

Introduction

Importance of Watershed Planning

Water is one of the many important resources of the Passaic River Basin, which is inhabited by over two million people and extends over an area of 936 square miles (sq. mi.) in New Jersey (788 sq. mi.) and New York (148 sq. mi.).

Water is essential to life. Clean and adequate supplies of water are essential for ecologic health as well as economic health and, therefore, provide the basis for healthy, vibrant, livable communities. These facts are commonly understood, but the availability of water suitable for man and the ecosystem is often taken for granted. The Passaic River Basin is the source of drinking water for over half of New Jersey's residents as well as water for irrigation and industry. In addition, the Basin is also used for many recreational activities including boating, fishing and hiking, and provides habitat for many aquatic and terrestrial organisms. Man and the natural environment are dependent upon the water resources available to the geographical area they inhabit, and the quantity and quality of the water resources are dependent upon the activities of the inhabitants. Natural features and events that occur in a geographical area have a major influence on the water resources of that area, and are largely beyond the control of man. However, the actions of the human population that lives and works in a geographic area can have a profound influence on local and regional water resources.

A watershed is a geographic region whose surface runoff drains to a common point, generally at the mouth or major location along a waterway. The limits of a watershed are generally determined based upon ground surface elevations and a delineation of the topographic ridgelines that define the direction of flow of water on the surface of the land. A designated Watershed Management Area (WMA) may contain one or more watersheds.

Unless mankind is aware of the potential impacts of its actions, the inhabitants of a watershed can destroy the very resources that are essential to their well being, and that of the ecological system in which they live.

The individual resident or worker may think that his actions are of little consequence and that water pollution is caused by industry or inadequate treatment of wastewater discharged to streams. They may be unaware that the actions of every person can have an impact. They may give little thought to the consequences of actions such as:

- Washing an automobile in the driveway and letting soapy water flow to a storm sewer inlet,
- Dumping unwanted materials into a storm sewer inlet or onto the ground,
- Using a dishwashing detergent containing phosphorous,
- Applying excessive fertilizers or pesticides to their lawn,
- Feeding the geese in the local park, or
- Failing to pick up pet waste.

These are examples of non-point sources of pollution. Each of these actions has a detrimental effect on water resources and can cause contamination of lakes and streams.

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The pollutants that we directly or indirectly allow to enter our waterways can adversely affect the environment and can end up in the source of our drinking water.

In the United States, efforts to reduce pollution due to surface water discharges began a little more than 100 years ago. Yet many of our waterways continued to degrade until major advancements in wastewater treatment were achieved following adoption of the federal Clean Water Act (CWA) of 1972 and subsequent amendments that provided for establishing and enforcing water quality standards, and funding for planning and for constructing required wastewater conveyance and treatment facilities. For two decades the emphasis of programs under the CWA was on addressing point sources of pollutants, such as domestic wastewater treatment plants and industrial process discharges, and on reducing the loss of wetlands, which were recognized as important components of the ecological system.

Significant improvements in water quality were achieved in the 1980s and 1990s, but the work is not over. Prior to the State of New Jersey Department of Environmental Protection (NJDEP) implementing an integrated approach to address water pollution issues, actions were often focused on individual aspects of the overall problem. Under the integrated approach, consideration is given to the concerns of multiple stakeholders such as environmental groups, municipal and county officials, industrial and municipal wastewater dischargers, water purveyors, development interests and agriculture. Taking a comprehensive, inclusive, and integrated approach to water resources planning, allocation and management is intended to produce a strategic action plan to better protect water quantity, water quality and related resources for current and future needs. Greater cooperation leads to widespread support for agreed upon management objectives and action plans, and reduced reliance on new regulatory requirements and litigation.

Effective water resources planning and management efforts have certain basic characteristics. These are:

- Comprehensive – in terms of basin geography, political units, and water resources;
- Inclusive – attentive to stakeholders and attentive to their environmental, social, regulatory and economic goals; and
- Integrated – taking stock of relationships between the quantity and quality of water, ground and surface water interaction, as well as interactions of other natural resources and environmental conditions.

Needs of competing interests, such as the ecological system, water supply and wastewater assimilation, are evaluated. The combined effects of point sources and non-point sources of pollution are considered, goals are identified, and management strategies are developed to protect and improve the water resources of a geographic region on a Watershed Management Area (WMA) basis.

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Project Background

The NJDEP has divided the state into five (5) Water Regions containing a total of twenty (20) WMAs including watersheds of 37 major rivers or groups of smaller rivers, as shown on Plate 0.6.1. The northeast portion of the state has been designated as the *Passaic Region*, which is divided into four (4) WMAs. One WMA (WMA 5) includes the Hackensack and Pascack watersheds, which are not tributary to the Passaic River. The area tributary to the Passaic River at its mouth at Newark Bay has been divided into three (3) WMAs, which contain ten (10) major watersheds, as follows:

- WMA 3 – Pompton, Pequannock, Wanaque, Ramapo River watersheds
- WMA 4 – Lower Passaic, Saddle River watersheds
- WMA 6 – Upper and Middle Passaic, Whippany, Rockaway River watersheds

The interrelationship of these three Watershed Management Areas is reviewed in Subsection 0.6 below and elsewhere in this report.

Watershed Management Planning is divided into two major phases:

Phase I – Watershed Characterization and Assessment

Phase II – Watershed Management Planning

Phase I - Watershed Characterization and Assessment provides for characterization of the water resources conditions in the watershed and identifies gaps between the current and desired conditions. This phase also includes identification of issues to be addressed in the subsequent planning process (Phase II). This report is part of the Phase I process and a further description of the scope of the project is presented below under Subsection 0.4.

Phase II - Watershed Management Planning includes the development of a Basin Management Plan that will be adopted as an official policy document by NJDEP under NJAC 7:15, the Water Quality Management Planning Rules (to be renamed the Watershed Management Rules).

Phase II - Watershed Management Planning activities generally include:

- Stakeholder participation in the process of developing the plan;
- Public education and training;
- Development of the Total Maximum Daily Load (TMDL) for critical parameters for a waterway segment or lake and establishing objectives to meet the surface water quality standards;
- Management Plan development, including documenting the technical basis for policy options, management actions, responsible parties, schedules and funding sources for preservation and restoration of water resources in the watershed;
- Interim Protection and Restoration Actions to identify projects that can be implemented in the field to quickly provide benefits.

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0.1 Purpose of the Report

Separate Phase I – Watershed Characterization and Assessment reports have been prepared for each WMA in the Passaic River Basin, that is, for WMAs 3, 4 and 6.

The reports provide information on the state of the watersheds in each WMA. The Watershed Management Areas (WMAs) have been designated by NJDEP and therefore, from a watershed management jurisdictional basis, only include the area in New Jersey. For this reason, the limits of WMA 3 and 4 shown on Plate 0.6.1 terminate at the state boundary. However, the natural watersheds also include areas in New York, and the Watershed Characterization reports include information for the entire area of those watersheds included in the respective WMA. Therefore, detailed maps developed for WMAs 3 and 4 cover the entire area of the watersheds for each of these WMAs.

0.2 Project History

- **WMA 3 and WMA 4**

WMA 3:

- Covers approximately 238 square miles in NJ
- Includes additional watershed area of approximately 140 square miles in NY
- Includes nine surface water reservoirs
 - Includes the Newark watershed lands and system of five reservoirs
 - Contains the Wanaque and Monksville Reservoirs - sources of drinking water for over 2 million New Jersey residents
 - Contains the Butler and Point View Reservoirs
- Spans 21 municipalities in four counties (Bergen, Morris, Passaic and Sussex) in NJ
- The watersheds extend into two counties (Orange and Rockland) in NY

WMA 4:

- Covers approximately 188 square miles in NJ
- Includes an additional watershed area of approximately 8 square miles in NY
- Includes the Great Falls of Paterson
- Spans 66 municipalities in five counties (Bergen, Essex, Hudson, Morris and Passaic) in NJ
- The watershed extends into one county (Rockland) in NY

Kickoff Meetings were held to begin the watershed planning process in WMAs 3 and 4 in March and February of 2001, respectively. Public Advisory Committees (PACs) were formed for each WMA. The PACs include representatives of interested Stakeholder groups in each WMA. In addition, Technical Advisory Committees (TACs) were formed to address specific issues or concerns in each WMA. Other work groups/committees focus on Education & Outreach, Open Space Preservation and other issues determined by the PAC. The Education and Outreach Committees have been meeting since April 2001, and the Open Space Committees began meeting in May 2001.

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- **WMA 6**
- Covers approximately 361 square miles in NJ
- Contains seven reservoirs
 - Boonton and Splitrock Reservoirs owned by Jersey City
 - Three New Jersey American Water Company reservoirs
 - Clyde Potts Reservoir and Taylortown Reservoir
- Includes a large portion of the area inundated by Glacial Lake Passaic, and major wetland habitats including the Great Swamp, Great Piece Meadows and Troy Meadows
- Spans 52 municipalities in five counties (Essex, Morris, Somerset, Sussex and Union) in NJ

Several groups in WMA 6 have made significant progress in the watershed, and have successfully worked in their respective watershed towns towards adoption of ordinances for non-point source control : i.e., the Whippany River PAC has prepared a Nonpoint Source Control Guidance Manual and worked with NJDEP to develop an Action Now Strategy for the Whippany River Watershed; the Rockaway River Watershed Cabinet and Ten Towns Great Swamp Watershed Committee have each developed watershed management plans that were accepted by the towns in each watershed. Many groups have participated in the WMA 6 PAC, TAC, and the Education/Outreach and Open Space Committees.

0.3 Project Oversight

On October 30, 2000, the New Jersey Department of Environmental Protection (NJDEP) contracted with the North Jersey District Water Supply Commission (the Commission) to function as its lead entity responsible for development of a watershed management plan for each WMA (WMA 3, 4 and 6) individually with an overview of planning for the Passaic River Basin as a whole. A consortium of organizations representing interests in each WMA agreed to assist the Commission in the process.

The Commission retained the services of a team of consultants to complete certain technical watershed management tasks described below for the Passaic River Basin WMAs 3, 4 and 6.

The purpose of the Passaic River Basin Watershed Management Plan process was the following:

- Develop a baseline of information necessary to evaluate current water quality, quantity, and ecosystem health conditions in the Passaic River Basin.
- Provide a baseline of information upon which to identify problems or gaps between water resources conditions desired and what presently exists, root causes for the identified problems or gaps, and their relative contributing factors.
- Provide a baseline of information upon which to examine what must be corrected (and to what extent) to achieve the standard for water use desired or designated.

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The technical portion of this process is this Watershed Characterization and Assessment Report. This document provides an understanding of the watershed. It is meant to be a living document that provides a compendium of current data and information related to the Passaic Basin that has been synthesized and analyzed to provide findings, guidance, and identification of information gaps. As the data and information gaps are filled, a more informed state of the watershed will emerge.

0.4 Scope of Project

The technical services for the project were divided into four major tasks:

Task 1 – Settings of WMAs 3, 4 & 6 / Identification of Watershed Stressors

Task 2 – GIS Mapping of WMAs 3, 4 & 6

Task 3 – Limnological Consulting

Task 4 – General Consulting and Project Oversight

Task 1 – Settings of WMAs 3, 4 & 6 / Identification of Watershed Stressors

Task 1 essentially consists of:

- Describing current conditions in each WMA such as natural resources, including surface water and groundwater resources, water supply and availability, recreational uses and demographics. See Section 1 of this report.
- Description of land use and land cover, use patterns and modern trends. See Section 2.
- Identification of potential sources of contamination - identification of stressors causing chemical, physical and biological impairment in aquatic resources and their causes. See Section 3.
- Review of surface water quality, including a summary of key issues, indicators, trends and prior management recommendations. See Section 4.
- Conducting a point and non-point source pollutant loading analysis of each WMA. See Section 5.
- Review of federal, state and local policy environment. See Section 6.
- A summary of technical findings. See Section 7.
- Management strategies and practices for each WMA. See Section 8.

In association with providing watershed characterization information and guidance under Task 1, the chairpersons of the Public Advisory Committee (PAC) and the Technical

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Advisory Committee (TAC) for each WMA were each furnished with a notebook containing information that could be used to aid in the selection of “endpoint” locations and water quality goals. Reference materials included: information regarding parameter concepts; list of diversions and reservoirs in WMAs 3, 4 and 6; NJ Surface Water Quality Standards (Supp 1-22-02); EPA 303d list for Hackensack-Passaic Basin; a copy of the paper entitled “Technical Approaches to Restore Impaired Waterbodies within the Non-tidal Passaic River Basin”, NJDEP (dated October 2001); and a partial copy of “Stressor Identification Guidance Document” (Table of Contents, Acronym List, Executive Summary, Chapter 1) EPA, December 2000. The notebook also included a map entitled “Impaired Waterbodies in the Passaic Basin Watersheds WMA 3, 4, & 6” based on the 303d list published by USEPA.

Task 2 – GIS Mapping of WMAs 3, 4 & 6

Under Task 2, approximately 36 maps were prepared for each WMA showing watershed characteristics such as watershed limits, natural resources, transportation networks, land use, locations of potential sources of contamination, surface water and groundwater dischargers, surface water monitoring stations, surface water impairments, and demographic information. Maps were developed using digital data in a Geographical Information System (GIS) format. Paper copies of the maps for this WMA are included and referenced in this report. Copies of the maps for all three WMAs are available as “static” images on the Passaic River Basin Project web site. The Project web site also includes “dynamic” or “interactive” maps for the area of all three WMAs that allow the user to focus on a geographical area, make inquiries of specific features and develop their own customized maps, which can be saved to the user’s computer as an image and printed. A tutorial section was prepared and posted on the web site to assist the public user of the interactive maps. The maps may be accessed by connecting to the Passaic River Basin Project web site at: <http://www.njdwsc.com/prbwmp/index.htm>.

An instructional session for use of the interactive web site resources was conducted on June 27, 2002, at the Passaic County Community College.

The Commission plans to maintain the GIS database upon completion of the Phase I - Watershed Characterization and Assessment project.

Task 3 - Limnological Consulting

The consultant team had some initial discussion of concepts of endpoints as water quality goals with Commission staff and members of the Consortium and developed a preliminary list of “endpoint” locations for water quality goals in the three WMAs for further review with PAC and TAC chairpersons prior to presentation to the full committees.

An outline of concepts for consideration in the selection of locations of concern and water quality goals was developed and reviewed with PAC and TAC chairpersons at meetings on March 11 and 14, 2002. The chairpersons were each presented with a 3-ring

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binder notebook containing relevant reference information (See description above). The chairpersons were requested to provide a list of locations of concern identified by their committees. A survey form was mailed to municipalities in each WMA.

The responses to the survey form provided to the PACs, TACs and municipalities were compiled and then reviewed by the consultants.

Activities included development of a draft advisory report discussing aquatic ecosystem resources, classification approaches for flowing and standing water systems, and critical natural features of different ecosystem types. Critical natural features and functional attributes of each aquatic ecosystem type are discussed as a foundation for developing a watershed management plan during subsequent project phases. Areas of further research and development were identified. (See Section 8 of this report.)

Task 4 – General Consulting and Project Oversight

Services provided under Task 4 are primarily for Project Oversight, and generally have included coordination of the consultant team and preparing progress reports.

Services also included developing a series of maps requested for use by WMA 4 TAC in selecting EWQ sites. The overall WMA 4 map was updated based on discussions at the April 2002 TAC meeting, and a series of local maps and aerial photos were developed depicting each site and alternative site being considered by the TAC.

0.5 Statement of Goals and Objectives

For Phase I – Watershed Characterization and Assessment

The primary goal of Phase I – Watershed Characterization and Assessment is to provide a technical basis for understanding the condition of water resources in the WMA and the factors affecting those resources. The Phase I report includes a description of existing water quality and trends, a comparison of present conditions to water quality standards, and identification of stressors affecting water resources. This characterization and assessment process allows the identification of gaps between current and desired conditions. The technical information serves as a basis for stakeholder education, issue identification, and management plan development in Phase II.

The objectives of the Phase I - Watershed Characterization and Assessment project services include:

- Document and catalog the historic and existing conditions in the watershed and identify watershed stressors.
- Provide a Geographic Information System (GIS) basis for watershed management planning.
- Provide technical information and expert analysis to the Commission concerning waterbody health and management.

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- Provide technical assistance to the Commission on an as-needed basis and coordinate the project team of consultants.

The first three objectives provide a technical basis for further planning for the WMAs. Much of the data gathered for this project is dynamic. Agencies are continuing to collect water quality and flow data. NJDEP and other agencies are continually updating the digital data available for download over the Internet. Therefore, designation of the source of the data for future reference is perhaps more useful for future planning than the collection of the data in its present form. Many references are provided throughout the report providing the reader with the location where updated data can be obtained.

By WMA PAC and TAC

Within each WMA, the PAC and TAC have developed vision statements, goals and objectives to varying degrees. As of June 2002, the following vision statements, goals and objectives have been developed for the indicated watershed.

WMA 3

The vision of WMA 3 is clean and plentiful water and a healthy ecosystem for now and the future. Through comprehensive management and education we will inspire and enable cooperative stewardship, restoration and conservation of all of our resources by means that are environmentally sound as well as economically viable.

WMA 4

The vision of WMA 4 is to preserve, protect, enhance and restore our water resources and the associated ecosystem and to instill pride in our rivers, streams, lakes and ponds. We will accomplish this through a balanced approach consisting of education, stewardship and managed growth in accord with available water resources while being environmentally sound and economically viable. We have created this vision for the benefit of our children and for future generations.

Key issues discussed in the Visioning Process (no goals have been formally adopted as of October 2002):

- Education
- Remediate Non-Source Pollution
- Preserve Open Space
- Instill Pride
- Restoration of Recreational Use of Lower Passaic
- Stakeholder Involvement/More Public Involvement
- Access Availability and Quality of Water
- Communication of Information

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- Collaborative Relationship Among All Parties (Government, NGO's, Citizens)
- Plan for Managed (Smart Growth)
- Fiscal Planning/Budgeting
- Protect Our Lakes, Reservoirs, etc.
- CSO's
- Providing Regulatory "Teeth"
- Steady Improvement of All Measures of Environmental Quality
- Increase River Access
- Managing Storm Water
- Raising Ground Water Levels
- Recycling Wastewater Effluent
- Stewardship
- Decrease Floatable Debris

WMA 6

Mission Statement/Purpose/Vision:

Our established vision for Watershed Management Area 6 is to maintain, and to restore, as needed, a watershed that is valued for the many environmental, economic, and aesthetic benefits it provides, including clean and available ground and surface water supplies, environmentally responsible economic activities, maintenance of aquatic ecosystem health, and recreational opportunities.

Goal 1: Public Health: *To recognize that public health protection is fundamental to watershed management.*

Objective 1. Maintain and improve the health of the watershed to protect public health.

Goal 2: Public Education and Outreach: *To have active participation in water resource management.*

- Foster local government's role in watershed management.
- Foster all stakeholders' roles in watershed management.
- Promote public education of the beneficial uses of water resources.

Objective 2. Increase environmental awareness through education for government, schools, stakeholders and the general public.

Goal 3: Research and Evaluation: *To have a better understanding of the dynamic interactions between the activities of people and the functioning of the ecosystems within the watershed.*

- Continue to monitor and assess the quantity and quality of surface and ground water.

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- Continue to monitor and assess the interrelationships of water quality, water quantity and ecosystems.
- Continue to monitor and assess impacts of existing and proposed human activities on water resources.
- Continue to monitor and assess existing conditions by quantitative chemical, physical and biological indicators.
- Coordinate and improve data collection and evaluation and integrate research efforts within the watershed.
- Inform stakeholders about findings.

Objective 3. Foster research and assessment of the natural resources of the watershed.

Goal 4.1: Maintenance and Improvement of the Watershed: *To maintain and preserve the quality and quantity of current water resources within the watershed.*

- *To improve the livability and habitat for people and other biota in the watershed.*
- *To protect quantities of surface and ground water for water supplies.*

Objective 4. Increase, or at a minimum, maintain recharge to ground water and ground water levels.

Objective 5. Maintain stream base flows.

Objective 6. Reduce consumptive uses of water.

Objective 7. Increase reuse of water within WMA 6.

Objective 8. Strive to sustain water supplies by considering reducing reliance on sources of water from outside WMA 6.

Goal 4.2: *To protect the quality of surface and ground water supplies.*

- Maintain or improve the existing water quality to protect it from degradation.
- Safeguard the watershed's assimilative capacity of waterborne pollutants.
- Protect the quality of existing and future wells.
- Reduce nonpoint source pollution of ground and surface waters.

Objective 9. Reduce contamination of surface and ground water.

Objective 10. Reduce, or, at a minimum, maintain existing loadings of nitrogen and phosphorus to ground water and surface water, to the extent feasible, given applicable technical, economic, social and ecologic constraints, until appropriate target levels can be established through scientific investigation.

Goal 4.3: Improve stormwater management

- Retrofit existing stormwater infrastructure to protect water quality and the integrity of stream corridors.
- Prevent increases in stormwater runoff volume from new development.
- Reduce, where possible, excessive runoff from existing development.
- Inventory and evaluate existing stormwater structures.

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- Maintain and improve existing stormwater structures.
- Maintain or decrease existing stormwater peak flows and volumes.
- Promote the use of non-structural methods of stormwater management and BMPs, including bioengineering.
- Promote use of BMPs in design of new development and redevelopment to prevent degradation of water resources.

Objective 11. Utilize BMPs to protect and improve water quality.

Goal 4.4: *Promote efforts to reduce flooding and the damage caused by flooding.*

- Promote protection of the riparian corridor from filling, vegetation loss and structures and placement of pollutants within the floodplain.
- Promote removal of old fill from the regulated flood plain.
- Promote restoration of natural systems that reduce flooding.

Objective 12. Reduce damages from flooding.

Goal 4.5: *Improve both the quantity and quality of water supplies by restoring ecosystem health.*

- Restore adversely affected areas of streams to a condition of stable, non-eroding streams.
- Maintain and restore the diverse, native vegetation in natural areas to maintain ecological and wildlife functions.

Objective 13. Improve ecological functioning of wetlands and stream corridors.

Objective 14. Maintain or improve aquatic communities and their habitats, including wetland communities.

Goal 4.6: *Promote a balance among land uses to protect water resources.*

- Sustain a balance among competing uses, anthropogenic and ecological, of water resources.
- Maintain and improve recreational capabilities of the water resources (lakes, rivers and streams).
- Preserve land through various methods, including acquisitions and easements.
- Promote the use of model environmental ordinances.

Objective 15. Develop improved guidelines for land use utilizing smart growth and sustainable development practices.

Goal 5: Watershed Management Planning and Implementation: *To develop and implement a watershed management planning process and plan that achieves the goals cited in 1 through 4.*

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- Promote coordination, reconciliation and integration of those elements of federal, state and local laws, regulations, ordinances and plans that relate to water resource management in the watershed with the watershed management plan.
- Provide processes to continue information gathering, including monitoring, planning and implementation into the future.
- Create and implement viable processes to maintain and improve water resources, both quality and quantity.
- Continually investigate adequate sources of funding to implement the goals.
- Respond collectively to issues of common interest.
- Promote government's role as a responsible partner in implementing the watershed management plan, through compliance, monitoring, enforcement, technical assistance and economic support.

Objective 16. Develop a Watershed Management Area 6 Management Plan!

0.6 Related Watersheds

As indicated above, the Passaic River Basin has been divided into three (3) Watershed Management Areas (WMAs) as follows:

- WMA 3 – Pompton, Pequannock, Wanaque, and Ramapo River watersheds.
- WMA 4 – Lower Passaic, Saddle River watersheds.
- WMA 6 – Upper and Mid-Passaic, Whippany, and Rockaway River watersheds.

These watersheds and WMAs are highly interrelated.

From a natural river flow perspective: The natural direction of flow of the rivers is from WMA 3 into the lower reach of WMA 6 and then from WMA 6 into WMA 4. The Passaic River in WMA 6 at Two Bridges receives flow from the Pompton River at the downstream end of WMA 3. The combined flow continues in the Passaic River and enters WMA 4. Thus the quantity and quality of water in WMA 3 affects the quantity and quality in the lower reach of WMA 6, and conditions in both WMA 3 and WMA 6 affect conditions in WMA 4.

Based upon water supply infrastructure: Water is pumped from the Pompton River just upstream of the confluence with the Passaic River in the Two Bridges area of Lincoln Park and Wayne. Depending upon the pumping rate and the rate of flow in each river, water may be diverted from the Passaic River into the pump intake. Pipelines convey the diverted water to storage and treatment facilities in WMA 3 and WMA 5 (storage in Oradell Reservoir), and treatment facilities in WMA 4, for use by residents and businesses in parts of WMA 3, WMA 4, WMA 5 and WMA 7 (part of Newark), with a portion of the water piped back into WMA 6 for distribution. Some of the water that is piped to WMA 6 is eventually conveyed to wastewater treatment plants and discharged to the Passaic River and its tributaries in that WMA, only to return again to the confluence

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of the Passaic and Pompton Rivers. Thus the quantity and quality of water in WMA 6 affects the conditions in WMA 3 by virtue of pumping and diversions. And conditions in WMA 3 and WMA 6 affect the water supply for WMA 4 and portions of WMA 6.

Because of these natural and manmade interrelationships, water resources planning and management in WMA 3, WMA 4 and WMA 6 must be closely coordinated. The three WMAs also have socio-economic interrelationships such that pressures and needs in one of the WMAs can affect the others, which adds to the need for coordination of planning among the three WMAs.

0.7 Municipal Index

Following is an alphabetical list of municipalities by county in WMA 3, 4 and 6, to assist the reader in determining which WMA contains a municipality of interest. Some municipalities are in more than one of these WMAs, and some municipalities are also partially in another WMA other than 3, 4 or 6.

Table 1-0.7.1 Alphabetical List of Municipalities by County

COUNTY	MUNICIPALITY	WMA	COUNTY	MUNICIPALITY	WMA
BERGEN	ALLENDALE BORO	4	BERGEN	SADDLE RIVER BORO	4
BERGEN	CARLSTADT BORO	4	BERGEN	SOUTH HACKENSACK TWP	4
BERGEN	EAST RUTHERFORD BORO	4	BERGEN	UPPER SADDLE RIVER BORO	4
BERGEN	ELMWOOD PARK BORO	4	BERGEN	WALDWICK BORO	4
BERGEN	FAIR LAWN BORO	4	BERGEN	WALLINGTON BORO	4
BERGEN	FRANKLIN LAKES BORO	3 and 4	BERGEN	WASHINGTON TWP	4
BERGEN	GARFIELD CITY	4	BERGEN	WOODCLIFF LAKE BORO	4
BERGEN	GLEN ROCK BORO	4	BERGEN	WOOD-RIDGE BORO	4
BERGEN	HACKENSACK CITY	4	BERGEN	WYCKOFF TWP	4
BERGEN	HASBROUCK HEIGHTS BORO	4	ESSEX	BELLEVILLE TOWN	4
BERGEN	HILLSDALE BORO	4	ESSEX	BLOOMFIELD TOWN	4
BERGEN	HOHOKUS BORO	4	ESSEX	CALDWELL BORO	4 and 6
BERGEN	LODI BORO	4	ESSEX	CEDAR GROVE TWP	4 and 6
BERGEN	LYNDHURST TWP	4	ESSEX	EAST ORANGE CITY	4
BERGEN	MAHWAH TWP	3 and 4	ESSEX	ESSEX FELLS BORO	4 and 6
BERGEN	MAYWOOD BORO	4	ESSEX	FAIRFIELD BORO	4 and 6
BERGEN	MIDLAND PARK BORO	4	ESSEX	GLEN RIDGE BORO	4
BERGEN	MONTVALE BORO	4	ESSEX	LIVINGSTON TWP	6
BERGEN	NORTH ARLINGTON BORO	4	ESSEX	MILLBURN TWP	6
BERGEN	OAKLAND BORO	3	ESSEX	MONTCLAIR TOWN	4
BERGEN	PARAMUS BORO	4	ESSEX	NEWARK CITY	4
BERGEN	RAMSEY BORO	3 and 4	ESSEX	NORTH CALDWELL BORO	4 and 6
BERGEN	RIDGEWOOD VILLAGE	4	ESSEX	NUTLEY TOWN	4
BERGEN	ROCHELLE PARK TWP	4	ESSEX	ORANGE CITY	4
BERGEN	RUTHERFORD BORO	4	ESSEX	ROSELAND BORO	6
BERGEN	SADDLE BROOK TWP	4	ESSEX	SOUTH ORANGE VILLAGE	4

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COUNTY	MUNICIPALITY	WMA
ESSEX	VERONA BORO	4 and 6
ESSEX	WEST CALDWELL BORO	4 and 6
ESSEX	WEST ORANGE TOWN	4 and 6
HUDSON	EAST NEWARK BORO	4
HUDSON	HARRISON TOWN	4
HUDSON	KEARNY TOWN	4
MORRIS	BOONTON TOWN	6
MORRIS	BOONTON TWP	6
MORRIS	BUTLER BORO	3
MORRIS	CHATHAM BORO	6
MORRIS	CHATHAM TWP	6
MORRIS	DENVILLE TWP	6
MORRIS	DOVER TOWN	6
MORRIS	EAST HANOVER TWP	6
MORRIS	FLORHAM PARK BORO	6
MORRIS	HANOVER TWP	6
MORRIS	HARDING TWP	6
MORRIS	JEFFERSON TWP	3 and 6
MORRIS	KINNELON BORO	3 and 6
MORRIS	LINCOLN PARK BORO	3, 4, and 6
MORRIS	LONG HILL TWP	6
MORRIS	MADISON BORO	6
MORRIS	MENDHAM BORO	6
MORRIS	MENDHAM TWP	6
MORRIS	MINE HILL TWP	6
MORRIS	MONTVILLE TWP	3 and 6
MORRIS	MORRIS PLAINS BORO	6
MORRIS	MORRIS TWP	6
MORRIS	MORRISTOWN TOWN	6
MORRIS	MOUNT ARLINGTON BORO	6
MORRIS	MOUNTAIN LAKES BORO	6
MORRIS	PARSIPPANY-TROY HILLS TWP	6
MORRIS	PEQUANNOCK TWP	3
MORRIS	RANDOLPH TWP	6

COUNTY	MUNICIPALITY	WMA
MORRIS	RIVERDALE BORO	3
MORRIS	ROCKAWAY BORO	6
MORRIS	ROCKAWAY TWP	3 and 6
MORRIS	ROXBURY TWP	6
MORRIS	VICTORY GARDENS BORO	6
MORRIS	WHARTON BORO	6
PASSAIC	BLOOMINGDALE BORO	3
PASSAIC	CLIFTON CITY	4
PASSAIC	HALEDON BORO	4
PASSAIC	HAWTHORNE BORO	4
PASSAIC	LITTLE FALLS TWP	4
PASSAIC	NORTH HALEDON BORO	3 and 4
PASSAIC	PASSAIC CITY	4
PASSAIC	PATERSON CITY	4
PASSAIC	POMPTON LAKES BORO	3
PASSAIC	PROSPECT PARK BORO	4
PASSAIC	RINGWOOD BORO	3
PASSAIC	TOTOWA BORO	4
PASSAIC	WANAQUE BORO	3
PASSAIC	WAYNE TWP	3 and 4
PASSAIC	WEST MILFORD TWP	3
PASSAIC	WEST PATERSON BORO	4
SOMERSET	BERNARDS TWP	6
SOMERSET	BERNARDSVILLE BORO	6
SOMERSET	BRIDGEWATER TWP	6
SOMERSET	FAR HILLS BORO	6
SOMERSET	WARREN TWP	6
SUSSEX	HARDYSTON TWP	3 and 6
SUSSEX	SPARTA TWP	6
SUSSEX	VERNON TWP	3
UNION	BERKELEY HEIGHTS TWP	6
UNION	NEW PROVIDENCE BORO	6
UNION	SUMMIT CITY	6

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