

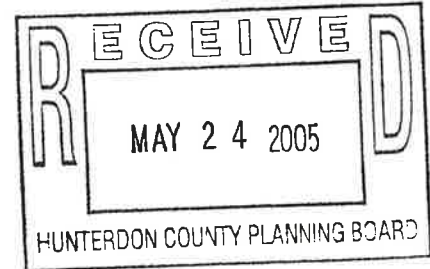


Township of Kingwood Planning Board

P.O. Box 199, Baptistown, New Jersey 08803-0199

(908) 996-3696

May 23, 2005



Hunterdon County Planning Board
P.O. Box 2900
Flemington, New Jersey 08822

Re: Municipal Stormwater Management Plan

Dear Sir:

Enclosed please find a copy of Kingwood Township's adopted Municipal Stormwater Management Plan. The plan was adopted at the May 10, 2005, Planning Board meeting.

Yours truly,

Diane Laudenschach
Secretary

Enclosure

CMRR: 7002-3150-0000-7295-7358

TOWNSHIP OF KINGWOOD
HUNTERDON COUNTY, NEW JERSEY

MUNICIPAL STORMWATER MANAGEMENT PLAN

2005

PREPARED FOR:
KINGWOOD TOWNSHIP PLANNING BOARD

BY:
HERITAGE CONSULTING ENGINEERS

APRIL 2005

ADOPTED MAY 10, 2005

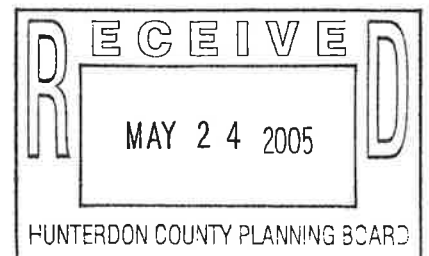


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INTRODUCTION

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for the Township of Kingwood (“the Township”) to address stormwater-related impacts. The creation of this plan is required by NJAC 7:14A-25 Municipal Stormwater Regulations. This plan contains all of the required elements described in NJAC 7:8 Stormwater Management Rules. The plan addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating stormwater design and performance standards for new major development, defined as projects that disturb one or more acres of land. These standards are intended to minimize the adverse impact of stormwater runoff on water quality and water quantity and the loss of groundwater recharge that provides baseflow in receiving water bodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities.

A “build-out” analysis has been included in this plan based upon existing zoning and land available for development. The plan also addresses the review and update of existing ordinances, the Township Master Plan, and other planning documents to allow for project designs that include low impact development techniques. The final component of this plan is a mitigation strategy for when a variance or exemption of the design and performance standards is sought. As part of the mitigation section of the stormwater plan, specific stormwater management measures are identified to lessen the impact of existing development.

GOALS

The goals of this Municipal Stormwater Management Plan are to:

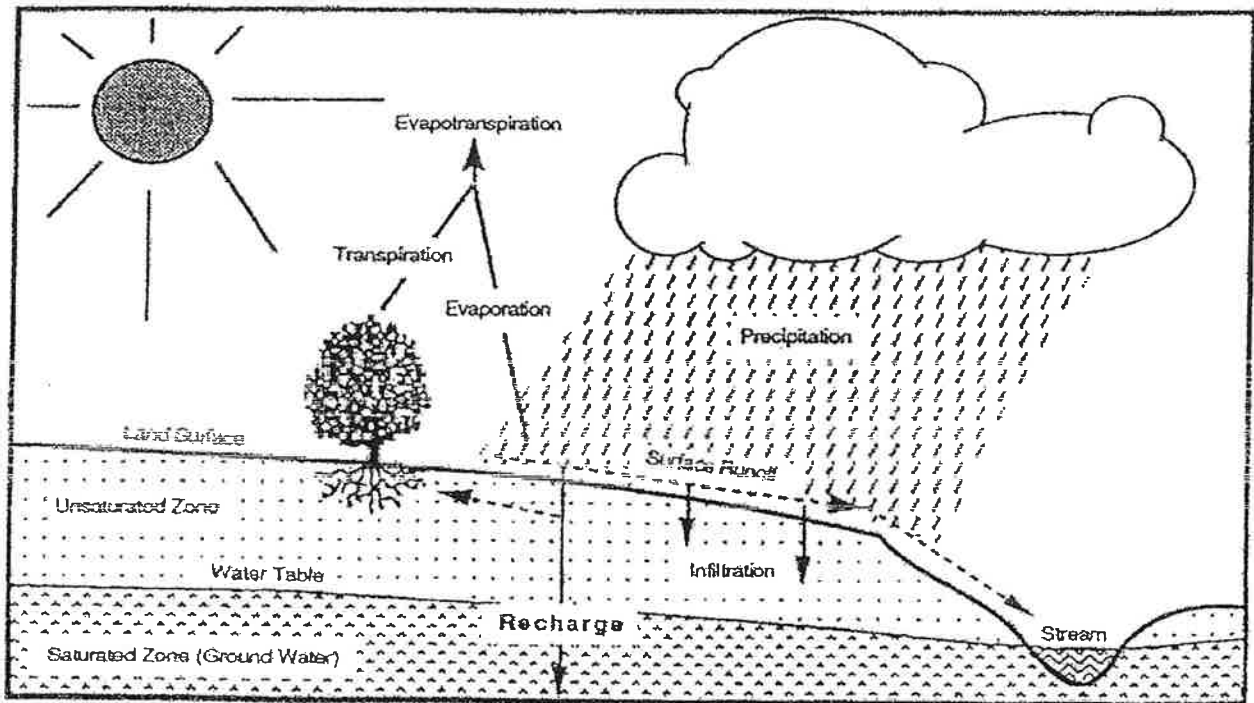
- reduce flood damage, including damage to life and property;
- minimize, to the extent practical, any increase in stormwater runoff from any new development; identify and mitigate problems with the existing stormwater system;
- reduce soil erosion from any development or construction project; or existing land use;
- assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
- maintain groundwater recharge; mitigation of recharge lost to development;
- prevent, to the greatest extent feasible, an increase in non-point pollution; locate and reduce existing NPS problems;
- maintain the integrity of stream channels of their biological functions, as well as for drainage;
- minimize pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the State, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water;
- protect public safety through the proper design and operation of stormwater basins.

To achieve these goals, this plan outlines specific stormwater design and performance standards for new development. Additionally, the plan proposes stormwater management controls to address impacts from existing development. Preventative and corrective maintenance strategies are included

in the plan to ensure long-term effectiveness of stormwater management facilities. The plan also outlines safety standards for stormwater infrastructure to be implemented to protect public safety.

STORMWATER DISCUSSION

Land development can dramatically alter the hydrologic cycle (See Figure below) of a site and, ultimately, an entire watershed. Prior to development, native vegetation can either directly intercept precipitation or draw that portion that has infiltrated into the ground and return it to the atmosphere through evapotranspiration. Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. Impervious areas that are connected to each other through gutter, channels, and storm sewers can transport runoff more quickly than natural areas. This shortening of the transport or travel time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher than natural conditions. These increases can create anew and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration which, in turn, reduces stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuations between normal and storm flow rates, which can increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can destroy habitat from which some species cannot adapt.



In addition to increases in runoff peaks, volumes, and loss of groundwater recharge, land development often results in the accumulation of pollutants on the land surface that runoff can mobilize and transport to streams. New impervious surfaces and cleared areas created by development can accumulate a variety of pollutants from the atmosphere, fertilizers, animal wastes, and leakage and wear from vehicles. Pollutants can include metals, suspended solids, hydrocarbons, pathogens, and nutrients. In addition to increased pollutant loading, land development can adversely affect water quality and stream biota in more subtle ways. For example, stormwater falling on impervious surfaces or stored in detention or retention basins can become heated and raise the temperature of the downstream waterway, adversely affecting cold water fish species such as trout. Development can remove trees along stream banks that normally provide shading, stabilization, and leaf litter that falls into streams and becomes food for the aquatic community.

BACKGROUND

The Township encompasses 35.7 square miles in Hunterdon County, New Jersey. The population of the Township was 2,772 in 1980; 3,325 in 1990 and 3,782 in the year 2000. The Township is predominantly rural as shown in the following table.

Table 1
 Exiting Land Use
 Township of Kingwood
 1995

| | <u>Acres</u> | <u>% of Total</u> |
|-------------|-----------------|-------------------|
| Agriculture | 8,366.03 | 36.69% |
| Barren Land | 12.71 | 0.06% |
| Forest | 7,935.42 | 34.80% |
| Urban | 2,293.52 | 10.06% |
| Water | 402.07 | 1.76% |
| Wetlands | <u>3,792.06</u> | <u>16.63%</u> |
| TOTAL | 22,801.81 | 100.00% |

Source: Hunterdon County Planning Board

Approximately 90% of the Township is agriculture, barren land, forest, water or wetlands.

Through June of 2004, 88 building permits have been issued for single family homes in the Township. Hunterdon County’s projected population for Kingwood Township for the Year 2020 is 4,693, an increase of 911 persons between the Years 2000 and 2020. This results in a modest growth of 45 persons per year.

Both the Open Space and Recreation Plan and the Farmland Preservation Element adopted August 14, 2000 set forth as goals and objectives:

1. The preservation of the Township's rural character;
2. The protection of natural resources and sensitive environmental areas; and,
3. The acquisition of lands or development rights in a manner which is fair to the citizen whose rights are being acquired.

The combination of zoning (4 acre minimum lot size) and physical characteristics (soil characteristics, shallow depth to bedrock and seasonal high water table) contribute to a modest population growth projection.

Map 1 shows the Waterways in the Township.

The Delaware River forms the western boundary of the Township. The waterways in the Township (Nishisakawick Creek, Copper Creek, Warford Creek, Lockatong Creek, Muddy Run and Wickecheoke Creek) drain the Township into the Delaware River.

Map 2 shows the Waterways in the Township by surface water quality classification.

Map 3 depicts the Township Boundary on the USGS Quadrangle Map.

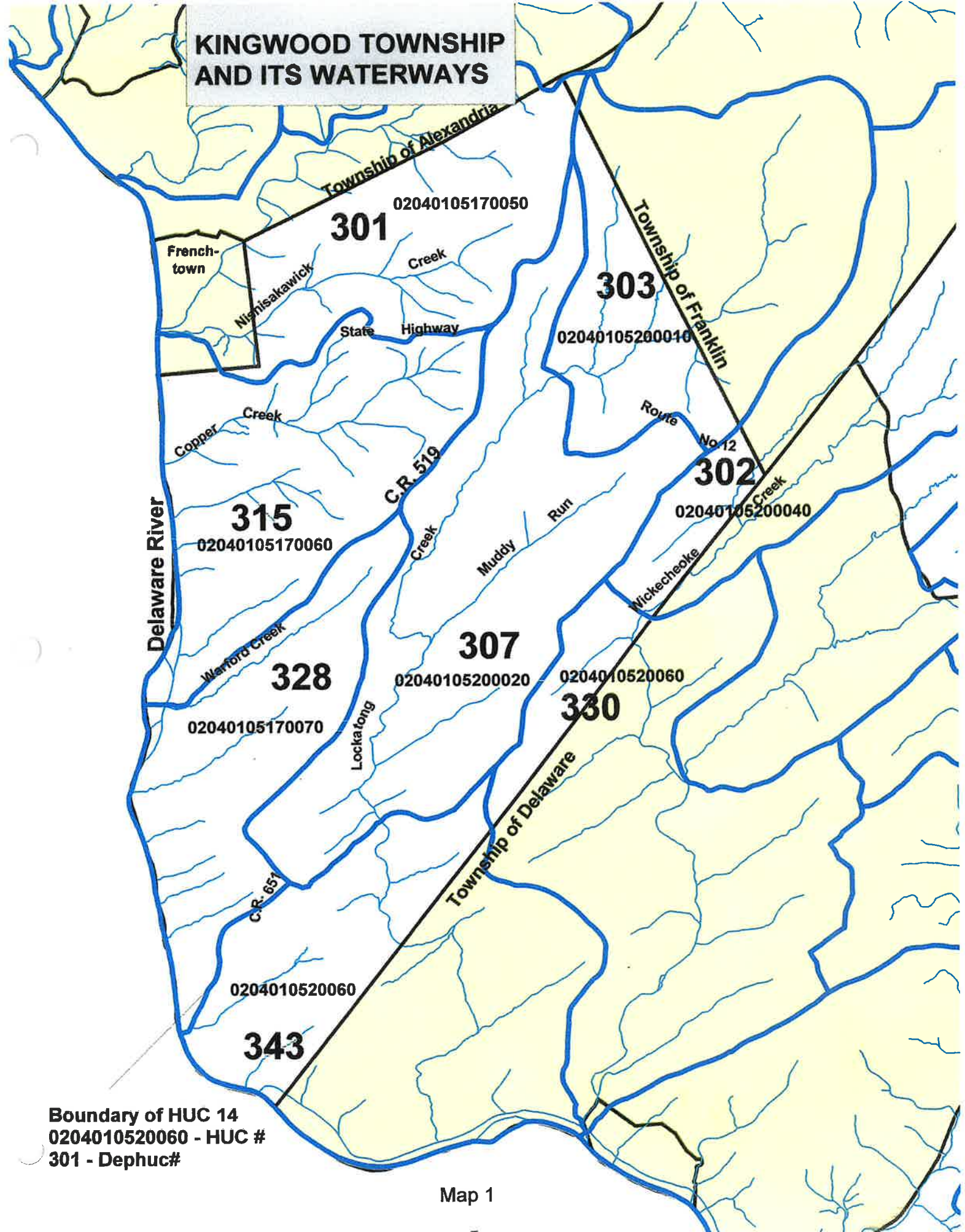
Map 4 shows the Existing Land Use of 1995 referenced in the previous table.

Category One (C-1) streams, consisting of Wickecheoke Creek, Lockatong Creek, Warford Creek and Nishisakawick Creek, are identified on Map 11 (Page 29). Wetlands are shown on Map 12 (Page 30).

The zoning of the Township reflects its rural character as a predominance of land is in the Agricultural/Residential (AR-2) Zoning District which requires a minimum lot size of four (4) acres per housing unit. Non-residential zoning occurs along Route 12 which including Business, Professional Office/Residential and Business Park Zoning Districts. The zoning pattern is shown on Map 5 entitled, "Kingwood Township Zoning Districts".

The Township roadway network consist of 55 miles of roads. Predominately, these roads are paved and serviced by some form of stormwater management system. The roads are maintained by the Township of Kingwood Department of Public Works. In addition the Township contains two (2) State highways and a number of County roads.

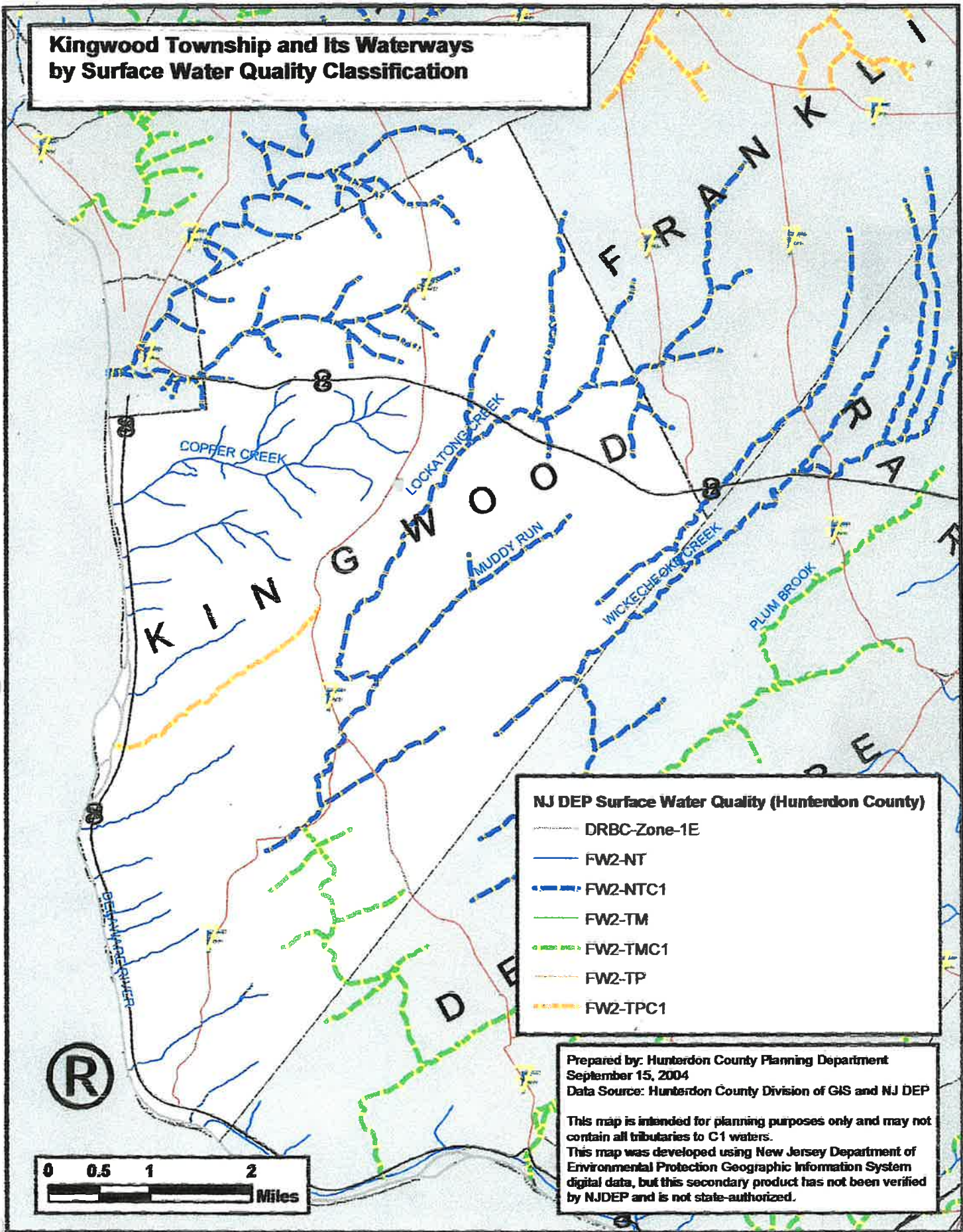
KINGWOOD TOWNSHIP AND ITS WATERWAYS



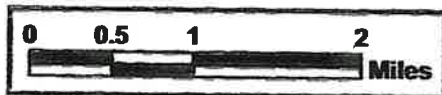
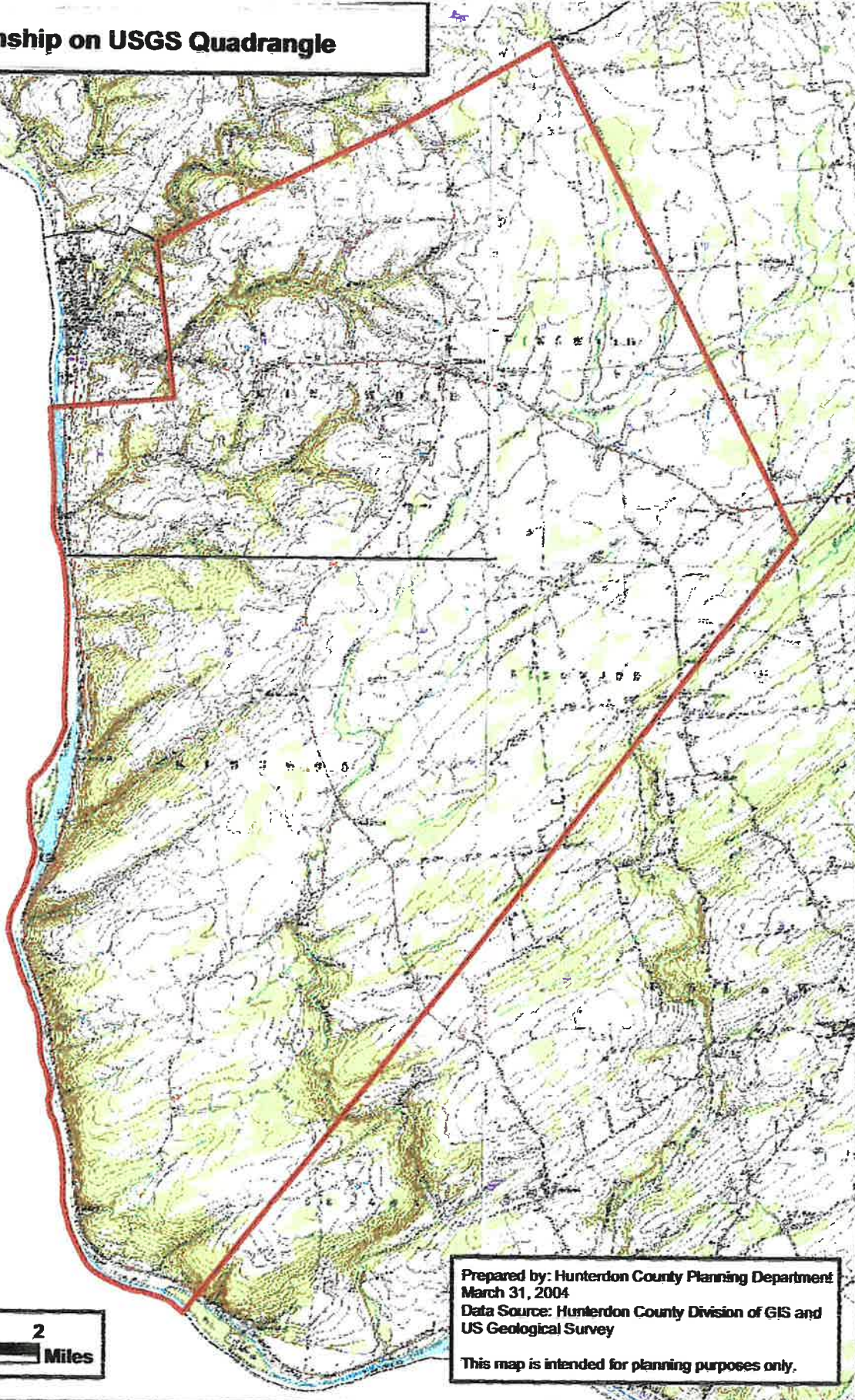
Boundary of HUC 14
0204010520060 - HUC #
301 - Dephuc#

Map 1

**Kingwood Township and Its Waterways
by Surface Water Quality Classification**



Kingwood Township on USGS Quadrangle



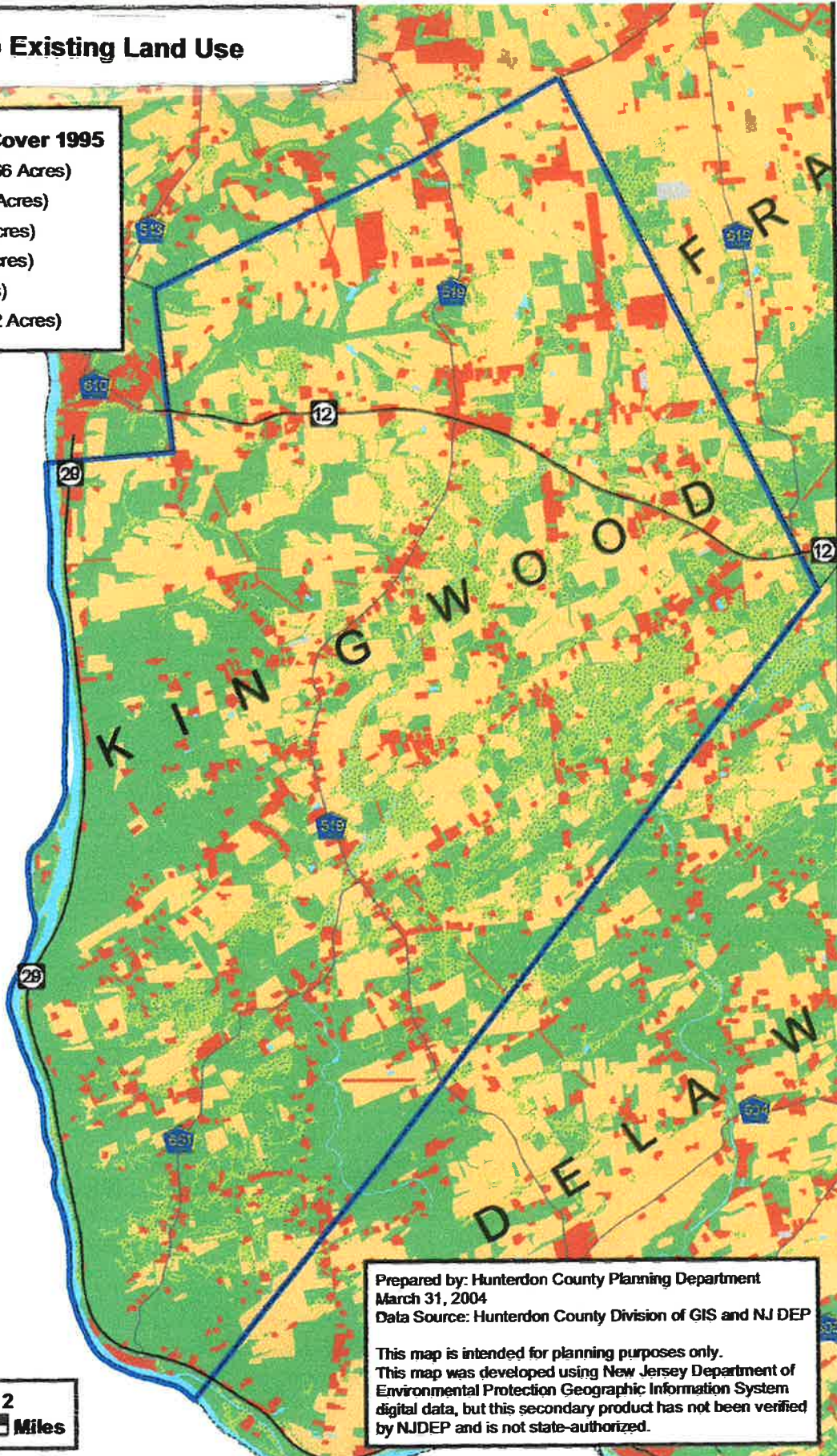
Prepared by: Hunterdon County Planning Department
March 31, 2004
Data Source: Hunterdon County Division of GIS and
US Geological Survey
This map is intended for planning purposes only.

Map 3

Kingwood Township Existing Land Use

NJ DEP Land Use/Land Cover 1995

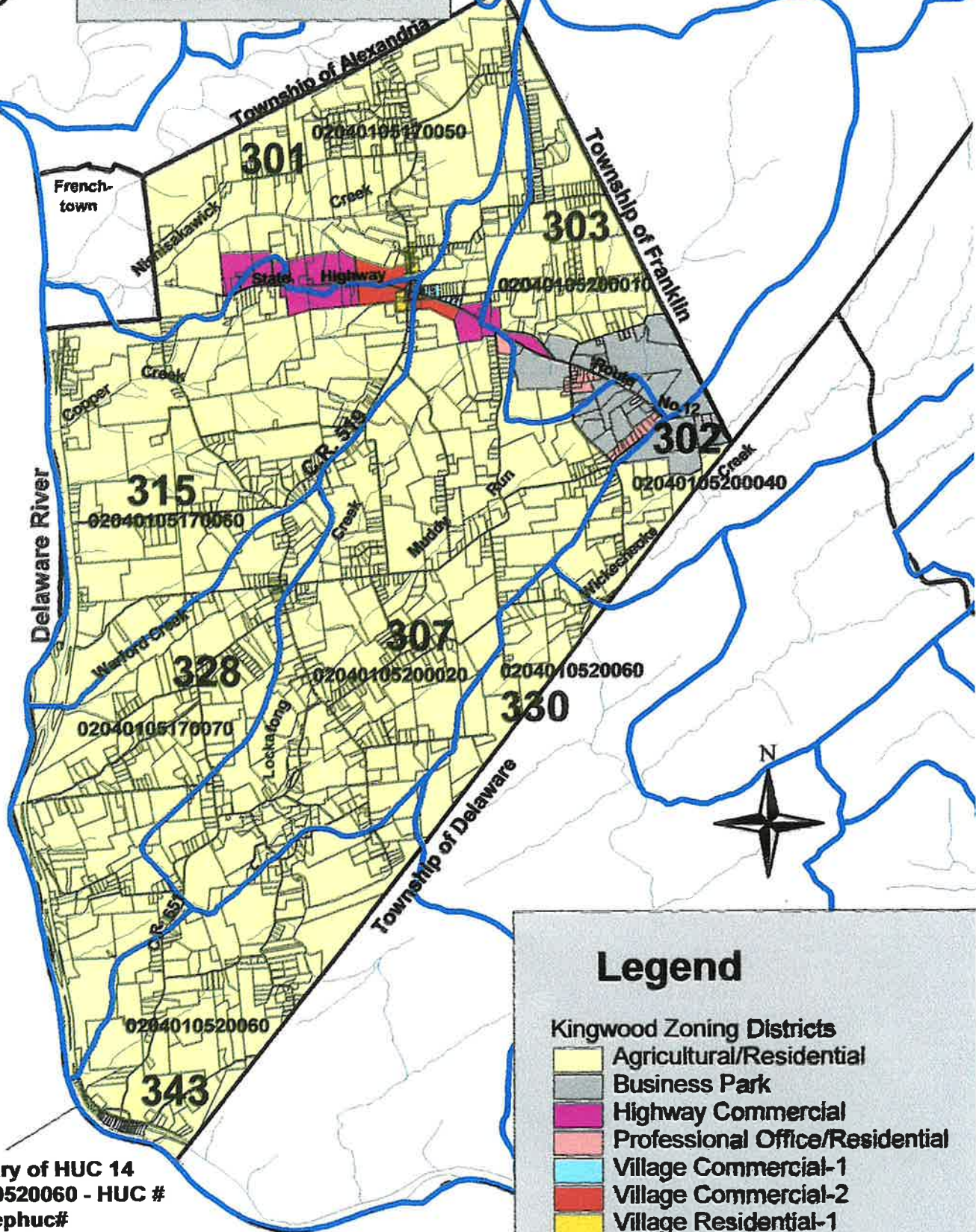
- Agriculture - 36.69% (8,366 Acres)
- Barren Land - 0.06% (13 Acres)
- Forest - 34.80% (7,935 Acres)
- Urban - 10.06% (2,294 Acres)
- Water - 1.76% (402 Acres)
- Wetlands - 16.63% (3,792 Acres)



Prepared by: Hunterdon County Planning Department
March 31, 2004
Data Source: Hunterdon County Division of GIS and NJ DEP

This map is intended for planning purposes only.
This map was developed using New Jersey Department of
Environmental Protection Geographic Information System
digital data, but this secondary product has not been verified
by NJDEP and is not state-authorized.

KINGWOOD TOWNSHIP ZONING DISTRICTS



Boundary of HUC 14
0204010520060 - HUC #
301 - Dephuc#

Legend

- Agricultural/Residential
- Business Park
- Highway Commercial
- Professional Office/Residential
- Village Commercial-1
- Village Commercial-2
- Village Residential-1
- Village Residential-2

ENVIRONMENTAL DATA

The New Jersey Department of Environmental Protection (NJDEP) has established an Ambient Biomonitoring Network (AMNET) to document the health of the State's waterways. There are over 800 AMNET sites throughout the State of New Jersey. These sites are sampled for benthic macroinvertebrates by NJDEP on a five-year cycle. Streams are classified as non-impaired, moderately impaired, or severely impaired based on the AMNET data. The data is used to generate a New Jersey Impairment Score (NJIS), which is based on a number of biometrics related to benthic macroinvertebrate community dynamics. The Delaware River forms the western boundary of the Township. Various smaller waterways (Nishisakawick Creek, Copper Creek, Warford Creek, Lockatong Creek, Muddy Run and Wickechoeke Creek) drain the Township. Attached is the most recent NJDEP AMNET data. Map 6 shows the Ambient Biomonitoring Network in New Jersey. Kingwood Township is in the Central Delaware Watershed Management Area (11) which is shown in more detail on Map 7. The data indicate that Copper Creek, Warford Creek and Wickechoeke Creek show moderate impairments. All other monitoring data show non-impairment. In addition 2001 Fish IBI data rates the Nishisakawick and Lockatong Creeks as "good".

The data as gathered and analyzed resulting in the stream biological condition (non-impairment, moderate impairment and severe impairment) are shown on Pages 14-23 for each of the stations in and near to Kingwood Township. (No stream in the stations monitored and reported on Pages 14-23 indicate any severe impairment.)

A TMDL is the amount of a pollutant that can be accepted by a water body without causing an exceedance of water quality standards or interfering with the ability to use a water body for one or more of its designated uses. The allowable load is allocated to the various sources of the pollutant, such as stormwater and wastewater discharges, which require an NJPDES permit to discharge, and non-point source, which includes stormwater runoff from agricultural areas and residential areas, along with a margin of safety. Provisions may also be made for future sources in the form of reserve capacity. An implementation plan is developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include improved stormwater treatment plants, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems and other BMPs.

The New Jersey Integrated Water Quality Monitoring and Assessment Report 305(b) and 303(d) (Integrated List) is required by the federal Clean Water Act to be prepared biennially and is a valuable source of water quality information. This combined report presents the extent to which New Jersey waters are attaining water quality standards, and identifies waters that are impaired. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more TMDLs are needed.

In addition to water quality problems, the Township has exhibited limited water quantity problems including flooding, stream bank erosion, and diminished base flow in its streams. As the imperviousness increases in the Township, the peaks and volume of stream flows will increase. The increased amount of water results in stream bank erosion, which results in unstable areas at roadway/bridge crossings, and degraded stream habitats.

Map 8 shows the 100 year flood plain along the delineated waterways (Lockatong Creek, Wickecheoke Creek and a portion of Muddy Run) as established by FEMA.

The increasing imperviousness of the Township may decrease groundwater recharge, decreasing base flows in streams during dry weather periods. Lower base flows can have a negative impact on in-stream habitat during the summer months. A map of the groundwater recharge areas are shown in Map 9. As can be seen from Map 9 of this plan, the Township's soils indicate recharge rates ranging from not applicable (for the hydric soils, wetlands, and open waters) to 16 inches per year. These rates are established purely as overall guidance in selecting areas for potential infiltration measures and are not to be utilized for design purposes. It is important to note that these rates are highly variable. A further discussion of Groundwater Recharge can be found in the Appendix of this report (Pages 45-47).

Wellhead protection areas, also required as part of the MSWMP, are shown in Map 10. There are no existing Public Community Water Supply (PCWS) wells located within the Township. Two (2) PCWS wells of the New Jersey American Water Company are located within Frenchtown Borough. The New Jersey Geological Survey (herein referred to as NJGS) delineated Wellhead Protection Areas (herein referred to as WHPAs) for each of these supply wells. A WHPA in New Jersey is a mapped area calculated around a Public Community Water Supply (PCWS) well in New Jersey and is defined as the portion of an aquifer that contributes water to a well over a specified time interval.

WHPAs are divided into three (3) sequential tiers based on Time of Travel (herein referred to as TOT) to a production well. TOT is the time it takes for a given particle of groundwater to flow to a pumping well and is directly related to the distance the water has to travel to arrive at the well once it starts pumping. For any given TOT, the distance will vary from well to well depending on the rate of pumping and aquifer characteristics. Tier 1, the 2-year TOT, is based on findings that bacteria have polluted wells and viruses have survived in groundwater up to 270 days. Tier 2, the 5-year TOT, is based on the lag time of a pollution plume caused by adsorption/desorption, the variable rate of pollutant travel, and the acceleration of groundwater once it comes close to a pumping well. Tier 3, the 12-year TOT, is defined to provide sufficient time so that monitoring and cleanup response to potential pollution sources/releases can be completed before contamination reaches a pumping well. The three (3) tiers, over two-, five-, and twelve-years, are defined using line boundaries and polygon areas generated with the ARC/INFO Geographic Information System (GIS). The southerly New Jersey American Water Company well protection extends into Kingwood Township.

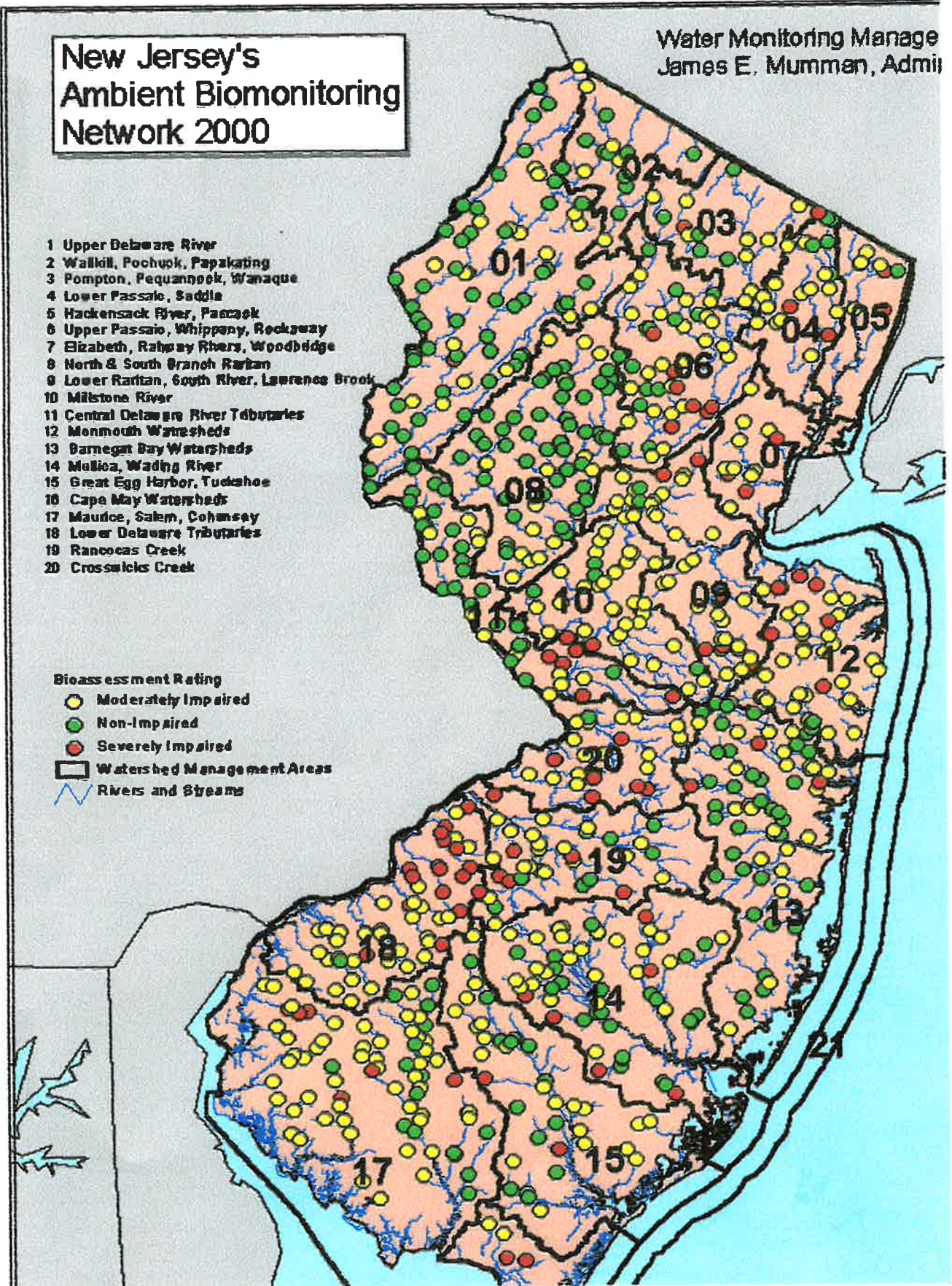
(A summary of related sections of a report "Kingwood Township Environmental Resources Inventory" is included in the Appendix of this report.)

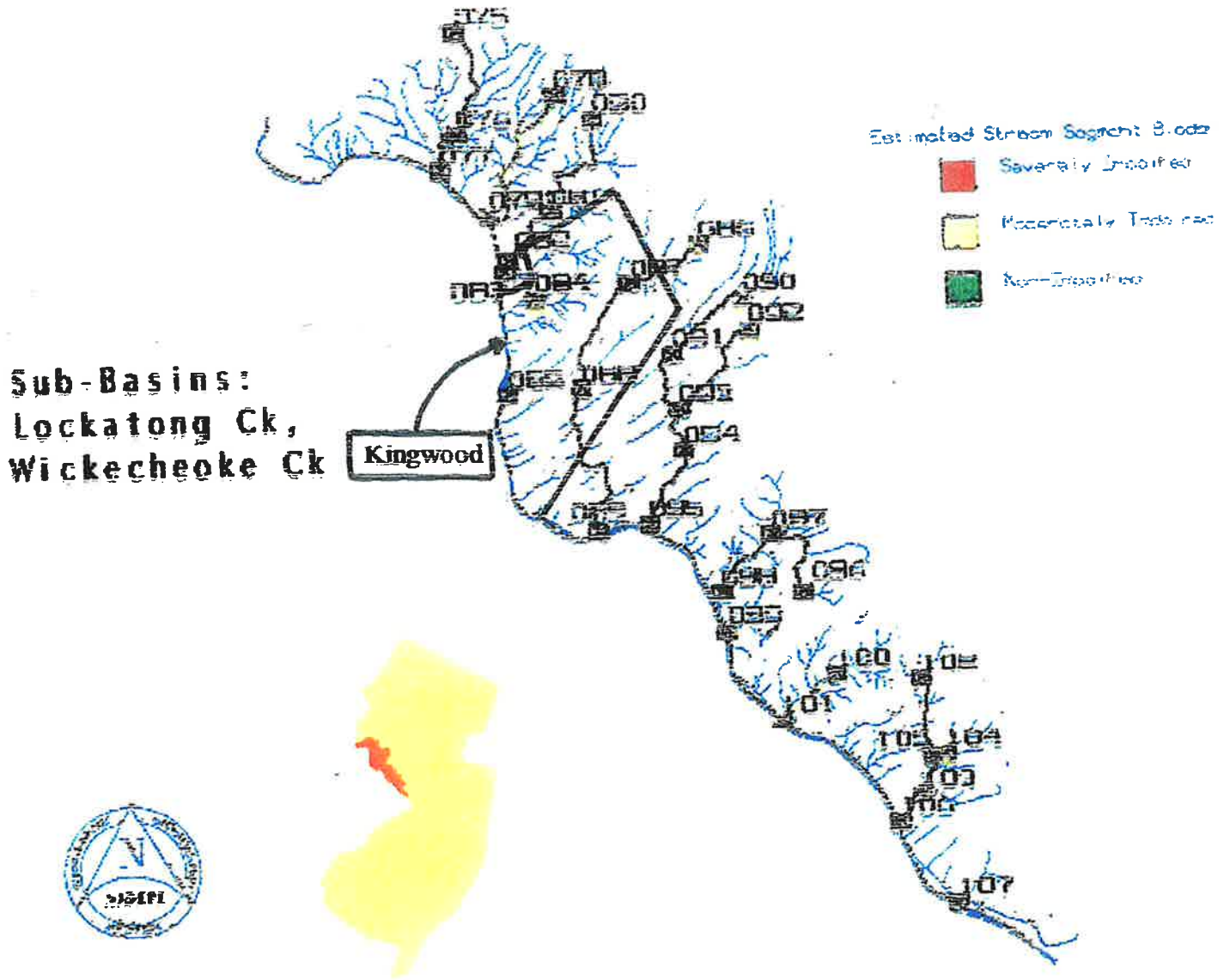
New Jersey's Ambient Biomonitoring Network 2000

Water Monitoring Manager
James E. Mumman, Admin

- 1 Upper Delaware River
- 2 Wallkill, Pochuck, Papakating
- 3 Pompton, Pequannock, Wanaque
- 4 Lower Passaic, Saddle
- 5 Hackensack River, Passaic
- 6 Upper Passaic, Whippany, Rockaway
- 7 Elizabeth, Rahway Rivers, Woodbridge
- 8 North & South Branch Raritan
- 9 Lower Raritan, South River, Lawrence Brook
- 10 Millstone River
- 11 Central Delaware River Tributaries
- 12 Monmouth Watersheds
- 13 Barnegat Bay Watersheds
- 14 Manasquan, Wading River
- 15 Great Egg Harbor, Tuckahoe
- 16 Cape May Watersheds
- 17 Maurice, Salem, Cohamsey
- 18 Lower Delaware Tributaries
- 19 Rancocas Creek
- 20 Crosswicks Creek

- Bioassessment Rating**
- Moderately Impaired
 - Non-Impaired
 - Severely Impaired
 - Watershed Management Areas
 - ~ Rivers and Streams





BIOLOGICAL CRITERIA FOR SCREENING WATER QUALITY IN NEW JERSEY FRESHWATER STREAMS*

Scoring Criteria for Rapid Bioassessments¹

| Biometrics | 6 | 3 | 0 |
|---|------|-------|------|
| Taxa Richness (total Families) | > 10 | 10-5 | 4-0 |
| E + P + T Index ² (EPT) | > 5 | 5-3 | 2-0 |
| Percent Dominance ³ (%CDF) | < 40 | 40-60 | > 60 |
| Percent EPT ⁴ (%EPT) | > 35 | 35-10 | < 10 |
| Modified Family Biotic Index ⁵ (FBI) | < 5 | 5-7 | > 7 |

NOTE: The previous AMNET reports (1994-1996) contained incorrect number ranges for Modified Family Biotic Index. Using the incorrect numbers could lower the biological assessment on 9% of the sites evaluated. The numbers now presented in this table are correct and scores from previous reports were calculated using these ranges. No incorrect biological assessments exist in the previous reports.

| Biological Assessment | Total Score |
|-----------------------|-------------|
| Non-impaired | 24-30 |
| Moderately Impaired | 9-21 |
| Severely Impaired | 0-6 |

Attributes

Non-impaired: benthic community comparable to other undisturbed streams within the region; community characterized by a maximum taxa richness, balanced taxa groups, and good representation of intolerant individuals.

Moderately Impaired: macroinvertebrate richness reduced, in particular EPT taxa; reduced community balance and numbers of intolerant taxa.

Severely Impaired: benthic community dramatically different from those in less impaired situations; macroinvertebrates dominated by a few taxa, but with many individuals; only tolerant individuals present.

* From Kurtenbach, 1991, based on RBP II protocols.
¹ Follows RBP Protocol II; using 100 organism subsample, family level taxonomy
² Ephemeroptera, Plecoptera, Trichoptera
³ % contribution of the dominant family
⁴ Including the hydropsychid family
⁵ Also known as the Hilsenhoff Biotic Index

Station: AN0081
 Nishisakawick Ck, Off Creek Rd Blw Everittstown, Hunterdon County
 Frenchtown USGS Quadrangle
 Date Sampled: 07/22/97

| Family | Family Tolerance Value (FTV) | Number of Individuals |
|-----------------------|------------------------------|-----------------------|
| Chironomidae | 6 | 27 |
| Hydropsychidae | 4 | 25 |
| Baetidae | 4 | 11 |
| Heptageniidae | 4 | 6 |
| Tipulidae | 3 | 4 |
| Corixidae | 9 | 3 |
| Caenidae | 7 | 2 |
| Philopotamidae | 3 | 2 |
| Elmidae | 4 | 2 |
| Empididae | 6 | 2 |
| Oligoneuriidae | 2 | 2 |
| Leptoceridae | 4 | 2 |
| Naididae | 7 | 2 |
| BloodRed Chironomidae | 8 | 2 |
| Physidae | 7 | 2 |
| Perlidae | 1 | 1 |
| Lepidostomatidae | 1 | 1 |
| Lumbriculidae | 8 | 1 |
| Leptophlebiidae | 2 | 1 |
| Sphaeriidae | 8 | 1 |
| Psephenidae | 4 | 1 |
| Odontoceridae | 0 | 1 |
| Sialidae | 4 | 1 |

Statistical Analysis

Number of Taxa: 23
 Total Number of Individuals: 102
 % Contribution of Dominant Family: 26.47 % (Chironomidae)
 Family Biotic Index: 4.83
 Scraper/Filterer Collector Ratio: 0.36
 Shredder/Total Ratio: 0.31
 E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 11
 % EPT: 52.94
 EPT/C: 1.83
 NJIS Rating: 30
 Biological Condition: Nonimpaired
 Habitat Analysis: 165

Observations

Streamwater: Turbid...Flow: Moderate...Width/Depth (ft): 17/1
 Substrate: Cobbles,gravel...StreamBank Vegetation/Stability: Trees,shrubs/Stable
 Canopy: Mostly Open...Other: Forested/Agricultural livestock; Water temp.20.3 /pH 7.9 /DO 8.1 /Cond.159

Station: AN0082
 Nishisakawick Ck, Creek Rd , Frenchtown, Hunterdon County
 Frenchtown USGS Quadrangle
 Date Sampled: 07/22/97

| Family | Family Tolerance Value (FTV) | Number of Individuals |
|-----------------------|------------------------------|-----------------------|
| Chironomidae | 6 | 24 |
| Heptageniidae | 4 | 18 |
| Baetidae | 4 | 15 |
| Lepidostomatidae | 1 | 14 |
| Physidae | 7 | 7 |
| Leptoceridae | 4 | 4 |
| Hydropsychidae | 4 | 3 |
| BloodRed Chironomidae | 8 | 3 |
| Caenidae | 7 | 2 |
| Lumbricidae | 10 | 2 |
| Tipulidae | 3 | 2 |
| Philopotamidae | 3 | 1 |
| Erpobdellidae | 8 | 1 |
| Helicopsychidae | 3 | 1 |
| Empididae | 6 | 1 |
| Oligoneuriidae | 2 | 1 |
| Leuctridae | 0 | 1 |
| Brachycentridae | 1 | 1 |
| Polycentropodidae | 6 | 1 |
| Tetrastemmatidae | 7 | 1 |
| Psephenidae | 4 | 1 |
| Odontoceridae | 0 | 1 |
| Veliidae | 9 | 1 |
| Lymnaeidae | 6 | 1 |

Statistical Analysis

Number of Taxa: 24
 Total Number of Individuals: 107
 % Contribution of Dominant Family: 22.43 % (Chironomidae)
 Family Biotic Index: 4.54
 Scraper/Filterer Collector Ratio: 0.80
 Shredder/Total Ratio: 0.17
 E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 13
 % EPT: 58.88
 EPT/C: 2.18
 NJIS Rating: 30
 Biological Condition: Nonimpaired
 Habitat Analysis: 171

Observations

Streamwater: Slightly Turbid...Flow: Moderate...Width/Depth (ft): 30/1
 Substrate: Cobbles, gravel...StreamBank Vegetation/Stability: Trees, shrubs/Stable
 Canopy: Mostly Open...Other: Forested; Water temp.20.4 /pH 8.0 /DO 8.7 /Cond.175

Station: AN0083
 Little Nishisakawick Ck, Rt 29 , Frenchtown, Hunterdon County
 Frenchtown USGS Quadrangle
 Date Sampled: 07/10/97

| Family | Family Tolerance Value (FTV) | Number of Individuals |
|------------------|------------------------------|-----------------------|
| Hydropsychidae | 4 | 14 |
| Psephenidae | 4 | 13 |
| Philopotamidae | 3 | 12 |
| Lepidostomatidae | 1 | 10 |
| Chironomidae | 6 | 10 |
| Baetidae | 4 | 9 |
| Glossosomatidae | 0 | 7 |
| Hydroptilidae | 4 | 7 |
| Physidae | 7 | 3 |
| Heptageniidae | 4 | 2 |
| Erpobdellidae | 8 | 2 |
| Veliidae | 9 | 2 |
| Gerridae | 8 | 2 |
| Limnephilidae | 4 | 1 |
| Caenidae | 7 | 1 |
| Tipulidae | 3 | 1 |
| Lumbriculidae | 8 | 1 |
| Leptoceridae | 4 | 1 |
| Naididae | 7 | 1 |
| Perlidae | 1 | 1 |

Statistical Analysis

Number of Taxa: 20
 Total Number of Individuals: 100
 % Contribution of Dominant Family: 14.00 % (Hydropsychidae)
 Family Biotic Index: 3.91
 Scraper/Filterer Collector Ratio: 1.15
 Shredder/Total Ratio: 0.10
 E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 11
 % EPT: 65.00
 EPT/C: 6.50
 NJIS Rating: 30
 Biological Condition: Nonimpaired
 Habitat Analysis: 148

Observations

Streamwater: Clear...Flow: Moderate...Width/Depth (ft): 6/<1
 Substrate: Cobbles,gravel...StreamBank Vegetation/Stability: Trees,shrubs,weeds/Stable
 Canopy: Mostly Closed...Other: Suburban; Water temp.21.0 /pH 7.8 /DO 7.5 /Cond.226

Station: AN0084
 Copper Ck, Horseshoe Bend Rd , Kingwood Twp, Hunterdon County
 Frenchtown USGS Quadrangle
 Date Sampled: 07/15/97

| Family | Family Tolerance Value (FTV) | Number of Individuals |
|------------------------|------------------------------|-----------------------|
| BloodRed Chironomidae | 8 | 36 |
| Chironomidae | 6 | 33 |
| Leptoceridae | 4 | 14 |
| Naididae | 7 | 3 |
| Psephenidae | 4 | 3 |
| Blood Red Chironomidae | 8 | 2 |
| Leptophlebiidae | 2 | 2 |
| Sialidae | 4 | 2 |
| Hydropsychidae | 4 | 2 |
| Baetidae | 4 | 1 |
| Veliidae | 9 | 1 |
| Elmidae | 4 | 1 |

Statistical Analysis

Number of Taxa: 12
 Total Number of Individuals: 100
 % Contribution of Dominant Family: 36.00 % (BloodRed Chironomidae)
 Family Biotic Index: 6.28
 Scraper/Filterer Collector Ratio: 2.09
 Shredder/Total Ratio: 0.00
 E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 4
 % EPT: 19.00
 EPT/C: 0.27
 NJIS Rating: 21
 Biological Condition: Moderately Impaired
 Habitat Analysis: 144

Observations

Streamwater: Clear....Flow: Slow...Width/Depth (ft): 4/<1
 Substrate: Bedrock....StreamBank Vegetation/Stability: Trees/Stable
 Canopy: Mostly Closed....Other: Forested/Agricultural; Water temp.21.9 /pH 7.2 /DO 7.9
 /Cond.183

Station: AN0085
 Warford Ck, Rt 29, Kingwood Station, Hunterdon County
 Lumberville USGS Quadrangle
 Date Sampled: 07/15/97

| Family | Family Tolerance Value (FTV) | Number of Individuals |
|-----------------------|------------------------------|-----------------------|
| Chironomidae | 6 | 66 |
| BloodRed Chironomidae | 8 | 19 |
| Leptoceridae | 4 | 6 |
| Sialidae | 4 | 6 |
| Hydropsychidae | 4 | 3 |
| Leuctridae | 0 | 2 |
| Perlidae | 1 | 1 |
| Dolichopodidae | 4 | 1 |
| Philopotamidae | 3 | 1 |
| Tubificidae | 10 | 1 |
| Lumbriculidae | 8 | 1 |
| Baetidae | 4 | 1 |
| Gerridae | 8 | 1 |

Statistical Analysis

Number of Taxa: 13
 Total Number of Individuals: 109
 % Contribution of Dominant Family: 60.55 % (Chironomidae)
 Family Biotic Index: 5.93
 Scraper/Filterer Collector Ratio: 1.23
 Shredder/Total Ratio: 0.02
 E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 6
 % EPT: 12.84
 EPT/C: 0.15
 NJIS Rating: 18
 Biological Condition: Moderately Impaired
 Habitat Analysis: 136
 Deficiency(s) noted: Chironomidae Family Overwhelmingly Dominant

Observations

Streamwater: Clear....Flow: Slow....Width/Depth (ft): 2/<1
 Substrate: Gravel....StreamBank Vegetation/Stability: Trees, shrubs/Stable
 Canopy: Mostly Closed....Other: Forested; Water temp.23.2 /pH 7.6 /DO 8.3 /Cond.174

Station: AN0087
 Lockatong Ck, Rt 12 , Baptistown, Hunterdon County
 Pittstown USGS Quadrangle
 Date Sampled: 07/15/97

| Family | Family Tolerance Value (FTV) | Number of Individuals |
|------------------|------------------------------|-----------------------|
| Hydropsychidae | 4 | 56 |
| Elmidae | 4 | 15 |
| Philopotamidae | 3 | 8 |
| Leptoceridae | 4 | 6 |
| Chironomidae | 6 | 5 |
| Psephenidae | 4 | 3 |
| Athericidae | 2 | 1 |
| Empididae | 6 | 1 |
| Gomphidae | 1 | 1 |
| Lepidostomatidae | 1 | 1 |
| Veliidae | 9 | 1 |
| Tipulidae | 3 | 1 |
| Dytiscidae | 5 | 1 |

Statistical Analysis

Number of Taxa: 13
 Total Number of Individuals: 100
 % Contribution of Dominant Family: 56.00 % (Hydropsychidae)
 Family Biotic Index: 4.01
 Scraper/Filterer Collector Ratio: 0.28
 Shredder/Total Ratio: 0.07
 E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 4
 % EPT: 71.00
 EPT/C: 14.20
 NJIS Rating: 24
 Biological Condition: Nonimpaired
 Habitat Analysis: 146

Observations

Streamwater: Slightly Turbid...Flow: Slow...Width/Depth (ft): 30/1
 Substrate: Cobbles...StreamBank Vegetation/Stability: Trees,shrubs/Stable
 Canopy: Mostly Open...Other: Rural/Agricultural; Water temp.24.0 /pH7.3 /DO 5.8 /Cond.176

Station: AN0088
 Lockatong Ck, Rt 519 , Kingwood Twp, Hunterdon County
 Lumberville USGS Quadrangle
 Date Sampled: 07/15/97

| Family | Family Tolerance Value (FTV) | Number of Individuals |
|------------------|------------------------------|-----------------------|
| Hydropsychidae | 4 | 31 |
| Elmidae | 4 | 14 |
| Philopotamidae | 3 | 10 |
| Psephenidae | 4 | 7 |
| Baetidae | 4 | 5 |
| Lepidostomatidae | 1 | 4 |
| Chironomidae | 6 | 4 |
| Leptoceridae | 4 | 4 |
| Heptageniidae | 4 | 4 |
| Planariidae | 4 | 3 |
| Oligoneuriidae | 2 | 3 |
| Veliidae | 9 | 3 |
| Helicopsychidae | 3 | 2 |
| Tipulidae | 3 | 1 |
| Athericidae | 2 | 1 |
| Erpobdellidae | 8 | 1 |
| Diplopoda | 5 | 1 |
| Sperchonidae | 2 | 1 |
| Sphaeriidae | 8 | 1 |

Statistical Analysis

Number of Taxa: 19
 Total Number of Individuals: 100
 % Contribution of Dominant Family: 31.00 % (Hydropsychidae)
 Family Biotic Index: 3.97
 Scraper/Filterer Collector Ratio: 0.60
 Shredder/Total Ratio: 0.09
 E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 8
 % EPT: 63.00
 EPT/C: 15.75
 NJIS Rating: 30
 Biological Condition: Nonimpaired
 Habitat Analysis: 148

Observations

Streamwater: Clear...Flow: Slow...Width/Depth (ft): 30/1
 Substrate: Cobbles...StreamBank Vegetation/Stability: Trees/Stable
 Canopy: Mostly Closed...Other: Forested/Rural; Water temp.23.9 /pH 7.3 /DO 6.0 /Cond.192

Station: AN0090
 Wickecheoke Ck, Rt 579 , Croton, Hunterdon County
 Pittstown USGS Quadrangle
 Date Sampled: 06/02/98

| Family | Family Tolerance Value (FTV) | Number of Individuals |
|-----------------------|------------------------------|-----------------------|
| Gammaridae | 4 | 30 |
| Chironomidae | 6 | 21 |
| Naididae | 7 | 18 |
| Physidae | 7 | 10 |
| Asellidae | 8 | 8 |
| Baetidae | 4 | 7 |
| Tubificidae | 10 | 3 |
| Planorbidae | 6 | 2 |
| Erpobdellidae | 8 | 2 |
| Elmidae | 4 | 2 |
| Gerridae | 8 | 2 |
| Dytiscidae | 5 | 1 |
| Nemouridae | 2 | 1 |
| Culicidae | 8 | 1 |
| BloodRed Chironomidae | 8 | 1 |
| Corixidae | 9 | 1 |

Statistical Analysis

Number of Taxa: 16
 Total Number of Individuals: 110
 % Contribution of Dominant Family: 27.27 % (Gammaridae)
 Family Biotic Index: 5.89
 Scraper/Filterer Collector Ratio: 4.00
 Shredder/Total Ratio: 0.01
 E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 2
 % EPT: 7.27
 EPT/C: 0.33
 NJIS Rating: 15
 Biological Condition: Moderately Impaired
 Habitat Analysis: 168
 Deficiency(s) noted: Paucity of Clean Water Organisms

Observations

Streamwater: Clear....Flow: Slow....Width/Depth (ft): 9/1
 Substrate: Cobbles....StreamBank Vegetation/Stability: Trees,shrubs,grasses/Stable
 Canopy: Mostly Open....Other: Rural; Water temp.16.7 /pH 6.6 /DO 7.0 /Cond.159

Station: AN0091
 Wickecheoke Ck, Locktown-Sergeantsville Rd , Locktown, Hunterdon County
 Stockton USGS Quadrangle
 Date Sampled: 07/16/97

| Family | Family Tolerance Value (FTV) | Number of Individuals |
|-----------------|------------------------------|-----------------------|
| Gammaridae | 4 | 36 |
| Corixidae | 9 | 20 |
| Heptageniidae | 4 | 7 |
| Glossiphoniidae | 8 | 6 |
| Psephenidae | 4 | 6 |
| Baetidae | 4 | 5 |
| Chironomidae | 6 | 5 |
| Physidae | 7 | 4 |
| Leptoceridae | 4 | 3 |
| Planorbidae | 6 | 2 |
| Asellidae | 8 | 1 |
| Aeshnidae | 3 | 1 |
| Protoneuridae | 9 | 1 |
| Lumbriculidae | 8 | 1 |
| Sialidae | 4 | 1 |
| Dytiscidae | 5 | 1 |

Statistical Analysis

Number of Taxa: 16
 Total Number of Individuals: 100
 % Contribution of Dominant Family: 36.00 % (Gammaridae)
 Family Biotic Index: 5.63
 Scraper/Filterer Collector Ratio: 2.60
 Shredder/Total Ratio: 0.01
 E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 3
 % EPT: 15.00
 EPT/C: 3.00
 NJIS Rating: 21
 Biological Condition: Moderately Impaired
 Habitat Analysis: 165

Observations

Streamwater: Clear....Flow: Slow...Width/Depth (ft): 60/1
 Substrate: Cobbles....StreamBank Vegetation/Stability: Trees/Stable
 Canopy: Mostly Open...Other: Forested/Rural; Water temp.18.8 /pH 7.4 /DO 6.6 /Cond.167

Water Monitoring & Standards

bureau of freshwater & biological monito

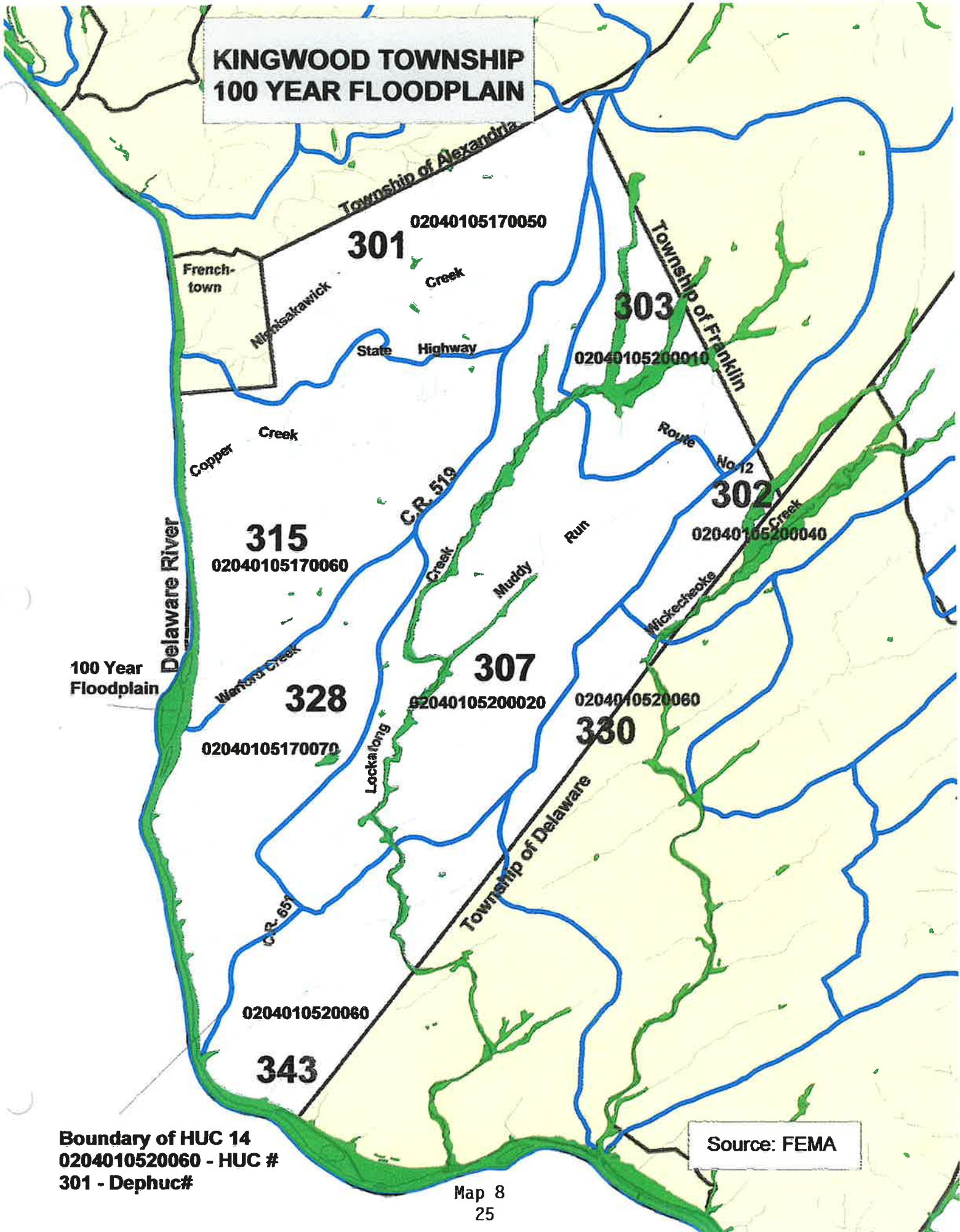
Index by Topic

Program Units

2001 FISH IBI DATA SUMMARY

| <u>FIBI Site</u> | <u>Waterbody</u> | <u>Location</u> | <u>County</u> | <u>IBI Rating</u> |
|------------------|---|---|-------------------|-------------------|
| FIBI008 | Sidney Brook (Grandin Meadow Brood (High Mountain)) | Sidney Rd. – C.R. 617 Downstream of Belmont Ave. crossing | Hunterdon | Excellent |
| FIBI011a | Rockaway River | Knoll Rd | Passaic | Good |
| FIBI021 | Neshanic River | along Kuhl Rd | Morris | Fair |
| FIBI023 | Passaic River | Stonehouse Rd | Hunterdon | Fair |
| FIBI024 | | | Morris & Somerset | Fair |
| FIBI025 | Peters Brook | Park Ave @ park | Somerset | Fair |
| FIBI026 | Nishisakawick Creek | Cross Rd @ Frenchtown | Hunterdon | Good |
| FIBI027 | Lockatong Creek | CR519 | Hunterdon | Good |
| FIBI028 | Moores Creek | Off Pleasant Valley Rd Bridge to house #48 | Mercer | Good |
| FIBI029 | Alexauken Creek | off Alexauken Cr Rd | Hunterdon | Good |
| FIBI030 | Stony Bk | off Stony Brook Rd | Mercer | Good |
| FIBI031 | North Branch Raritan River | Easton Tpk | Somerset | Good |
| FIBI032 | Lamington River | off Black River Rd | Somerset | Good |
| FIBI033 | Pohatcong Creek | SR 31 | Warren | Good |
| FIBI034 | Harihokake Creek | Milford-Frenchtown Rd(CR 619) | Hunterdon | Good |
| FIBI035 | Plum Brook | Pine Hill Rd | Hunterdon | Good |
| FIBI036 | Spruce Run | Main Street | Hunterdon | Excellent |
| FIBI037 | Drakes Brook | Old RR. Off N. 4 Bridges Road | Morris | Good |
| FIBI038 | Middle Brook | River Road | Somerset | Good |
| FIBI039 | Van Campens Brook | Depew Ree Site Rd, off Old Mine Rd | Warren | Excellent |
| FIBI040 | West Branch Papakating Creek | CR565 | Sussex | Excellent |

**KINGWOOD TOWNSHIP
100 YEAR FLOODPLAIN**



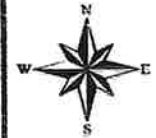
Boundary of HUC 14
0204010520060 - HUC #
301 - Dephuc#

Source: FEMA

Groundwater Recharge Areas in Kingwood Township

NJ GS Groundwater Recharge

- 17 to 23 in/yr
- 13 to 16 in/yr
- 10 to 12 in/yr
- 1 to 9 in/yr
- 0 in/yr
- Hydric Soils
- Wetlands and Open Water
- No Recharge Calculated



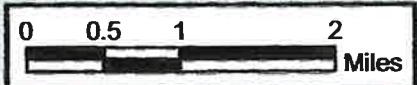
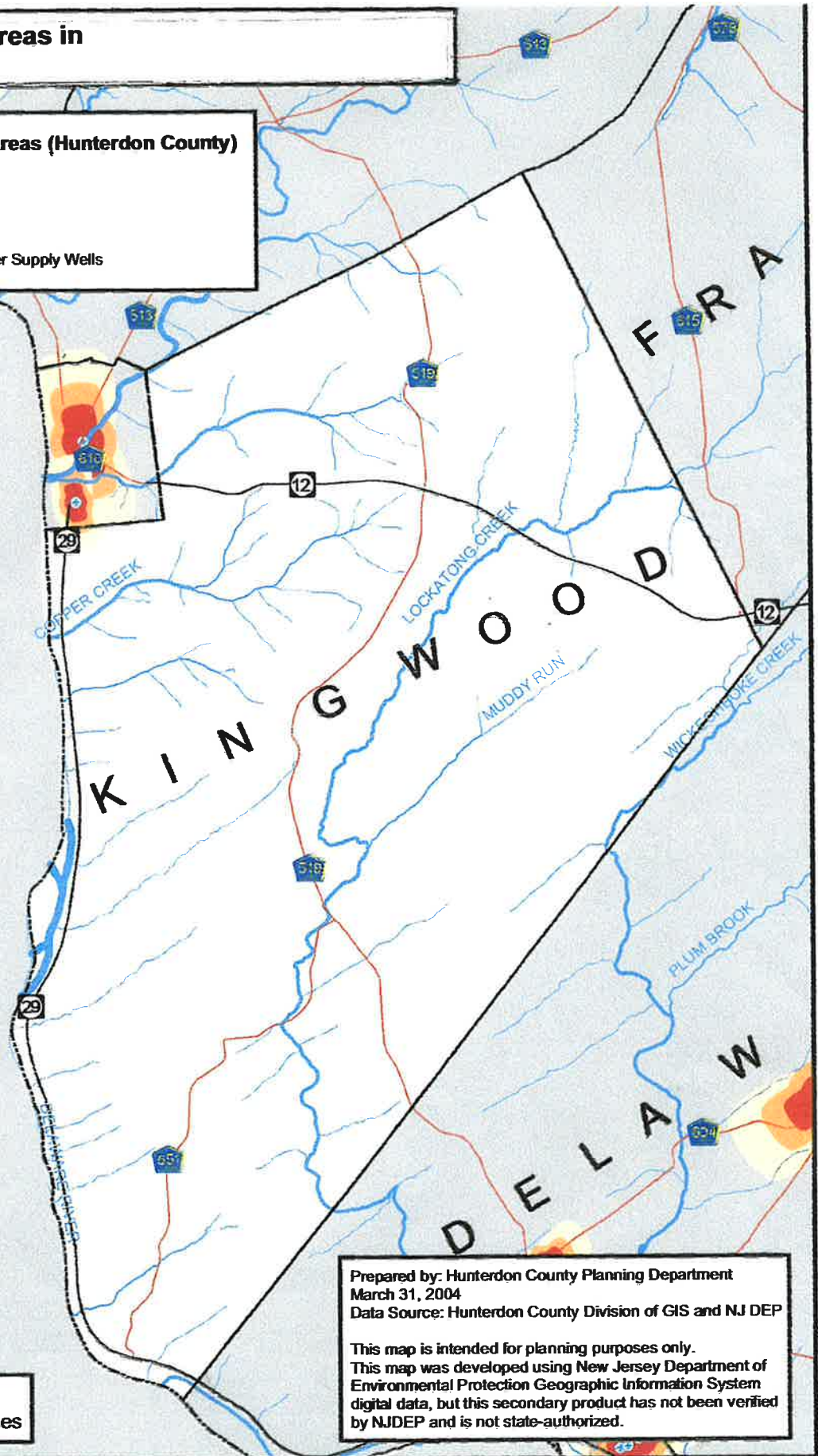
Prepared by: Hunterdon County Planning Department
March 31, 2004
Data Source: Hunterdon County Division of GIS and NJ DEP

This map is intended for planning purposes only.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Wellhead Protection Areas in Kingwood Township

NJ GS Wellhead Protection Areas (Hunterdon County)

- Tier 1 (2 years)
- Tier 2 (5 years)
- Tier 3 (12 years)
- NJ DEP Public Community Water Supply Wells



Prepared by: Hunterdon County Planning Department
March 31, 2004
Data Source: Hunterdon County Division of GIS and NJ DEP

This map is intended for planning purposes only.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

DESIGN AND PERFORMANCE STANDARDS

The Township will adopt the design and performance standards for stormwater management measures as presented in NJAC 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies. The design and performance standards include the language for maintenance of stormwater management measures consistent with the stormwater management rules at NJAC 7:8-5.8 Maintenance Requirements, and language for safety standards consistent with NJAC 7:8-6 Safety Standards for Stormwater Management Basins. The ordinance will be submitted to the County for review and approval. Designs shall first address non-structural stormwater management standards. Only after all non-structural stormwater management methods have been exhausted shall structural methods be used. Every major application shall first hold a pre-application meeting with the Township Professionals at which time the project shall complete and submit a low impact development checklist for review.

Groundwater recharge shall be prohibited on sites with soil contamination. During construction, Township inspectors will observe the construction of the project to ensure that the stormwater management measures are constructed and function as designed.

All projects will be required to file a maintenance plan and submit on-going maintenance documents to the Township Engineer to ensure the continued maintenance of any stormwater management system. No residential stormwater management system shall be the responsibility of a single property owner.

The Wickecheoke Creek, Lockatong Creek, Warford Creek and Nishisakawick Creek, have been classified as a Category One Waters and are shown on Map 11. Special water resource protection areas are mandated for all C-1 waters in the State and all perennial or intermittent streams that drain into these watercourses. Significant wetlands (16.63% of the Township) exist in Kingwood Township. The wetlands are shown on Map 12.

Wetlands are regulated by the State of New Jersey. Preservation of natural resources and sensitive environmental areas which would include wetlands is a goal of the Open Space and Recreation Plan.

PLAN CONSISTENCY

The Township is not within a Regional Stormwater Management Planning Area and no TMDLs have been developed for waters within the Township; therefore this plan does not need to be consistent with any regional stormwater management plans (RSWMPs) nor any TMDLs. If any RSWMPs or TMDLs are developed in the future, this Municipal Stormwater Management Plan will be updated to be consistent.

The Municipal Stormwater Management Plan is consistent with the Residential Site Improvement Standards (RSIS) at NJAC 5:21. The Township will utilize the most current update of the RSIS in the stormwater management review of residential areas. This Municipal Stormwater Management Plan will be updated to be consistent with any future updates to the RSIS.

KINGWOOD TOWNSHIP C-1 STREAMS

C-1 Stream
300 Foot
Buffer

Delaware River

French town

301

02040105170050

Township of Franklin

303

02040105200040

State Highway

315

02040105170060

302

02040105200040

328

02040105170070

307

02040105200020

330

02040105200060

343

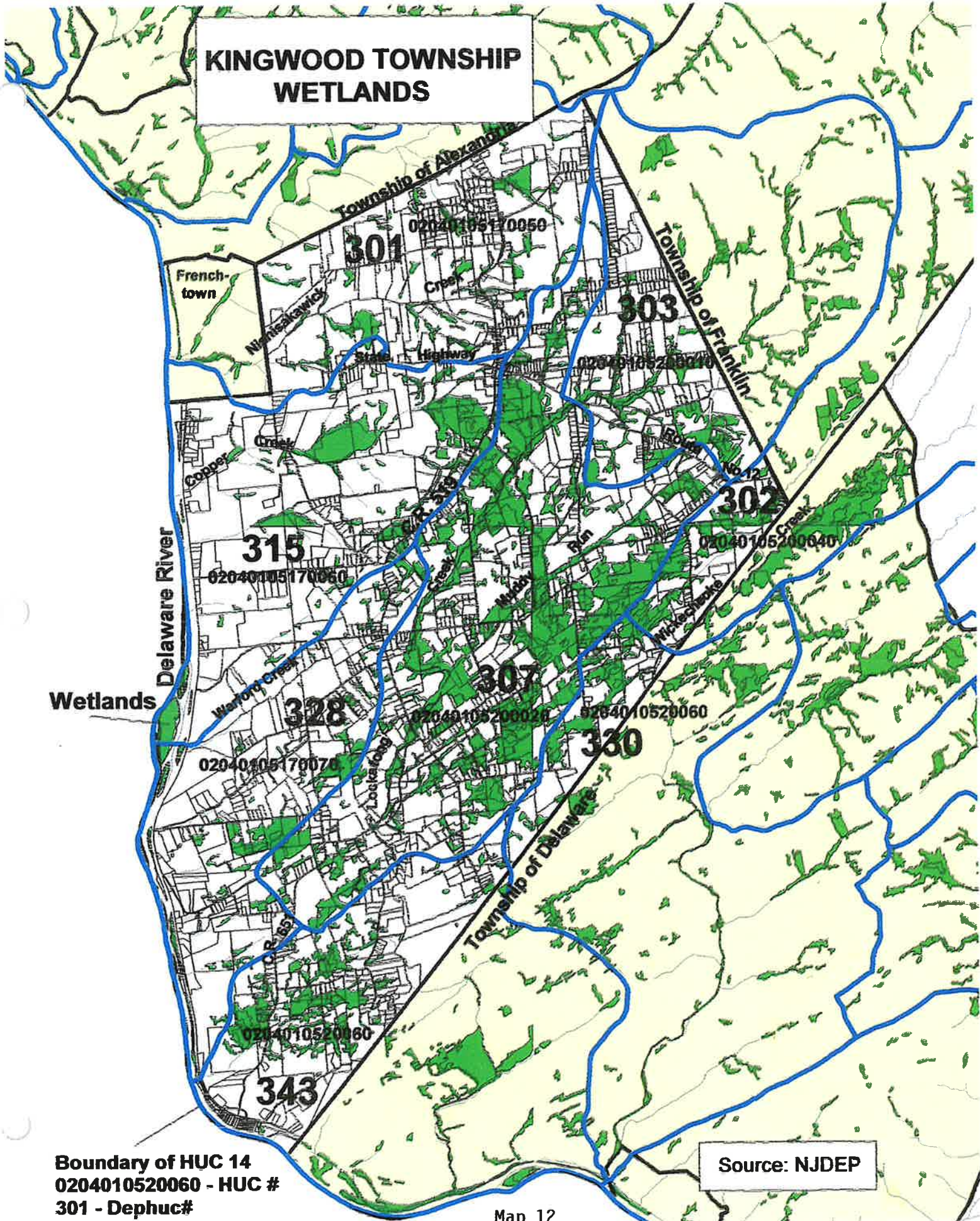
0204010520060

Township of Delaware

Boundary of HUC 14
0204010520060 - HUC #
301 - Dephuc#

Source: NJDEP

KINGWOOD TOWNSHIP WETLANDS



Source: NJDEP

Boundary of HUC 14
0204010520060 - HUC #
301 - Dephuc#

The Township's Stormwater Management Ordinance requires all new development and redevelopment plans to comply with New Jersey's Soil Erosion and Sediment Control Standards. During construction, Township inspectors will observe on-site soil erosion and sediment control measures and report any inconsistencies to the local Soil Conservation District.

NONSTRUCTURAL STORMWATER MANAGEMENT STRATEGIES

The Township has reviewed the master plan and ordinances, and has provided a list of the sections in the Township Zoning Ordinance and Subdivision of Land Ordinance that are to be modified to incorporate nonstructural stormwater management strategies. These are the ordinances identified for revision. Once the ordinance texts are completed, they will be submitted to the County review agency for review and approval. A copy will be sent to the Department of Environmental Protection at the time of submission.

Chapter 132 of the Township Code, entitled Zoning Ordinance and Chapter 115 entitled, Subdivision of Land, were reviewed with regard to incorporating nonstructural stormwater management strategies.

Zoning and Site Plan Ordinance
(Chapter 132)

A. Section 132-34 - HC Commercial District

1. Paragraph J(4) requires that parking areas be setback 50 feet from the street and planted. This section should be revised to encourage the use of native vegetation.
2. Paragraph J(5) requires landscaping of property not covered by buildings or paved surfaces. This section should be revised to encourage the use of native vegetation and to require that changes in elevations and grading be minimized wherever possible.
3. Paragraph J(6) requires a minimum buffer area of at least 100 feet wide be provided along a common boundary with a residential district. This section should be amended to encourage the use of native vegetation and to allow buffer areas to be used for stormwater management by disconnecting impervious surfaces and treating runoff from impervious surfaces.

B. Section 132-37 - FP Flood Plain District

This section needs to be coordinated with the new stormwater regulations. A requirement that existing native vegetation be preserved in the flood plain and cleared areas restored is recommended. A minimum setback from stream banks is recommended. C-1 stream requirements should be referenced.

C. Section 132-51 - Grading

Should recommend that grade changes be minimized, native vegetation be preserved. This section should reference the new stormwater regulations and Best Management Practices.

D. Section 132-53 - Off-Street Parking, Loading and Driveways

The section should be revised to allow for flush curb with curb stops, or curbing with curb cuts to encourage developers to allow for the discharge of impervious areas into landscaped areas for Stormwater Management.

This section should also allow for use of natural vegetated swales for the water quality design storm, with overflow for larger storm events into storm sewers. Consideration should be given to allowing pervious paving. The section should reference the new stormwater regulations and Best Management Practices.

E. Section 132-54 - Performance Standards for All Uses.

Subsection A. Buffers

The use of buffers should include, as appropriate, areas for recharge, bio-retention and constructed wetlands. The use of native species should be recommended.

F. Section 132-56 - Off-Tract Improvements

Off-Tract improvement should be required to comply with the “Design and Performance Standards” in this plan.

G. Section 132-100 Conditional Uses

Overall standards should incorporate reference to new stormwater regulations and BMP’s which must be met and that the use of native vegetation in buffers and landscaped areas is encouraged.

H. Section 132-110 - Preliminary Site Plan

The reference to the new stormwater management regulations and BMP’s should be incorporated.

The preliminary site plan details (Subsection b.) should be amended to incorporate the submission of a stormwater management plan including all necessary information to determine compliance with the regulations.

I. Section 132-112 - Site Plan Checklist and Section 132-113 - Combined Checklist for Conditional Use Applications

Necessary information to determine compliance with new stormwater regulations should be included.

A maintenance plan and maintenance requirements need to be developed and set forth as a checklist requirement.

Subdivision of Land Ordinance
(Chapter 115)

Preliminary Major Subdivision Approval

J. Section 115-6.2 - Stormwater Management

Reference to new stormwater regulations and BMP’s need to be included.

K. Section 115-8 - Fees, Performance Guarantee

Reference to maintenance requirements of stormwater features and guarantee of such need to be included.

L. Section 115-9 - Engineering Details

This section needs to conform to new stormwater and BMP Standards.

M. Section 115-110 - Subdivision Design Standards

Subsection C

The right-of-way as well as design standards need to conform to Residential Site Improvement Standards (RSIS).

Subsection D - Preservation of Natural Features

This section should be expanded to encourage the preservation of native species along streams.

N. Section 115-11 - Improvement Design Standards

Curbs and Gutters

Allow for curb cuts and flush curbs with curb stops to allow vegetated swales to be used for stormwater conveyance and to allow the disconnection of impervious areas.

Shade Trees

Encourage use of native species.

Drainage System Design Standards

Incorporate reference to new stormwater regulations and BMP's.

LAND USE/BUILD-OUT ANALYSIS

A detailed land use analysis for the Township was conducted. Map 4 illustrates the existing land use in the Township based on 1995/97 GIS information from NJDEP. Map 1 illustrates the HUC-14s within the Township. The Township Zoning Map with HUC-14's superimposed is shown in Map 5. Map 13 illustrates the constrained lands within the Township. The build-out calculations for impervious cover are shown in Table C-1. As expected when developing agricultural and forest lands, the build-out of these eight HUC-14s will result in a significant increase in impervious surfaces.

KINGWOOD TOWNSHIP CONSTRAINED LAND

C-1 Stream
300 Foot
Buffer

Delaware River

Wetlands

Boundary of HUC 14
0204010520060 - HUC #
301 - Dephuc#

Source: NJDEP

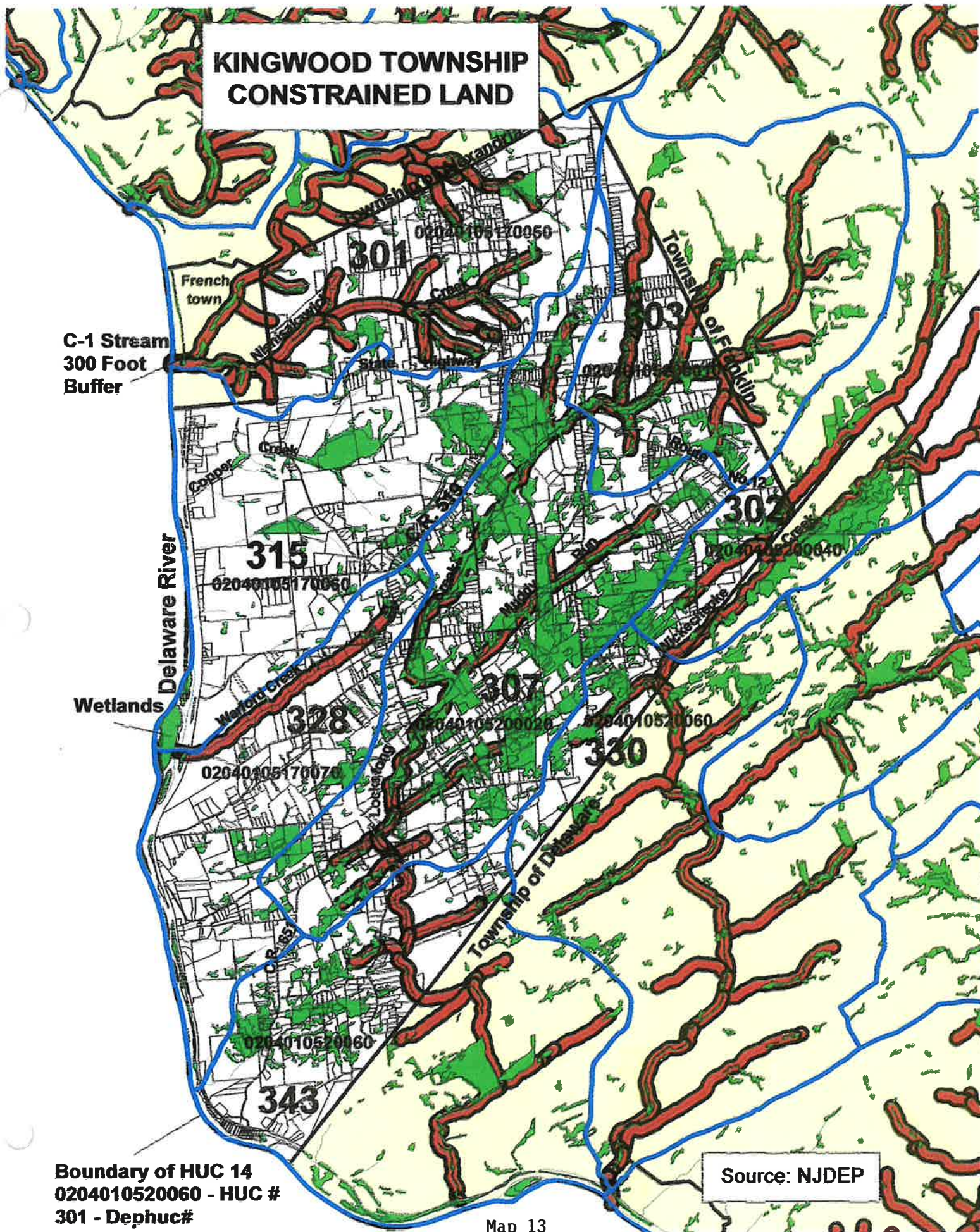


Table C-2 presents the pollutant loading coefficients by land cover. The pollutant loads at full build-out are also presented in Table C-3.

Table C-1
Kingwood Township
Build-Out Calculations By Zoning District By HUC'14s

| <u>HUC 14 & Zones</u> | <u>Total Area (Acres)</u> | <u>Water (Acres)</u> | <u>Wetlands (Acres)</u> | <u>C-1 Buffer (Acres)</u> | <u>Total Constrained Area (Acres)</u> | <u>Developable Land (Acres)</u> | <u>Allowable Impervious</u> | <u>Build Out Impervious (Acres)</u> |
|--|---------------------------|----------------------|-------------------------|---------------------------|---------------------------------------|---------------------------------|-----------------------------|-------------------------------------|
| HUC-14 - 02040105170050 | | | | | | | | |
| DEPHUC-14 - 301 | | | | | | | | |
| HC - Highway Commercial | 146.1 | - | 7.9 | 30.1 | 38.0 | 108.1 | .45 | 48.6 |
| VC-2 - Village Commercial | 44.9 | - | 2.2 | 3.7 | 5.9 | 39.0 | .40 | 15.6 |
| VR-1 - Village Residential | 21.4 | - | - | 1.1 | 1.1 | 20.3 | .10 | 2.0 |
| Agricultural/Residential | <u>2,875.4</u> | - | <u>140.9</u> | <u>557.1</u> | <u>698.0</u> | <u>2,177.4</u> | .05 | <u>108.9</u> |
| Subtotal | 3,087.8 | | 151.0 | 592.0 | 743.0 | 2,344.8 | | 175.1 |
| HUC-14 - 02040105200040 | | | | | | | | |
| DEPHUC-14 - 302 | | | | | | | | |
| BP - Business Park | 258.8 | - | 70.2 | 20.7 | 90.9 | 167.9 | .45 | 75.6 |
| Agricultural/Residential | <u>474.1</u> | - | <u>99.1</u> | <u>248.2</u> | <u>347.3</u> | <u>126.8</u> | .05 | <u>6.3</u> |
| Subtotal | 732.9 | | 169.3 | 268.9 | 438.2 | 294.7 | | 81.9 |
| HUC-14 - 02040105200010 | | | | | | | | |
| DEPHUC-14 - 303 | | | | | | | | |
| HC - Highway Commercial | 36.4 | - | 3.1 | 7.8 | 10.9 | 25.5 | .45 | 11.5 |
| PO/R - Professional Office/Residential | 38.1 | - | 9.6 | - | 9.6 | 28.5 | .40 | 11.4 |
| BP - Business Park | 457.4 | - | 149.5 | 57.9 | 207.4 | 250.0 | .45 | 112.5 |
| Agricultural/Residential | <u>1,329.2</u> | - | <u>26.8</u> | <u>458.7</u> | <u>485.5</u> | <u>843.7</u> | .05 | <u>42.2</u> |
| Subtotal | 1,861.1 | | 189.0 | 524.4 | 713.4 | 1,147.7 | | 177.6 |
| HUC-14 - 02040105200020 | | | | | | | | |
| DEPHUC-14 - 307 | | | | | | | | |
| HC - Highway Commercial | 48.5 | - | 2.5 | 18.7 | 21.2 | 27.3 | .45 | 12.3 |
| VC-2 - Village Commercial | 21.1 | - | 10.5 | 2.6 | 13.1 | 8.0 | .40 | 3.2 |
| VC-1 - Village Commercial | 23.0 | - | 4.9 | 2.7 | 7.6 | 15.4 | .60 | 9.2 |
| PO/R - Professional Office/Residential | 46.9 | - | 10.0 | 2.7 | 12.7 | 34.2 | .40 | 13.7 |
| BP - Business Professional | 152.6 | - | 44.6 | - | 44.6 | 108.0 | .45 | 48.6 |
| Agricultural/Residential | <u>5,880.8</u> | - | <u>1,534.8</u> | <u>1,317.8</u> | <u>2,852.6</u> | <u>3,028.2</u> | .05 | <u>151.4</u> |
| Subtotal | 6,172.9 | | 1,607.3 | 1,344.5 | 2,951.8 | 3,221.1 | | 238.4 |
| HUC-14 - 02040105170060 | | | | | | | | |
| DEPHUC-14 - 315 | | | | | | | | |
| HC - Highway Commercial | 112.5 | - | 17.2 | - | 17.2 | 95.3 | .45 | 42.9 |
| VC-2 - Village Commercial | 40.3 | - | 4.0 | - | 4.0 | 36.3 | .40 | 14.5 |
| VC-1 - Village Commercial | 3.2 | - | - | - | - | 3.2 | .60 | 1.9 |
| VR-1 - Village Residential | 12.5 | - | 0.5 | - | 0.5 | 12.0 | .10 | 1.2 |
| Agricultural/Residential | <u>4,239.0</u> | <u>163.9</u> | <u>361.4</u> | - | <u>525.3</u> | <u>3,713.7</u> | .05 | <u>185.7</u> |
| Subtotal | 4,407.5 | 163.9 | 383.1 | | 547.0 | 3,860.5 | | 246.2 |
| HUC-14 - 02040105170070 | | | | | | | | |
| DEPHUC-14 - 328 | | | | | | | | |
| VR-2 - Village Residential | 18.9 | - | 1.7 | 0.5 | 2.2 | 16.7 | .08 | 1.3 |
| Agricultural/Residential | <u>3,216.0</u> | <u>168.7</u> | <u>369.7</u> | <u>322.2</u> | <u>860.6</u> | <u>2,355.4</u> | .05 | <u>117.8</u> |
| Subtotal | 3,234.9 | 168.7 | 371.4 | 322.7 | 862.8 | 2,372.1 | | 119.1 |
| HUC-14 - 02040105200060 | | | | | | | | |
| DEPHUC-14 - 330 | | | | | | | | |
| Agricultural/Residential | 816.2 | - | 93.5 | 147.9 | 241.4 | 574.8 | .05 | 28.7 |
| HUC-14 - 02040105200030 | | | | | | | | |
| DEPHUC-14 - 343 | | | | | | | | |
| Agricultural/Residential | <u>2,522.7</u> | 70.1 | 252.6 | 309.2 | 631.9 | <u>1,890.8</u> | .05 | 94.5 |
| TOTALS | 22,836.0 | 402.7 | 3,217.2 | 3,509.6 | 7,129.5 | 15,706.5 | | 1,161.5 |

cd\kingwood\com\rc\build out calcs

Table C-2: Pollutant Loads by Land Cover

| Land Cover | Total Phosphorus Load (lbs/acre/year) | Total Nitrogen Load (lbs/acre/year) | Total Suspended Solids Load (lbs/acre/yr) |
|----------------------------------|--|--|--|
| High, Medium Density Residential | 1.4 | 15 | 140 |
| Low Density, Rural Residential | 0.6 | 5 | 100 |
| Commercial | 2.1 | 22 | 200 |
| Industrial | 1.5 | 16 | 200 |
| Urban, Mixed Urban, Other Urban | 1.0 | 10 | 120 |
| Agricultural | 1.3 | 10 | 300 |
| Forest, Water, Wetlands | 0.1 | 3 | 40 |
| Barrenland/Transitional Area | 0.5 | 5 | 60 |

Source: NJDEP Stormwater BMP Manual 2004.

Table C-3
Kingwood Township
Nonpoint Source Loads at Build-Out for HUC 14's

| HUC-14 & Zones | Build-Out Zoning | Developable Area (Acres) | TP (lbs/acre/yr) | TP (lbs/yr) | TN (lbs/acre/yr) | TN (lbs/yr) | TSS (lbs/acre/yr) | TSS (lbs/yr) |
|--|----------------------------|--------------------------|------------------|----------------|------------------|-----------------|-------------------|----------------|
| HUC-14 - 02040105170050 DEPHUC-14 - 301 | | | | | | | | |
| HC - Highway Commercial | Commercial | 108.1 | 2.1 | 227.0 | 22 | 2,378.2 | 200 | 21,620 |
| VC-2 - Village Commercial | Commercial | 39.0 | 2.1 | 81.9 | 22 | 838.0 | 200 | 7,800 |
| VR-1 - Village Residential | Medium Density Residential | 20.3 | 1.4 | 28.4 | 15 | 304.5 | 140 | 2,842 |
| Agricultural/Residential | Rural Residential | <u>2,177.4</u> | 0.5 | <u>1,088.7</u> | 5 | <u>10,887.0</u> | 100 | <u>217,740</u> |
| Totals | | 2,344.8 | | 1,426.0 | | 14,427.7 | | 250,002 |
| HUC-14 - 02040105200040 DEPHUC-14 - 302 | | | | | | | | |
| BP - Business Park | Industrial | 167.9 | 1.5 | 251.9 | 16 | 2,686.4 | 200 | 33,480 |
| Agricultural/Residential | Rural Residential | <u>126.8</u> | 0.5 | <u>63.4</u> | 5 | <u>634.0</u> | 100 | <u>12,680</u> |
| Totals | | 294.7 | | 315.3 | | 3,320.4 | | 46,160 |
| HUC-14 - 02040105200010 DEPHUC-14 - 303 | | | | | | | | |
| HC - Highway Commercial | Commercial | 25.5 | 2.1 | 53.6 | 22 | 561.0 | 200 | 5,100 |
| PO/R - Professional Office/Residential | Commercial | 28.5 | 2.1 | 59.9 | 22 | 627.0 | 200 | 5,700 |
| BP - Business Park | Industrial | 250.0 | 1.5 | 375.0 | 16 | 4,000.0 | 200 | 50,000 |
| Agricultural/Residential | Rural Residential | <u>843.1</u> | 0.5 | <u>421.9</u> | 5 | <u>4,218.5</u> | 100 | <u>84,370</u> |
| Totals | | 1,147.7 | | 910.4 | | 9,406.5 | | 145,170 |
| HUC-14 - 02040105200020 DEPHUC-14 - 307 | | | | | | | | |
| HC - Highway Commercial | Commercial | 27.3 | 2.1 | 57.3 | 22 | 600.6 | 200 | 5,460 |
| VC-2 - Village Commercial | Commercial | 8.0 | 2.1 | 16.8 | 22 | 176.0 | 200 | 1,600 |
| VC-1 - Village Commercial | Commercial | 15.4 | 2.1 | 32.3 | 22 | 338.8 | 200 | 3,080 |
| PO/R - Professional Office/Residential | Commercial | 34.2 | 2.1 | 71.8 | 22 | 752.4 | 200 | 6,840 |
| BP - Business Park | Industrial | 108.0 | 1.5 | 162.0 | 16 | 1,728.0 | 200 | 21,600 |
| Agricultural/Residential | Rural Residential | <u>3,028.2</u> | 0.5 | <u>1,514.1</u> | 5 | <u>15,141.0</u> | 100 | <u>302,820</u> |
| Totals | | 3,221.1 | | 1,854.3 | | 18,736.8 | | 341,400 |

Table C-3 (Continued)

| HUC-14 & Zones | | Build-Out Zoning | Developable Area (Acres) | | | | |
|--|--------------|------------------|--------------------------|-------------|------------------|-------------|-------------------|
| HUC-14 - 02040105170060 DEPHUC-14 - 315 | Area (Acres) | | TP (lbs/acre/yr) | TP (lbs/yr) | TN (lbs/acre/yr) | TN (lbs/yr) | TSS (lbs/acre/yr) |
| HC - Highway Commercial | 95.3 | 2.1 | 200.1 | 22 | 2,096.6 | 200 | 19,060 |
| VC-2 - Village Commercial | 36.3 | 2.1 | 76.2 | 22 | 798.6 | 200 | 7,260 |
| VC-1 - Village Commercial | 3.2 | 2.1 | 6.7 | 22 | 70.4 | 200 | 640 |
| VR-1 - Village Residential | 12.0 | 1.4 | 16.8 | 15 | 180.0 | 140 | 1,680 |
| Agricultural/Residential | 3,713.7 | 0.5 | 1,856.9 | 5 | 18,568.5 | 100 | 371,370 |
| Total | 3,860.5 | | 2,156.7 | | 21,714.1 | | 400,010 |
| HUC-14 - 02040105170070 DEPHUC-14 - 328 | | | | | | | |
| VR-2 - Village Residential | 16.7 | 1.4 | 23.4 | 15 | 250.5 | 140 | 2,338 |
| Agricultural/Residential | 2,355.4 | 0.5 | 1,177.7 | 5 | 11,777.0 | 100 | 235,540 |
| Total | 2,372.1 | | 2,378.8 | | 12,027.5 | | 237,878 |
| HUC-14 - 0204010520060 DEPHUC-14 - 330 | | | | | | | |
| Agricultural/Residential | 574.8 | 0.5 | 287.4 | 5 | 2,874.0 | 100 | 57,480 |
| HUC-14 - 0204010520030 DEPHUC-14 - 343 | | | | | | | |
| Agricultural/Residential | 1,890.8 | 0.5 | 945.4 | 5 | 9,454.0 | 100 | 189,080 |
| TOTALS | 15,706.5 | | 10,274.3 | | 91,961.0 | | 1,667,180 |

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MITIGATION PLAN

Mitigation Project Criteria

1. The mitigation project must be implemented in the same drainage area as the proposed development. The project must provide additional groundwater recharge benefits, or protection from stormwater runoff quality and quantity from previously developed property that currently does not meet the design guidelines and performance standards outlined in the Municipal Stormwater Management Plan. The developer must ensure the long-term maintenance of the project, including the maintenance requirements. The design engineer will be required to prepare a maintenance plan for the stormwater management measures incorporated into the design of a major development. The maintenance plan must contain specific preventative maintenance tasks and schedules; cost estimates, including estimated cost of sediment, debris, or trash removal; and the name, address, and telephone number of the person or persons responsible for preventative and corrective maintenance (including replacement). If the maintenance plan identifies a person other than the developer (for example, a public agency or homeowners' association) as having the responsibility for maintenance, the plan must include documentation of such person's agreement to assume this responsibility, or of the developer's obligation to dedicate a stormwater management facility to such person under an applicable ordinance or regulation. Responsibility for maintenance will not be assigned or transferred to the owner or tenant of an individual property in a residential development or project, unless such owner or tenant owns or leases the entire residential development or project. If the person responsible for maintenance is not a public agency, the maintenance plan and any future revisions will be recorded upon the deed of record for each property on which the maintenance described in the maintenance plan must be undertaken. Preventative and corrective maintenance will be required to be performed to maintain the function of the stormwater management measure, including repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of non-vegetated linings. The person responsible for maintenance must maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders and shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed. If the stormwater management facilities are dedicated to the Township, the above procedures and requirements will not apply; however, the Township will require a 2 year maintenance guarantee in accordance with the provisions of the MLUL.

The Applicant can select one or more of the following projects listed to compensate for the deficit in performance standards resulting from the proposed project. More detailed information on the projects can be obtained from the Township Engineer. Listed below are specific projects that can be used to address the mitigation requirements.

Groundwater Recharge

Retrofit existing detention basins and stormwater collection systems in King's Ridge and Winberry Subdivisions to provide additional annual recharge.

Water Quality

Retrofit King's Ridge and Winberry detention basins to provide water quality control.

Water Quantity

Retrofit King's Ridge and Winberry detention basin outlet structures to attenuate storm discharges of lesser intensity than the 100 year recurrence interval and coincidentally to increase retention time for containment of the water quality storm. Reconfiguration of low flow channels, clean up and silt removal may also be a supplemental consideration.

If a suitable site cannot be located in the same drainage area as the proposed development, then another site may be selected from the above lists to address the development shortfall as to water quality and groundwater recharge only.

The Township may allow a developer to provide funding or partial funding to the Township for an environmental enhancement project that has been identified in a Municipal Stormwater Management Plan or towards the development of a Regional Stormwater Management Plan. The funding must be equal to or greater than the cost to implement the mitigation outlined above, including costs associated with purchasing the property or easement for mitigation and the cost associated with the long-term maintenance requirements of the mitigation measure.

SAFETY STANDARDS FOR STORMWATER MANAGEMENT BASINS

Subchapter 6 (NJAC 7:8-6) sets forth requirements for trash racks, overflow grates and escape provisions concerning design and operation of stormwater management basins. These will be reviewed for inclusion in the Stormwater Management Ordinance as necessary and appropriate.

APPENDIX

A report entitled, "Kingwood Township Environmental Resource Inventory" and dated June 2004 was prepared by the Kingwood Township Environmental Commission in consultation with the Kingwood Township Committee and Kratzer Environmental Services. The report was written by Deborah J. Kratzer. Certain of the material contained in this report is pertinent to this Stormwater Management Plan and is summarized as follows:

(The figure numbers are those set forth in the Environmental Inventory.)

1. Figure 3d: Steep Slopes
2. Figure 4b: Depth to Bedrock - The depth to bedrock is the distance from the land surface to bedrock. Kingwood Township has very shallow depths to bedrock, ranging from zero (bedrock is exposed at the surface, with no soil above it) to 60 inches. Areas near the Delaware River, the islands in the river, and a small area on Barbertown-Point Breeze Road have depths greater than 60 inches.
3. Figure 4c: Depth to High Water Table - The water table is the top of the water surface in the saturated part of an aquifer. The type of water table is listed, with the months during which the seasonal high water table occurs at the depth specified in a normal year. The types of water table include apparent and perched.
4. Figure 4d: Hydrologic Soil Group - The hydrologic soil grouping describes the rate that water infiltrates into the ground. A small area on Barbertown-Point Breeze Road has a high infiltration rate (Class A). The majority of the Township has slow to very slow infiltration rates.
5. Figure 4e: Soil Texture - The soil texture describes the mineral soil particles on the basis of size. Sand particles are 2.0 to 0.05 mm diameter; silt ranges from 0.05-0.002 mm diameter; while clay particles are less than 0.002 mm diameter. Sand particles feel gritty and have the least water and nutrient holding capacity. Silt particles feel smooth like a powder and have little tendency to stick together, but gave greater capacity to hold available water for plant growth. Because clay particles are so small, their surface area is many thousands of time greater than for silt and nearly a million times more than that for very coarse sand. Water and nutrients are held on the surface of the clay particles, therefore clay holds the greatest amount of water and nutrients. Soil types are classified according to the proportions of sand, silt and clay. A soil with equal parts of the three sizes is characterized as a "clay loam." Within the Township, silt loams and silty clay loams predominate, followed by weathered and unweathered bedrock. Sandy soils can be found along the Delaware River and on the islands in the river.

Many soils in Kingwood contain significant rock fragments. Some soils in Kingwood are gravelly (containing appreciable amounts of pebbles, 2 to 75 mm diameter), stony (containing stones 250 to 600 mm diameter), or channery (containing thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches in length).

6. Figure 4f: Soil Erodibility Factor - Erosion is the wearing away of the land surface by running water, wind, ice, or other geological agents. Erosion is often accelerated as a result of human activities. The soil erodibility factor (known as "K") is a number which quantifies the susceptibility of soil particles to detachment and movement by water. This factor is used in the Universal Soil Loss Equation to calculate soil loss by water. It takes into account the affects of infiltration rate, permeability and total water capacity and factors that resist the forces of the rainfall and runoff.
7. Figure 4g: Soil Permeability - The permeability is the ability of the soil to transmit water or air. It is usually measured as a rate of water flow through the soil in a given period of time (expressed as inches/hour). Permeability is a major factor in determining how much precipitation will run off and how much will infiltrate into the soil. In addition, knowledge of permeability is important for septic system design and erosion control measures.
8. Figure 5b: Groundwater Aquifers
9. Figure 5d: Groundwater Recharge

Groundwater recharge is defined as water added to an aquifer (for example, precipitation that seeps into the ground). A groundwater recharge area is the land area that allows precipitation to seep into the saturated zone. These areas are generally at topographically high areas with discharge areas at lower elevations, commonly at streams or other water bodies (i.e. the groundwater returns to surface water). In general, groundwater divides coincide with, or are slightly offset from, surface water divides (Lewis-Brown, 1995). Most groundwater flows through the shallow layers of soil and weathered bedrock to the nearest stream. A smaller percentage penetrates deeper and recharges the aquifer.

Many factors affect the amount of recharge that will occur in a given area, including climate (e.g. the amount, intensity and form of precipitation, and the effect of wind, humidity and air temperature on evapotranspiration), soil, surficial geology and vegetation factors. In addition, recharge of groundwater varies seasonally. During the growing season, precipitation is intercepted by plants and returned to the atmosphere through transpiration (part of the hydrologic cycle). Evaporation likewise, is higher during the warmer months. Therefore, most recharge occurs during late fall, winter and early spring, when plants are dormant and evaporation rates are minimal (Heath, 1983).

Recharge rates are expressed in terms of the amount of precipitation that reaches the aquifer per unit of time (e.g. inches/year). Recharge rates vary from year to year, depending on the amount of precipitation, its seasonal distribution, air temperature, land use and other factors. Relative to land use, recharge rates in forests are much higher than those in urban areas (Hath, 1983). This is because urban areas have large areas covered with impermeable surfaces, hastening runoff to surface water, instead of allowing precipitation to percolate into the ground.

NJSA 58:11A, 12-16 required the NJDEP to publish a methodology to map and rank aquifer-recharge areas. In addition, the legislation required the development of groundwater protection practices designed to encourage ecologically sound development in aquifer-recharge areas (Charles et. al., 1993).

To fulfill the requirements of this legislation, the NJ Geological Survey developed GSR-32, which estimates groundwater recharge (but not aquifer recharge), and is useful for evaluating the relative effect of present and future land uses on recharge areas (Charles et. al., 1993). For this method, recharge was calculated based on data for precipitation, soil, land-use/land-cover, surface runoff, and evapotranspiration. This method was then applied by NJGS to create a GIS coverage (See Figure 5d). There were a number of assumptions made for the calculations and model inputs which limit the accuracy of the method: 1.) the calculated groundwater recharge includes any water entering the ground (lesser amounts actually enter the aquifer); 2.) assumes that all water which migrates below the root zone recharges the aquifer (which doesn't happen); 3.) addresses only natural groundwater recharge, and does not include artificial recharge, withdrawals or natural discharge; 4.) wetlands and water bodies were eliminated from analysis, because the direction of flow between groundwater and surface water is site-specific and also varies seasonally, and this level of detail was beyond the scope of the study (these areas were assumed to provide no recharge or discharge); and 5.) stream baseflows used may not be representative of local streams (Charles et. al., 1993). An additional limitation of the data is that they estimate long-term average annual recharge, which does not represent the reduced recharge during critical summertime conditions (NJ Water Supply Authority, 2002).

Keeping these limitations in mind, the method estimated recharge rates from 1 to 16 inches per year in Kingwood (excluding surface water, wetlands and hydric soils), for estimated average annual subsurface recharge (see Figure 5d). This represents 2 to 34% of precipitation.

For comparison in 1966, the State Geologist estimated recharge to be 10 to 15% of precipitation for areas similar to Kingwood Township (Kasabach, 1966), while a typical figure for recharge in the sandy coastal areas of New Jersey is approximately 50% of rainfall.

As previously mentioned, only a portion of water entering the ground actually recharges the aquifer, but the GSR-32 did not attempt to quantify this amount. According to Lewis-Brown (1995), of the US Geological Survey, "...only about 6% of the recharge at land surface reaches depths greater than 75 feet below land surface," In contrast, Robert Canace, of the

NJ Geological Survey, suggested that 20% of the estimated recharge should be used for planning purposes, representing the portion of recharge actually available for use during drought conditions (Canace, 1995). Using the 6% figure, Kingwood may have usable recharge of 0.06 to 0.96 inch. If assuming that 20% of ground recharge is aquifer recharge, 0.2 to 3.2 inches are added to groundwater per year. While it is unknown at this time which figure is closer to actual conditions in Kingwood, the general principle is this: Recharge is limited. Therefore, if withdrawals of groundwater are greater than the recharge amounts, the aquifer would experience a continuous net reduction in the available water supply.

10. Figure 5e: Groundwater Monitoring Sites, Well Head Protection Areas, Sole Source Aquifer and Known Contaminated Sites

Known Contaminated Sites

The NJDEP Bureau of Planning and Systems compiled a list of Known Contaminated Sites (KCS). The Known Contaminated Sites List for New Jersey 2001 (as required under NJSA 58:10-23.16-17) are those sites and properties within the State where contamination of soil or groundwater has been identified or where there has been, or there is suspected to have been, a discharge of contamination. It is important to note that some of the cases listed may have been fully remediated and should no longer be considered contaminated site. Additionally new contaminated sites may have been identified since the creation of this list and are not included here. For further information contact NJDEP's Site Remediation Programs (SRP) lead program, which are identified with each site listed in this data base (see Table 2.12).

Table AP-1
Known Contaminated Sites

| Site Identification # | Name & Address | City | Status ³ | Status Date | Lead Agency | REM ⁴ | |
|--|----------------|--|---------------------|-------------|-------------|---|------------|
| In Kingwood | NJD981873755 | Magnesium Elektron, Inc. 500 Barbertown-Point Breeze Rd | Kingwood Township | Active | 1995 | NJDEP Bureau of Environmental Evaluation, Cleanup & Responsibility Assessment | D |
| | NJL800076226 | Barbertown Garage Rt. 519 & Kingwood Sta. | Kingwood Township | Active | 1995 | NJDEP Bureau of Underground Storage | C2 |
| | NJD980761373 | Derewal Chem. Co. Rt. 29 (River Rd.) | Kingwood Township | Active | 1985 | NJDEP Bureau of Site Management | C3 |
| | NJL800610388 | 3 Hampton Rd. | Kingwood Township | Active | 2000 | NJDEP Bureau of Field Operations-Case Assignment Section | C1 |
| | NJL800262164 | Forge Anvil Tavern 650 Rt. 519 | Kingwood Township | Active | 1997 | NJDEP Bureau of Field Operations-Northern | Not listed |
| Within watersheds shared with Kingwood | NJL600192595 | Getty Service Station Race Str. & Kingwood Avenue | Frenchtown Borough | Active | 1992 | NJDEP Bureau of Underground Storage | C2 |
| | NJL000050831 | 274 Kingwood Stockton Rd. | Delaware Township | Pending | 1993 | NJDEP Bureau of Field Operations | C2 |
| | NJL820000305 | Mobil Serv. Station 22 Race Street | Frenchtown Borough | Active | 2000 | NJDEP Bureau of Field Operations-Northern | C2 |
| | NJD002346245 | Frenchtown Ceramics Co. 8 th & Harrison Strs. | Frenchtown Borough | Active | 1994 | NJDEP Bureau of Field Operations-Initial Notice Section | B |
| | NJL800218216 | 190 Locust Grove Rd | Franklin Township | Active | 2000 | NJDEP Bureau of Field Operations- Northern | C1 |
| | NJL800473720 | 41 Kingwood Ave. | Frenchtown Borough | Active | 1999 | NJDEP Bureau of Field Operations-Northern | C2 |
| | NJL800614778 | National Hotel 31 Race Street | Frenchtown Borough | Active | 2001 | NJDEP Bureau of Field Operations-Northern | C1 |
| | NJL800467250 | 107 Spring Hill Rd. | Frenchtown Borough | Active | 1999 | NJDEP Bureau of Field Operations-Northern | Not listed |
| | NJL600256366 | All American Auto 1120 Route 12 | Frenchtown Borough | Active | 1999 | NJDEP Bureau of Underground Storage | Not listed |

³**STATUS** describes the site's position in the remedial process:

Active: this status is designated when a contaminated site is assigned to a remedial program and measures such as a preliminary assessment, remedial investigation or cleanup work is underway.

Pending: This status is designated when a contaminated site awaits the execution of an oversight documents such as a Memorandum of Agreement or an Administrative Consent Order or the availability of resources for publicly funded action prior to assignment to a specific remedial program bureau.

⁴**REM = REMEDIAL LEVEL**, as defined below:

B: emergency response, simple removal activities of contaminants; usually no impact to soil or groundwater

C1: simple sites with one or two contaminants localized to soil and the immediate spill or discharge area

C2: more complicated contaminant discharges, multiple site spills and discharges, more than one contaminant, with both soil and groundwater impacted or threatened

C3: high complexity and threatening sites; multiple contaminants, some at high concentrations with unknown sources continuing to impact soils, groundwater and possibly surface waters and potable water resources; dangerous for direct contact with contaminated soils

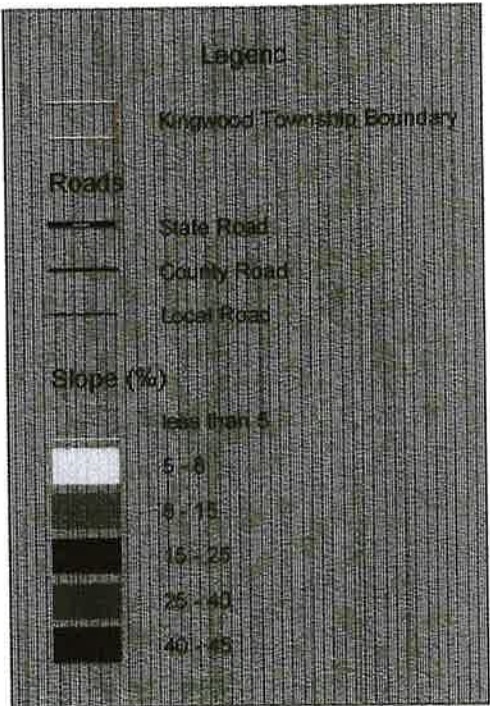
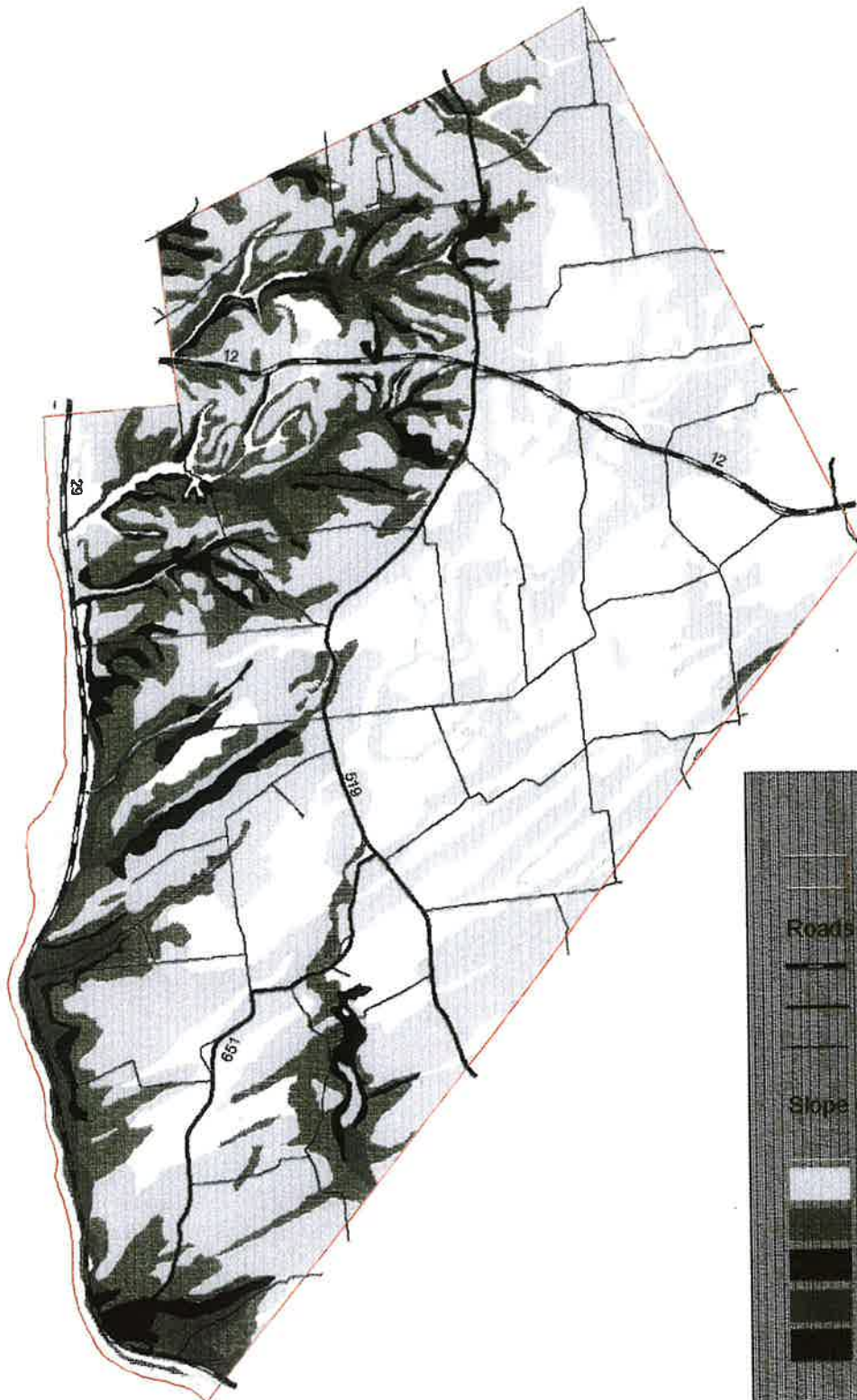
D: Same conditions as C3 except that D levels are also usually designed Federal "Superfund Sites".

Source: NJDEP Known Contaminated Sites GIS data.

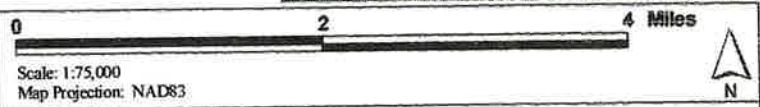
Table AP-2
Underground Storage Tanks

| City | Case Identification Number | Case Name | Address | Status | Status Date | Lead Bureau | REM |
|--|----------------------------|---|--------------------------------------|--------|-------------|-------------|-----|
| Kingwood Township | 99-12-10-1550-33 | Koches Repairs, Inc. | 1282 Rt 12, West | ATP | | BUST | |
| | 94-02-10-1148 | Baptistown Corner Store | Rt. 519 & 12 | NFA | 1997 | BUST | C1 |
| | 94-07-22-1134 | Barbertown Garage | Rt 519 -Kingwood | ATP | | BUST | C2 |
| | 96-10-08-1829-06 | Barbertown/Idell & Kingwood Rd | Barbertown/Idell & Kingwood Rd | NFA | 1997 | BUST | B |
| | 92-11-16-1238 | Kingwood Twp Elementary School | Route 519 | NFA | 1993 | BUST | C1 |
| | 89-03-20-1504 | Precision Drilling | Route 519 | NFA | 1992 | BUST | |
| | 99-06-04-1406-10 | Twp of Kingwood Garage | 288 Kingwood Station - Barbertown Rd | AA | | BFO-IN | |
| | | Commercial Property - Discount Auto Parts | 1266 State Rt 12 | NFA | 2001 | BFO-IIN | B |
| Frenchtown | 99-01-07-1504-41 | 1282 West Hunterdon Transit, Inc. | Route 12 | NFA | 2000 | BUST | B |
| | 89-01-12-1044 | A&L Oil (Gas Station) | 22 Race Street | NFA | 1992 | BUST | C1 |
| | 98-12-10-1443-57 | All American Auto | 1120 Route 12 | ATP | | BUST | B |
| | 98-12-10-1443-57 | Echlin Truck | 203 Harrison Street | NFA | 1992 | BFO-IN | B |
| | | Faller Property | 19 Race Street | NFA | 1994 | BFO-IN | B |
| | 98-12-11-1336-24 | Frenchtown Municipal Bldg. | River Road | AA | | BFO-IN | |
| | 92-08-07-1109 | Kerrs Getty S/S | Race Str/Kingwood Ave | ATP | | BUST | |
| <p>Notes: BUST is the Bureau of Underground Storage Tanks; BFO-IN is the Bureau of Field Operations - Initial Notice Section NFA = No Further Action; AA = Awaiting Assignment; ATP = Assigned to Project; See Table 2.13 for REM definitions.</p> | | | | | | | |
| <p>Source: NJDEP Site Remediation, Bureau of Underground Storage Tanks. http://www.nj.gov/dep/srp/bust/njust.zip</p> | | | | | | | |

11. Figure 11: Open Space, Recreational and Publicly Owned Land Resources



Data Sources: Soils (steep slopes) - NJDEP, OIRM, BGIA;
 Township boundary - Hunterdon County GIS
 Scale of data: 1:24,000
 Note: Map accuracy is limited to the accuracy of the scale of the original data sets.
 Disclaimer: This map was developed using NJDEP and Hunterdon County GIS digital data, but this secondary product has not been verified by NJDEP or Hunterdon County and is not NJDEP- or county-authorized.



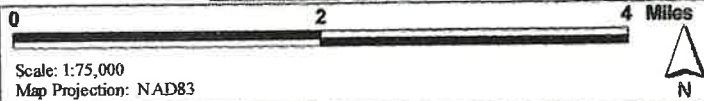
Kingwood Township ERI, 2004
 Prepared by Kratzer Environmental Services

Figure 3d: Steep Slopes



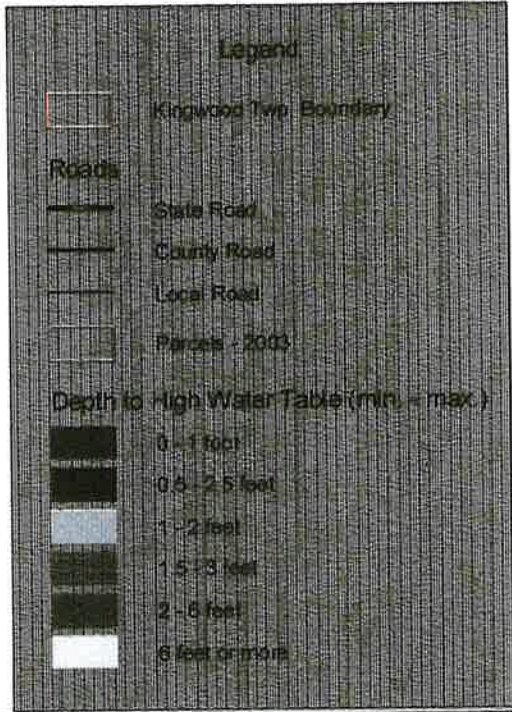
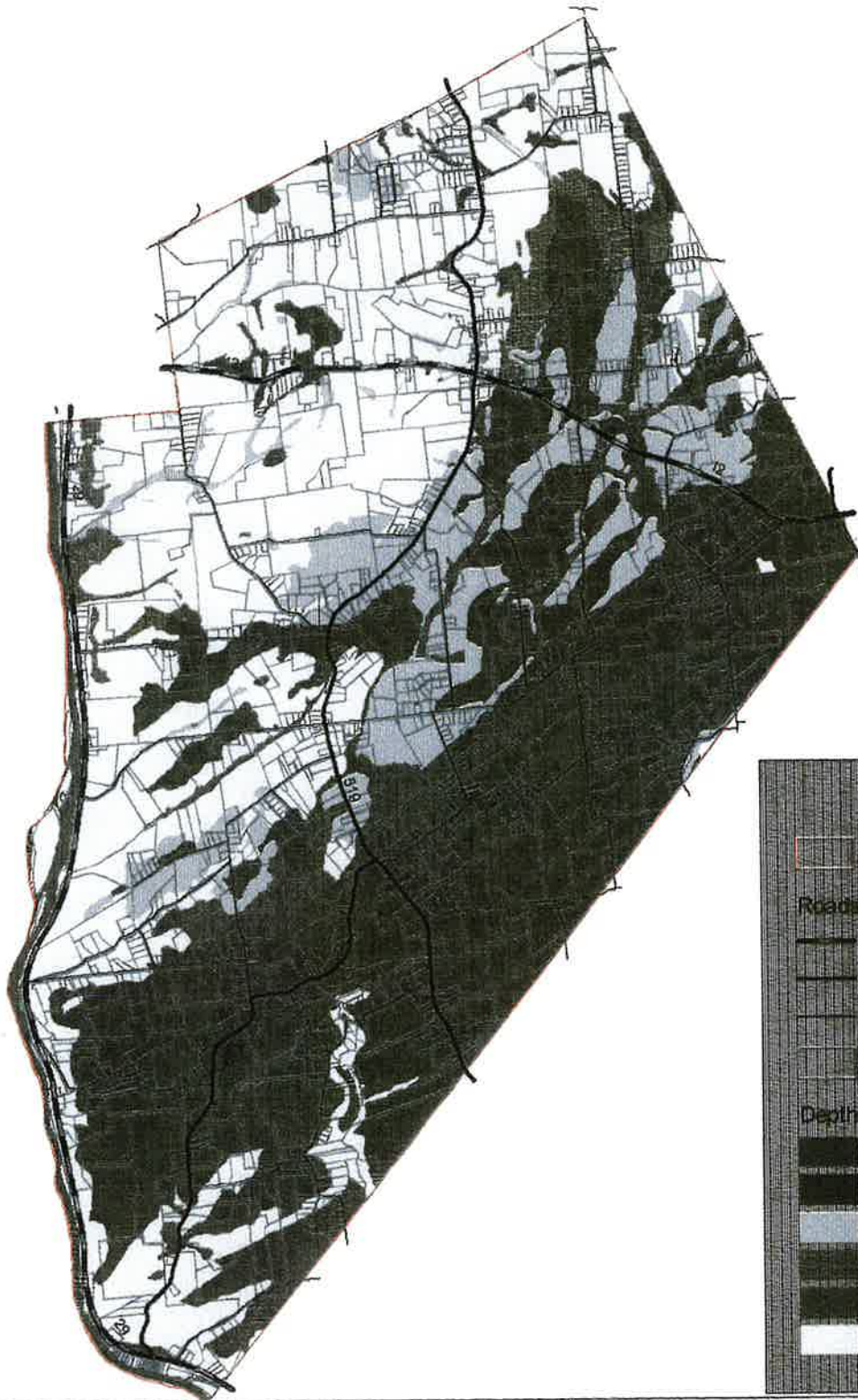
Data Sources: Soils - NRCS;
 Township boundary, roads & parcels- Hunterdon County GIS
 Scale of data: 1:24,000

Note: Map accuracy is limited to the accuracy of the scale of the original data sets.
 Disclaimer: This map was developed using NRCS and Hunterdon County GIS digital data, but this secondary product has not been verified by NRCS or Hunterdon County and is not NRCS- or county-authorized.



Kingwood Township ERI, 2004
 Prepared by Kratzer Environmental Services

Figure 4b: Depth to Bedrock



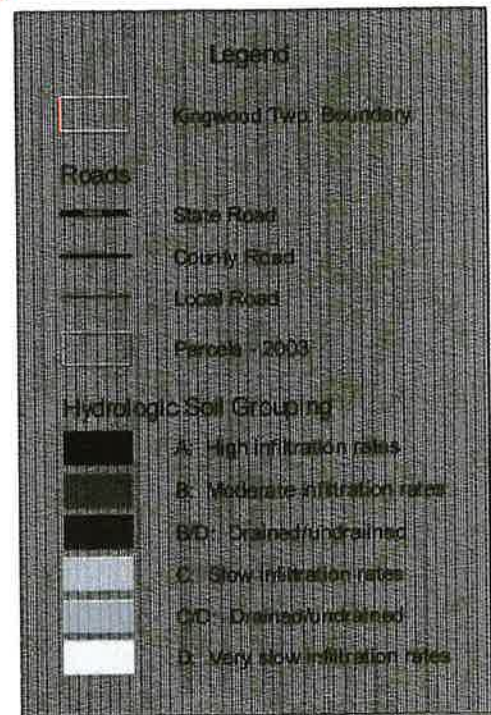
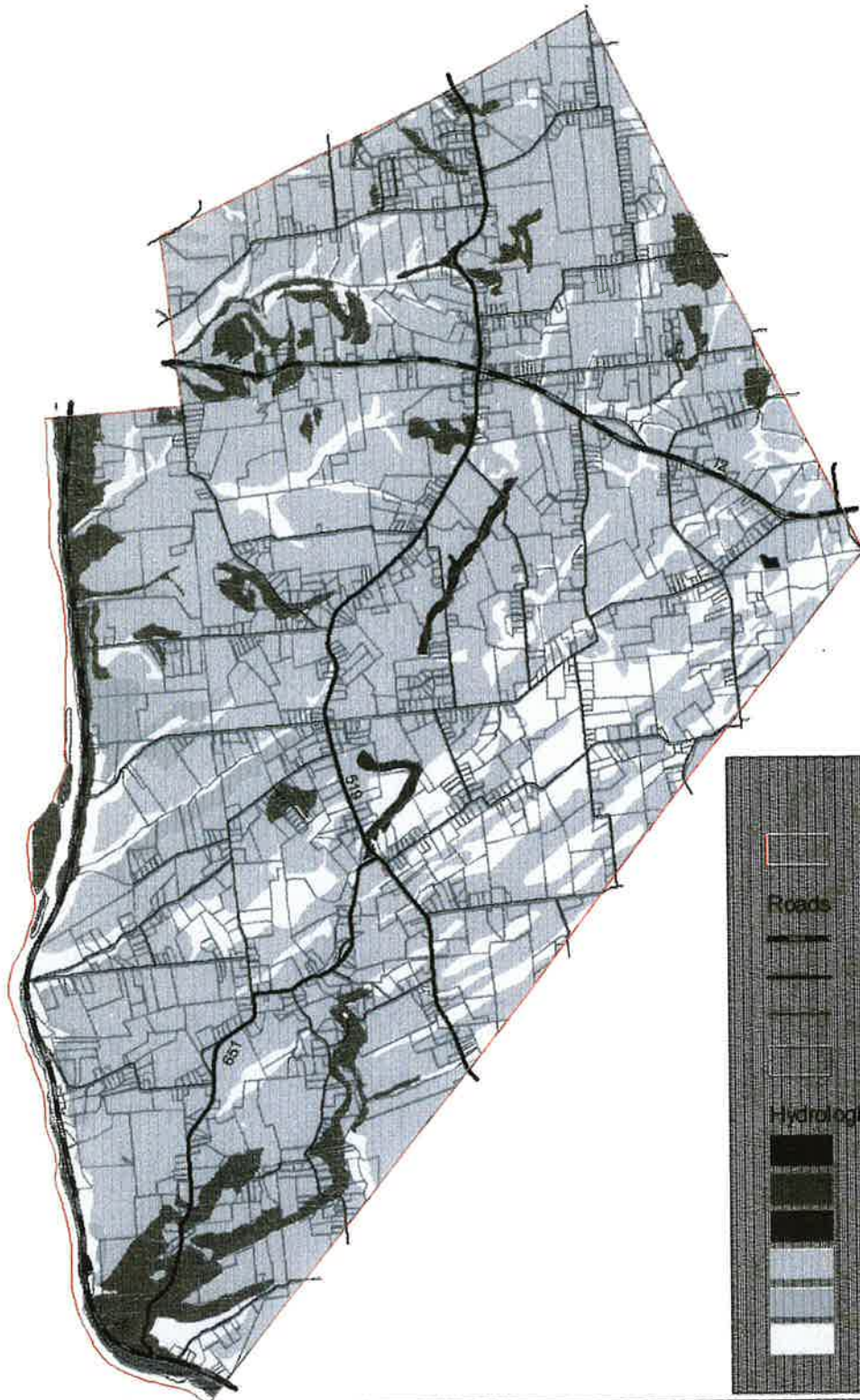
Data Sources: Soils - NRCS;
 Township boundary and roads - Hunterdon County GIS
 Scale of data: 1:24,000
 Note: Map accuracy is limited to the accuracy of the scale of the original data sets.
 Disclaimer: This map was developed using NRCS and Hunterdon County GIS digital data, but this secondary product has not been verified by NRCS or Hunterdon County and is not NRCS- or county-authorized.



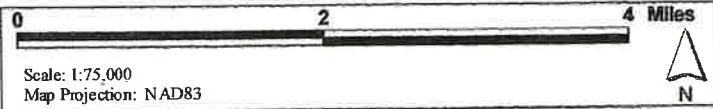
Scale: 1:75,000
 Map Projection: NAD83

Kingwood Township ERI, 2004
 Prepared by Kratzer Environmental Services

Figure 4c: Depth to High Water Table



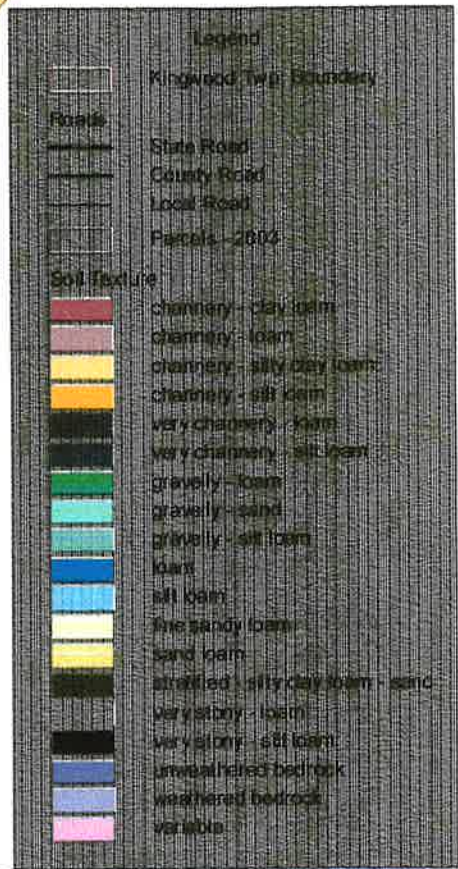
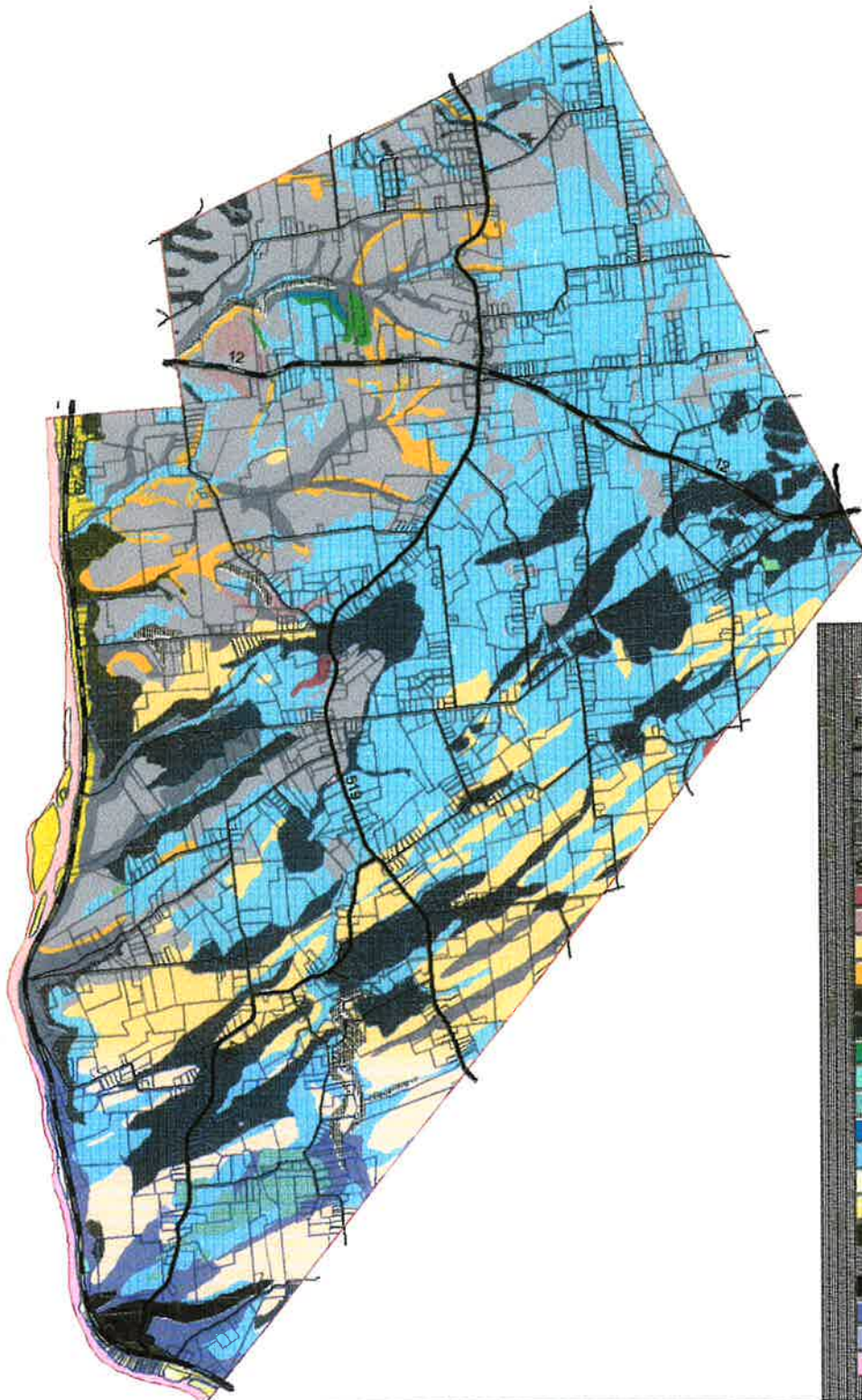
Data Sources: Soils - NRCS;
 Township boundary, roads & parcels - Hunterdon County GIS
 Scale of data: 1:24,000
 Note: Map accuracy is limited to the accuracy of the scale of the original data sets.
 Disclaimer: This map was developed using NRCS and Hunterdon County GIS digital data, but this secondary product has not been verified by NRCS or Hunterdon County and is not NRCS- or county-authorized.



Scale: 1:75,000
 Map Projection: NAD83

Kingwood Township ERI, 2004
 Prepared by Kratzer Environmental Services

Figure 4d: Hydrologic Soil Groups



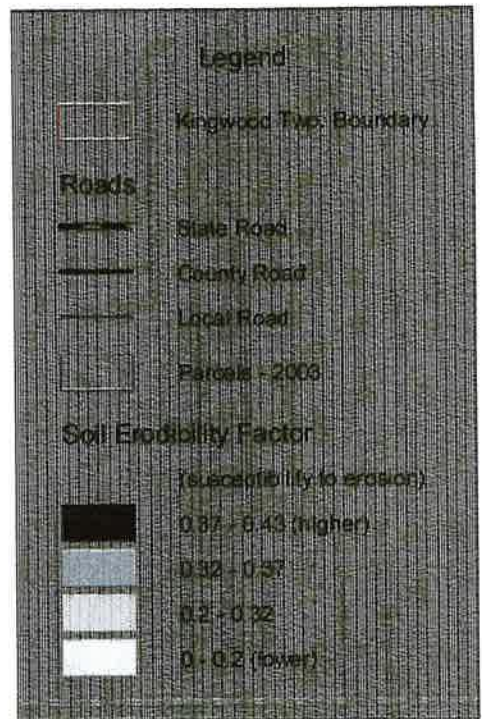
Data Sources: Soils - NRCS;
 Township boundary, roads & parcels Hunterdon County GIS
 Scale of data: 1:24,000
 Note: Map accuracy is limited to the accuracy of the scale of the original data sets.
 Disclaimer: This map was developed using NRCS and Hunterdon County GIS digital data, but this secondary product has not been verified by NRCS or Hunterdon County and is not NRCS- or county-authorized.



Scale: 1:75,000
 Map Projection: NAD83

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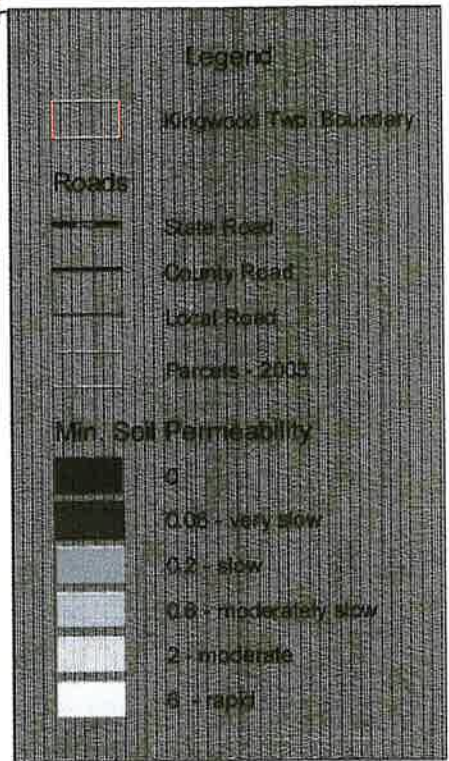
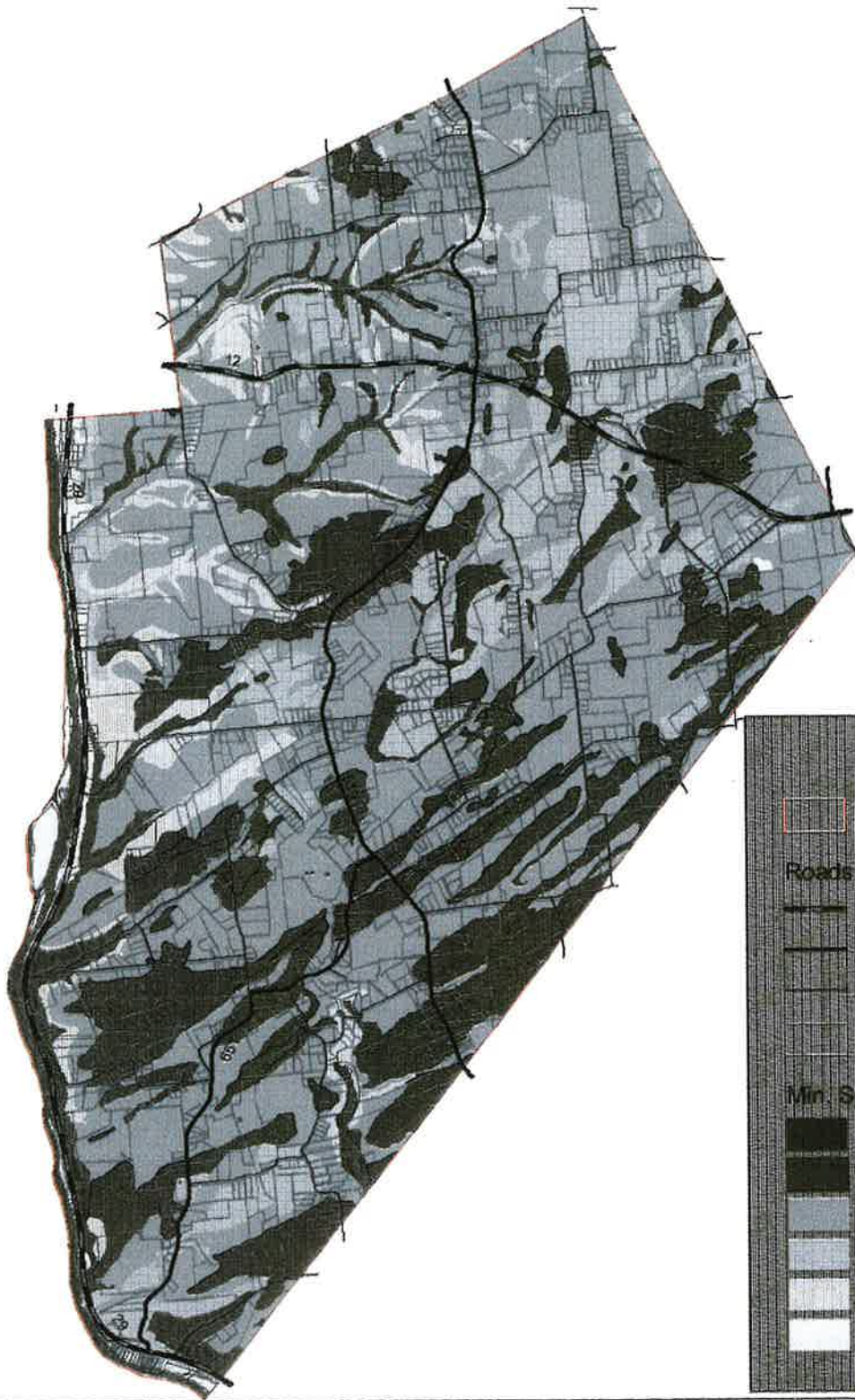
Figure 4e: Soil Surface Texture



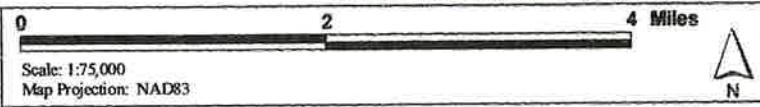
Data Sources: Soils - NRCS;
 Township boundary, roads & parcels - Hunterdon County GIS
 Scale of data: 1:24,000
 Note: Map accuracy is limited to the accuracy of the scale of the original data sets.
 Disclaimer: This map was developed using NRCS and Hunterdon County GIS digital data, but this secondary product has not been verified by NRCS or Hunterdon County and is not NRCS- or county-authorized.

0 2 4 Miles
 Scale: 1:75,000
 Map Projection: NAD83
 Kingwood Township ER1, 2004
 Prepared by Kratzer Environmental Services

Figure 4f: Soil Erodibility Factor



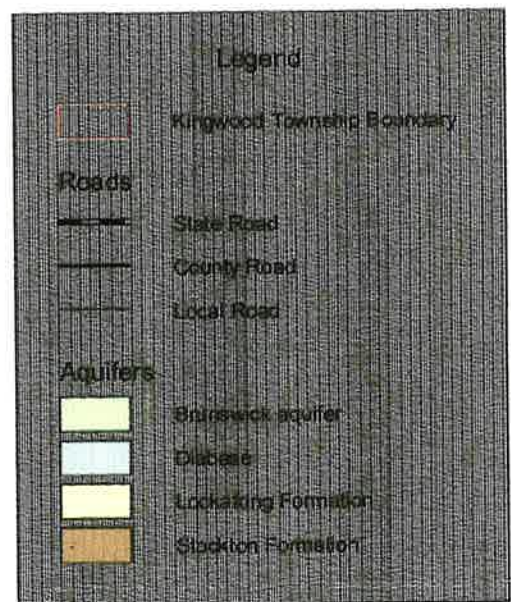
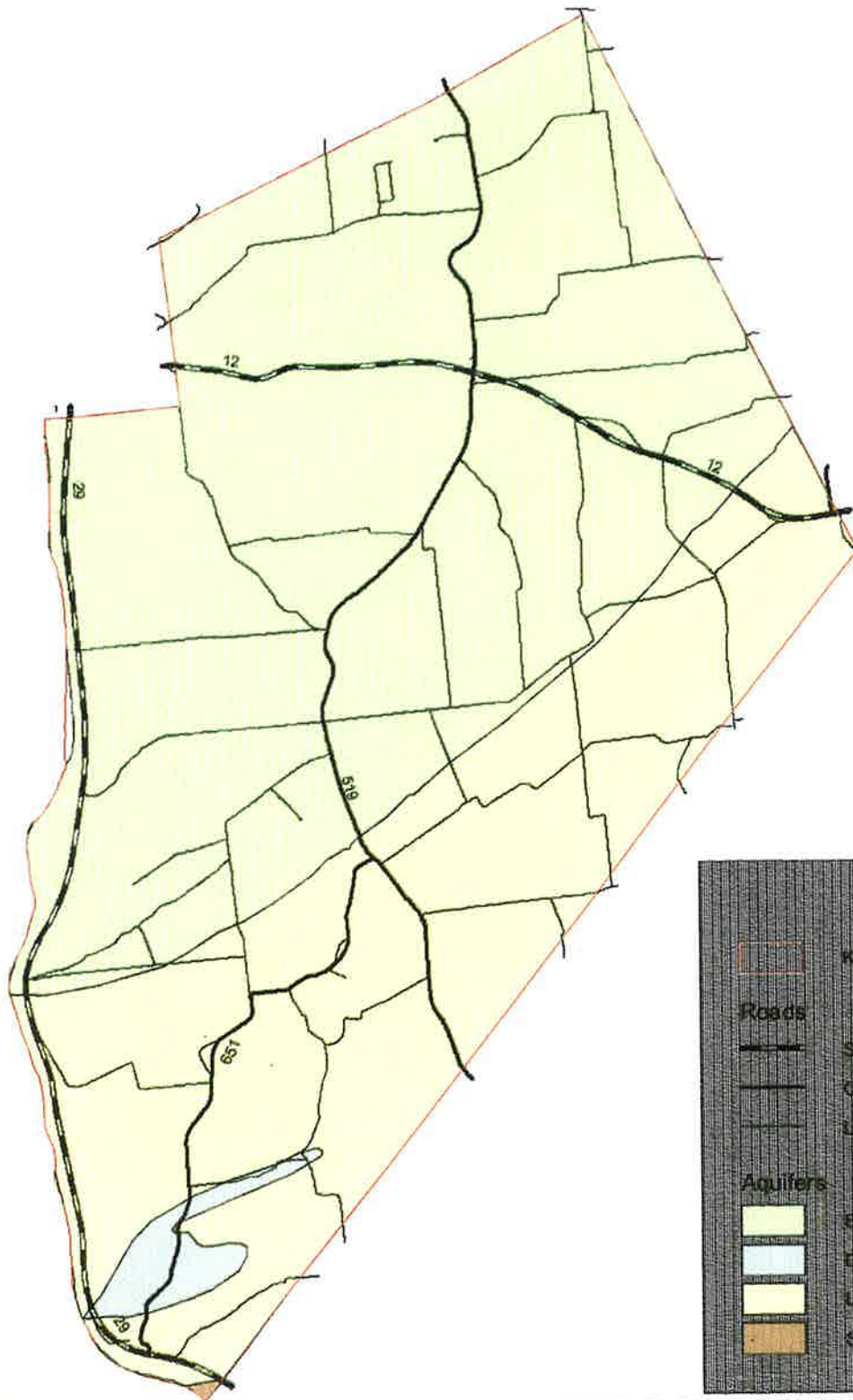
Data Sources: Soils (steep slopes) - NJDEP, OIRM, BGIA;
 Township boundary & parcels - Hunterdon County GIS
 Scale of data: 1:24,000
 Note: Map accuracy is limited to the accuracy of the scale of the original data sets.
 Disclaimer: This map was developed using NJDEP and Hunterdon County GIS digital data, but this secondary product has not been verified by NJDEP or Hunterdon County and is not NJDEP- or county-authorized.



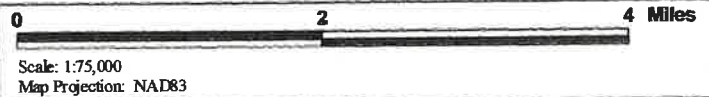
Scale: 1:75,000
 Map Projection: NAD83

Kingwood Township ERI, 2004
 Prepared by Kratzer Environmental Services

Figure 4g: Soil Permeability

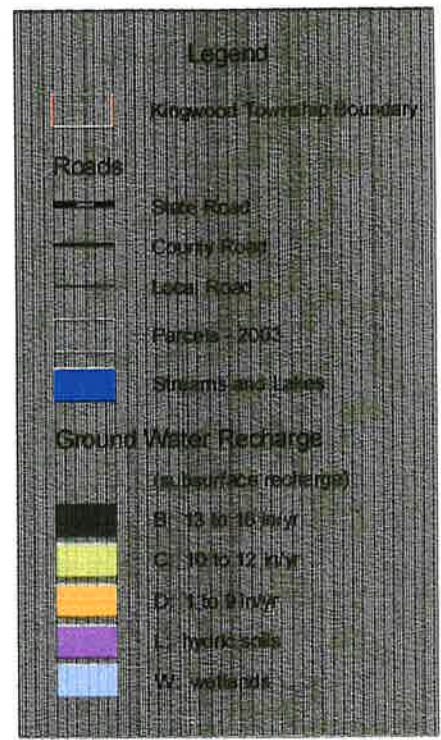
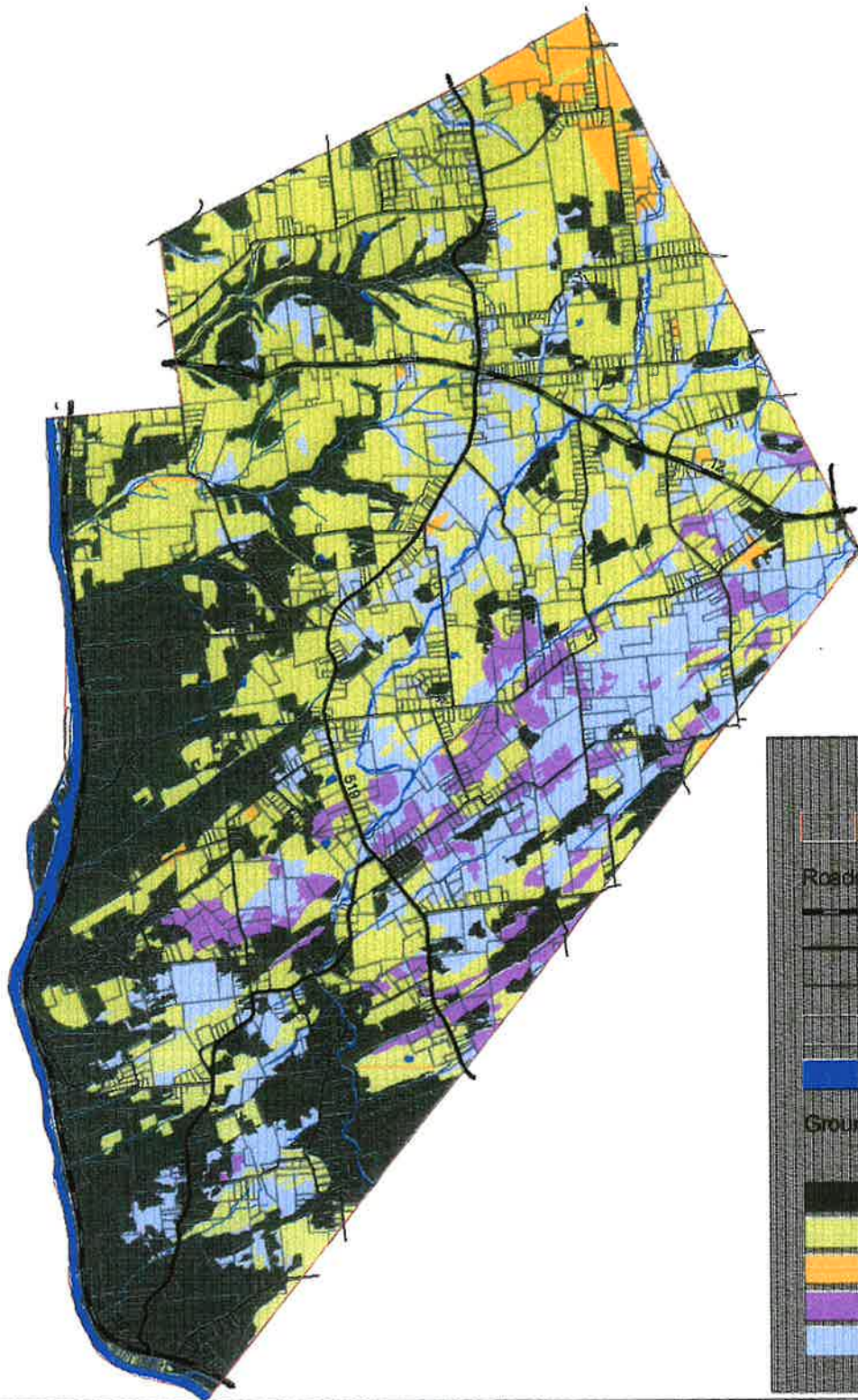


Data Sources: Aquifers - NJGS;
 Township boundary and roads- Hunterdon County GIS
 Scale of data: 1:24,000
 Note: Map accuracy is limited to the accuracy of the scale of the original data sets.
 Disclaimer: This map was developed using NJGS and Hunterdon County GIS digital data, but this secondary product has not been verified by NJGS or Hunterdon County and is not NJGS- or county-authorized.



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 Prepared by Kratzer Environmental Services

Figure 5b: Ground Water Aquifers



Data Sources: Ground Water Recharge - NJGS; wetlands, hyric soils - NJDEP, OIRM, BGIA; Township boundary, streams, roads, & parcels - Hunterdon County GIS
 Scale of data: 1:24,000
 Note: Map accuracy is limited to the accuracy of the scale of the original data sets.
 Disclaimer: This map was developed using NJDEP and Hunterdon County GIS digital data, but this secondary product has not been verified by NJDEP or Hunterdon County and is not NJDEP- or county-authorized.



Kingwood Township ERI, 2004
 Prepared by Kratzer Environmental Services

Figure 5d: Ground Water Recharge

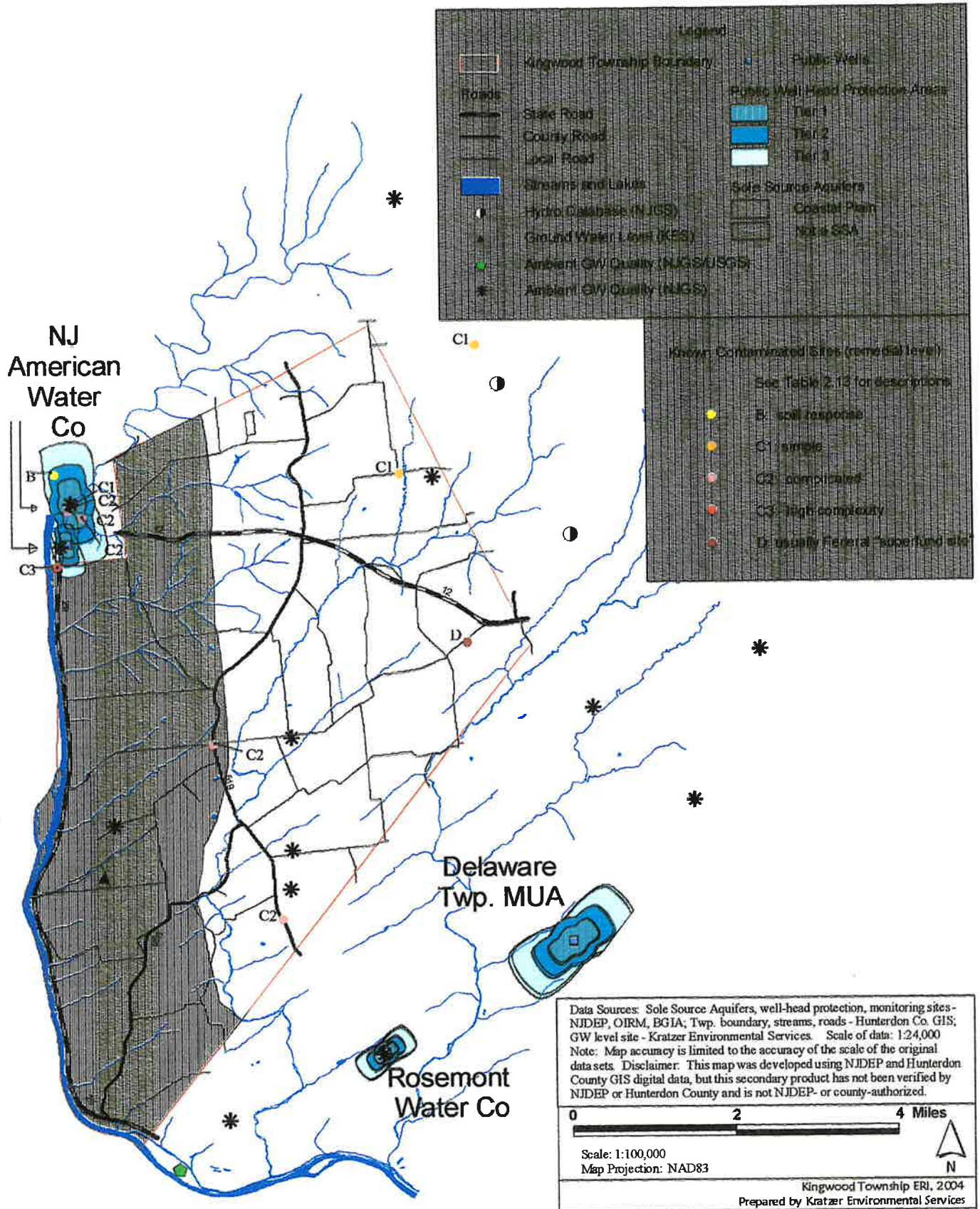
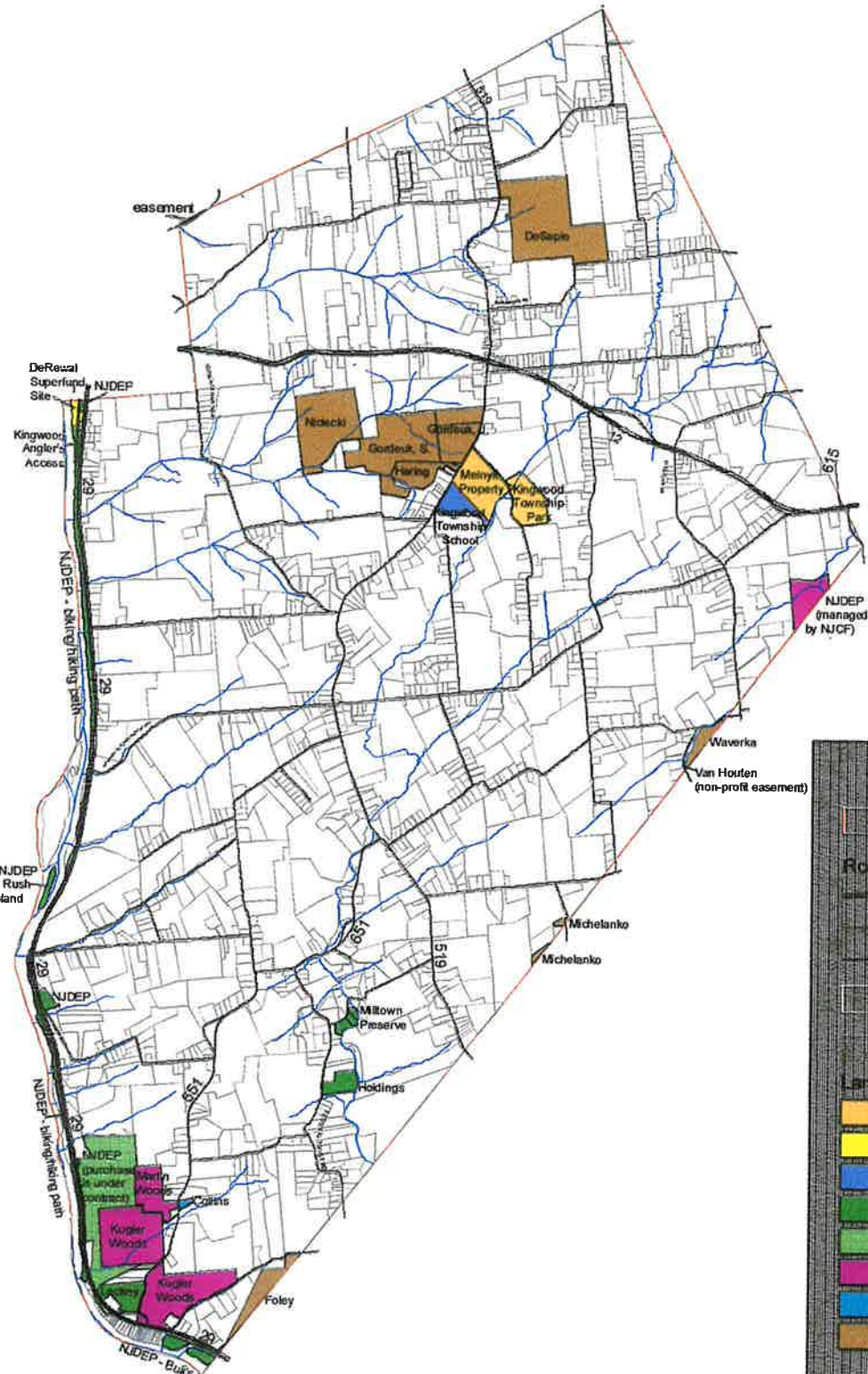


Figure 5e: Ground Water Monitoring Sites, Well-Head Protection Areas, Sole Source Aquifer and Known Contaminated Sites



Legend

- Kingwood Township Boundary

Roads

- State Road
- County Road
- Local Road
- Parade - 2003
- Kingwood Streams

Land Resources - Ownership

- Municipal
- Municipal/State
- State of NJ/State
- State owned - Open space
- State (purchase under contract)
- State owned easement
- Non-profit owned easement
- Registered farm

Data Sources: Township boundary, parcels, open space - Hunterdon County GIS; open space - Township and NJDEP records.
 Scale of data: 1:24,000
 Note: Map accuracy is limited to the accuracy of the scale of the original data sets.
 Disclaimer: This map was developed using Hunterdon County GIS digital data, but this secondary product has not been verified by Hunterdon County and is not county-authorized.

0 2 4 Miles

Scale: 1:75,000
 Map Projection: NAD83

N

Kingwood Township ERI, 2004
 Prepared by Kratzer Environmental Services

Figure 11: Open Space, Recreational and Publicly Owned Land Resources

New Jersey Stormwater Best Management Practices Manual

April 2004

A P P E N D I X D

Model Stormwater Control Ordinance for Municipalities

Important note: *This sample ordinance is provided to assist municipalities in the development of municipal stormwater control ordinances and the incorporation of design and performance standards into municipal stormwater management plans. It is provided for information purposes only. It is important that current regulations are carefully reviewed before any portion of this draft ordinance is adopted.*

This model ordinance does not include a section on fees. The Department expects that the review of development applications under this ordinance would be an integral part of the municipal review of subdivisions and site plans. As a result, the costs to municipalities of reviewing development applications under this ordinance can be defrayed by fees charged for review of subdivisions and site plans under N.J.S.A. 40:55D-8.b.

Notes are provided in italics throughout this model stormwater control ordinance, and are not intended to be adopted as part of the ordinance.

An editable Word version of this model ordinance is available at <http://www.state.nj.us/dep/watershedmgt/bmpmanualfeb2004.htm>.

Section 1: Scope and Purpose

A. Policy Statement

Flood control, groundwater recharge, and pollutant reduction through nonstructural or low impact techniques shall be explored before relying on structural BMPs. Structural BMPs should be integrated with nonstructural stormwater management strategies and proper maintenance plans. Nonstructural strategies include both environmentally sensitive site design and source controls that prevent pollutants from being placed on the site or from being exposed to stormwater. Source control plans should be developed based upon physical site conditions and the origin, nature, and the anticipated quantity or amount of potential pollutants. Multiple stormwater management BMPs may be necessary to achieve the established performance standards for water quality, quantity, and groundwater recharge.

Note: Municipalities are encouraged to participate in the development of regional stormwater management plans, and to adopt and implement ordinances for specific drainage area performance standards that address local stormwater management and environmental characteristics.

B. Purpose

It is the purpose of this ordinance to establish minimum stormwater management requirements and controls for "major development," as defined in Section 2.

C. Applicability

1. This ordinance shall be applicable to all site plans and subdivisions for the following major developments that require preliminary or final site plan or subdivision review:

- a. Non-residential major developments; and
- b. Aspects of residential major developments that are not pre-empted by the Residential Site Improvement Standards at N.J.A.C. 5:21.

2. This ordinance shall also be applicable to all major developments undertaken by [insert name of municipality].

D. Compatibility with Other Permit and Ordinance Requirements

Development approvals issued for subdivisions and site plans pursuant to this ordinance are to be considered an integral part of development approvals under the subdivision and site plan review process and do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act, or ordinance. In their interpretation and application, the provisions of this ordinance shall be held to be the minimum requirements for the promotion of the public health, safety, and general welfare. This ordinance is not intended to interfere with, abrogate, or annul any other ordinances, rule or regulation, statute, or other provision of law except that, where any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule or regulation, or other provision of law, the more restrictive provisions or higher standards shall control.

Section 2: Definitions

Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application. The definitions below are the same as or based on the corresponding definitions in the Stormwater Management Rules at N.J.A.C. 7:8-1.2.

“CAFRA Planning Map” means the geographic depiction of the boundaries for Coastal Planning Areas, CAFRA Centers, CAFRA Cores and CAFRA Nodes pursuant to N.J.A.C. 7:7E-5B.3.

“CAFRA Centers, Cores or Nodes” means those areas within boundaries accepted by the Department pursuant to N.J.A.C. 7:8E-5B.

“Compaction” means the increase in soil bulk density.

“Core” means a pedestrian-oriented area of commercial and civic uses serving the surrounding municipality, generally including housing and access to public transportation.

“County review agency” means an agency designated by the County Board of Chosen Freeholders to review municipal stormwater management plans and implementing ordinance(s). The county review agency may either be:

A county planning agency; or

A county water resource association created under N.J.S.A 58:16A-55.5, if the ordinance or resolution delegates authority to approve, conditionally approve, or disapprove municipal stormwater management plans and implementing ordinances.

“Department” means the New Jersey Department of Environmental Protection.

“Designated Center” means a State Development and Redevelopment Plan Center as designated by the State Planning Commission such as urban, regional, town, village, or hamlet.

“Design engineer” means a person professionally qualified and duly licensed in New Jersey to perform engineering services that may include, but not necessarily be limited to, development of project requirements, creation and development of project design and preparation of drawings and specifications.

“Development” means the division of a parcel of land into two or more parcels, the construction, reconstruction, conversion, structural alteration, relocation or enlargement of any building or structure, any mining excavation or landfill, and any use or change in the use of any building or other structure, or land or extension of use of land, by any person, for which permission is required under the Municipal Land Use Law , N.J.S.A. 40:55D-1 et seq. In the case of development of agricultural lands, development means: any activity that requires a State permit; any activity reviewed by the County Agricultural Board (CAB) and the State Agricultural Development Committee (SADC), and municipal review of any activity not exempted by the Right to Farm Act , N.J.S.A 4:1C-1 et seq.

“Drainage area” means a geographic area within which stormwater, sediments, or dissolved materials drain to a particular receiving waterbody or to a particular point along a receiving waterbody.

“Environmentally critical areas” means an area or feature which is of significant environmental value, including but not limited to: stream corridors; natural heritage priority sites; habitat of endangered or threatened species; large areas of contiguous open space or upland forest; steep slopes; and well head protection and groundwater recharge areas. Habitats of endangered or threatened species are identified

using the Department's Landscape Project as approved by the Department's Endangered and Nongame Species Program.

"Empowerment Neighborhood" means a neighborhood designated by the Urban Coordinating Council "in consultation and conjunction with" the New Jersey Redevelopment Authority pursuant to N.J.S.A. 55:19-69.

"Erosion" means the detachment and movement of soil or rock fragments by water, wind, ice or gravity.

"Impervious surface" means a surface that has been covered with a layer of material so that it is highly resistant to infiltration by water.

"Infiltration" is the process by which water seeps into the soil from precipitation.

"Major development" means any "development" that provides for ultimately disturbing one or more acres of land. Disturbance for the purpose of this rule is the placement of impervious surface or exposure and/or movement of soil or bedrock or clearing, cutting, or removing of vegetation.

"Municipality" means any city, borough, town, township, or village.

"Node" means an area designated by the State Planning Commission concentrating facilities and activities which are not organized in a compact form.

"Nutrient" means a chemical element or compound, such as nitrogen or phosphorus, which is essential to and promotes the development of organisms.

"Person" means any individual, corporation, company, partnership, firm, association, [*insert name of municipality*], or political subdivision of this State subject to municipal jurisdiction pursuant to the Municipal Land Use Law, N.J.S.A. 40:55D-1 et seq.

"Pollutant" means any dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, refuse, oil, grease, sewage sludge, munitions, chemical wastes, biological materials, medical wastes, radioactive substance (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.), thermal waste, wrecked or discarded equipment, rock, sand, cellar dirt, industrial, municipal, agricultural, and construction waste or runoff, or other residue discharged directly or indirectly to the land, ground waters or surface waters of the State, or to a domestic treatment works. "Pollutant" includes both hazardous and nonhazardous pollutants.

"Recharge" means the amount of water from precipitation that infiltrates into the ground and is not evapotranspired.

"Sediment" means solid material, mineral or organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water or gravity as a product of erosion.

"Site" means the lot or lots upon which a major development is to occur or has occurred.

"Soil" means all unconsolidated mineral and organic material of any origin.

"State Development and Redevelopment Plan Metropolitan Planning Area (PA1)" means an area delineated on the State Plan Policy Map and adopted by the State Planning Commission that is intended to be the focus for much of the state's future redevelopment and revitalization efforts.

"State Plan Policy Map" is defined as the geographic application of the State Development and Redevelopment Plan's goals and statewide policies, and the official map of these goals and policies.

“Stormwater” means water resulting from precipitation (including rain and snow) that runs off the land’s surface, is transmitted to the subsurface, or is captured by separate storm sewers or other sewage or drainage facilities, or conveyed by snow removal equipment.

“Stormwater runoff” means water flow on the surface of the ground or in storm sewers, resulting from precipitation.

“Stormwater management basin” means an excavation or embankment and related areas designed to retain stormwater runoff. A stormwater management basin may either be normally dry (that is, a detention basin or infiltration basin), retain water in a permanent pool (a retention basin), or be planted mainly with wetland vegetation (most constructed stormwater wetlands).

“Stormwater management measure” means any structural or nonstructural strategy, practice, technology, process, program, or other method intended to control or reduce stormwater runoff and associated pollutants, or to induce or control the infiltration or groundwater recharge of stormwater or to eliminate illicit or illegal non-stormwater discharges into stormwater conveyances.

“Tidal Flood Hazard Area” means a flood hazard area, which may be influenced by stormwater runoff from inland areas, but which is primarily caused by the Atlantic Ocean.

“Urban Coordinating Council Empowerment Neighborhood” means a neighborhood given priority access to State resources through the New Jersey Redevelopment Authority.

“Urban Enterprise Zones” means a zone designated by the New Jersey Enterprise Zone Authority pursuant to the New Jersey Urban Enterprise Zones Act, N.J.S.A. 52:27H-60 et. seq.

“Urban Redevelopment Area” is defined as previously developed portions of areas:

- (1) Delineated on the State Plan Policy Map (SPPM) as the Metropolitan Planning Area (PA1), Designated Centers, Cores or Nodes;
- (2) Designated as CAFRA Centers, Cores or Nodes;
- (3) Designated as Urban Enterprise Zones; and
- (4) Designated as Urban Coordinating Council Empowerment Neighborhoods.

“Waters of the State” means the ocean and its estuaries, all springs, streams, wetlands, and bodies of surface or ground water, whether natural or artificial, within the boundaries of the State of New Jersey or subject to its jurisdiction.

“Wetlands” or “wetland” means an area that is inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation.

Section 3: General Standards

A. Design and Performance Standards for Stormwater Management Measures

1. Stormwater management measures for major development shall be developed to meet the erosion control, groundwater recharge, stormwater runoff quantity, and stormwater runoff quality standards in Section 4. To the maximum extent practicable, these standards shall be met by incorporating nonstructural stormwater management strategies into the design. If these strategies alone are not sufficient to meet these standards, structural stormwater management measures necessary to meet these standards shall be incorporated into the design.
2. The standards in this ordinance apply only to new major development and are intended to minimize the impact of stormwater runoff on water quality and water quantity in receiving water bodies and maintain groundwater recharge. The standards do not apply to new major development to the extent that alternative design and performance standards are applicable under a regional stormwater management plan or Water Quality Management Plan adopted in accordance with Department rules.

Note: Alternative standards shall provide at least as much protection from stormwater-related loss of groundwater recharge, stormwater quantity and water quality impacts of major development projects as would be provided under the standards in N.J.A.C. 7:8-5.

Section 4: Stormwater Management Requirements for Major Development

- A. The development shall incorporate a maintenance plan for the stormwater management measures incorporated into the design of a major development in accordance with Section 10.
- B. Stormwater management measures shall avoid adverse impacts of concentrated flow on habitat for threatened and endangered species as documented in the Department' Landscape Project or Natural Heritage Database established under N.J.S.A. 13:1B-15.147 through 15.150, particularly *Helonias bullata* (swamp pink) and/or *Clemmys muhlnebergi* (bog turtle).
- C. The following linear development projects are exempt from the groundwater recharge, stormwater runoff quantity, and stormwater runoff quality requirements of Sections 4.F and 4.G:
 1. The construction of an underground utility line provided that the disturbed areas are revegetated upon completion;
 2. The construction of an aboveground utility line provided that the existing conditions are maintained to the maximum extent practicable; and
 3. The construction of a public pedestrian access, such as a sidewalk or trail with a maximum width of 14 feet, provided that the access is made of permeable material.
- D. A waiver from strict compliance from the groundwater recharge, stormwater runoff quantity, and stormwater runoff quality requirements of Sections 4.F and 4.G may be obtained for the enlargement of an existing public roadway or railroad; or the construction or enlargement of a public pedestrian access, provided that the following conditions are met:

1. The applicant demonstrates that there is a public need for the project that cannot be accomplished by any other means;
2. The applicant demonstrates through an alternatives analysis, that through the use of nonstructural and structural stormwater management strategies and measures, the option selected complies with the requirements of Sections 4.F and 4.G to the maximum extent practicable;
3. The applicant demonstrates that, in order to meet the requirements of Sections 4.F and 4.G, existing structures currently in use, such as homes and buildings, would need to be condemned; and
4. The applicant demonstrates that it does not own or have other rights to areas, including the potential to obtain through condemnation lands not falling under D.3 above within the upstream drainage area of the receiving stream, that would provide additional opportunities to mitigate the requirements of Sections 4.F and 4.G that were not achievable on-site.

E. Nonstructural Stormwater Management Strategies

1. To the maximum extent practicable, the standards in Sections 4.F and 4.G shall be met by incorporating nonstructural stormwater management strategies set forth at Section 4.E into the design. The applicant shall identify the nonstructural measures incorporated into the design of the project. If the applicant contends that it is not feasible for engineering, environmental, or safety reasons to incorporate any nonstructural stormwater management measures identified in Paragraph 2 below into the design of a particular project, the applicant shall identify the strategy considered and provide a basis for the contention.
2. Nonstructural stormwater management strategies incorporated into site design shall:
 - a. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss;
 - b. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces;
 - c. Maximize the protection of natural drainage features and vegetation;
 - d. Minimize the decrease in the "time of concentration" from pre-construction to post construction. "Time of concentration" is defined as the time it takes for runoff to travel from the hydraulically most distant point of the watershed to the point of interest within a watershed;
 - e. Minimize land disturbance including clearing and grading;
 - f. Minimize soil compaction;
 - g. Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides;
 - h. Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas;
 - i. Provide other source controls to prevent or minimize the use or exposure of pollutants at the site, in order to prevent or minimize the release of those pollutants into stormwater runoff. Such source controls include, but are not limited to:

- (1) Site design features that help to prevent accumulation of trash and debris in drainage systems, including features that satisfy Section 4.E.3. below;
- (2) Site design features that help to prevent discharge of trash and debris from drainage systems;
- (3) Site design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments; and
- (4) When establishing vegetation after land disturbance, applying fertilizer in accordance with the requirements established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq., and implementing rules.

3. Site design features identified under Section 4.E.2.i.(2) above shall comply with the following standard to control passage of solid and floatable materials through storm drain inlets. For purposes of this paragraph, "solid and floatable materials" means sediment, debris, trash, and other floating, suspended, or settleable solids. For exemptions to this standard see Section 4.E.3.c below.

- a. Design engineers shall use either of the following grates whenever they use a grate in pavement or another ground surface to collect stormwater from that surface into a storm drain or surface water body under that grate:
 - (1) The New Jersey Department of Transportation (NJDOT) bicycle safe grate, which is described in Chapter 2.4 of the NJDOT Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines (April 1996); or
 - (2) A different grate, if each individual clear space in that grate has an area of no more than seven (7.0) square inches, or is no greater than 0.5 inches across the smallest dimension.

Examples of grates subject to this standard include grates in grate inlets, the grate portion (non-curb-opening portion) of combination inlets, grates on storm sewer manholes, ditch grates, trench grates, and grates of spacer bars in slotted drains. Examples of ground surfaces include surfaces of roads (including bridges), driveways, parking areas, bikeways, plazas, sidewalks, lawns, fields, open channels, and stormwater basin floors.

- b. Whenever design engineers use a curb-opening inlet, the clear space in that curb opening (or each individual clear space, if the curb opening has two or more clear spaces) shall have an area of no more than seven (7.0) square inches, or be no greater than two (2.0) inches across the smallest dimension.
- c. This standard does not apply:
 - (1) Where the review agency determines that this standard would cause inadequate hydraulic performance that could not practicably be overcome by using additional or larger storm drain inlets that meet these standards;
 - (2) Where flows from the water quality design storm as specified in Section 4.G.1 are conveyed through any device (e.g., end of pipe netting facility, manufactured treatment device, or a catch basin hood) that is designed, at a minimum, to prevent delivery of all solid and floatable materials that could not pass through one of the following:
 - (a) A rectangular space four and five-eighths inches long and one and one-half inches wide (this option does not apply for outfall netting facilities); or

- (b) A bar screen having a bar spacing of 0.5 inches.
 - (3) Where flows are conveyed through a trash rack that has parallel bars with one-inch (1") spacing between the bars, to the elevation of the water quality design storm as specified in Section 4.G.1; or
 - (4) Where the New Jersey Department of Environmental Protection determines, pursuant to the New Jersey Register of Historic Places Rules at N.J.A.C. 7:4-7.2(c), that action to meet this standard is an undertaking that constitutes an encroachment or will damage or destroy the New Jersey Register listed historic property.
4. Any land area used as a nonstructural stormwater management measure to meet the performance standards in Sections 4.F and 4.G shall be dedicated to a government agency, subjected to a conservation restriction filed with the appropriate County Clerk's office, or subject to an approved equivalent restriction that ensures that measure or an equivalent stormwater management measure approved by the reviewing agency is maintained in perpetuity.
5. Guidance for nonstructural stormwater management strategies is available in the New Jersey Stormwater Best Management Practices Manual. The BMP Manual may be obtained from the address identified in Section 7, or found on the Department's website at www.njstormwater.org.

F. Erosion Control, Groundwater Recharge and Runoff Quantity Standards

1. This subsection contains minimum design and performance standards to control erosion, encourage and control infiltration and groundwater recharge, and control stormwater runoff quantity impacts of major development.
- a. The minimum design and performance standards for erosion control are those established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq. and implementing rules.
 - b. The minimum design and performance standards for groundwater recharge are as follows:
 - (1) The design engineer shall, using the assumptions and factors for stormwater runoff and groundwater recharge calculations at Section 5, either:
 - (a) Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measures maintain 100 percent of the average annual pre-construction groundwater recharge volume for the site; or
 - (b) Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater runoff volume from pre-construction to post-construction for the 2-year storm is infiltrated.
 - (2) This groundwater recharge requirement does not apply to projects within the "urban redevelopment area," or to projects subject to (3) below.
 - (3) The following types of stormwater shall not be recharged:
 - (a) Stormwater from areas of high pollutant loading. High pollutant loading areas are areas in industrial and commercial developments where solvents and/or petroleum products are loaded/unloaded, stored, or applied, areas where pesticides are loaded/unloaded or stored; areas where hazardous materials are expected to be present in greater than "reportable quantities" as defined by the United States Environmental Protection Agency (EPA) at 40

CFR 302.4; areas where recharge would be inconsistent with Department approved remedial action work plan or landfill closure plan and areas with high risks for spills of toxic materials, such as gas stations and vehicle maintenance facilities; and

- (b) Industrial stormwater exposed to "source material." "Source material" means any material(s) or machinery, located at an industrial facility, that is directly or indirectly related to process, manufacturing or other industrial activities, which could be a source of pollutants in any industrial stormwater discharge to groundwater. Source materials include, but are not limited to, raw materials; intermediate products; final products; waste materials; by-products; industrial machinery and fuels, and lubricants, solvents, and detergents that are related to process, manufacturing, or other industrial activities that are exposed to stormwater.
 - (4) The design engineer shall assess the hydraulic impact on the groundwater table and design the site so as to avoid adverse hydraulic impacts. Potential adverse hydraulic impacts include, but are not limited to, exacerbating a naturally or seasonally high water table so as to cause surficial ponding, flooding of basements, or interference with the proper operation of subsurface sewage disposal systems and other subsurface structures in the vicinity or downgradient of the groundwater recharge area.
- c. In order to control stormwater runoff quantity impacts, the design engineer shall, using the assumptions and factors for stormwater runoff calculations at Section 5, complete one of the following:
- (1) Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the two, 10, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events;
 - (2) Demonstrate through hydrologic and hydraulic analysis that there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the two, 10, and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. This analysis shall include the analysis of impacts of existing land uses and projected land uses assuming full development under existing zoning and land use ordinances in the drainage area;
 - (3) Design stormwater management measures so that the post-construction peak runoff rates for the 2, 10 and 100 year storm events are 50, 75 and 80 percent, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed. The percentages shall not be applied to post-construction stormwater runoff into tidal flood hazard areas if the increased volume of stormwater runoff will not increase flood damages below the point of discharge; or
 - (4) In tidal flood hazard areas, stormwater runoff quantity analysis in accordance with (1), (2) and (3) above shall only be applied if the increased volume of stormwater runoff could increase flood damages below the point of discharge.

2. Any application for a new agricultural development that meets the definition of major development at Section 2 shall be submitted to the appropriate Soil Conservation District for review and approval in accordance with the requirements of this section and any applicable Soil Conservation District guidelines for stormwater runoff quantity and erosion control. For the purposes of this section, “agricultural development” means land uses normally associated with the production of food, fiber and livestock for sale. Such uses do not include the development of land for the processing or sale of food and the manufacturing of agriculturally related products.

G. Stormwater Runoff Quality Standards

1. Stormwater management measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff by 80 percent of the anticipated load from the developed site, expressed as an annual average. Stormwater management measures shall only be required for water quality control if an additional 1/4 acre of impervious surface is being proposed on a development site. The requirement to reduce TSS does not apply to any stormwater runoff in a discharge regulated under a numeric effluent limitation for TSS imposed under the New Jersey Pollution Discharge Elimination System (NJPDES) rules, N.J.A.C. 7:14A, or in a discharge specifically exempt under a NJPDES permit from this requirement. The water quality design storm is 1.25 inches of rainfall in two hours. Water quality calculations shall take into account the distribution of rain from the water quality design storm, as reflected in Table 1. The calculation of the volume of runoff may take into account the implementation of non-structural and structural stormwater management measures.

| Table 1: Water Quality Design Storm Distribution | | | |
|---|-------------------------------------|-----------------------|-------------------------------------|
| Time (Minutes) | Cumulative Rainfall (Inches) | Time (Minutes) | Cumulative Rainfall (Inches) |
| 0 | 0.0000 | 65 | 0.8917 |
| 5 | 0.0083 | 70 | 0.9917 |
| 10 | 0.0166 | 75 | 1.0500 |
| 15 | 0.0250 | 80 | 1.0840 |
| 20 | 0.0500 | 85 | 1.1170 |
| 25 | 0.0750 | 90 | 1.1500 |
| 30 | 0.1000 | 95 | 1.1750 |
| 35 | 0.1330 | 100 | 1.2000 |
| 40 | 0.1660 | 105 | 1.2250 |
| 45 | 0.2000 | 110 | 1.2334 |
| 50 | 0.2583 | 115 | 1.2417 |
| 55 | 0.3583 | 120 | 1.2500 |
| 60 | 0.6250 | | |

2. For purposes of TSS reduction calculations, Table 2 below presents the presumed removal rates for certain BMPs designed in accordance with the New Jersey Stormwater Best Management Practices Manual. The BMP Manual may be obtained from the address identified in Section 7, or found on the Department's website at www.njstormwater.org. The BMP Manual and other sources of technical guidance are listed in Section 7. TSS reduction shall be calculated based on the removal rates for the BMPs in Table 2 below. Alternative removal rates and methods of calculating removal rates may be used if the design engineer provides documentation demonstrating the capability of these alternative rates and methods to the review agency. A copy of any approved alternative rate or method of calculating the removal rate shall be provided to the Department at the following address: Division of Watershed Management, New Jersey Department of Environmental Protection, PO Box 418 Trenton, New Jersey, 08625-0418.
3. If more than one BMP in series is necessary to achieve the required 80 percent TSS reduction for a site, the applicant shall utilize the following formula to calculate TSS reduction:

$$R = A + B - (AXB)/100$$

Where

R = total TSS percent load removal from application of both BMPs, and

A = the TSS percent removal rate applicable to the first BMP

B = the TSS percent removal rate applicable to the second BMP

| Table 2: TSS Removal Rates for BMPs | |
|--|---------------------------------|
| Best Management Practice | TSS Percent Removal Rate |
| Bioretention Systems | 90 |
| Constructed Stormwater Wetland | 90 |
| Extended Detention Basin | 40-60 |
| Infiltration Structure | 80 |
| Manufactured Treatment Device | See Section 6.C |
| Sand Filter | 80 |
| Vegetative Filter Strip | 60-80 |
| Wet Pond | 50-90 |

4. If there is more than one onsite drainage area, the 80 percent TSS removal rate shall apply to each drainage area, unless the runoff from the subareas converge on site in which case the removal rate can be demonstrated through a calculation using a weighted average.
5. Stormwater management measures shall also be designed to reduce, to the maximum extent feasible, the post-construction nutrient load of the anticipated load from the developed site in stormwater runoff generated from the water quality design storm. In achieving reduction of nutrients to the maximum extent feasible, the design of the site shall include nonstructural strategies and structural

measures that optimize nutrient removal while still achieving the performance standards in Sections 4.F and 4.G.

6. Additional information and examples are contained in the New Jersey Stormwater Best Management Practices Manual, which may be obtained from the address identified in Section 7.
7. In accordance with the definition of FW1 at N.J.A.C. 7:9B-1.4, stormwater management measures shall be designed to prevent any increase in stormwater runoff to waters classified as FW1.
8. Special water resource protection areas shall be established along all waters designated Category One at N.J.A.C. 7:9B, and perennial or intermittent streams that drain into or upstream of the Category One waters as shown on the USGS Quadrangle Maps or in the County Soil Surveys, within the associated HUC14 drainage area. These areas shall be established for the protection of water quality, aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, and exceptional fisheries significance of those established Category One waters. These areas shall be designated and protected as follows:
 - a. The applicant shall preserve and maintain a special water resource protection area in accordance with one of the following:
 - (1) A 300-foot special water resource protection area shall be provided on each side of the waterway, measured perpendicular to the waterway from the top of the bank outwards or from the centerline of the waterway where the bank is not defined, consisting of existing vegetation or vegetation allowed to follow natural succession is provided. (2) Encroachment within the designated special water resource protection area under Subsection (1) above shall only be allowed where previous development or disturbance has occurred (for example, active agricultural use, parking area or maintained lawn area). The encroachment shall only be allowed where applicant demonstrates that the functional value and overall condition of the special water resource protection area will be maintained to the maximum extent practicable. In no case shall the remaining special water resource protection area be reduced to less than 150 feet as measured perpendicular to the top of bank of the waterway or centerline of the waterway where the bank is undefined. All encroachments proposed under this subparagraph shall be subject to review and approval by the Department.
 - b. All stormwater shall be discharged outside of and flow through the special water resource protection area and shall comply with the Standard for Off-Site Stability in the "Standards For Soil Erosion and Sediment Control in New Jersey," established under the Soil Erosion and Sediment Control Act , N.J.S.A. 4:24-39 et seq.
 - c. If stormwater discharged outside of and flowing through the special water resource protection area cannot comply with the Standard For Off-Site Stability in the "Standards for Soil Erosion and Sediment Control in New Jersey," established under the Soil Erosion and Sediment Control Act , N.J.S.A. 4:24-39 et seq., then the stabilization measures in accordance with the requirements of the above standards may be placed within the special water resource protection area, provided that:
 - (1) Stabilization measures shall not be placed within 150 feet of the Category One waterway;
 - (2) Stormwater associated with discharges allowed by this section shall achieve a 95 percent TSS post-construction removal rate;
 - (3) Temperature shall be addressed to ensure no impact on the receiving waterway;

- (4) The encroachment shall only be allowed where the applicant demonstrates that the functional value and overall condition of the special water resource protection area will be maintained to the maximum extent practicable;
 - (5) A conceptual project design meeting shall be held with the appropriate Department staff and Soil Conservation District staff to identify necessary stabilization measures; and
 - (6) All encroachments proposed under this section shall be subject to review and approval by the Department.
- d. A stream corridor protection plan may be developed by a regional stormwater management planning committee as an element of a regional stormwater management plan, or by a municipality through an adopted municipal stormwater management plan. If a stream corridor protection plan for a waterway subject to Section 4.G(8) has been approved by the Department of Environmental Protection, then the provisions of the plan shall be the applicable special water resource protection area requirements for that waterway. A stream corridor protection plan for a waterway subject to G.8 shall maintain or enhance the current functional value and overall condition of the special water resource protection area as defined in G.8.a.(1) above. In no case shall a stream corridor protection plan allow the reduction of the Special Water Resource Protection Area to less than 150 feet as measured perpendicular to the waterway subject to this subsection.
- e. Paragraph G.8 does not apply to the construction of one individual single family dwelling that is not part of a larger development on a lot receiving preliminary or final subdivision approval on or before February 2, 2004 , provided that the construction begins on or before February 2, 2009.

Section 5: Calculation of Stormwater Runoff and Groundwater Recharge

A. Stormwater runoff shall be calculated in accordance with the following:

- 1. The design engineer shall calculate runoff using one of the following methods:
 - a. The USDA Natural Resources Conservation Service (NRCS) methodology, including the NRCS Runoff Equation and Dimensionless Unit Hydrograph, as described in the NRCS National Engineering Handbook Section 4 – Hydrology and Technical Release 55 – Urban Hydrology for Small Watersheds; or
 - b. The Rational Method for peak flow and the Modified Rational Method for hydrograph computations.
- 2. For the purpose of calculating runoff coefficients and groundwater recharge, there is a presumption that the pre-construction condition of a site or portion thereof is a wooded land use with good hydrologic condition. The term “runoff coefficient” applies to both the NRCS methodology at Section 5.A.1.a and the Rational and Modified Rational Methods at Section 5.A.1.b. A runoff coefficient or a groundwater recharge land cover for an existing condition may be used on all or a portion of the site if the design engineer verifies that the hydrologic condition has existed on the site or portion of the site for at least five years without interruption prior to the time of application. If more than one land cover have existed on the site during the five years immediately prior to the time of application, the land cover with the lowest runoff potential shall be used for the computations. In addition, there is the presumption that the site is in good hydrologic condition (if the land use type is pasture, lawn, or park), with good cover (if the land use type is woods), or with good hydrologic condition and conservation treatment (if the land use type is cultivation).

3. In computing pre-construction stormwater runoff, the design engineer shall account for all significant land features and structures, such as ponds, wetlands, depressions, hedgerows, or culverts, that may reduce pre-construction stormwater runoff rates and volumes.
 4. In computing stormwater runoff from all design storms, the design engineer shall consider the relative stormwater runoff rates and/or volumes of pervious and impervious surfaces separately to accurately compute the rates and volume of stormwater runoff from the site. To calculate runoff from unconnected impervious cover, urban impervious area modifications as described in the NRCS Technical Release 55 – Urban Hydrology for Small Watersheds and other methods may be employed.
 5. If the invert of the outlet structure of a stormwater management measure is below the flood hazard design flood elevation as defined at N.J.A.C. 7:13, the design engineer shall take into account the effects of tailwater in the design of structural stormwater management measures.
- B. Groundwater recharge may be calculated in accordance with the following:
1. The New Jersey Geological Survey Report GSR-32 A Method for Evaluating Ground-Water Recharge Areas in New Jersey, incorporated herein by reference as amended and supplemented. Information regarding the methodology is available from the New Jersey Stormwater Best Management Practices Manual; at <http://www.state.nj.us/dep/njgs/>; or at New Jersey Geological Survey, 29 Arctic Parkway, P.O. Box 427 Trenton, New Jersey 08625-0427; (609) 984-6587.

Section 6: Standards for Structural Stormwater Management Measures

- A. Standards for structural stormwater management measures are as follows:
1. Structural stormwater management measures shall be designed to take into account the existing site conditions, including, for example, environmentally critical areas, wetlands; flood-prone areas; slopes; depth to seasonal high water table; soil type, permeability and texture; drainage area and drainage patterns; and the presence of solution-prone carbonate rocks (limestone).
 2. Structural stormwater management measures shall be designed to minimize maintenance, facilitate maintenance and repairs, and ensure proper functioning. Trash racks shall be installed at the intake to the outlet structure as appropriate, and shall have parallel bars with one-inch (1") spacing between the bars to the elevation of the water quality design storm. For elevations higher than the water quality design storm, the parallel bars at the outlet structure shall be spaced no greater than one-third (1/3) the width of the diameter of the orifice or one-third (1/3) the width of the weir, with a minimum spacing between bars of one-inch and a maximum spacing between bars of six inches. In addition, the design of trash racks must comply with the requirements of Section 8.D.
 3. Structural stormwater management measures shall be designed, constructed, and installed to be strong, durable, and corrosion resistant. Measures that are consistent with the relevant portions of the Residential Site Improvement Standards at N.J.A.C. 5:21-7.3, 7.4, and 7.5 shall be deemed to meet this requirement.
 4. At the intake to the outlet from the stormwater management basin, the orifice size shall be a minimum of two and one-half inches in diameter.
 5. Stormwater management basins shall be designed to meet the minimum safety standards for stormwater management basins at Section 8.

- B. Stormwater management measure guidelines are available in the New Jersey Stormwater Best Management Practices Manual. Other stormwater management measures may be utilized provided the design engineer demonstrates that the proposed measure and its design will accomplish the required water quantity, groundwater recharge and water quality design and performance standards established by Section 4 of this ordinance.
- C. Manufactured treatment devices may be used to meet the requirements of Section 4 of this ordinance, provided the pollutant removal rates are verified by the New Jersey Corporation for Advanced Technology and certified by the Department.

Section 7: Sources for Technical Guidance

- A. Technical guidance for stormwater management measures can be found in the documents listed at 1 and 2 below, which are available from Maps and Publications, New Jersey Department of Environmental Protection, 428 East State Street, P.O. Box 420, Trenton, New Jersey, 08625; telephone (609) 777-1038.
 - 1. Guidelines for stormwater management measures are contained in the New Jersey Stormwater Best Management Practices Manual, as amended. Information is provided on stormwater management measures such as: bioretention systems, constructed stormwater wetlands, dry wells, extended detention basins, infiltration structures, manufactured treatment devices, pervious paving, sand filters, vegetative filter strips, and wet ponds.
 - 2. The New Jersey Department of Environmental Protection Stormwater Management Facilities Maintenance Manual, as amended.
- B. Additional technical guidance for stormwater management measures can be obtained from the following:
 - 1. The "Standards for Soil Erosion and Sediment Control in New Jersey" promulgated by the State Soil Conservation Committee and incorporated into N.J.A.C. 2:90. Copies of these standards may be obtained by contacting the State Soil Conservation Committee or any of the Soil Conservation Districts listed in N.J.A.C. 2:90-1.3(a)4. The location, address, and telephone number of each Soil Conservation District may be obtained from the State Soil Conservation Committee, P.O. Box 330, Trenton, New Jersey 08625; (609) 292-5540;
 - 2. The Rutgers Cooperative Extension Service, 732-932-9306; and
 - 3. The Soil Conservation Districts listed in N.J.A.C. 2:90-1.3(a)4. The location, address, and telephone number of each Soil Conservation District may be obtained from the State Soil Conservation Committee, P.O. Box 330, Trenton, New Jersey, 08625, (609) 292-5540.

Section 8: Safety Standards for Stormwater Management Basins

A. This section sets forth requirements to protect public safety through the proper design and operation of stormwater management basins. This section applies to any new stormwater management basin.

Note: The provisions of this section are not intended to preempt more stringent municipal or county safety requirements for new or existing stormwater management basins. Municipal and county stormwater management plans and ordinances may, pursuant to their authority, require existing stormwater management basins to be retrofitted to meet one or more of the safety standards in Sections 8.B.1, 8.B.2, and 8.B.3 for trash racks, overflow grates, and escape provisions at outlet structures.

B. Requirements for Trash Racks, Overflow Grates and Escape Provisions

1. A trash rack is a device designed to catch trash and debris and prevent the clogging of outlet structures. Trash racks shall be installed at the intake to the outlet from the stormwater management basin to ensure proper functioning of the basin outlets in accordance with the following:
 - a. The trash rack shall have parallel bars, with no greater than six inch spacing between the bars.
 - b. The trash rack shall be designed so as not to adversely affect the hydraulic performance of the outlet pipe or structure.
 - c. The average velocity of flow through a clean trash rack is not to exceed 2.5 feet per second under the full range of stage and discharge. Velocity is to be computed on the basis of the net area of opening through the rack.
 - d. The trash rack shall be constructed and installed to be rigid, durable, and corrosion resistant, and shall be designed to withstand a perpendicular live loading of 300 lbs/ft sq.
2. An overflow grate is designed to prevent obstruction of the overflow structure. If an outlet structure has an overflow grate, such grate shall meet the following requirements:
 - a. The overflow grate shall be secured to the outlet structure but removable for emergencies and maintenance.
 - b. The overflow grate spacing shall be no less than two inches across the smallest dimension.
 - c. The overflow grate shall be constructed and installed to be rigid, durable, and corrosion resistant, and shall be designed to withstand a perpendicular live loading of 300 lbs./ft sq.
3. For purposes of this paragraph 3, escape provisions means the permanent installation of ladders, steps, rungs, or other features that provide easily accessible means of egress from stormwater management basins. Stormwater management basins shall include escape provisions as follows:
 - a. If a stormwater management basin has an outlet structure, escape provisions shall be incorporated in or on the structure. With the prior approval of the reviewing agency identified in Section 8.C a free-standing outlet structure may be exempted from this requirement.
 - b. Safety ledges shall be constructed on the slopes of all new stormwater management basins having a permanent pool of water deeper than two and one-half feet. Such safety ledges shall be comprised of two steps. Each step shall be four to six feet in width. One step shall be located approximately two and one-half feet below the permanent water surface, and the second step shall be located one to

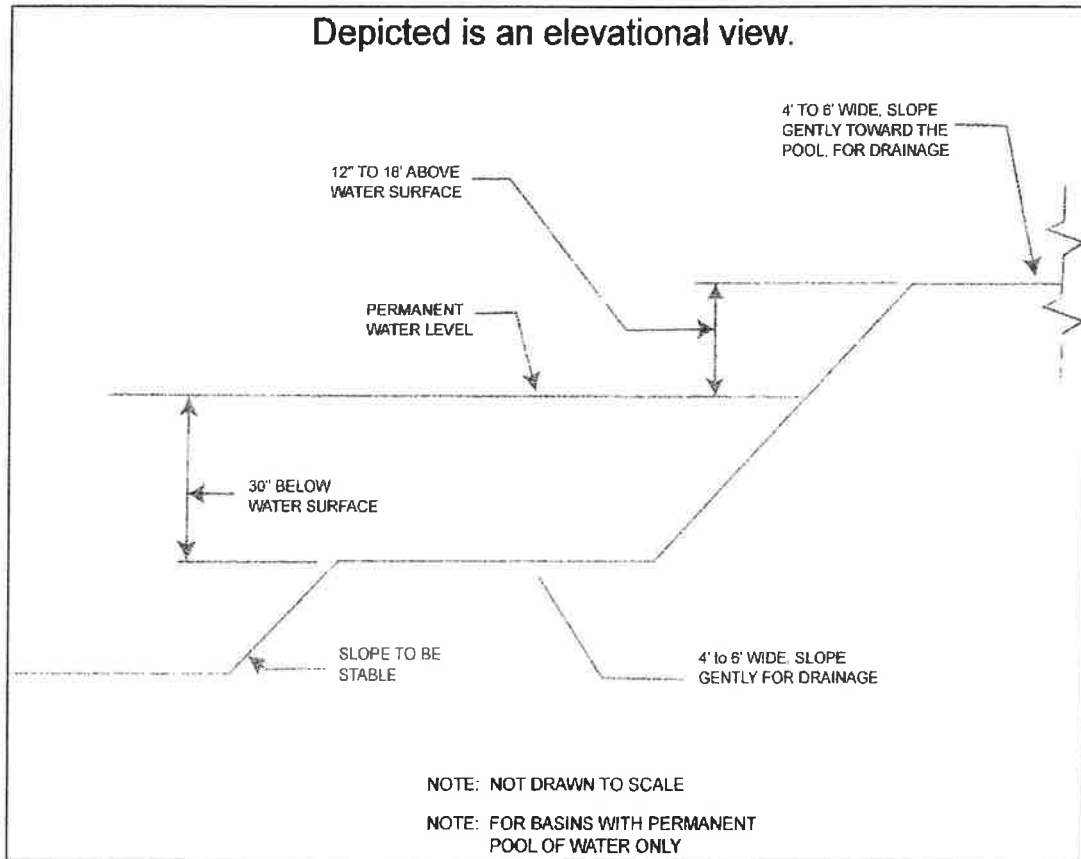
one and one-half feet above the permanent water surface. See Section 8.D for an illustration of safety ledges in a stormwater management basin.

- c. In new stormwater management basins, the maximum interior slope for an earthen dam, embankment, or berm shall not be steeper than 3 horizontal to 1 vertical.

C. Variance or Exemption from Safety Standards

- 1. A variance or exemption from the safety standards for stormwater management basins may be granted only upon a written finding by the appropriate reviewing agency (municipality, county or Department) that the variance or exemption will not constitute a threat to public safety.

D. Illustration of Safety Ledges in a New Stormwater Management Basin



Section 9: Requirements for a Site Development Stormwater Plan

A. Submission of Site Development Stormwater Plan

1. Whenever an applicant seeks municipal approval of a development subject to this ordinance, the applicant shall submit all of the required components of the Checklist for the Site Development Stormwater Plan at Section 9.C below as part of the submission of the applicant's application for subdivision or site plan approval.
2. The applicant shall demonstrate that the project meets the standards set forth in this ordinance.
3. The applicant shall submit [*specify number*] copies of the materials listed in the checklist for site development stormwater plans in accordance with Section 9.C of this ordinance.

B. Site Development Stormwater Plan Approval

The applicant's Site Development project shall be reviewed as a part of the subdivision or site plan review process by the municipal board or official from which municipal approval is sought. That municipal board or official shall consult the engineer retained by the Planning and/or Zoning Board (as appropriate) to determine if all of the checklist requirements have been satisfied and to determine if the project meets the standards set forth in this ordinance.

C. Checklist Requirements

The following information shall be required:

1. Topographic Base Map

The reviewing engineer may require upstream tributary drainage system information as necessary. It is recommended that the topographic base map of the site be submitted which extends a minimum of 200 feet beyond the limits of the proposed development, at a scale of 1"=200' or greater, showing 2-foot contour intervals. The map as appropriate may indicate the following: existing surface water drainage, shorelines, steep slopes, soils, erodible soils, perennial or intermittent streams that drain into or upstream of the Category One waters, wetlands and flood plains along with their appropriate buffer strips, marshlands and other wetlands, pervious or vegetative surfaces, existing man-made structures, roads, bearing and distances of property lines, and significant natural and manmade features not otherwise shown.

2. Environmental Site Analysis

A written and graphic description of the natural and man-made features of the site and its environs. This description should include a discussion of soil conditions, slopes, wetlands, waterways and vegetation on the site. Particular attention should be given to unique, unusual, or environmentally sensitive features and to those that provide particular opportunities or constraints for development.

3. Project Description and Site Plan(s)

A map (or maps) at the scale of the topographical base map indicating the location of existing and proposed buildings, roads, parking areas, utilities, structural facilities for stormwater management and sediment control, and other permanent structures. The map(s) shall also clearly show areas where alterations occur in the natural terrain and cover, including lawns and other landscaping, and seasonal

high ground water elevations. A written description of the site plan and justification of proposed changes in natural conditions may also be provided.

4. Land Use Planning and Source Control Plan

This plan shall provide a demonstration of how the goals and standards of Sections 3 through 6 are being met. The focus of this plan shall be to describe how the site is being developed to meet the objective of controlling groundwater recharge, stormwater quality and stormwater quantity problems at the source by land management and source controls whenever possible.

5. Stormwater Management Facilities Map

The following information, illustrated on a map of the same scale as the topographic base map, shall be included:

- a. Total area to be paved or built upon, proposed surface contours, land area to be occupied by the stormwater management facilities and the type of vegetation thereon, and details of the proposed plan to control and dispose of stormwater.
- b. Details of all stormwater management facility designs, during and after construction, including discharge provisions, discharge capacity for each outlet at different levels of detention and emergency spillway provisions with maximum discharge capacity of each spillway.

6. Calculations

- a. Comprehensive hydrologic and hydraulic design calculations for the pre-development and post-development conditions for the design storms specified in Section 4 of this ordinance.
- b. When the proposed stormwater management control measures (e.g., infiltration basins) depends on the hydrologic properties of soils, then a soils report shall be submitted. The soils report shall be based on onsite boring logs or soil pit profiles. The number and location of required soil borings or soil pits shall be determined based on what is needed to determine the suitability and distribution of soils present at the location of the control measure.

7. Maintenance and Repair Plan

The design and planning of the stormwater management facility shall meet the maintenance requirements of Section 10.

8. Waiver from Submission Requirements

The municipal official or board reviewing an application under this ordinance may, in consultation with the municipal engineer, waive submission of any of the requirements in Sections 9.C.1 through 9.C.6 of this ordinance when it can be demonstrated that the information requested is impossible to obtain or it would create a hardship on the applicant to obtain and its absence will not materially affect the review process.

Section 10: Maintenance and Repair

A. Applicability

1. Projects subject to review as in Section 1.C of this ordinance shall comply with the requirements of Sections 10.B and 10.C.

B. General Maintenance

1. The design engineer shall prepare a maintenance plan for the stormwater management measures incorporated into the design of a major development.
2. The maintenance plan shall contain specific preventative maintenance tasks and schedules; cost estimates, including estimated cost of sediment, debris, or trash removal; and the name, address, and telephone number of the person or persons responsible for preventative and corrective maintenance (including replacement). Maintenance guidelines for stormwater management measures are available in the New Jersey Stormwater Best Management Practices Manual. If the maintenance plan identifies a person other than the developer (for example, a public agency or homeowners' association) as having the responsibility for maintenance, the plan shall include documentation of such person's agreement to assume this responsibility, or of the developer's obligation to dedicate a stormwater management facility to such person under an applicable ordinance or regulation.
3. Responsibility for maintenance shall not be assigned or transferred to the owner or tenant of an individual property in a residential development or project, unless such owner or tenant owns or leases the entire residential development or project.
4. If the person responsible for maintenance identified under Section 10.B.2 above is not a public agency, the maintenance plan and any future revisions based on Section 10.B.7 below shall be recorded upon the deed of record for each property on which the maintenance described in the maintenance plan must be undertaken.
5. Preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of nonvegetated linings.
6. The person responsible for maintenance identified under Section 10.B.2 above shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.
7. The person responsible for maintenance identified under Section 10.B.2 above shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed.
8. The person responsible for maintenance identified under Section 10.B.2 above shall retain and make available, upon request by any public entity with administrative, health, environmental, or safety authority over the site, the maintenance plan and the documentation required by Sections 10.B.6 and 10.B.7 above.

9. The requirements of Sections 10.B.3 and 10.B.4 do not apply to stormwater management facilities that are dedicated to and accepted by the municipality or another governmental agency.

(Note: It may be appropriate to delete requirements in the maintenance and repair plan that are not applicable if the ordinance requires the facility to be dedicated to the municipality. If the municipality does not want to take this responsibility, the ordinance should require the posting of a two year maintenance guarantee in accordance with N.J.S.A. 40:55D-53. Guidelines for developing a maintenance and inspection program are provided in the New Jersey Stormwater Best Management Practices Manual and the NJDEP Ocean County Demonstration Study, Stormwater Management Facilities Maintenance Manual, dated June 1989 available from the NJDEP, Watershed Management Program.)

10. In the event that the stormwater management facility becomes a danger to public safety or public health, or if it is in need of maintenance or repair, the municipality shall so notify the responsible person in writing. Upon receipt of that notice, the responsible person shall have fourteen (14) days to effect maintenance and repair of the facility in a manner that is approved by the municipal engineer or his designee. The municipality, in its discretion, may extend the time allowed for effecting maintenance and repair for good cause. If the responsible person fails or refuses to perform such maintenance and repair, the municipality or County may immediately proceed to do so and shall bill the cost thereof to the responsible person.

- B. Nothing in this section shall preclude the municipality in which the major development is located from requiring the posting of a performance or maintenance guarantee in accordance with N.J.S.A. 40:55D-53.

Section 11: Penalties

Any person who erects, constructs, alters, repairs, converts, maintains, or uses any building, structure or land in violation of this ordinance shall be subject to the following penalties: [*Municipality to specify*].

Section 12: Effective Date

This ordinance shall take effect immediately upon the approval by the county review agency, or sixty (60) days from the receipt of the ordinance by the county review agency if the county review agency should fail to act.

Section 13: Severability

If the provisions of any section, subsection, paragraph, subdivision, or clause of this ordinance shall be judged invalid by a court of competent jurisdiction, such order of judgment shall not affect or invalidate the remainder of any section, subsection, paragraph, subdivision, or clause of this ordinance.