element, Data Acquistion and Analysis
Address: 1474 Prospect Street, P.O. Box CN-029, Trenton, New Jersey 08625

Contact: Robert Runyon, Supervising Environmental Specialist
Telephone: (609) 292-0425

GENERAL RESPONSIBILITY Surface Water Quality Monitoring				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Implement ambient surface water quality monitoring program.	III.B.6.a.	A. Coordinate sampling to integrate water quality data with streamflow gaging, ground water studies, and local meteorological records.	III.B.6.a.	-	-	-
		B. Encourage other agencies doing water quality monitoring to participate in a cooperative system of reporting analytical results for inclusion into STORET and having access to data,	III.B.6.a.			
		C. Ensure that all agencies cooperating in monitoring system employ sampling techniques, laboratory procedures, and reporting formats that are acceptable to EPA &DEP	III.B.6.a.			

GENERAL RESPONSIBILITY				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Implement ambient surface water quality monitoring program. (continued)		D. Select non-traditional parameters to obtain information on possible specific problems for stream reaches.	III.B.6.a.			
		E. Identify water quality trouble spots or high priority waters for intensive survey.	III.B.6.a.			
		F. Conduct non-point source monitoring in areas with no upstream point discharges and in areas with land use types not represented in current monitoring program.	VI.B.6.a.			
2) Conduct intensive surveys to determine causes of water quality problems.	III.B.6.b.	To be developed on a case-by-case basis.		-	-	-

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCY

Agency: New Jersey Department of Environmental Protection
Ground Water Support Group
Address: 1474 Prospect Street, P.O. Box CN-029
Trenton, NJ 08625
Contact: Frank Markewicz, Supervising Geologist
Telephone: (609) 292-0668

GENERAL RESPONSIBILITY Ground Water Management				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Implement a Ground Water Management Program	III.C.3.	A. Establish a program to manage pumping patterns.	III.C.3.	-	-	-
		B. Establish guidelines to encourage direct aquifer recharge	III.C.3.			
		C. Inventory well locations and pumping rates.	III.C.3.			
		D. Investigate water diversion controls.	III.C.3.			
		E. Investigate methods to encourage natural aquifer recharge.	III.C.3.			

GENERAL RESPONSIBILITY				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
		F. Map and delineate prime aquifer recharge areas for protective measures. G. Establish a long-term monitoring program.	III.C.3.	-	-	-

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INTERIM DESIGNATICN OF PROPOSED MANAGEMENT AGENCY

Agency:	New Jersey Department of Environmental Protection Office of the Commissioner, Program on Environmental Cancer and Toxic Substances
Address:	Labor and Industry Building, 8th Floor Trenton, NJ 08625
Contact:	Peter W. Preuss, Special Assistant to the Assistant Commissioner
Telephone:	(609) 292-0648

GENERAL RESPONSIBILITY Ground Water Management				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Improve interpretability of all future ground water toxic sampling.	III.C.3.	A. Set up a quality assurance program.	III.C.3.	-	-	-
		B. Document reasonable data variability in data.	III.C.3.			
		C. Perform sampling to determine field variability of data.	III.C.3.			

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Section A

INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCY

Agency: New Jersey Department of Environmental Protection, Division of Water Resources, Water Resources Planning and Management Element, Ground Water Support Unit
Address: 1474 Prospect Street, P.O. Box CN-029, Trenton, New Jersey 08625

Contact: Frank Markewicz, Supervising Geologist
Telephone: (609) 292-0424

GENERAL RESPONSIBILITY Ground Water Management				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Implement a program for the protection and management of aquifer prime recharge zones including: -Formulation of guidelines and regulations protecting these areas from extensive impermeable cover. -Formulation of guidelines and regulations regarding the location of high pollution potential activities in prime recharge zones.	III.C.3.	To be developed		-	-	-
2) Follow-up sampling of wells surrounding those wells having toxic contaminants.	III.C.3.	To be developed		-	-	-

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Section A

INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCY

Agency: New Jersey Department of Environmental Protection
Bureau of Geology
Address: 88 East State Street, Trenton, New Jersey 08625

Contact: Kemble Widmer, State Geologist
Telephone: (609) 292-2576

GENERAL RESPONSIBILITY Ground Water Management				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
* Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Review well log data sheets and require that, as a minimum, certain portions be completed by the driller.	III. C.3.	To be developed		-	-	-

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Section A

INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCY

Agency: DEP Agency to be identified. (Since sources of funding for this program are still under investigation, DEP is not in a position to accept this management designation until the nature of this program and sources of funding are better defined.)

Address:

Contact:

Telephone:

GENERAL RESPONSIBILITY Ground Water Management				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Require that all new wastewater lagoons be lined with an impermeable material, unless it can be demonstrated that significant ground water pollution would not result from an unlined installation.	III.C.3.	To be developed		-	-	-
2) Institute a permit system for wastewater lagoons.	III.C.3.	To be developed		-	-	-

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Section A

INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCY

Agency: New Jersey Department of Environmental Protection, Division of Water Resources

Address: 1474 Prospect Street
Trenton, NJ 08625

Contact: Jeff Zelikson, Acting Director
Telephone: (609) 292-1637

GENERAL RESPONSIBILITY Protection and Management of Environmentally Sensitive Areas				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Develop and implement guidelines for the evaluation of environmentally sensitive areas in planning the construction of wastewater treatment facilities.	IV.G.2	To be developed		-	-	-

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Section A

INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCY

Agency: New Jersey Department of Environmental Protection, Division of Water Resources
Public Wastewater Facilities Element*

Address: 1474 Prospect Street, P.O. Box CN-029, Trenton, New Jersey

Contact: Anthony Ricigliano, Assistant Director
Telephone: (609) 292-0959

GENERAL RESPONSIBILITY Review and Certification of Funded and Non-Funded Sewerage Facilities Projects				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Review and certification of funded (201) sewerage facilities projects.	V.	A) Population and Flow Projections: Review and certify to conformance with population projection policy (Appendix IV-1), the projections contained in areawide plans, and applicable provisions of federalregulations.	V. Introduction IV.A.1. V. B.2.	+: 40 CFR Part 35 subpart E however not specifically cited in WQM Plan at this time.	+: Annual Water Resources Program Plan, Fiscal Year 1978-79, however not specifically cited in WQM Plan at this time.	+: Annual Water Resources Program Plan, Fiscal Year 1978-79, however not specifically cited in WQM Plan at this time.
		B) Treatment Plant, Interceptor, and Collection System Configurations: Review and certify to conformance with areawide plans, cost effectiveness, environmental acceptability, and applicable provisions of federal regulations.	V.B.1.6. V.B.2			

* Note:
As the lead group for the review and certification of sewerage facilities projects, the Public Wastewater Facilities Element is responsible for ensuring the coordination of internal reviews of projects by the Offices of Areawide Planning, Environmental Assessment, and Sludge Management and Industrial Pretreatment.

GENERAL RESPONSIBILITY Review and Certification of Funded and Non-Funded Sewerage Facilities Projects				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Review and certification of funded (201) sewerage facilities projects (continued)		C) <u>Treatment Levels and Waste Load Allocations</u>: Review and certify to conformance with areawide plans, other requirements established as necessary by Office of Areawide Planning, and applicable federal regulations.	V.B.4 V.B.5			
		D) <u>Evaluation of Alternative Systems:</u> Review and certify to conformance with guidelines for evaluation of alternative systems contained in areawide plans, and applicable federal program guidance and regulations.	V.B.3.			
		E) <u>Evaluation of Environmentally Sensitive Areas</u>: Review and certify to conformance with guidelines for evaluation of environmentally sensitive areas (to be developed) and applicable federal program guidance.	IV.C.2.c.			

GENERAL RESPONSIBILITY Review and Certification of Funded and Non-Funded Sewerage Facilities Projects				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Review and certification of funded (201) sewerage facilities projects (continued).		F) Disinfection: 1) Promulgate new regulations allowing alternative methods of disinfection of wastewater in addition to chlorination.	III.A.2.b.			
		2) Review of facility Plans to determine if new wastewater treatment plants have provided for chlorine optimization where chlorination is proposed as the method of disinfection.	III.A.2.b.			
		G) Sludge Management: Review and certify to conformance with Statewide sludge management plan (to be developed).	V.B.7.			
		H) Industrial Pretreatment: Review and certify to conformance with Statewide industrial pretreatment plan (to be developed).	V.B.6.			

GENERAL RESPONSIBILITY Review and Certification of Funded and Non-Funded Sewerage Facilities Projects				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
2) Review and certification of non-funded sewerage facilities projects.	IV.	A) Review and certify to conformance with requirements of WQM Plan governing population and flow projections. Note: The following activities also apply to non-funded projects however they are not elaborated upon in the WQM Plan at this time. Review and certify to conformance with appropriate State requirements for effluent limitations. Review and certify to conformance with appropriate State regulations governing the engineering design of sewerage facilities. Issue permits for construction of non-funded projects. Issue permits for the operation of non-funded sewerage facilities.	IV.A.1	+: N.J. Water Pollution Control Act, 1977 and NJAC 7:14-1 et seq however not specifically cited in the WQM Plan at this time.	+: Annual Water Resources Program Plan Fiscal Year 1978-79	+: Annual Water Resources Program Plan, Fiscal Year 1978-79.

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Section A

INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCY

Agency: New Jersey Department of Environmental Protection, Division of Water Resources
Office of Areawide Planning
Address: 1474 Prospect Street, P.O. Box CN-029, Trenton, New Jersey 08625

Contact: Joseph Wiley, Program Director
Telephone: (609) 292-0667

GENERAL RESPONSIBILITY Waste Load Allocations				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Establishment of Water Quality Based Effluent Limitations for Waste Treatment Facilities Treating Domestic and/or Industrial Wastes which are Discharged Directly to Surface Waters.	V.B.4	A. As allocations are requested, establish categories of streams based on water quality conditions.	V.B.4	+:V.B.4	-	-
		B. As allocations are requested, determine data requirements for developing effluent limitations.	V.B.4			
2) Develop programs and procedures to implement State's Antidegradation requirements.	V.B.4	C. Employ effluent limitation methodology for each stream category.	V.B.4	+:V.B.4	-	-
		D. Implement procedures for appeal of assigned effluent limits.	V.B.4			

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Section A

INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCY

Agency: New Jersey Department of Environmental Protection, Division of Water Resources
Monitoring, Surveillance, and Enforcement Element
Address: 1474 Prospect Street, P.O. Box CN-029, Trenton, New Jersey 08625

Contact: Richard Bellis, Assistant Director
Telephone: (609) 292-0580

GENERAL RESPONSIBILITY Point Source Dischange Permits				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Incorporation of effluent limitations developed in WQM Plan into point source discharge permits.	V. B.4.	A) Incorporate effluent limitation requirements of the WQM Plan and effluent limitation requirements developed on a case-by-case basis (as indicated in the WQM Plan) into conceptual approval of treatment works, federal NPDES permits, and State NJPDES permits.	V.B.4.c.	+: N.J. Water Pollution Control Act Chapter 74 Regulations NJAC 7:14-1 et seq. WQM Section V.B.4.c.	+: Annual Water Resources Program Plan Fiscal Year 1978-79, however not specifically cited in WQM Plan at this time.	+: Annual Water Resources Program Plan, Fiscal Year 1978-79, however not specifically cited in WQM Plan at this time.

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Section A

INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCY

Agency: New Jersey Department of Agriculture, Division of Rural Resources, State Soil Conservation Committee
Address: P.O. Box 1888, Trenton, New Jersey 08625

Contact: Phillip Alampi, Chairman (Samuel R. Race, Executive Secretary)
Telephone: (609) 292-5540

GENERAL RESPONSIBILITY Best Management Practices for Agriculture, Silviculture, Construction, and Surface Mining				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Coordinate Soil Conservation District Programs for Best Management Practices Implementation.	VI.C.2.c	A. Assist Soil Conservation Districts as they manage voluntary program to implement Best Management Practices for agriculture and silviculture.	VI.C.2.c and VI.C.2.d	+:W.P.8.1/ 8.2	-	-
		B. Provide leadership to the Soil Conservation Districts as they manage a regulatory program to implement Best Management Practices for construction and surface mining activities.	VI.C.2.c and VI.C.2.d			

GENERAL RESPONSIBILITY				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
2) Perform Related State Level Administrative Functions.	VI.C.2.c	A. Assist Soil Conservation Districts as they administer "special projects" for implementation of Best Management Practices.	VI.C.2.c and VI.C.2.d	+:W.P. 8.1/8.2	-	-
		B. Perform as liaison between local Soil Conservation Districts and other State agencies' programs.	VI.C.2.c and VI.C.2.d			

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Section A

INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCY

Agency: New Jersey Soil Conservation Districts (Bergen, Burlington, Camden, Cape-Atlantic, Cumberland, Freehold, Gloucester, Hudson-Essex-Passaic, Hunterdon, Mercer, Morris, Ocean, Salem, Somerset-Union, Sussex, and Warren).
Address: See Attachment
Contact: See Attachment
Telephone: See Attachment

GENERAL RESPONSIBILITY Best Management Practices for Agriculture, Silviculture, Construction, and Surface Mining				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Assist Farmers and Woodland Owners to Voluntarily Implement Best Management Practices.	VI.C.2.c	A. Conduct comprehensive public information and education program.	VI.C.2.d	+: W.P. 8.1/8.2		
		B. Prioritize problem pollution categories and/or geographic areas for BMP implementation	VI.C.2.d			
		C. Develop timetable to achieve nonpoint pollution water quality goals.	VI.C.2.d			
		D. Administer "Special Projects" where specific funding for water quality problems becomes available.	VI.C.2.c			
2) Regulate Construction Activities to Implement Best Management Practices.	VI.C.2.c	A. Modify the N.J. Soil Erosion & Sediment Control Act of 1975 (Ch.251)	VI.C.2.d	+: W.P. 8.1/8.2		

GENERAL RESPONSIBILITY				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
3) Develop Surface Mining Regulations to Implement Best Management Practices.	VI.C.2.C	A. Modify the N.J. Soil Erosion and Sediment Control Act of 1975. (ch. 251)	VI.C.2.d	+: W.P. 8.1/8.2	-	-

ADDRESS LIST - SOIL CONSERVATION DISTRICTS

Bergen County SCD
405 State Street
Hackensack, N.J. 07601
Contact: Col. C.E. Tarvin, Chairman
(Robert Glennon, Dist. Admin.)
Telephone: (201) 489-7777

Burlington County SCD
Cramer Building, Route 38
Mount Holly, N.J. 08060
Contact: John R. Traino, Chairman
(Raymond Gravatt, Dist. Mgr.)
Telephone: (609) 267-7410

Camden County SCD
Municipal Building
59 W. White Horse Pike
Berlin, N.J. 08009
Contact: Robert K. Dobbs, Chairman
(Robert Pacione, Natural Resource Assistant)
Telephone: (609) 767-3977)

Cape-Atlantic SCD
1200 W. Harding Highway
Mays Landing, N.J. 08330
Contact: Louis M. DiLuzio, Chairman
(Dominick J. Cassetta, Jr., District Manager)
Telephone: (609) 625-9400

Cumberland SCD
P.O. Box 148, Rt. 77
Seabrook, N.J. 08302
Contact: Norman H. Shimp, Chairman
(Rudolph Carnegie, Dist. Mgr.)
Telephone: (609) 451-2144

Freehold SCD
20 Court Street
Freehold, N.J. 07728
Contact: Edward Donnelly, Chairman
(Gary Eichler, Dist. Mgr.)
Telephone: (201) 431-3850

Gloucester County SCD
N. Blackhorse Pike
P.O. Box L
Williamstown, N.J. 08094
Contact: Harvey Skinner, Chairman
Telephone: (609) 478-2497

Hudson, Essex, Passaic SCD
201 Bloomfield Avenue
Verona, N.J. 07044
Contact: Martin Hamstra, Chairman
(Robert Glennon Dist. Admin.)
Telephone: (201) 489-7777

Hunterdon County SCD
Agricultural Center RD 6, Box 49
Flemington, N.J. 08822
Contact: John VanNuys, Chairman
(A. William Dietze, Dist. Dir.)
Telephone: (201) 782-3915

Mercer County SCD.
930 Spruce Street
Trenton, N.J. 08648
Contact: C. Howell Updike, Chairman
(James L. Morley, Dist. Mgr.)
Telephone: (609) 989-6847

Morris County SCD
Court House
Morristown, N.J. 07960
Contact: G. Mills Bockover, Chairman
(Steve Widuta, Dist. Dir.)
Telephone: (201) 285-6110

Ocean County SCD
Agricultural Center
Whitesville Road
Toms River, N.J. 08753
Contact: Frank Bartolf, Chairman
(David Friedman, Dist. Mgr.)
Telephone: (201) 244-7048

ADDRESS LIST - SOIL CONSERVATION DISTRICTS

Salem SCD
1000 East, Rt. 40,
P.O. Box 47
Woodstown, N.J. 08098
Contact: Newton Layton, Chairman
Telephone: (609) 769-1124

Somerset-Union SCD
Somerset County 4-H Building
308 Milltown Road
Bridgewater, N.J. 08807
Contact: John Koscielny, Chairman
(Ernest H. Thurlow, Dist. Mgr.)
Telephone: (201) 526-2701

Sessex County SCD
R.D. 1 - Box 13
Newton, N.J. 07860
Contact: Delbert Voight, Chairman
(Phyllis M. Bauer, Dist. Mgr.)
Telephone: (201) 383-7315

Warren County SCD
Stiger Street
Hackettstown, N.J. 07840
Contact: Norman Schnetzer, Chairman
(Duane Copley, Dist. Mgr.)
Telephone: (201) 852-2579

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Section A

INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCY

Agency: New Jersey Department of Environmental Protection, Solid Waste Administration

Address: Trenton, New Jersey 08625

Contact: Beatrice Tylutki, Director of Solid Waste Administration
Telephone: (609) 292-9120

GENERAL RESPONSIBILITY Sanitary Landfill Water Quality Monitoring				DOCUMENTATION OF AUTHORITY AND CAPABILITY		
Specific Responsibility	Plan Reference	Work Activities to Carry Out Responsibilities	Reference	Legal Authority	Financial Capability	Institutional Capability
1) Implement specific provisions of the Solid Waste Administration Rules regarding the number and placement of monitoring wells necessary at a sanitary landfill, and the necessity of surface water quality monitoring near a landfill.	VI.C.3	To be developed		-	-	-
2) Coordinate with Division of Water Resources on sampling program quality assurance, inclusion of analytical results into STORET system, and enforcement.	VI.C.3	To be developed		-	-	-

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES

Section B

The following tables list the agencies proposed for interim designation as management agencies for the planning and management of sewerage facilities. The format of the tables in this section differs from that in Section A because of the specific responsibilities that the proposed management agencies for sewerage facilities are to assume. The tables in this section identify the type of sewerage facility requiring planning and management. Sewerage facility types are organized into treatment works, conveyance systems, collection systems, and alternative systems. For each sewerage facility type, an agency is identified for both management and planning responsibilities. Management responsibilities are divided into construction, operation, and maintenance functions. More specific planning responsibilities have not been identified in the tables. Planning for sewerage facilities is to be conducted in accordance with federal regulations and appropriate provisions of the WQM Plan, especially those of Chapter 5. The tables do not include an indication of proposed agency authority and capability since this information will be documented at a later date.

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Section B

INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES FOR SEWERAGE FACILITIES

Wanaque Valley Regional Sewerage Authority (WVRSA)

Type of Facility	Responsibility: Management — Construct Operate Maintain	Responsibility: Planning
1. Treatment Works	WVRSA for the regional facility facility to be constructed in Wanaque	WVRSA
2. Conveyance	WVRSA	WVRSA
3. Collectors	The municipalities in the facilities planning area or their designated authority.	
4. Alternative Systems (On-site and Packaged Plants)		

Northwest Bergen County Utilities Authority (NWBCUA)

Type of Facility	Responsibility: Management — Construct Operate Maintain	Responsibility: Planning
1. Treatment Works	NWBCUA for regional facility located in Waldwick.	NWBCUA including alternative systems
2. Conveyance	NWBCUA	NWBCUA
3. Collectors	The municipalities in the facilities planning area or their designated authority.	
4. Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES
FOR SEWERAGE FACILITIES

Bergen County Utilities Authority (BCUA)

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	BCUA for regional facility at Little Ferry.	BCUA
2. Conveyance	BCUA	BCUA
3. Collectors	The municipalities in the facilities planning area or their designated authority.	
4. Alternative Systems (On-site and Packaged Plants)		

Pequannock River Basin Regional Sewerage Authority (PRBRSA)

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	PRBRSA for regional facility located in Bloomingdale.	PRBRSA
2. Conveyance	PRBRSA	PRBRSA
3. Collectors	The municipalities in the facilities planning area or their designated authority.	
4. Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES FOR SEWERAGE FACILITIES

Pompton Lakes M.U.A.

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	Pompton Lakes MUA for the regional facility in Pompton Lakes.	Pompton Lakes MUA including alternative systems.
2. Conveyance	Pompton Lakes MUA	Pompton Lakes MUA
3. Collectors	The municipalities in the facilities planning area or their designated authority.	
4. Alternative Systems (On-site and Packaged Plants)		

Ridgewood - Fair Lawn

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	Ridgewood for its facility in Glen Rock. Fair Lawn for its facility in Fair Lawn.	Ridgewood-Fair Lawn
2. Conveyance	Ridgewood for its conveyance system. Fair Lawn for its conveyance system.	Ridgewood and Fair Lawn separate
3. Collectors	The municipalities in the facilities planning area or their designated authority.	
4. Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES
FOR SEWERAGE FACILITIES

Rockaway Valley Regional Sewerage Authority (RURSA)

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	RVRSA for the regional facility located in Boonton.	RVRSA
2. Conveyance	RVRSA	RVRSA
3. Collectors	The municipalities in the facilities planning area or their designated authority	
4. Alternative Systems (On-site and Packaged Plants)		

Parsippany - Troy Hills

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	Parsippany-Troy Hills for the regional facility located in Parsippany Troy-Hills	Parsippany-Troy Hills
2. Conveyance	Parsippany-Troy Hills	Parsippany-Troy Hills
3. Collectors	The municipalities in the facilties planning area or their designated authority	
4. Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES
FOR SEWERAGE FACILITIES

Pequannock, Lincoln Park, and Fairfield (P, LP, and F)

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	P, LP and F for the facility being constructed in Lincoln Park.	P, LP and F.
2. Conveyance	P, LP and F.	P, LP and F.
3. Collectors	The municipalities in the facili-planning area or their designated authority.	
4. Alternative Systems (On-site and Packaged Plants)		

Wayne

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	Wayne for the Mountain View facility	Wayne
2. Conveyance	Wayne	Wayne
3. Collectors	Wayne	Wayne
4. Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES
FOR SEWERAGE FACILITIES

Totowa - West Paterson

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	Totowa for the Riverview plant. West Paterson for its facility.	Totowa-West Paterson
2. Conveyance	Totowa and West Paterson separately for their respective conveyance systems.	Totowa and West Paterson separately
3. Collectors	Totowa for their collectors. West Paterson for their collection system.	Totowa and West Paterson separately.
4. Alternative Systems (On-site and Packaged Plants)		

Passaic Valley Sewerage Commissioners (PVSC)

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	PVSC for the regional facility located in Newark	PVSC
2. Conveyance	PVSC	PVSC
3. Collectors	The municipalities in the facilities planning area or their designated authority.	
4. Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES
FOR SEWERAGE FACILITIES

Edgewater

	Type of Facility	Responsibility: Management (Construct, Operate, Maintain)	Responsibility: Planning
1.	Treatment Works	Edgewater for the facility located in Edgewater.	Edgewater
2.	Conveyance	Edgewater	Edgewater
3.	Collectors	The municipalities in the facilities planning area or their designated authority.	
4.	Alternative Systems (On-site and Packaged Plants)		

Caldwell

	Type of Facility	Responsibility: Management (Construct, Operate, Maintain)	Responsibility: Planning
1.	Treatment Works	Caldwell for the regional facility located in West Caldwell	Caldwell
2.	Conveyance	Caldwell	Caldwell
3.	Collectors	The municipalities in the facilities planning area or their designated authority.	
4.	Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES
FOR SEWERAGE FACILITIES

Peckman River

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	The municipalities of Little Falls, Cedar Grove and Verona along with the Essex County Improvement Authority for their respective facilities.	Peckman River
2. Conveyance	The municipalities of Little Falls, Cedar Grove and Verona along with the Essex County Improvement Authority for their respective conveyance systems.	
3. Collectors		
4. Alternative Systems (On-site and Packaged Plants)	The municipalities of Little Falls, Cedar Grove and Verona along with the Essex County Improvement Authority for their respective conveyance systems.	

Hudson County Sewerage Authority (HCSA)

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	HCSA for the facilities located in Secaucus, Bayonne, Jersey City, and Hoboken.	HCSA
2. Conveyance	HCSA	HCSA
3. Collectors	The municipalities in the facilities planning area or their designated authority.	
4. Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES
FOR SEWERAGE FACILITIES

Morris Township

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	Morris Township for their Butterworth and Woodland facilities.	Morris Township, Whippany and Upper Passaic River Basin Wastewater Management Committee(WMC)
2. Conveyance	Morris Township	Morris Township
3. Collectors	The municipalities in the facilities planning area or their designated authority.	
4. Alternative Systems (On-site and Packaged Plants)		Morris Township

Morristown

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	Morristown for their facility located in Hanover	Morristown and Whippany River Basin WMC
2. Conveyance	Morristown	Morristown
3. Collectors	Morristown	Morristown
4. Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES
FOR SEWERAGE FACILITIES

Hanover

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	Hanover for their facility	Hanover and Whippany River Basin WMC
2. Conveyance	Hanover	Hanover
3. Collectors	Hanover	Hanover
4. Alternative Systems (On-site and Packaged Plants)		

Mendham Township and Mendham Borough

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works (including Alternative Systems)	Mendham Township and Mendham Borough	Mendham
2. Conveyance	Mendham Township and Mendham Borough	Mendham
3. Collectors	Mendham Township and Mendham Borough	Mendham
4. Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES FOR SEWERAGE FACILITIES

Livingston - Florham Park

	Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1.	Treatment Works	Livingston for its facility. Florham Park for its facility.	Livingston - Florham Park including alternative systems.
2.	Conveyance	Livingston for its conveyance system. Florham Park for its conveyance system.	Livingston and Florham Park separately.
3.	Collectors	Livingston for its collectors. Florham Park for its Collection System.	Livingston and Florham Park separately.
4.	Alternative Systems (On-site and Packaged Plants)		

Essex and Union County Joint Meeting (E&U Jt Mtg)

	Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1.	Treatment Works	E & U Jt. Mtg. for the regional facility located in Elizabeth	E & U Jt. Mtg.
2.	Conveyance	E & U Jt. Mtg.	E & U Jt. Mtg.
3.	Collectors	The municipalities in the facilities planning area or their designated authority.	
4.	Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES
FOR SEWERAGE FACILITIES

Bernards

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	Bernards for its facility	Bernards and Upper Passaic River WMC
2. Conveyance	Bernards	Bernards
3. Collectors	Bernards	Bernards
4. Alternative Systems (On-site and Packaged Plants)		

Passaic - Warren

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	Passaic-Warren for the regional facility to be located in Passaic	Passaic-Warren and Upper Passaic River Basin WMC
2. Conveyance	Passaic-Warren	Passaic-Warren
3. Collectors	Passaic-Warren	Passaic-Warren
4. Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES
FOR SEWERAGE FACILITIES

Chatham Township

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	Chatham Twp. for its facility	Chatham Twp. and Upper Passaic River Basin WMC
2. Conveyance	Chatham Twp.	Chatham Twp.
3. Collectors	Chatham Twp.	Chatham Twp.
4. Alternative Systems (On-site and Packaged Plants)		

Madison - Chatham

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	Madison-Chatham for the regional facility located in Chatham Borough	Madison-Chatham and Upper Passaic River Basin WMC
2. Conveyance	Madison-Chatham	Madison-Chatham
3. Collectors	Madison-Chatham	Madison-Chatham
4. Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES FOR SEWERAGE FACILITIES

New Providence

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	New Providence for its facility	New Providence and Upper Passaic River Basin WMC
2. Conveyance	New Providence	New Providence
3. Collectors	New Providence	New Providence
4. Alternative Systems (On-site and Packaged Plants)		

Berkeley Heights

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	Berkeley Heights for its facility	Berkeley Heights and Upper Passaic River Basin WMC.
2. Conveyance	Berkeley Heights	Berkeley Heights
3. Collectors	Berkeley Heights	Berkeley Heights
4. Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES FOR SEWERAGE FACILITIES

Rahway-Valley Sewerage Authority (RVSA)

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	RVSA for the regional facility located in Rahway	RVSA
2. Conveyance	RVSA	RVSA
3. Collectors	The municipalities in the facilities planning area or their designated authority	
4. Alternative Systems (On-site and Packaged Plants)		

Linden-Roselle Sewerage Authority (L-RSA)

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	L-RSA for the regional facility located in Linden	L-RSA
2. Conveyance	L-RSA	L-RSA
3. Collectors	L-RSA	L-RSA
4. Alternative Systems (On-site and Packaged Plants)		

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INTERIM DESIGNATION OF PROPOSED MANAGEMENT AGENCIES
FOR SEWERAGE FACILITIES

Harding

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works	Harding	Harding
2. Conveyance	Harding	Harding
3. Collectors	Harding	Harding
4. Alternative Systems (On-site and Packaged Plants)		

Type of Facility	Responsibility: Management (Construct Operate Maintain)	Responsibility: Planning
1. Treatment Works		
2. Conveyance		
3. Collectors		
4. Alternative Systems (On-site and Packaged Plants)		