

Township of Randolph

MUNICIPAL STORMWATER MANAGEMENT PLAN

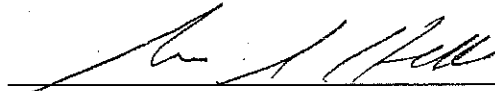
MORRIS COUNTY, NEW JERSEY
MARCH 2005

Prepared for: Township of Randolph
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Randolph, New Jersey 07869

Prepared By: Suburban Consulting Engineers, Inc.
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INTRODUCTION

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for Randolph Township ("the Township") to address stormwater-related impacts. The creation of this plan is required by N.J.A.C. 7:14A-25 Municipal Stormwater Regulations. This plan contains all of the required elements described in N.J.A.C. 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 acre 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 addresses a 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.

I. GOALS

The goals of this MSWMP are to:

1. Reduce flood damage, including damage to life and property;
2. Minimize, to the extent practical, any increase in stormwater runoff from any new development;
3. Reduce soil erosion from any development or construction project;
4. Assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
5. Maintain groundwater recharge;
6. Prevent, to the greatest extent feasible, an increase in nonpoint pollution;
7. Maintain the integrity of stream channels for their biological functions, as well as for drainage;
8. 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; and
9. Protect public safety through the proper design and operation of stormwater basins.

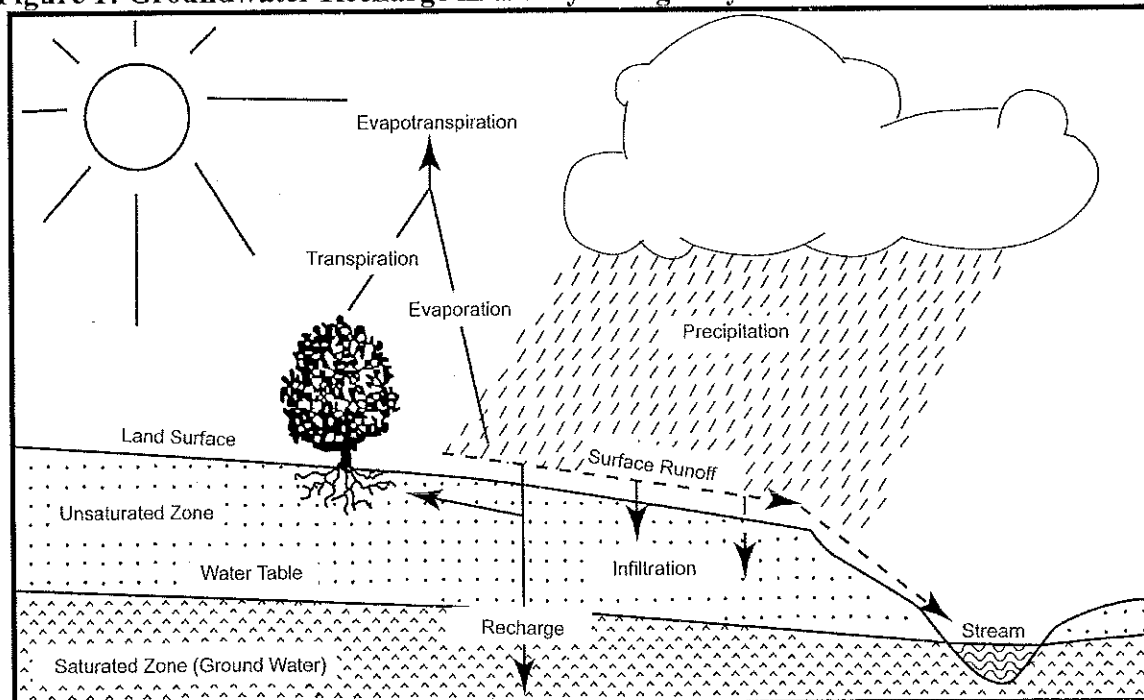
To achieve these goals, this plan outlines specific stormwater design and performance standards for new development. Additionally, the plan proposes stormwater management controls to address impacts from existing development. Preventative and corrective maintenance strategies are included in the plan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

II. STORMWATER DISCUSSION

Land development can dramatically alter the hydrologic cycle (See Figure 1) 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 gutters, 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 new 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.

Figure 1: Groundwater Recharge in the Hydrologic Cycle



Source: New Jersey Geological Survey Report GSR-32.

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.

III. BACKGROUND

Randolph Township is 22 square miles in size and is located in western Morris County. Its neighboring municipalities include Roxbury and Chester Township to the west, Mendham Township to the south, Rockaway, Denville and Morris Townships to the east and Mine Hill Township and the Town of Dover to the north. The main County roads servicing the Township are Dover-Chester Road (Route 513), Hanover Avenue (Route 650), Quaker Church Rd (Route 662), Randolph Avenue (Route 662), Millbrook Ave to Schoolhouse Rd to Centergrove Rd (Route 670) and Sussex Turnpike (Route 617). Additionally, Route 10 is a state road that traverses the northern portion of the Township in an east-west direction.

Randolph Township has been designated half rural and half suburban by the State Planning Commission. The Township's population has been increasing over several decades, most likely as a result of Randolph's proximity to easy access to Routes 10, 287, 24 and 78. The U.S. Census population for the Township was recorded at 17,828 persons in 1980, 19,974 persons in 1990 and 24,847 persons in 2000. These numbers indicate a population increase of 12.0% from 1980 and 1990 and 24.4% from 1990 to 2000. The population increase between 1990 and 2000 is essentially twice that found from 1980 to 1990 indicating increasing development pressure in recent years. New development due to current and future population increases often causes changes to occur to the landscape that will increase stormwater runoff volumes and pollutant loads to the waterways of the municipality.

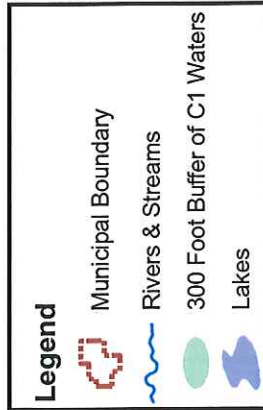
Most streams in Randolph Township are considered high quality surface water resources and are capable of either trout maintenance (TM) or trout production (TP). Figure 2 illustrates the waterways in the Township and Figure 3 specifies the current surface water classifications. All stream segments within the Township, except for Den Brook and the most easterly portion of the Mill Brook, are currently classified as Category One waters. The Category One (C1) designation indicates the highest level of protection to prevent further water-quality degradation. The Stormwater Rules require C1 designation waterways to be accompanied with a requirement of a 300-foot buffer zone to restrict development and protect water quality.

Randolph is located within the Highlands, one of New Jersey's four major physiographic provinces. Part of the Appalachian Mountain range, the Highlands are characterized by alternating flat-topped ridges and deep-striking valleys. Land in Randolph runs from 551 to 1120 feet above sea level. For reference, Figure 4 depicts the Township boundary and topography on the USGS quadrangle maps.

Water Quality

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. The presence of benthic macroinvertebrates indicates the health of the waterway. Streams are classified as non-impaired, moderately impaired, or severely impaired based on the AMNET data. The data is used to generate a New

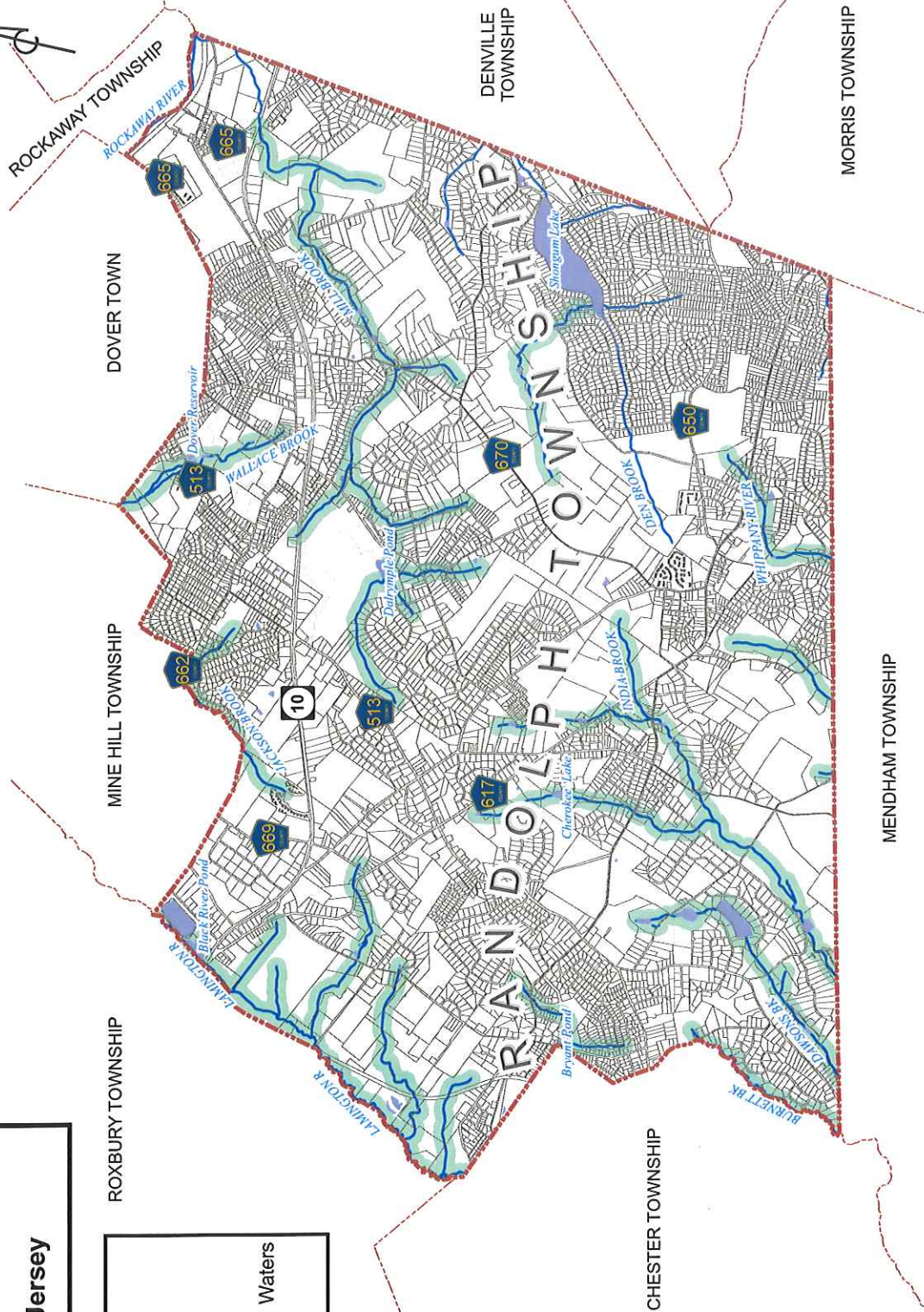
**Figure 2: Township of Randolph
and its Waterways
Morris County, New Jersey**



Source:

- Randolph Township Planning Department.
- Parcels.
- Municipal Boundary.
- Lakes.
- Roads.
- NJ DEP.
- New Jersey Department of Environmental Protection, Division of Landuse Management, Bureau of Freshwater & Biological Monitoring, Surface Water Quality Standards of New Jersey, swqs.

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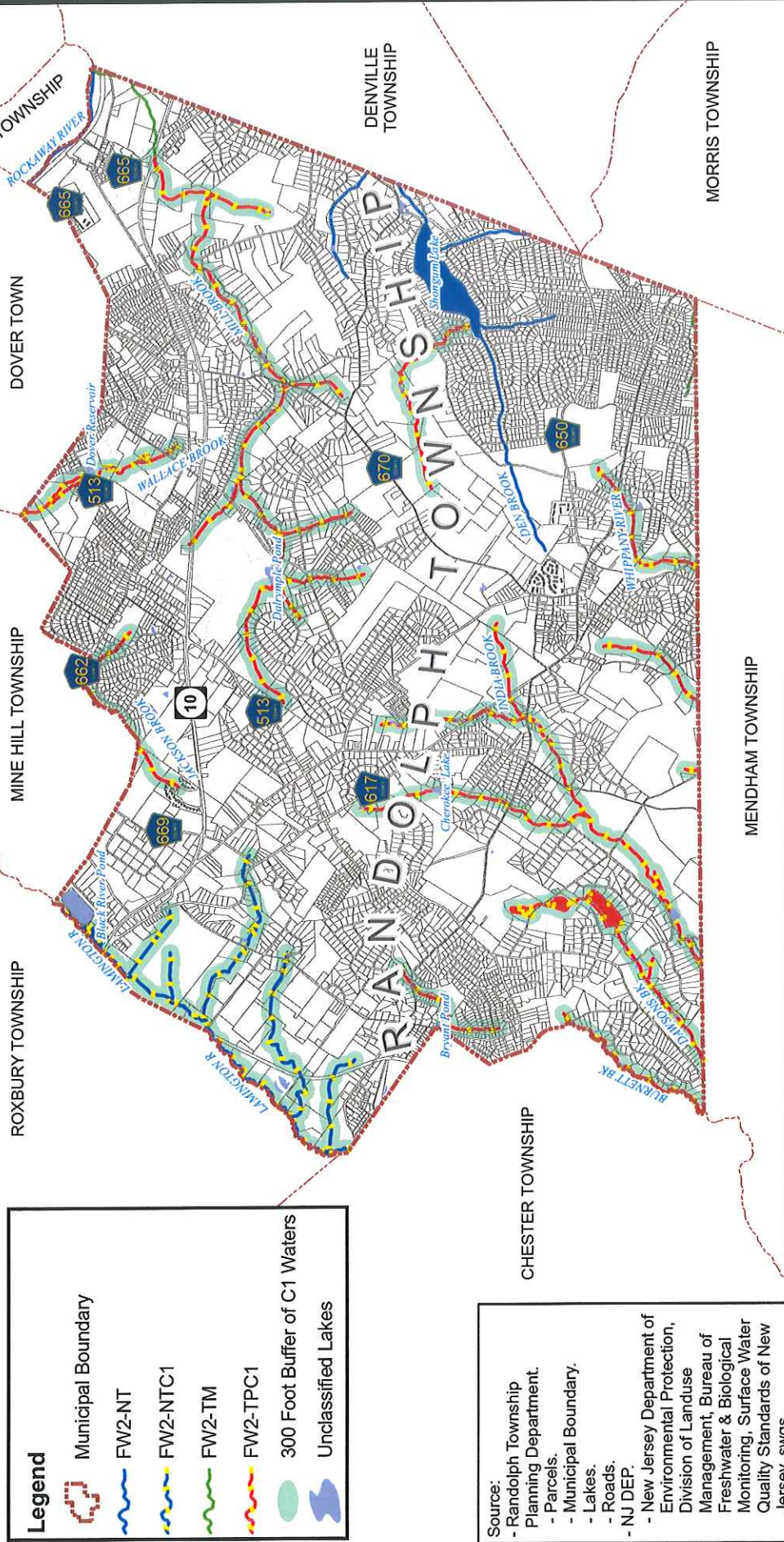
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Figure 3: Township of Randolph and its Waterways by Surface Water Classification Morris County, New Jersey



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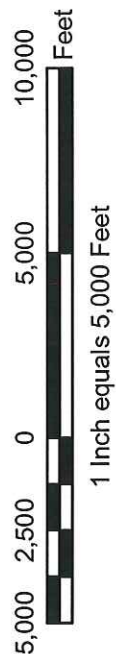
**Figure 4: Township of Randolph on
USGS Quadrangles
Morris County, New Jersey**

Legend
 Municipal Boundary



Source:
 - NJ DEP.
 - US Geological Survey
 Dover, Chester and
 Mendham Quadrangles.

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Jersey Impairment Score (NJIS), which is based on a number of biometrics related to benthic macroinvertebrate community dynamics.

The following are the AMNET sites located within the Township:

- India Brook at Calais Rd BR#733 in Randolph, AN0344A
- India Brook Unknown Tributary at Calais Rd in Randolph, AN0344
- Mill Brook at Palmer Rd in Randolph, AN0244

The first two sites along the India Brook are classified as attaining the water quality standard and no use is threatened. The third site along the Mill Brook is listed on Sublist 3 which indicates that there is insufficient or no data to determine if any designated use is attained at this time. Further determination on this waterway will be made following the NJDEP gathering of supplementary data and information.

In addition to the AMNET data, the NJDEP and other regulatory agencies collect water quality chemical data on the streams in the state. 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. The one additional waterway listed on the Integrated List with other regulatory agency data is the following:

- Randolph Park Lake-08

Randolph Park Lake is a municipal swimming facility that is located in the northwest portion of the town. The Randolph Park Lake was tested at the Left Beach, Right Beach, and Swim Lanes for fecal coliform by the Randolph Township Health Department. The water quality standard was not attained for fecal coliform and the lake appears on Sublist 5.

Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants for which the NJDEP is required to develop one or more Total Maximum Daily Loads (TMDLs) for each waterway. A TMDL is the amount of a pollutant that can be accepted by a waterbody without causing an exceedance of water quality standards or interfering with the ability to use a waterbody 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 nonpoint sources, which include stormwater runoff from agricultural and residential areas, along with a margin of safety.

At this time, no TMDLs have been identified for Randolph Park Lake. There are various potential sources of fecal coliform to the lake, including runoff containing pet and wildlife wastes and malfunctioning septic systems. Through public education, a pet waste ordinance and by adopting Canadian goose management techniques, the fecal coliform levels in Randolph Park Lake should drop over time and water quality improvements will be seen.

Water Quantity

As with most New Jersey municipalities in the Highlands, portions of Randolph Township occasionally exhibit water quantity problems including flooding and stream bank erosion during severe storm events. During severe storm events, peak and volumes of stream flows are increased. Some of the culverts associated with road crossings were designed for different hydrologic conditions (i.e., less impervious area) than presently exist in the Township. As such, during severe storm events, they might not have adequate capacity, thereby causing a backwater effect and flooding upstream.

Additional effects of increased peaks and volumes of stream flows include stream bank erosion and lower base flows in streams. The lower base flows in streams results from a loss of groundwater recharge areas due to increased imperviousness. Lower base flows can have a negative impact on instream habitats during the summer months. A map of the groundwater recharge areas is shown for reference and planning in Figure 5. Wellhead protection areas, also areas to be considered for additional protection, are shown in Figure 6.

In a proactive manner to combat stream bank erosion and scouring, the Township staff has been following a program of locating, mapping and prioritizing outfalls for repairs.

Watershed Management Areas (WMAs)

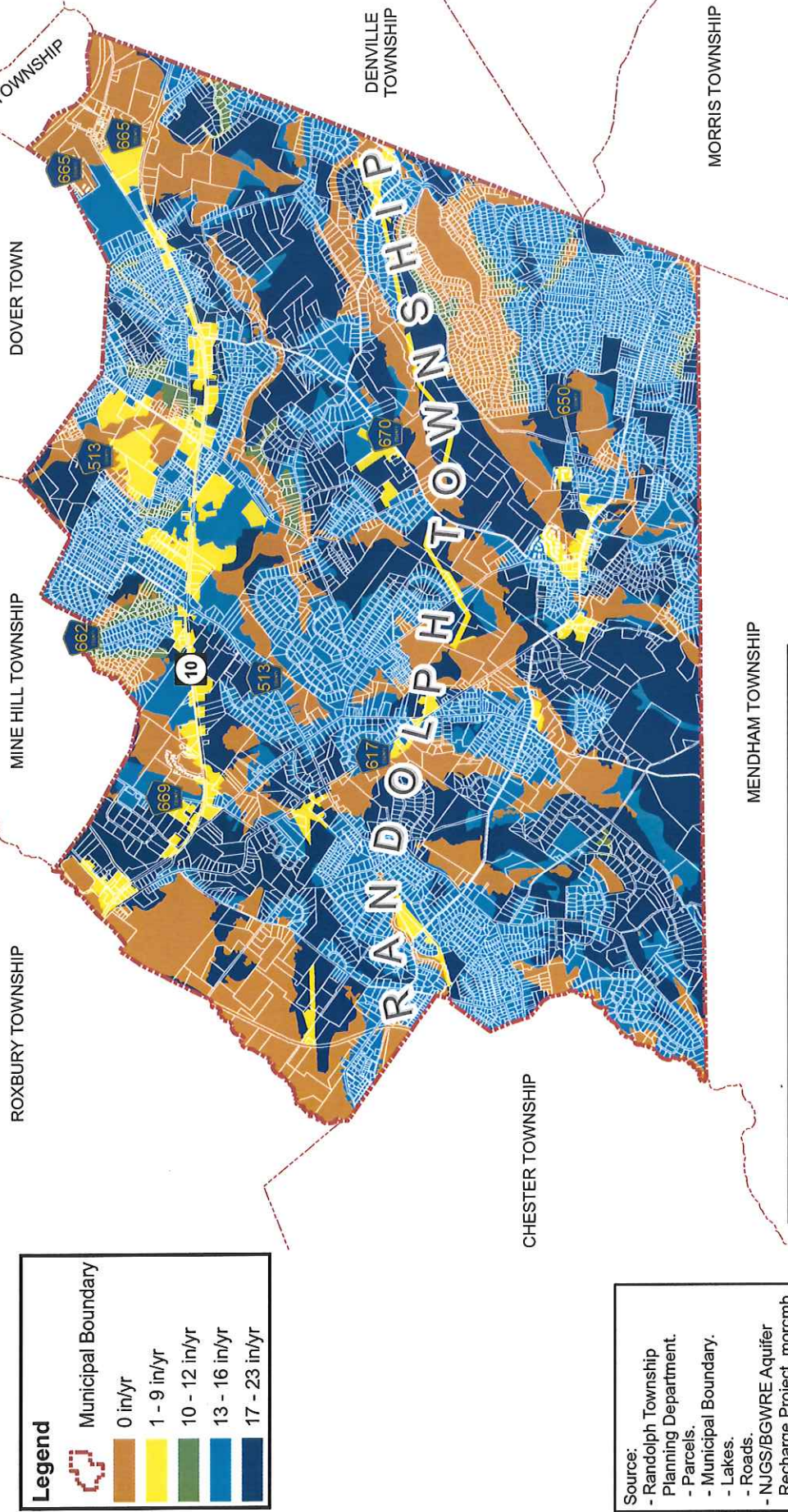
Randolph Township is divided into two Watershed Management Areas (WMAs), WMA 6- the Upper-Mid Passaic, Whippany and Rockaway River Watershed and WMA 8- the North and South Branches of the Raritan River Watershed (Figure 7). Within the WMAs, there are further drainage area designations delineated by hydraulic unit code (HUC) designations. The system starts with the largest possible drainage areas and progressively smaller subdivisions of the drainage area are delineated and numbered in a nested fashion. A drainage area with a hydrologic unit code (HUC) designation with 14 numbers, or HUC-14, is one of several sub watersheds of a larger watershed with 11 numbers, or a HUC-11.

The portion of Randolph Township in WMA 6 is the eastern portion of the Township. Two HUC-11 divisions are within Randolph Township's borders that are part of the WMA 6, the Rockaway River and the Whippany River. In fact, the Rockaway River itself forms the northeastern township border. Furthermore, four HUC-14 divisions exist within the Rockaway River HUC-11; Rockaway R (74d 33m 30s to Stephens Bk), Rockaway R (BM 534 to 74d 33m 30s), Mill Brook (Morris Co.) and Den Brook. Additionally, three HUC-14 divisions exist within the Whippany River HUC-11; Whippany R (above road at 74d 33m), Whippany R (Wash. Valley Rd to 74d 33m) and Whippany R (Lk Pocahontas to Wash Val Rd).

The main waterways in the Township that are part of WMA 6 are the Jackson Brook, Wallace Brook, Dover Reservoir, Rockaway River, Dalrymple Pond, Mill Brook, Den Brook, Shongum Lake and Whippany River.

The western portion of Randolph Township is comprised of WMA 8, the North and South Branches of the Raritan River. Two HUC-11 divisions are within Randolph Township's borders

**Figure 5: Groundwater Recharge Areas In
The Township of Randolph
Morris County, New Jersey**



Legend

- Municipal Boundary
- 0 in/yr
- 1 - 9 in/yr
- 10 - 12 in/yr
- 13 - 16 in/yr
- 17 - 23 in/yr

- Source:**
- Randolph Township Planning Department.
 - Parcels.
 - Municipal Boundary.
 - Lakes.
 - Roads.
 - NJGS/BGWRE Aquifer Recharge Project, morcmb.

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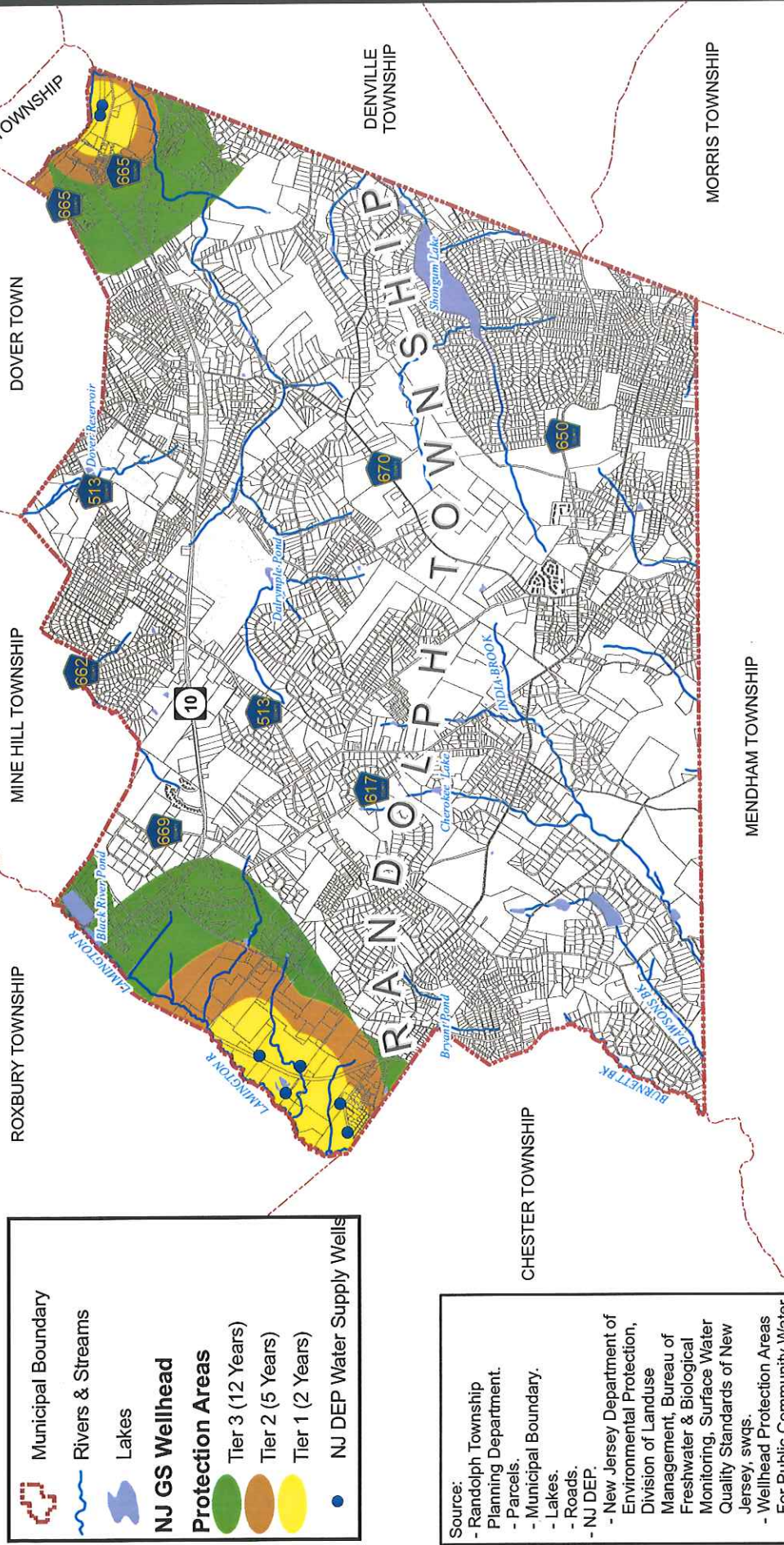


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**Figure 6: Wellhead Protection Areas In
The Township of Randolph
Morris County, New Jersey**



Municipal Boundary

Rivers & Streams

Lakes

NJ GS Wellhead

Protection Areas

Tier 3 (12 Years)

Tier 2 (5 Years)

Tier 1 (2 Years)

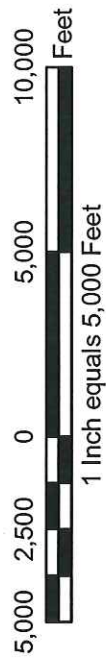
• NJ DEP Water Supply Wells

Source:

- Randolph Township Planning Department.
- Parcels.
- Municipal Boundary.
- Lakes.
- Roads.
- NJ DEP.
- New Jersey Department of Environmental Protection, Division of Landuse Management, Bureau of Freshwater & Biological Monitoring, Surface Water Quality Standards of New Jersey, swqs.
- Wellhead Protection Areas For Public Community Water Supply Wells in New Jersey, mor.

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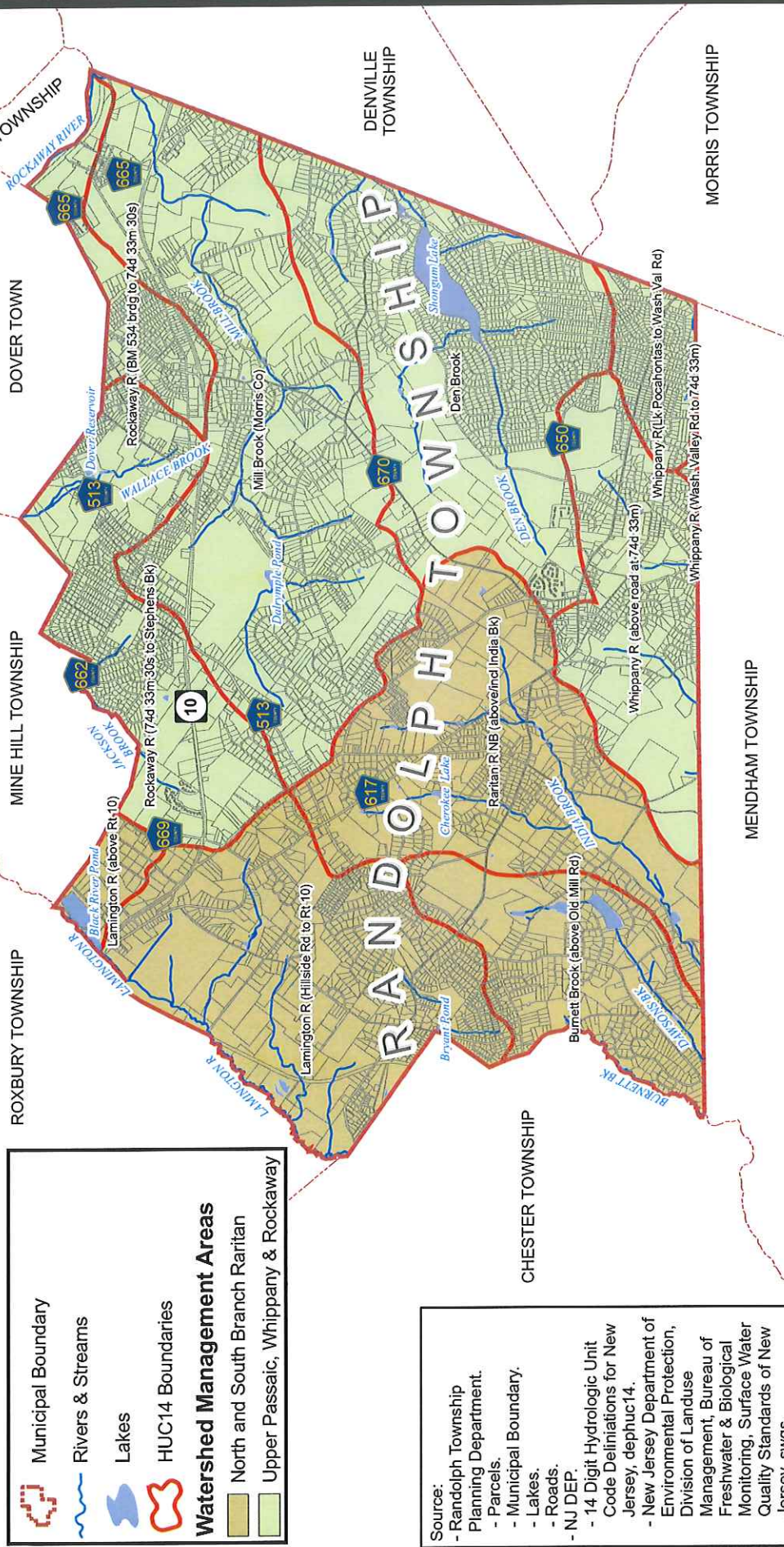
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Figure 7: Hydrologic Unit Codes (HUC14s) Within The Township of Randolph Morris County, New Jersey



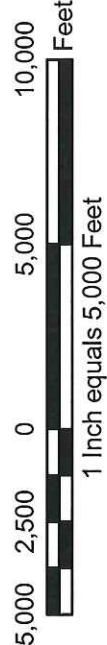
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that are part of the WMA 8, the Lamington River and the North Branch of the Raritan River. The Lamington River forms the northwestern township border. Two HUC-14 divisions exist within the Lamington River HUC-11; Lamington R (above Rt 10) and Lamington R (Hillside Rd to Rt 10). Additionally, two HUC-14 divisions exist within the North Branch HUC-11; Burnett Brook (above Old Mill Rd) and Raritan R NB (above/incl. India Bk.)

The main waterways in the Township that are part of WMA 8 are the Lamington River, Black River Pond, Bryant Pond, Burnett Brook, Dawsons Brook, India Brook and Cherokee Lake.

IV. DESIGN AND PERFORMANCE STANDARDS

The Township will adopt the design and performance standards for stormwater management measures as presented in N.J.A.C. 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 N.J.A.C. 7:8-5.8 Maintenance Requirements, and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The ordinances will be submitted to the county for review and approval by April 1, 2006. A proposed draft of the Ordinance is included as an Appendix to this plan.

In order to control stormwater runoff quantity impacts, one of the following must be demonstrated for major development:

1. The post-construction runoff hydrographs for the 2, 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. There is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the 2, 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.
3. The post-construction peak runoff rates for the 2, 10 and 100 year storm events are 50, 75 and 80 percent, respectively, of the preconstruction peak runoff rates.

Major development is defined as new development that will ultimately result in the disturbance of one or more acres of land, or increase impervious surfaces by one-quarter acre.

The Stormwater Management Rules also stress performance standards for ground water recharge to increase the integrity of the state's aquifers. They establish a goal of maintaining 100 percent of the average annual pre-construction groundwater recharge volume for new major development projects or demonstrate that the increase of stormwater runoff volume from pre-construction to post-construction for the 2-year storm is infiltrated.

In addition to recharge standards, the regulations also stress water quality controls, such as best management practices to reduce runoff of total suspended solids (TSS) by 80 percent and other pollutants up to the maximum extent feasible. The rules promote smart growth techniques, stressing low impact site designs for stormwater management systems that maintain natural vegetation and drainage and reduce clear-cutting and the unnecessary loss of trees.

V. PLAN CONSISTENCY

The Township is part of the Jackson Brook Regional Stormwater Management Planning Area. The drainage area of the Jackson Brook includes the Township of Randolph, the Township of Mine Hill, the Borough of Wharton and the Town of Dover. The Jackson Brook originates in the northern portion of Randolph Township (termed the Upper Jackson Brook) and flows north to Hedden Pond in Hedden Park and finally to its confluence with the Rockaway River.

The Regional Plan was prepared to provide a comprehensive plan to manage the increased runoff which has resulted in flooding problems, stream channel erosion and siltation, degraded water quality and reduced groundwater recharge. In the plan, the Upper Jackson Brook was designated as an On-Site Stormwater Management Zone which requires municipal ordinance amendments to include provisions for on-site release rate policy and the retrofitting of existing drainage structures with infiltration measures. The Plan also recommends the improvement of the Twin Reservoir Impoundment on Reservoir Road along Wallace Brook including the removal of sediment deposits. This Municipal Stormwater Management Plan for Randolph is consistent with the Jackson Brook Regional Stormwater Management Plan. The various design and performance standards, along with the non-structural stormwater techniques recommended in this plan, will help meet the intended goals of the Jackson Brook Regional Stormwater Plan.

No TMDLs have yet been developed for waters within the Township; although the state is in the process of developing a TMDL for fecal coliform at Randolph Park Lake. In a proactive move, the Township should consider conducting public education on septic system maintenance and developing a goose management plan to control the impact from the resident geese at the local park. Some of the measures which could be included in a goose management plan include vegetation barriers, overhead wire grids, repellants, egg addling and public education.

The Municipal Stormwater Management Plan is consistent with the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21. The municipality 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.

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 and enforce all on-site soil erosion and sediment control measures. The Township of Randolph is an exempt municipality and therefore has the responsibility to enforce any soil erosion and sediment control inconsistencies or violations.

VI. NONSTRUCTURAL STORMWATER MANAGEMENT STRATEGIES

The new stormwater regulations are immediately applicable to new residential development through the application of the Residential Site Improvement Standards at N.J.A.C. 5:21. Since the revised Residential Site Improvement Standards have come into effect, the Township has been complying with the standards as they relate to residential development despite many local ordinances being in conflict.

The master plan and ordinances of Randolph Township have been reviewed with regard to compliance with RSIS and incorporating nonstructural stormwater management strategies. The review is detailed below and a list of relevant sections in the Land Development Ordinance that either meet or are to be modified are provided. Once the ordinance texts are completed, they are to be submitted to the county review agency for review and approval by April 1, 2006. A copy shall also be sent to the Department of Environmental Protection at the time of submission.

Vegetation and Landscaping

Effective management of both existing and proposed site vegetation can reduce a development's adverse impacts on groundwater recharge and stormwater runoff quality and quantity.

15-60.3. General site, subdivision and building design standards.

This section specifies a regard for natural features and requires that developments be designed so as to minimize tree clearance and the destruction of natural amenities.

Section 15-48 Tree Removal Protection.

This section specifies standards for protection of existing trees over 8" in caliper. The section also specifies that the removal and cutting of trees upon lots and tracts of land within the Township causes increases drainage control costs, increases soil erosion and sedimentation, decreases fertility of the soil, degrades water resources and decreases groundwater recharge.

15-70.5.D. Grading.

This chapter specifies that only those trees necessary to permit construction of streets, driveways and dwellings and other authorized structures shall be removed.

15-81.7. Environmental impact statements.

This chapter requires that when an Environmental Impact Statement be performed that soils, natural vegetation, surface water and subsurface water be considered and alternatives to development be considered.

15-71.2. Parking lot landscaping.

This section should be amended to allow islands to be used for stormwater management by disconnecting impervious surfaces and treating runoff from the impervious surfaces. This section should also be amended to encourage curb cuts or flush curbs with curb stops when possible to allow vegetated swales to be used for stormwater conveyance.

Minimizing Land Disturbance

The minimization of disturbance can be used at different phases of a development project. The goal is to limit clearing, grading, and other disturbance associated with development to protect existing features that provide stormwater benefits.

15-60.5. Residential cluster site and building design standards.

This section encourages cluster development option in order to provide permanent open space, to prevent development on environmentally sensitive areas, and to aid in reducing the cost of providing streets, utilities and services in residential developments. This cluster option is an excellent tool for reducing impervious roads and driveways. The option allows for smaller lots with smaller front and side yard setbacks than traditional development options. It also minimizes the disturbance of large tracts of land, which is a key nonstructural stormwater management strategy. The cluster option requires that the open space area shall have an area of at least five (5) acres.

15-78. Open Space and Recreation

Open space and recreation areas shall be required as designated below this section and Article II. Open space may be divided into active (developed) and passive (undeveloped) areas. Developed open space is designed to provide active recreational facilities to serve the residents. Undeveloped open space is designed to preserve the following important site amenities and environmentally sensitive areas to the extent consistent with the reasonable utilization of the land.

Stream Corridor Buffer Ordinance

The Township may want to consider adopting a stream corridor buffer that specifies permitted activities and provides for restoration or rehabilitation. The purpose of a stream buffer ordinance is to maintain the quality of streams and open waters in the Township, protect significant ecological components of stream corridors and open waters such as riparian areas, floodplains, wetlands, woodlands, steep slopes, and plant and associated wildlife communities within the stream corridors and open waters of the Township; and minimize flood-related damage to properties in the Township.

Impervious Area Management

The amount of impervious area, and its relationship to adjacent vegetated areas, can significantly change the amount of runoff that needs to be addressed by BMPs. Most of a proposed site's impervious surfaces are typically located in the streets, sidewalks, driveways, and parking areas.

15-72.4. Right-of-way and cartway widths.

The Township has several street classifications, ranging from "Minor Arterial," which has a minimum right-of-way of 66 feet and paving width of 40 feet, to "Local," which has a minimum right-of-way of 50 feet and paving width of 30 feet or when approved by the Planning Board reduced to 28 feet. The Major Arterial classification only applies to NJ Route 10. These cartway widths should be reviewed to ensure are the minimum necessary for traffic density and emergency vehicle movement.

15-72.10. Curbs.

This chapter requires that granite block curb be installed on both sides of all Township streets. This chapter is to be amended to encourage curb cuts or flush curbs with curb stops when possible to allow vegetated swales to be used for stormwater conveyance and to allow the disconnection of impervious areas. The use of vegetated channels, rather than the standard curb and gutter configuration, can decrease flow velocity, and allow for stormwater filtration and re-infiltration.

15-71.1.A. Parking space size

This chapter specifies that the size of each parking space shall be a minimum of 9 feet in width by 20 feet in length. This parking ratio recommended for low impact design is 9 feet by 18 feet.

15-72.11.K. Sidewalk Construction.

This chapter designates materials to be used in sidewalk construction. This section is to be amended to allow the use of pervious paving materials to minimize stormwater runoff and promote groundwater recharge.

15-72.12. F. Residential and nonresidential driveways.

This chapter specifies that all driveways shall be hard surfaced. However, the Township staff has considered the use of stone driveways to meet this standard. For clarification, this section is to be amended to encourage the use of gravel or pervious paving materials to minimize stormwater runoff and promote groundwater recharge.

15-79.1. Paving materials.

This chapter shall be expanded to consider stormwater management and groundwater recharge when choosing paving materials. This section is to be amended to encourage the use of pervious paving materials, including pavers and porous pavement, to minimize stormwater runoff and promote groundwater recharge.

Surface Water Design Standards

15-70.2.C. Site plan and subdivision standards--General.

This section is to be amended to state that adequate provisions shall be made for the disposal of storm water in accordance with the New Jersey Site Improvement Standards and the Stormwater Control Ordinance (Appendix) or as otherwise approved by the Township Engineer and the Planning Board.

15-70.5. A. Grading.

This section is to be amended to allow collection and treatment of surface water on lots. Instead of the lots being graded so that the surface waters flow unimpeded to the street, where applicable, the lots should be graded to slow the velocity and impede concentration of surface waters.

15-75. Stormwater Management

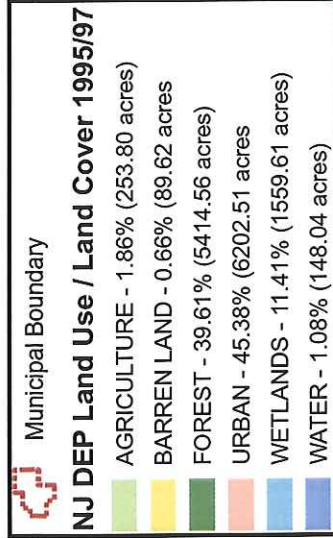
This section is to be amended to state that design, standards and specifications shall be in accordance with the New Jersey Site Improvement Standards and the Stormwater Control Ordinance (Appendix) or as otherwise approved by the Township Engineer and the Planning Board. It may be appropriate merge any appropriate language of the existing section with the proposed ordinance.

VII. LAND USE/BUILD-OUT ANALYSIS

A complete build-out analysis utilizing the 2002 Land Use/Land Cover NJDEP GIS layer will be conducted by April 1, 2006 as required.

Although, included in this plan, is an existing land use analysis for the Township. Figure 8 illustrates the existing land use in the Township based on 1995/97 GIS information from NJDEP, the Township zoning map is shown in Figure 9 and Figure 10 illustrate the constrained lands within the Township.

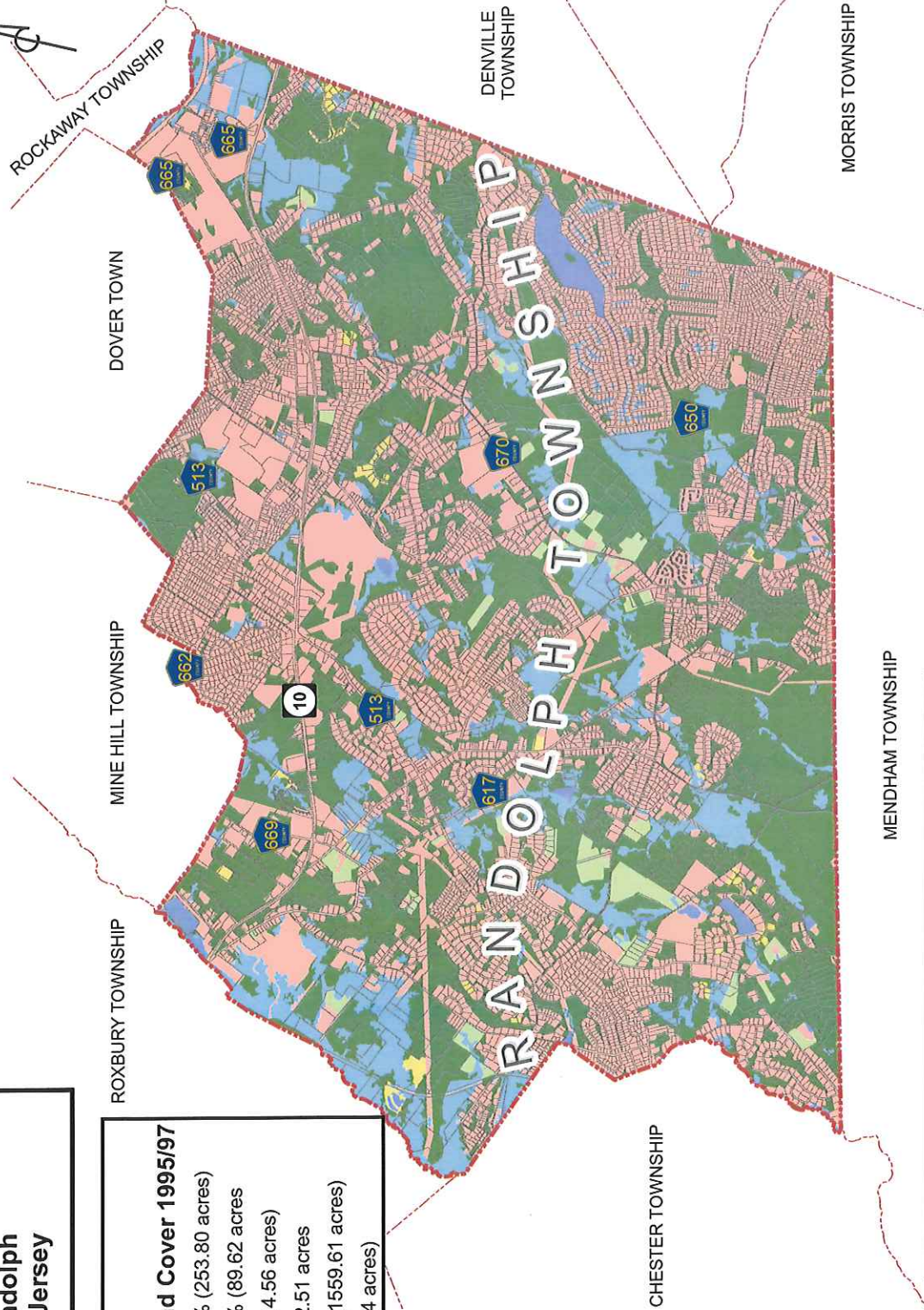
**Figure 8: Land Use / Land Cover For
The Township of Randolph
Morris County, New Jersey**



Source:

- Randolph Township Planning Department.
- Parcels.
- Municipal Boundary.
- Roads.
- NJ DEP.
- 1995/97 Land Use/ Land Cover Update, Upper Passaic, Whippany and Rockaway Watershed Management Area WMA-6, Upper and Lower Raritan Watershed Management Area WMA-8.

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 Suburban Consulting Engineers, Inc.



Suburban Consulting Engineers, Inc.

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- Municipal Engineers -

- Planners - Environmental - Land Surveyors -

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J.J.W.

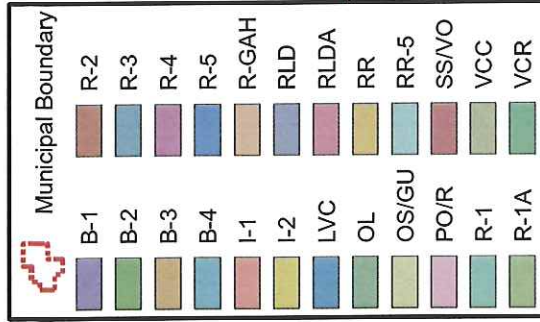
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A.S.H.

DATE:
02/04/05

SCALE:
1" = 5000'

PROJECT NO.
SCE-3924

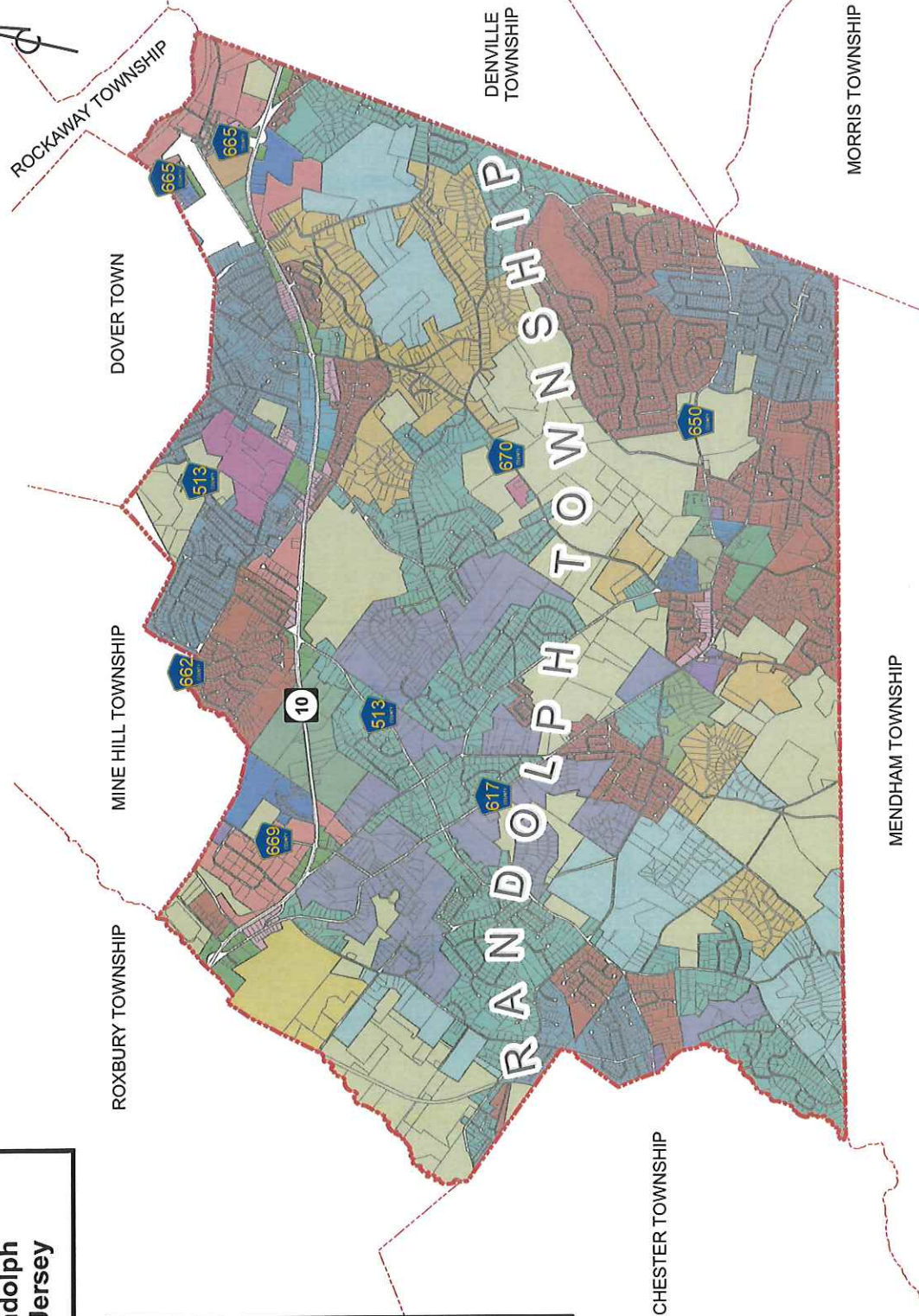
**Figure 9: Zoning Districts Within
The Township of Randolph
Morris County, New Jersey**



Source:

- Randolph Township
- Planning Department
- Parcels
- Municipal Boundary
- Zoning
- Roads
- NJ DEP
- 1995/97 Land Use/
- Land Cover Update,
- Upper Passaic, Whippany
- and Rockaway Watershed
- Management Area WMA-6.
- Upper and Lower Raritan
- Watershed Management
- Area WMA-8.

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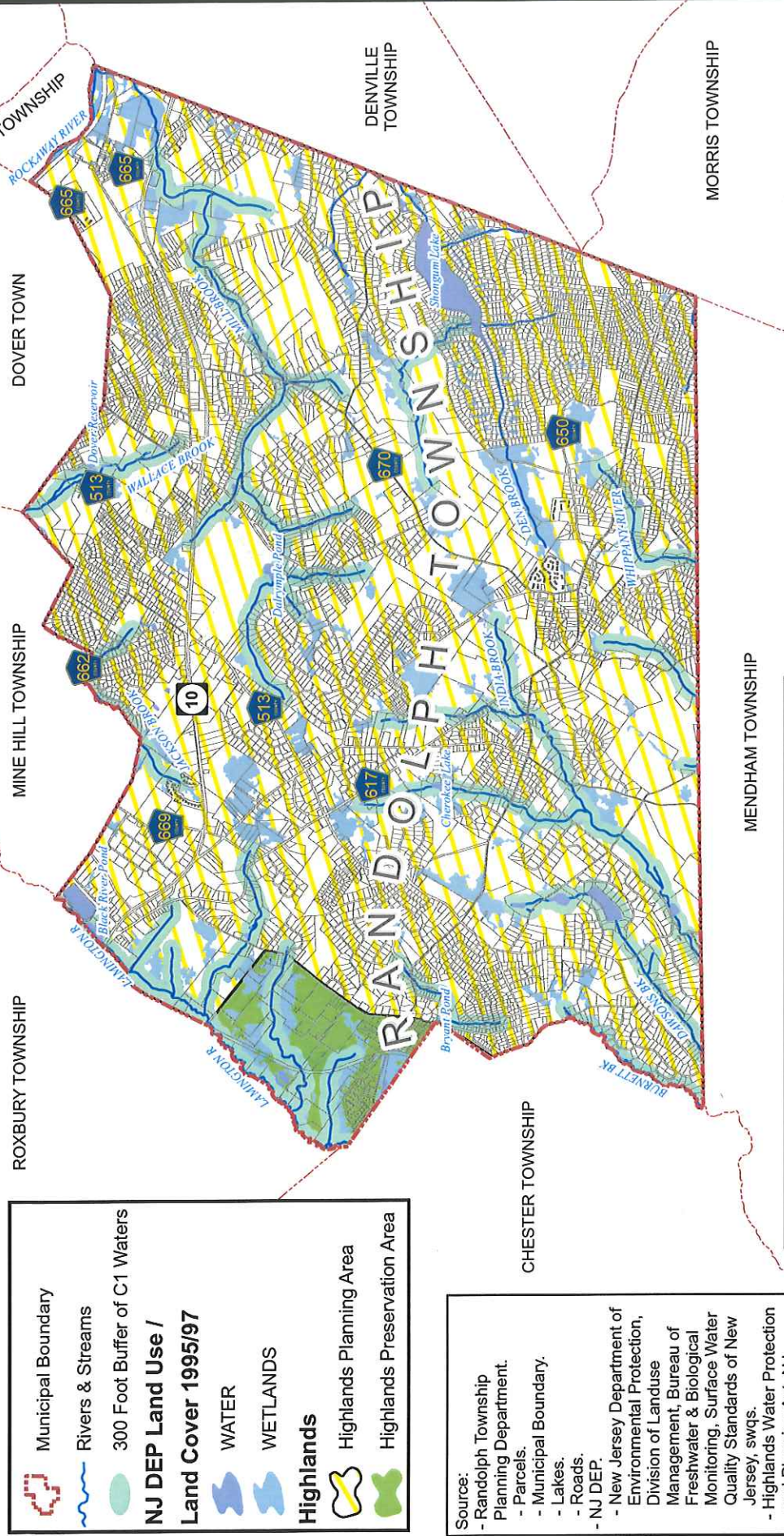
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**Figure 10: Constrained Land Within
The Township of Randolph
Morris County, New Jersey**



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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 Suburban Consulting Engineers, Inc.

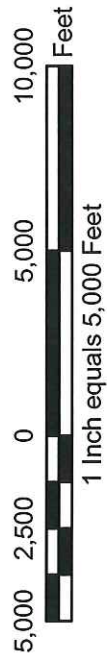


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VIII. MITIGATION PLANS

Applicants seeking a variance or exemption from the stormwater management design and performance standards can design and implement or provide funding for a compensating measure to mitigate groundwater recharge, stormwater quantity control, and/or stormwater quality control impacts at an pre-developed site as defined in the Township's Mitigation Plan.

The Mitigation Plan identifies a hierarchy of options that offset the effect on groundwater recharge, stormwater quantity control, and/or stormwater quality control that was created by granting the variance or exemption. The applicant can select a project listed in the Mitigation Plan to compensate for the deficit from the performance standards resulting from the proposed project. The mitigation project must be implemented in the same drainage area as the proposed development. The applicant seeking the variation or exemption must ensure the long-term maintenance of the project, including the maintenance requirements under Chapters 8 and 9 of the NJDEP Stormwater BMP Manual and also listed in Section 10 of the Stormwater Control Ordinance.

The applicant must gain approval of the Township Planning Board and Engineer for the proposed project. Additionally, the applicant must gain all necessary agreements and permits necessary to complete the mitigation project. A copy of the Mitigation Plan and more detailed information on potential projects can be obtained from the Township Engineer.

APPENDIX -- PROPOSED STORMWATER CONTROL ORDINANCE

Proposed Stormwater Control Ordinance for the Township of Randolph

Section 1: 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 measures and proper maintenance plans. Nonstructural measures include both environmentally sensitive site design and source controls that prevent pollutants from being placed on the site. Source control plans should be developed based upon physical site conditions and the origin, nature, and the anticipated loading of potential pollutants. Multiple stormwater management BMPs may be necessary to achieve the established performance standards for water quality, quantity, and groundwater recharge.

B. Purpose

It is the purpose of this ordinance to establish minimum stormwater management requirements and controls for major development.

C. Applicability

1. This ordinance shall be applicable to any site plan or subdivision that requires preliminary or final site plan review:
 - a. Non-residential major development; and
 - b. Aspects of the residential major developments that are not pre-empted by the Residential site Improvements Standards at N.J.A.C. 5:21.
2. This ordinance shall also be applicable to all major developments undertaken by Randolph Township.

D. Compatibility with Other Permit and Ordinance Requirements

Development approvals issued 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.

“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, 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 constrained area” means the following areas where the physical alteration of the land is in some way restricted, either through regulation, easement, deed restriction or ownership such as: wetlands, floodplains, threatened and endangered species sites or designated habitats, and parks and preserves. 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.

“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.

“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 that seeps into the soil from precipitation.

“Major development” means any “development” that provides for ultimately disturbing one or more acres of land or increasing impervious surface by one-quarter acre or more. 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. Projects undertaken by any government agency which otherwise meet the definition of “major development” but which do not require approval under the Municipal Land Use Law, N.J.S.A. 40:55D-1 et seq. are also considered “major development.”

“Municipality” means Randolph Township.

“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, or political subdivision of this State and any state, interstate or federal agency.

“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 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.

“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.

“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 this section. To the maximum extent feasible, 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. Such 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 this subchapter.

3. For site improvements regulated under the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21, the RSIS shall apply in addition to this section except to the extent the RSIS are superseded by this section or alternative standards applicable under a regional stormwater management plan or Water Quality Management Plan adopted in accordance with Department rules.

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 muhlenbergi* (bog turtle).
- C. The following linear development projects are exempt from the groundwater recharge, stormwater runoff quantity, and stormwater runoff quality requirements at 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 at 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 at 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 for 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 4.F and 4.G shall be met by incorporating nonstructural stormwater management strategies at 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 3.E.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 measures 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. These source controls include, but are not limited to:
 - (1) Site design features that help to prevent accumulation of trash and debris in drainage systems;

- (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 measures 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 section 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 4, either:
 - (a) Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measures maintain 100% 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) 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 40CFR 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.
 - (3) 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 down gradient 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 2, 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 2, 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 preconstruction 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.
2. Because Randolph is an exempt municipality, any application for a new agricultural development that meets the definition of major development at Section 2 shall be submitted to the Township for review and approval in accordance with the requirements of this section and any applicable Soil Conservation 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 $\frac{1}{4}$ 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		

- 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.
- If more than one BMP in series is necessary to achieve the required 80% 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% 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. At the present time, no waterways within the Township are 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. 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% TSS postconstruction removal rate;
 - (3) Temperature shall be addressed to ensure no impact on 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 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. This subsection 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 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 7.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 this Section 4 of this ordinance.
- C. Manufactured treatment devices may be used to meet the requirements of Section 4, 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, 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 Soil Conservation District 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 subchapter applies to any new stormwater management basin.

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.

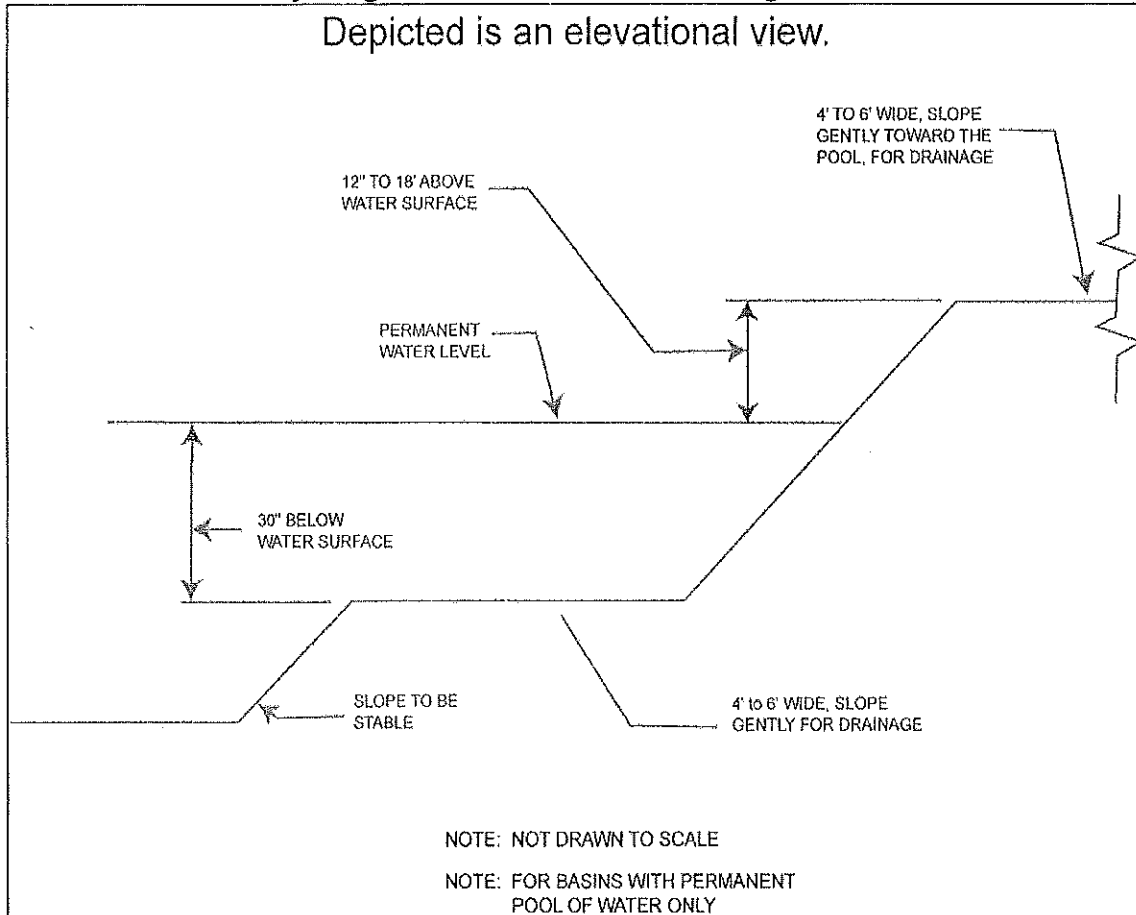
3. For purposes of this subsection, escape provisions means the permanent installation of ladders, steps, rungs, or other features that provide easily accessible means of egress from stormwater management basins. Stormwater management basins shall include escape provisions as follows:

- 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 freestanding 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 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 four (4) copies of the materials listed in the checklist for site development stormwater plans in accordance with Section 9.C of this ordinance.

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 postdevelopment conditions for the design storms specified in Section 4 of this ordinance.
- b. When the proposed stormwater management control measures (e.g. infiltration basins) depend 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 soil types 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 Section 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

of the facility in a manner that is approved by the municipal engineer or his designee. 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.

- C. 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, upon conviction thereof by any court authorized by law to hear and determine the matter, be liable to a fine of not more than one thousand (\$1,000.00) dollars, or to imprisonment for a term of not more than ninety (90) days, or both, as such court in its discretion may impose. Each day during or on which a violation occurs or continues shall be deemed a separate offense.

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 article, 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 article, section, subsection, paragraph, subdivision, or clause of this ordinance.