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# Municipal Stormwater Management Plan

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Township of Lopatcong  
Warren Co., New Jersey

**Prepared for: LOPATCONG TOWNSHIP PLANNING BOARD**

*under the supervision of:*

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**February 10, 2005**  
**Revised January 11, 2006**

**Adopted as revised by the Board on February 22, 2006**

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## Introduction

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for Lopatcong 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 or result in an increase in impervious surfaces by one-quarter acre or more. 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 base flow in receiving water bodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities.

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 code review included in this MSWMP has not addressed implications associated with regulations contained in the recently adopted Highlands Water Protection and Planning Act. A “build-out” analysis based upon existing zoning and land available for development has been completed and is included in this plan. The final component of this plan is a discussion regarding mitigation for a variance or exemption of the design and performance standards. The Planning Board has determined that variances or exemptions should not be permitted and therefore this MSWMP does not include a mitigation plan.

## Goals

The goals of this MSWMP 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;
- reduce soil erosion from any development or construction project;
- assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
- maintain groundwater recharge;
- prevent, to the greatest extent feasible, an increase in nonpoint pollution;
- maintain the integrity of stream channels for 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; and
- protect public safety through the proper design and operation of stormwater basins.

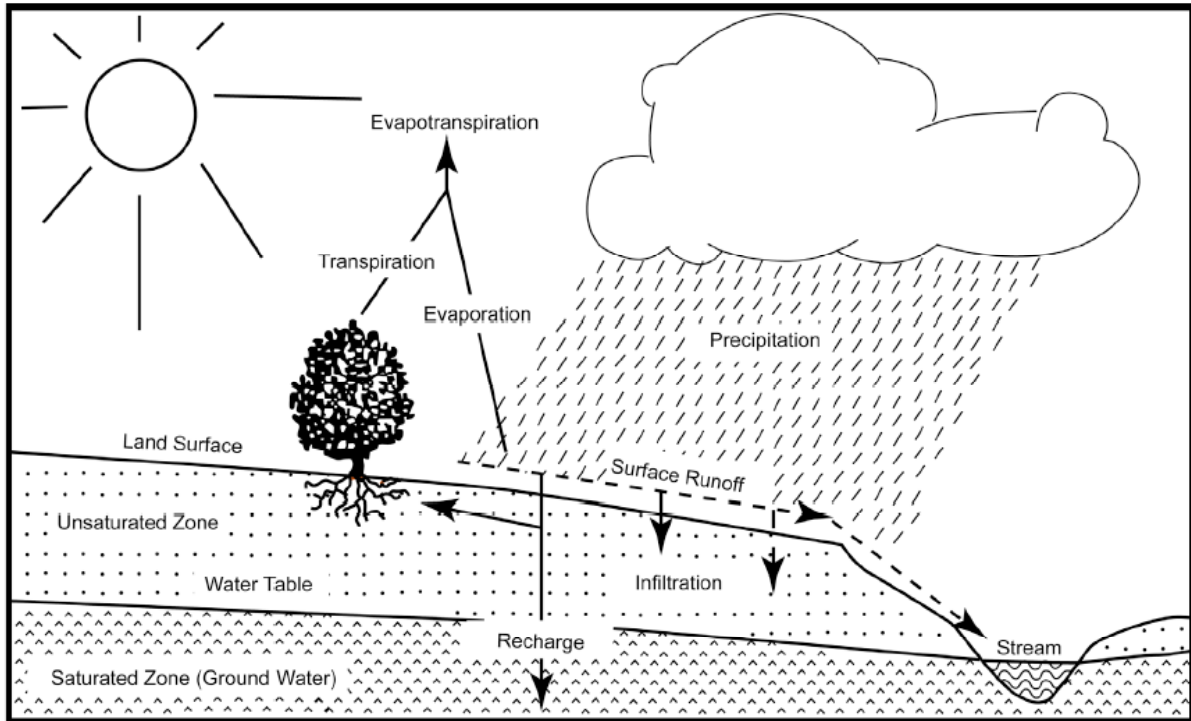
To achieve these goals, this plan outlines specific stormwater design and performance standards for new development. Additionally, the plan proposes stormwater management controls to address impacts from existing development. Preventative and corrective maintenance strategies are included in the plan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

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.

**Figure 1: Groundwater Recharge in the Hydrologic Cycle**



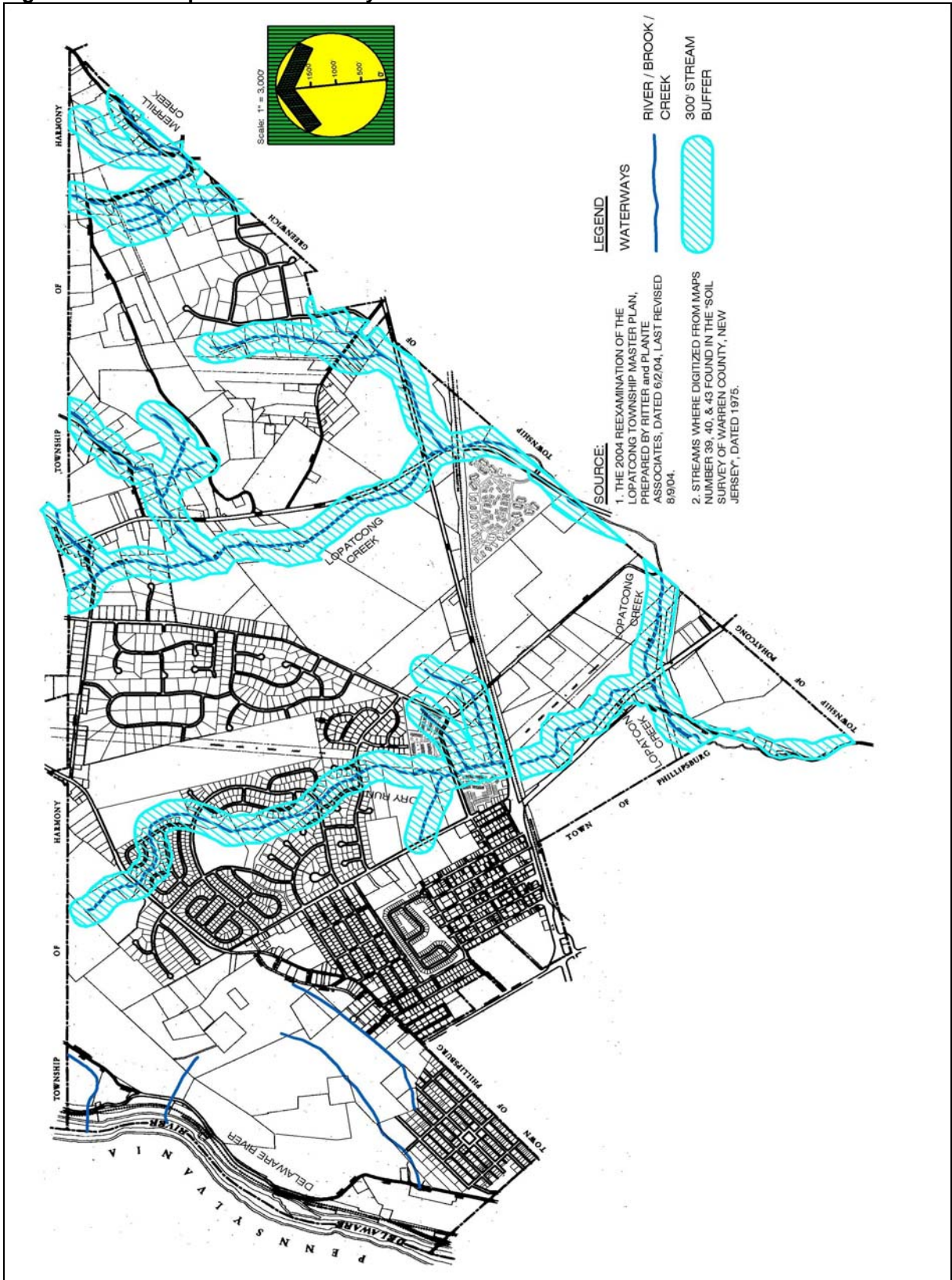
Source: New Jersey Geological Survey Report GSR-32.

## Background

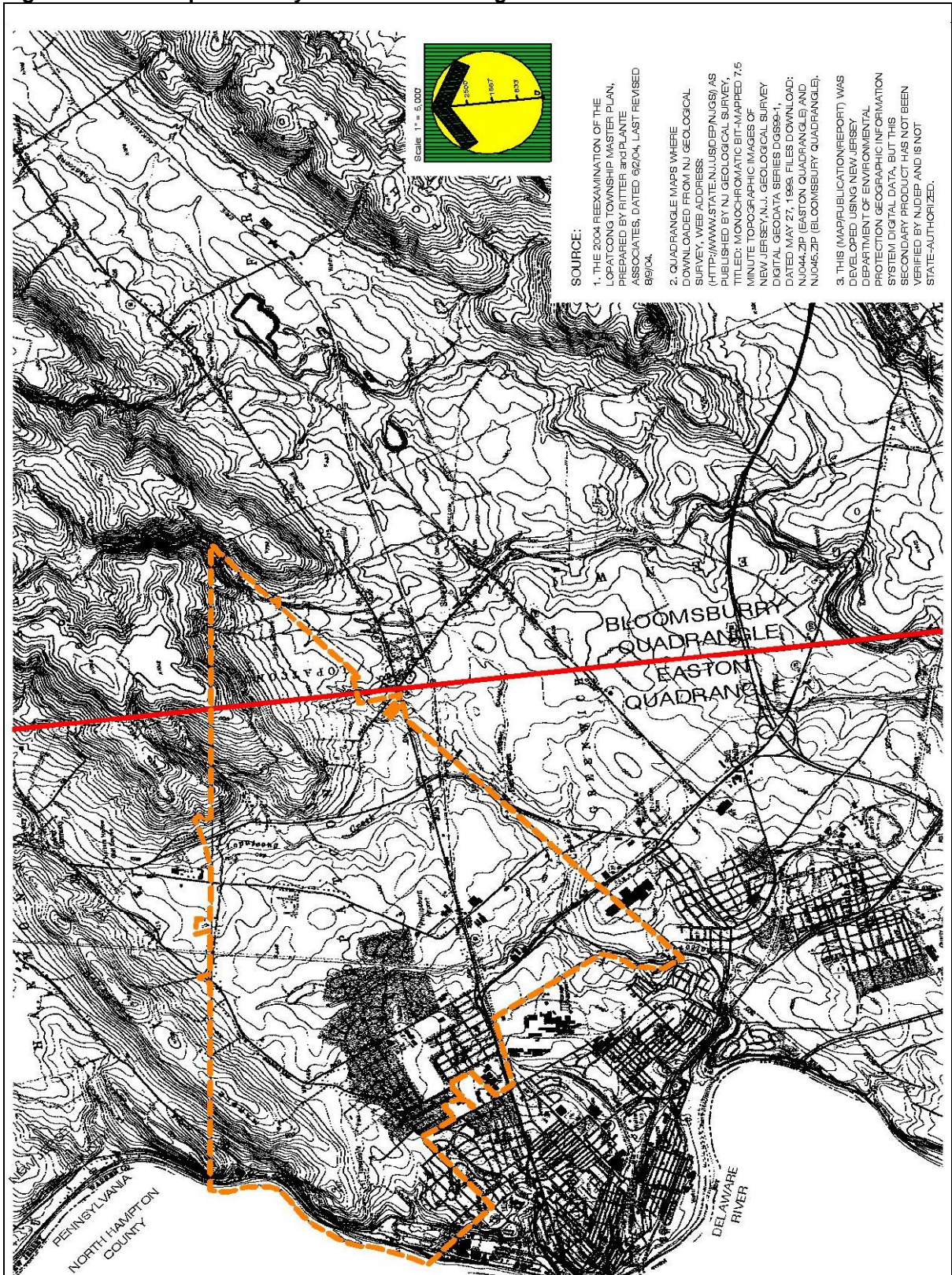
Lopatcong Township encompasses a 7.45 square mile area in Warren County, New Jersey. In recent years, the Township has been under significant development pressure. The population of the Township has increased from 4,998 in 1980, to 5,052 in 1990, to 5,765 in 2000. This population increase has resulted in considerable demand for new development; changes in the landscape have most likely increased stormwater runoff volumes and pollutant loads to the waterways of the municipality. Figure 2 illustrates the waterways in the Township. Figure 3 depicts the Township boundary on the USGS quadrangle maps.

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 are used to generate a New Jersey Impairment Score (NJIS), which is based on a number of biometrics related to benthic macroinvertebrate community dynamics. The two major waterways that flow through the Township, Lopatcong Creek and Merrill Creek, are both unimpaired. Dry Run and the unnamed tributaries that flow through the Township to these water bodies are also unimpaired based on AMNET data. The Upper Delaware River forms the western boundary of the Township. The river segment that borders the Township and its tributaries within Lopatcong are unimpaired.

Figure 2: Township and its Waterways



**Figure 3: Township Boundary on USGS Quadrangles**



**SOURCE:**

1. THE 2004 REEXAMINATION OF THE LOPATCONG TOWNSHIP MASTER PLAN, PREPARED BY RITTER AND PLANTE ASSOCIATES, DATED 02/04, LAST REVISED 09/04.
2. QUADRANGLE MAPS WERE DOWNLOADED FROM NJ GEOLOGICAL SURVEY, WEB ADDRESS: (<http://www.state.nj.us/dep/njgs/>) AS PUBLISHED BY NJ GEOLOGICAL SURVEY, TITLED: MONOCHROMATIC BIT-MAPPED 7.5 MINUTE TOPOGRAPHIC IMAGES OF NEW JERSEY, NJ. GEOLOGICAL SURVEY DIGITAL GEODATA SERIES DGB99-1, DATED MAY 27, 1999. FILES DOWNLOADED: NJ004.ZIP (EASTON QUADRANGLE) AND NJ005.ZIP (BLOOMSBURY QUADRANGLE).
3. THIS (MAP/PUBLICATION) REPORT 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.

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. The segments of Lopatcong Creek and Merrill Creek that flow through the Township and the segment of the Delaware River that borders Lopatcong are not listed on Sublist 5 of the 2004 Integrated List.

Although the Township does not have water quality problems associated with its waterways, the Township has exhibited severe water quantity problems including flooding, stream bank erosion, and diminished base flow in its streams (example: culvert @ Belview Road for Lopatcong Creek). Many of the culverts associated with road crossings in the Township may be undersized. During severe storm events, these undersized culverts do not have adequate capacity, thereby causing a backwater effect and flooding upstream.

These culverts were designed for much different hydrologic conditions (i.e., less impervious area) than presently exist in the Township. As the imperviousness increased in the Township, the peak rates of runoff and volumes of stream flows also increased. The increased amount of water has resulted in stream bank erosion, which resulted in unstable areas at roadway/bridge crossings, and degraded stream habitats. The high imperviousness of the Township has significantly decreased groundwater recharge, resulting in decreased base flows in streams during dry weather periods. Lower base flows can have a negative impact on instream habitat during the summer months. The Township should explore the impact of development on water quality within wellhead protection areas to determine if a wellhead protection ordinance is required. A map of the groundwater recharge areas is shown in Figure 4. Wellhead protection areas, also required as part of the MSWMP, are shown in Figure 5.



Figure 4: Groundwater Recharge Areas in the Township

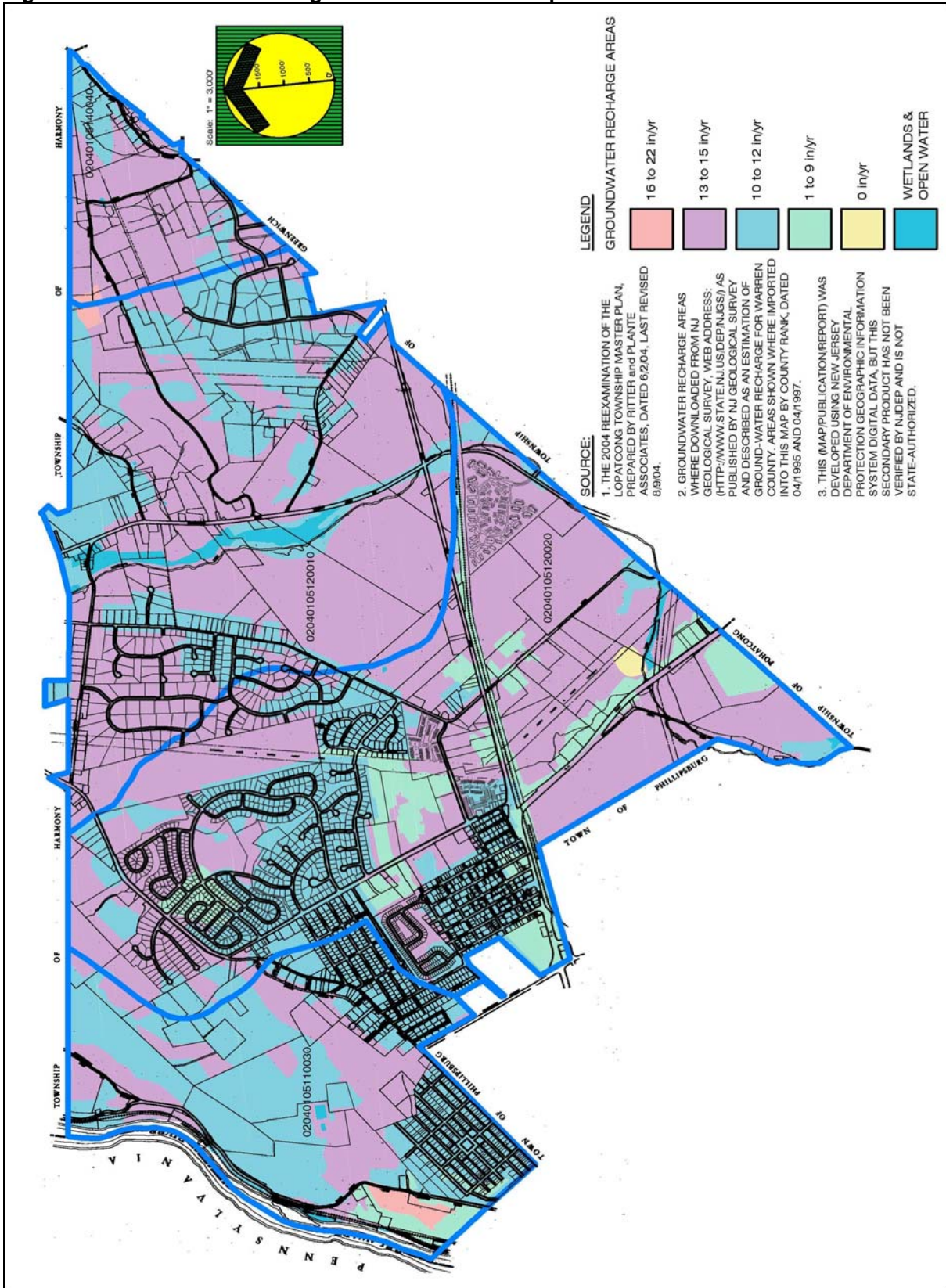
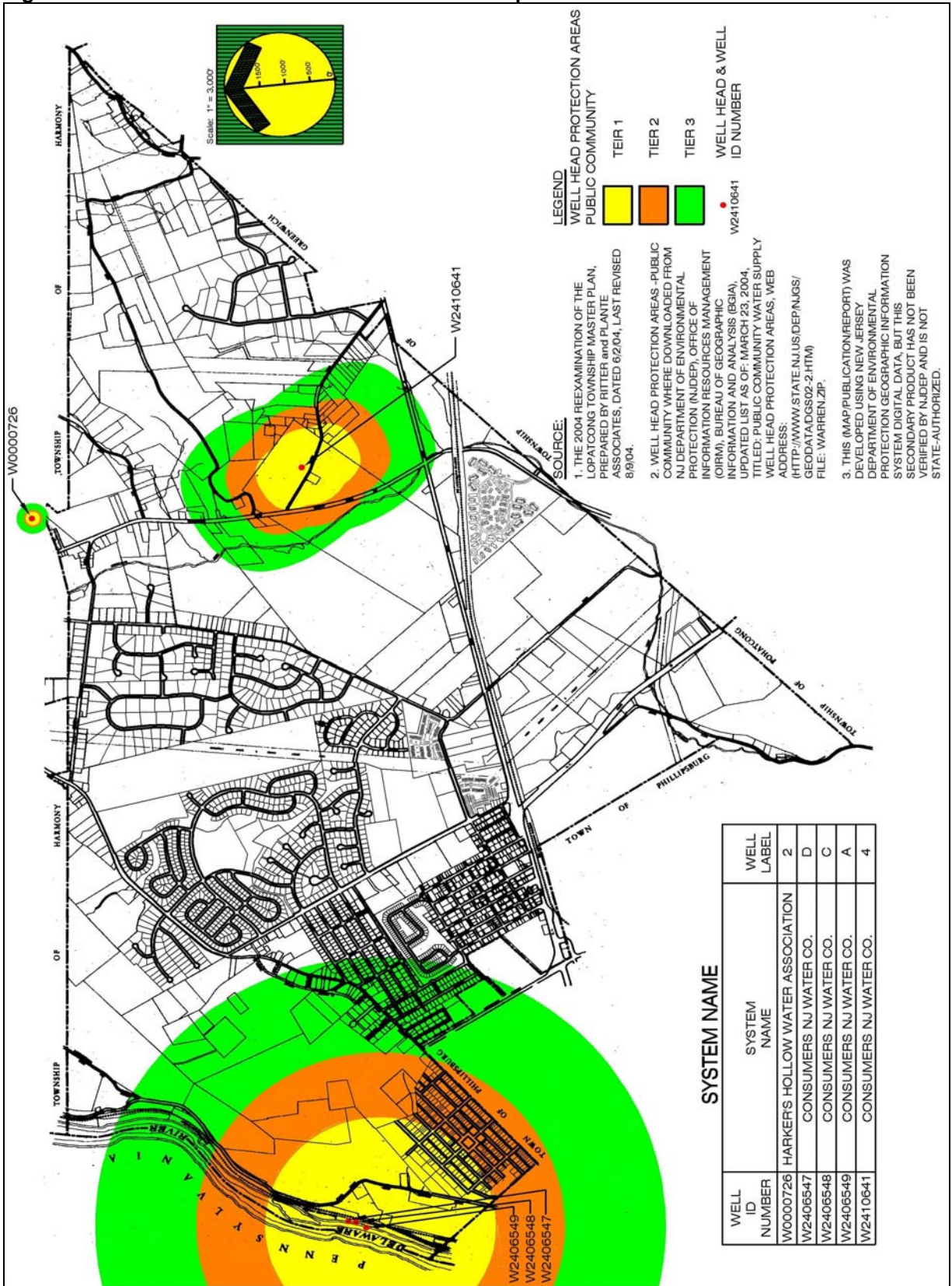


Figure 5: Wellhead Protection Areas in the Township



## 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 following design and performance standards shall be incorporated into Section 199, Stormwater Management, of the Lopatcong Township Code. These standards replace those currently in the code that were adopted prior to the current stormwater management rules at N.J.A.C. 7:8. The ordinance will be submitted to the county for review and approval by February 1, 2006.

During construction, Township inspectors will observe construction activities to ensure that the stormwater management measures are constructed and function as designed.

### 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 Best Management Practices (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.

#### 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 as defined in Section 2 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 the Township of Lopatcong or other governmental entities.

#### 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.

“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:

- (1) A county planning agency; or
- (2) 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.

“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 or increasing impervious coverage by 0.25 acres 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.

“Municipality” means the Township of Lopatcong.

“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, the Township of Lopatcong, 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.

“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.

“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.

### 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 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.

- (3) 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.
      - (c) 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
      - (d) 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](http://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 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 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 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.
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](http://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 alternative rate or method of calculating the removal rate approved by the Department must be provided.

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 also be subject to review and approval of 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 Township, Department, 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:

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 unless otherwise approved by the Township.
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

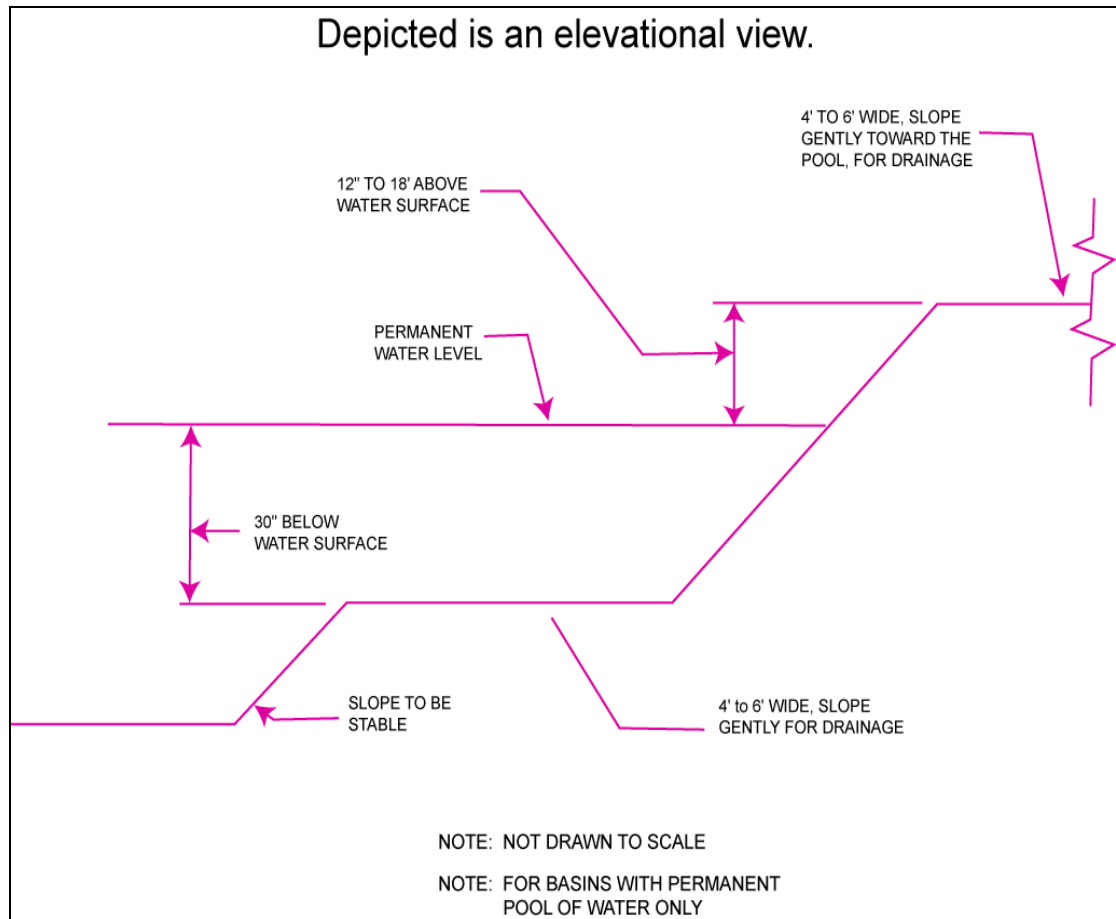
- A. This section sets forth requirements to protect public safety through the proper design and operation of stormwater management basins. This section applies to any new stormwater management basin.
- B. Requirements for Trash Racks, Overflow Grates and Escape Provisions
  - 1. A trash rack is a device 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 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

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 six (6) 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. The topographic base map of the site which is submitted shall extend 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, geology, 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, dry wells, stormwater management 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 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

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.
  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.
- 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 be subject to the following penalties: It is recommended that the proposed Stormwater Management Ordinance, Chapter 199, provides for the maximum penalty allowed by law.

#### 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.

## Plan Consistency

The Township is not within a Regional Stormwater Management Planning Area and no Total Maximum Daily Limits (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 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, Chapter 199, requires all nonresidential 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 Planning Board has reviewed the master plan and ordinances, and has provided a list below of the sections in the Township land use and zoning ordinances that are to be modified to incorporate nonstructural stormwater management strategies. The list contains recommendations for amendments. Once the ordinance texts effectuating the amendments are completed, they will be submitted to the county review agency for review and approval by March 2, 2006. A copy will be sent to the Department of Environmental Protection at the time of submission.

The Township Code was reviewed with regard to incorporating nonstructural stormwater management strategies. Several changes are proposed to Chapter 243, Zoning & Land Use, Chapter 199, Stormwater Management, Chapter 203, Streets and Sidewalks, Chapter 153, Off-Tract Improvements, and Chapter 105, Driveways to incorporate these strategies.

### **Chapter 243, Zoning & Land Use**

**Section 243-40: Preliminary plat data** requires delineation of existing site conditions including streets, easements, drainage structures, utilities, water features, public lands, buildings and other structures, and trees over four inches in diameter. The following changes to the Zoning & Land Use ordinance are recommended:

- Expand this section to include all existing vegetative cover on the development site, upland and wetland, including lawns, hedgerows, forests, successional fields, and brushlands/shrublands.
- Where drainage calculations are required, refer to the appropriate section in Chapter 199, Stormwater Management where submission requirements are situated.
- Add language to require submission of information regarding groundwater recharge including delineation of recharge zones as shown on maps produced by

the New Jersey Geological Survey (NJGS) and areas of the site that have the greatest potential for recharge and stormwater runoff storage as per NJGS data.

- Add a requirement to this section to delineate soil types as per the Warren County Soil Survey.

**Section 243-62: Buffer strips, screening and planting** describes landscape requirements for planting on unimproved lot areas, buffer strips and where screening is required. This section currently limits the amount of impervious surface improvements permitted in buffers by restricting uses to decorative or passive recreation. The landscape requirements for these areas in the existing section do not recommend the use of native vegetation. The following changes to the Zoning & Land Use ordinance are recommended:

- Amend the language of this section to require the use of native vegetation, which requires less fertilization and watering than non-native species.
- Include additional language to allow buffer areas to be used for stormwater management.
- Permitted uses within the buffers should be limited to driveways used for access to lots or parking areas.

**Section 243-48: Minimum design standards** contains a section on storm drainage that provides for inlet type options for street drainage. The section also describes standards for islands in parking areas. Curbs are required for parking lot islands. The following changes to the Zoning & Land Use ordinance are recommended:

- This section should be amended to allow for the use of flush curbs and curb cuts with wheel stops or bollards to allow for runoff to discharge into vegetated islands as sheet flow.
- Add language to refer to the Residential Site Improvement Standards for street construction requirements for residential projects.
- Add language to encourage the used of natural vegetated swales in lieu of inlets and pipes for storm drainage.

**Section 243-49: General parking regulations** describes the requirements for off-street parking. Off-street parking in open air or indoor lots is required for all new construction or use and shall be separate from streets and other traveled rights-of-way. Collective parking for two or more buildings is permitted provided that the total parking shall not be less than the sum of parking required for each use. A parking space for one passenger automobile shall be a rectangle measuring 10 feet wide by 20 feet long except that spaces used exclusively for employee parking may be 9 feet wide. The length may be reduced to 18 feet where a 2-foot clear area exclusive of sidewalks is provided behind the curb. Site plans are required for parking areas of 4 or more automobiles with an exemption for farm vehicles parked on a farm. Parking areas with 10 or more spaces shall provide shade trees located in curbed islands. The following changes to the Zoning & Land Use ordinance are recommended:

- This section should be amended to allow for flush curb with curb stop, or raised curbing with curb cuts to allow for the discharge of impervious areas into designated planting areas used for stormwater management.
- Add language to allow for the use of natural vegetated swales for the water quality design storm, with overflow for larger storm events into storm sewers.
- The requirement for tree planting should be amended to require the use of native trees whenever possible.

- Amend the section to allow pervious paving materials to be used in areas that provide overflow parking.
- To reduce the amount of impervious surface area utilized for parking, the minimum size of a parking stall should be revised to 9 feet by 18 feet for all stalls with 10 foot wide stalls required only in parking areas that service retail uses that provide shopping carts for its patrons. Additionally, the minimum width of a parking aisle for 90° parking and a drive that provides access to parking areas should be reduced from 25 feet to 24 feet.
- This section should include language to require that developers provide open space within parking fields. The minimum amount of square footage of open space required should be calculated by multiplying the total amount of parking stalls by 100. The required open space should be distributed within the boundaries of the parking field in landscaped areas that separate parking bays, islands that separate parking stalls from access drives, and islands used to breakup parking rows.

**Section 243-45D: Preservation of natural environment** requires that natural features, such as trees, watercourses, terrain, soil fertility, and drainage lines, be preserved whenever possible, and that care be taken to preserve selected trees and shrubs to enhance landscaped treatment of the area. The section regulates topsoil removal and distribution. The following changes to the Zoning & Land Use ordinance are recommended:

- This section should be amended to add forest areas as a natural feature to be preserved and to require that the natural ground cover associated with preserved forest areas be retained in its natural state to ensure that leaf litter and other beneficial aspects of the forest are maintained in addition to the trees.
- Language should be added to this section stating that the Board may require that natural features be protected by placing them within a conservation easement or by a deed restriction.
- The section should include language that requires that the amount of natural area to be preserved is the maximum amount feasible.

**Section 243-50: Off-street parking** provides guidance on minimum parking space requirements. These requirements are based on the gross floor area. The following change to the Zoning & Land Use ordinance is recommended:

- The section is under review to determine if the minimum parking requirements should be revised to reflect current standards published by the Institute of Transportation Engineers.

**Section 243-78.1D: Tree protection** restricts and otherwise controls the removal of trees in conjunction with an application for site plan or subdivision approval. With limited exceptions, the cutting down or removal of trees having a DPM of 8 inches or greater or a specimen tree of 24 inches or greater requires compliance with this ordinance. The section requires that a person apply for and obtain a tree removal permit prior to any removal of a regulated tree. The ordinance also requires that a person that causes a tree to be removed shall compensate for the removal by planting replacement trees. The following changes to the Zoning & Land Use ordinance are recommended:

- This section should be amended to include a “lot clearing limit ratio” that indicates the portion of a lot from which vegetation may be removed. This amendment recognizes that the preservation of mature trees and forested areas

is a key strategy in the management of environmental resources, particularly watershed management, air quality, and ambient heating and cooling. The added measures comply with minimizing land disturbance, which is a nonstructural stormwater management strategy. Lot clearing limit ratios should be applied only to residential zones on tracts located outside of the Highlands Preservation Area, and in proportion to the minimum lot size and lot coverage requirements of the district, with an exemption for farms as follows:

1. R-10/2: 50% for each individual clustered lot and/or 10% of tract area, whichever is less.
  2. R-5/2: 50% for each individual clustered lot and/or 20% of tract area, whichever is less.
  3. R-3/2: 50% for each individual clustered lot and/or 33% of the tract area, whichever is less; 85% other permitted uses.
  4. R-2: 50% for each individual lot and 50% for the tract area, whichever is less.
  5. R-150: 50% for each individual lot and 50% for the tract area, whichever is less; 85% other permitted uses.
  6. R-120A: 50% for each individual lot and 50% for the tract area, whichever is less w/o public sewer; 85% for each individual lot and 50% for the tract area, whichever is less w/public sewer; 85% other permitted uses.
  7. R-120: 85% single-family residential; 85% other permitted uses; cluster and small lot residential individual lots, are exempt.
  8. R-100: single-family residential exempt; 85% senior citizen tract area; 85% other permitted uses.
  9. R-75: single-family residential exempt; 85% other permitted uses.
  10. R-MF: 85% of tract area.
- The section should provide the following or similar language for lots located in the Highlands Preservation Area: Lots located in the Highlands Preservation Area shall be subject to clearing limit regulations for major Highlands development contained in the Highlands Water Protection and Planning Act or as may be issued by NJDEP or the Highlands Commission.
  - This section should be amended to contain the following or similar language to protect upland forests in all areas of the Township outside of the Highlands Preservation Area: Lots located in the Highlands Planning Area that contain upland forested areas shall be subject to the following clearing limit regulations:
    1. Trees having a DPM of 2.5 inches or greater for deciduous trees or 10 feet or greater for evergreen trees shall not be cleared more than 20 feet directly adjacent to a structure and no more than 10 feet on each side of a driveway that is necessary to access a building or a non-forested area of the lot.
    2. Other vegetation associated with the forested area and non-forested areas of the lot are subject to the clearing limits specified above.
  - Language should be added to this section regarding development on previously cleared lots as follows: On farmland or other previously disturbed and/or cleared

sites a portion of an individual lot and/or the tract shall be revegetated according to the following schedule:

1. R-10/2: 50% for each individual clustered lot and/or 90% of tract area, whichever is greater.
  2. R-5/2: 50% for each individual clustered lot and/or 80% of tract area, whichever is greater.
  3. R-3/2: 50% for each individual clustered lot and/or 67% of the tract area, whichever is greater; 15% other permitted uses.
  4. R-2: 50% for each individual lot and 50% for the tract area, whichever is greater.
  5. R-150: 50% for each individual lot and 50% for the tract area, whichever is greater; 15% other permitted uses.
  6. R-120A: 50% for each individual lot and 50% for the tract area, whichever is greater w/o public sewer; 15% for each individual lot and 50% for the tract area, whichever is greater w/public sewer; 15% other permitted uses.
  7. R-120: 15% single-family residential; 15% other permitted uses; cluster and small lot residential individual lots, are exempt.
  8. R-100: single-family residential exempt; 15% senior citizen tract area; 15% other permitted uses.
  9. R-75: single-family residential exempt; 15% other permitted uses.
  10. R-MF: 15% of tract area.
- Vegetation used to restore previously disturbed/cleared areas shall be native plants suitable for the environmental conditions present on the lot or tract. All of the revegetated area shall be protected from future disturbance with a conservation easement or deed restriction acceptable to the Board Attorney.
  - This section should be amended to include a provision for protection of undisturbed vegetation on a lot or tract. The following language is recommended: All remaining undisturbed areas of a lot or tract shall be protected from future disturbance with a conservation easement or deed restriction acceptable to the Board Attorney.
  - A definition for vegetation should be included in this section. Vegetation should include grasses and other ground covers, shrubs, trees, and other plants consisting of native and non-native varieties of both upland and wetland communities except as otherwise exempted. Farm crops grown for consumption or for commercial purposes should be exempt from this definition of vegetation.

**Section 243-46: Improvement design standards** describe specific design standards for site improvements. Streets design standards detail requirements for alignment, sight distances, and other street improvements. Although sidewalks are required along all streets, the Township can waive them because of hardship, peculiar situations or special development provisions that make their use impractical or undesirable. Sidewalks are to be a minimum of four feet wide and constructed of concrete. Section 243-46 contains standards for landscaping including requirements for street trees, planting strips, and shade trees for individual residential lots. The following changes to the Zoning & Land Use ordinance are recommended:

- Language should be added to require the use of native plants that are appropriate for the given soil conditions, hydrology and geology unless it can be demonstrated that non-native varieties would be more appropriate.

- The drainage system design standards contained in this section should be amended to add language to refer to the Residential Site Improvement Standards for design requirements for residential projects.
- The Residential Site Improvement Standards should be referenced in this section for street design requirements for residential projects.

**Section 243-61: Preservation of natural features** addresses retention of site features that includes trees, brooks, drainage channels, and views. This ordinance requires retention of such features to the maximum extent possible. The following change to the Zoning & Land Use ordinance is recommended:

- This section should be expanded to include forested areas, areas that contribute to high rates of groundwater recharge, and highly permeable soils as natural features to be preserved whenever possible.

**Section 243-45: Subdivision design requirements** describes general design standards to guide subdivision development in the Township. The requirements for streets in the Township provide for several street classifications, ranging from “Major Collector,” which has a minimum right-of-way of 60 feet, to “Local,” which has a minimum right-of-way of 50 feet. Street classifications are a function of the maximum average daily traffic volume. Through traffic is discouraged for local street layout and block lengths are limited to a maximum length of 2,000 feet. This section also requires that cul-de-sacs have a maximum length of 1,500 feet and a minimum curb radius of 50 feet and contains development criteria for preservation of the natural environment including terrain, natural drainage lines, trees and shrubs, soil fertility, open watercourses, and topsoil. The following changes to the Zoning & Land Use ordinance are recommended:

- This section should be amended to refer to the Residential Site Improvement Standards for street design requirements for residential projects.
- Language should be added to this section to reduce the minimum radius of cul-de-sac designs for nonresidential development. Cul-de-sacs with landscaped islands should have a minimum radius of 45 feet; cul-de-sacs with flush curbs should have a minimum radius of 40 feet, with a minimum 6-foot reinforced shoulder to accommodate larger equipment and emergency vehicles.
- Language should be added to require compliance with the design and performance standards for nonstructural stormwater measures for preservation of vegetation including forest and limitations on land disturbance as identified in Chapter 199, Stormwater Management.
- The additional standards language should be amended to provide for use of native vegetation for landscaping and revegetation of disturbed areas and use of permeable paving material where appropriate. At a minimum, 80% of all plants used for landscaping and to revegetate disturbed areas should be native varieties.

**Section 243-47D: Surface water drainage** provides a description of the general design considerations for stormwater management. This section is applicable to all site plans submitted to the Township for review and approval by the board of jurisdiction. The following change to the Zoning & Land Use ordinance is recommended:

- Language should be added to refer to the Residential Site Improvement Standards for stormwater drainage requirements for residential projects and to Chapter 199, Stormwater Management for non-residential development.

## **Chapter 203, Streets and Sidewalks**

**Section 203-4: Width and elevation** of streets stipulates that all streets and roads in the Township shall be at least thirty (30) feet wide. The following change to the Streets and Sidewalks ordinance is recommended:

- The Residential Site Improvement Standards should be referenced in this section for street design requirements for residential projects.

**Section 203-5,6,7,8 & 10: Specifications** for streets and curbs contains constructions standards for streets, sidewalks and curbs in the Township. The language that specifies curbing requires that concrete curb, or Belgian block curb be installed along all roads within the Township. The following changes to the Streets and Sidewalks ordinance are recommended:

- This section should be amended to allow for curb cuts or flush curbs with curb stops to allow vegetated swales to be used for stormwater conveyance and to allow the disconnection of impervious areas.
- Language should be added to refer to the Residential Site Improvement Standards for street and sidewalk construction requirements for residential projects.

## **Chapter 199, Stormwater Management**

**Stormwater Management** contains regulations and design standards for stormwater management in the Township. Many of the standards were found to be in conflict with the design and performance standards for stormwater management measures contained in N.J.A.C. 7:8 et seq. The following change to the Stormwater Management ordinance is recommended:

- The content of Chapter 199 should be replaced with the language contained in the proposed Lopatcong Township Stormwater Management Ordinance.

## **Chapter 105, Driveways**

**Section 105-4: Minimum requirements** contains the design and construction standards for driveways in the Township. The number and location of driveway openings is specified as is sight distances, grading at intersections and garages, and turning radius standards. The following change to the Driveways ordinance is recommended:

- Drainage standards for driveways found in this section should be replaced with language that requires compliance with the nonstructural stormwater management strategies in N.J.A.C. 7:8-5.3b.

**Section 105-12: Construction materials** describes the methods and materials to be employed for the construction of driveway segments lying within a municipal right-of-way. Driveways entering upon a paved road shall be constructed using traditional paving methods that rely on the use of bituminous concrete material that is impervious. The following change to the Driveways ordinance is recommended:

- Language should be added to this section to permit construction using pervious pavement and concrete paver blocks.



## **Chapter 153, Off-Tract Improvements**

**Off-tract Improvements** describes methods for calculating off-tract improvement costs and contributions and responsibility for payment of contributions. The following change to the Off-Tract Improvements ordinance is recommended:

- Language should be added to Section 153-3D, Storm drainage, to require that any off-site and off-tract stormwater management and drainage improvements must conform to the “Design and Performance Standards” described in this plan and provided in Chapter 199 of the Township Code.

## **Zoning**

The Township has 11 types of residential districts. Each residential district has a maximum percent impervious surface allocation, ranging from 20 percent for the R-150 District, which has a minimum lot size of 1.5 acres for detached single-family homes, to 65 percent for public, religious and semipublic uses in the R-75 District, which has a minimum lot size of one acre for those uses. The Township has 6 types of nonresidential districts including 2 overlay zones. Each of these districts has a maximum percent impervious surface allocation, ranging from 50 percent for the HB and ROM Districts to 65 percent for the PO and RB Districts.

- Although each zone has a maximum allowable percent impervious surface, the Township Code should be amended to remind developers that satisfying the percent impervious requirements does not relieve them of responsibility for complying with the Design and Performance Standards for Stormwater Management Measures contained in Chapter 199, Stormwater Management.
- The Township should evaluate the maximum allowable impervious cover for each zone to determine whether a reduction in impervious cover is appropriate.
- The current coverage limit for public buildings or facilities, schools, religious buildings and semipublic/nonprofit uses is 65%. It is recommended that the limit be reduced to 50% for these uses which will occupy lots of 5 acres or more.

## Land Use/Build-Out Analysis

A detailed land use analysis for the Township was conducted. Figure 6 illustrates the existing land use in the Township based on 1995/97 GIS information from NJDEP that has been updated to reflect current conditions. Figure 7 illustrates the HUC14s within the Township. The Township zoning map is shown in Figure 8. Figure 9 illustrates the constrained lands within the Township. The build-out calculations for impervious cover are shown in Table 3. As expected when developing agricultural and forestlands, the build-out of these four HUC14s will result in a significant increase in impervious surfaces. Table 4 presents the pollutant loading coefficients by land cover. The pollutant loads at full build-out are presented in Table 5.

The methodology used in the build-out analysis duplicates that found in the Sample MSWMP provided by NJDEP as a guide for use by municipalities. The four-step process consists of a series of calculations based on in-house mapping and mapping provided by NJDEP. The total land area for each HUC14 sub watershed is determined followed by a calculation of constrained lands within. The constrained area includes land that could not be developed because of restrictions imposed by current zoning, NJDEP requirements, and limitations imposed within the Highlands Preservation Area. Constrained lands also include public property and lands subject to easements. Constrained land area is subtracted from the total area leaving developable land area. Since existing developed area could be redeveloped it is not considered constrained land and is included in the developable area calculation. Finally, the developable area is multiplied by the percent of allowable impervious coverage resulting in the total acreage that would be covered by impervious surfaces at full development under existing zoning. This process is repeated for each zoning district within each HUC14 as shown in Table 3.

Lopatcong Township is comprised of four (4) HUC14 sub watersheds. The build-out analysis demonstrates that three of the four HUC14s would experience significant increase of impervious area at full build-out. One sub watershed would see a slight decrease of impervious acreage due to strict regulations imposed by the Highlands Water Protection and Planning Act. Overall, the impervious cover in the Township would jump from 625 acres to 1,246 acres, a 99% increase.

The developable land area calculated in Table 3 is applied to pollutant loading figures developed by NJDEP for various land cover categories (Table 3). The calculations contained in Table 5 illustrate the effects of nonpoint source pollution at full build-out for each HUC14. This information can be used by the municipality, County and the State of New Jersey to determine planning strategies that will minimize the amount of pollutants that enter surface and subsurface water supplies within the Township and adjacent communities that result from land development in Lopatcong Township.

**Figure 6: Township's Existing Land Use**

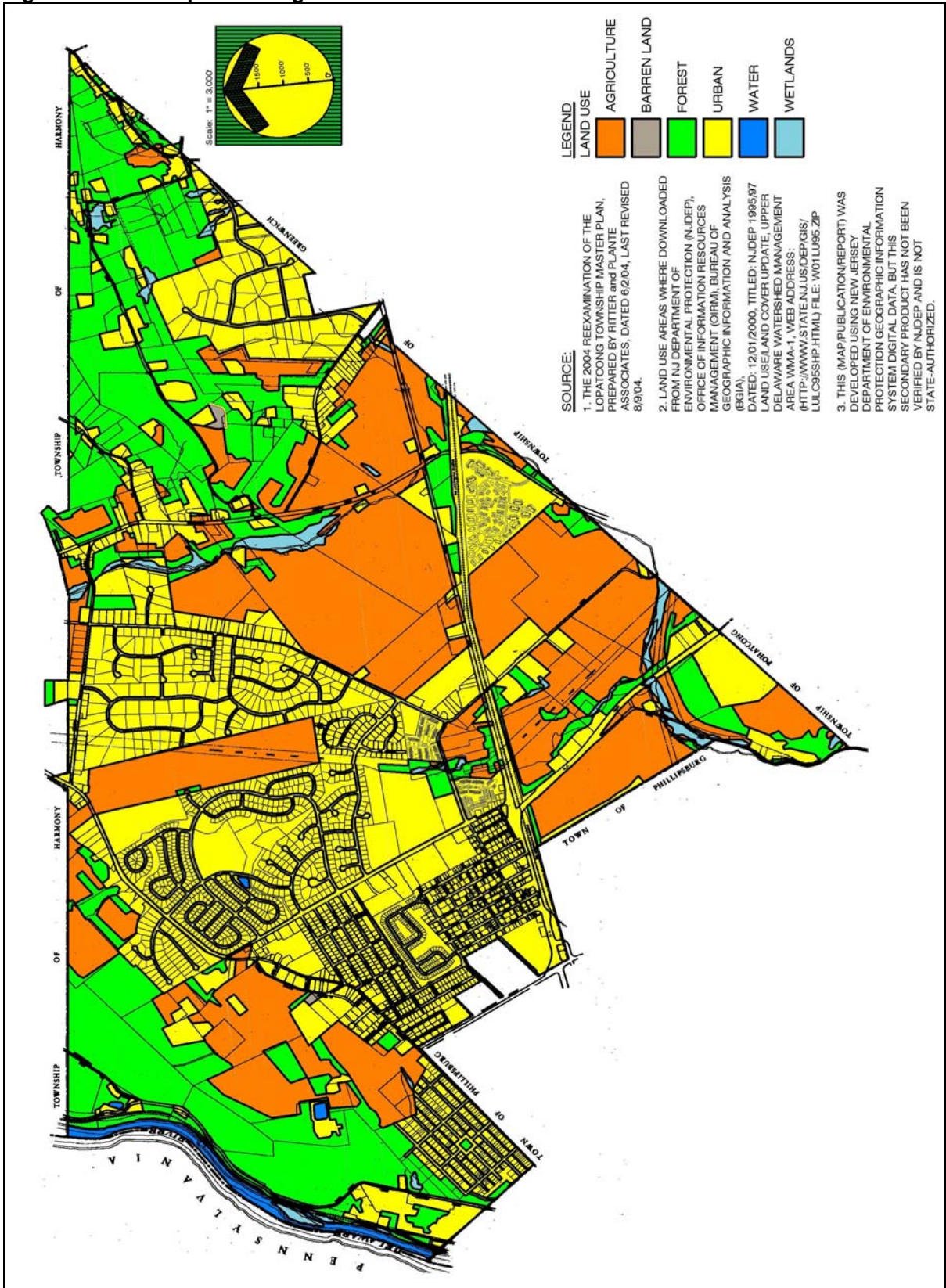


Figure 7: Hydrologic Units (HUC14s) Within the Township

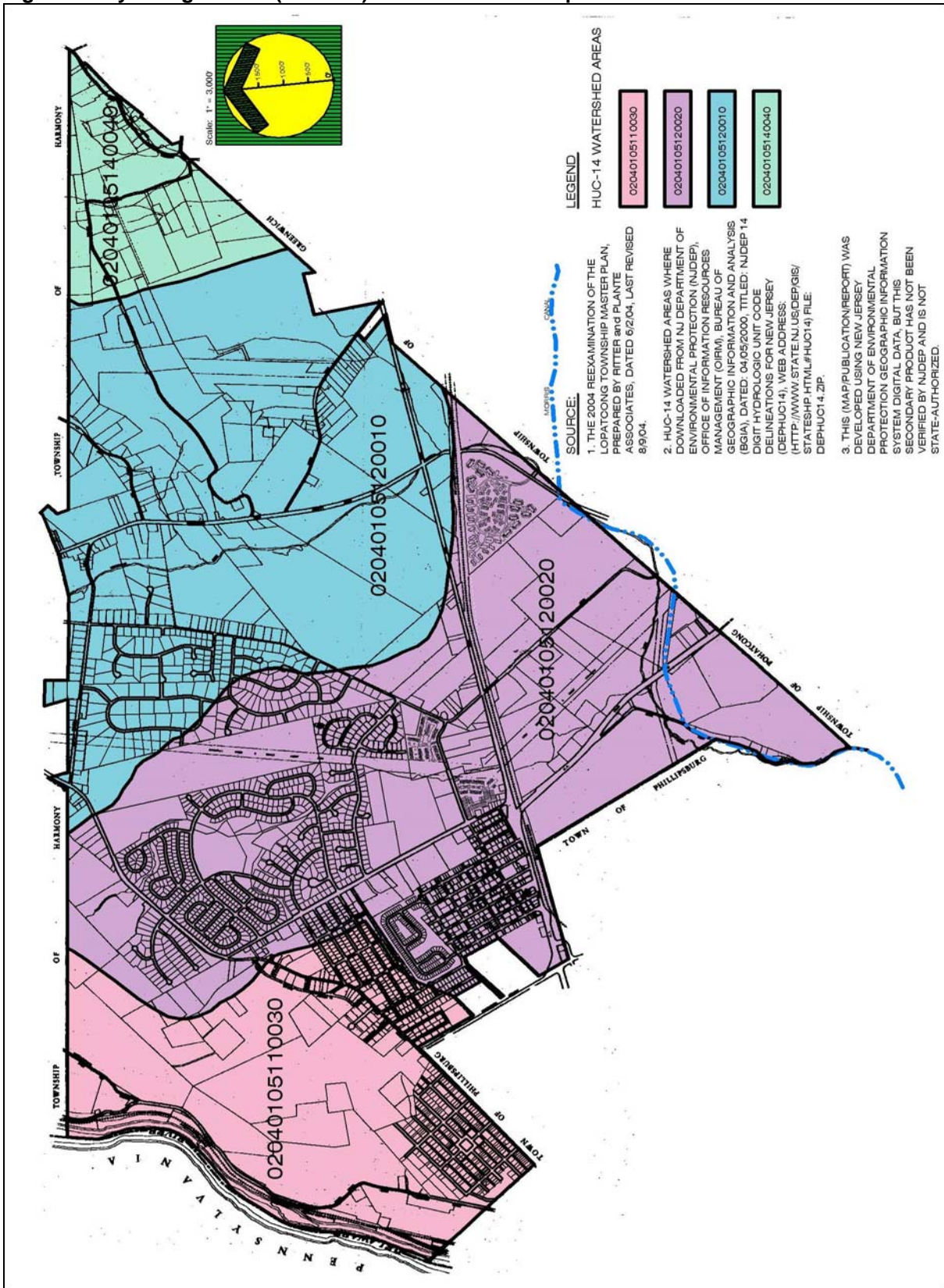


Figure 8: Existing Zoning in the Township

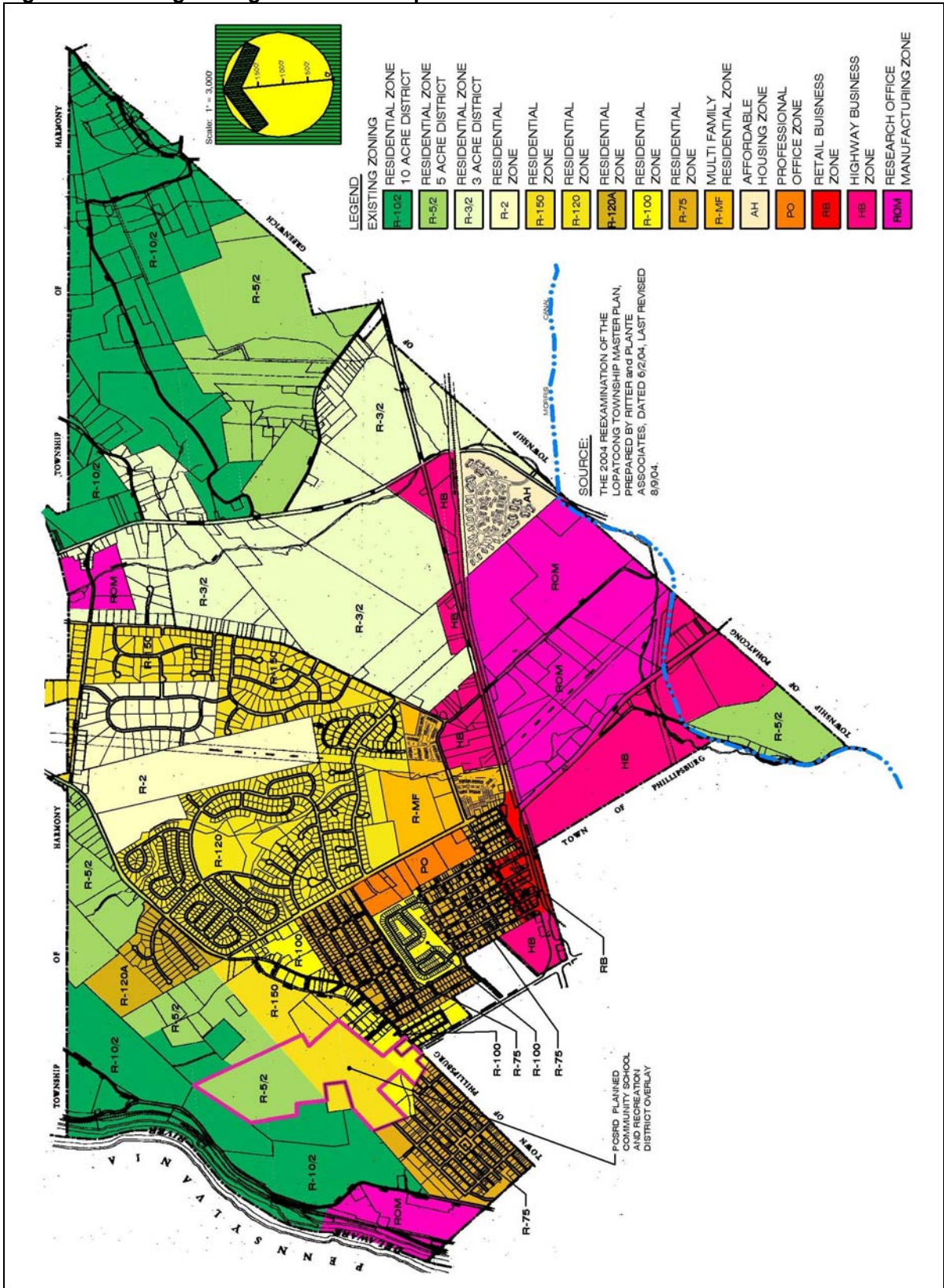
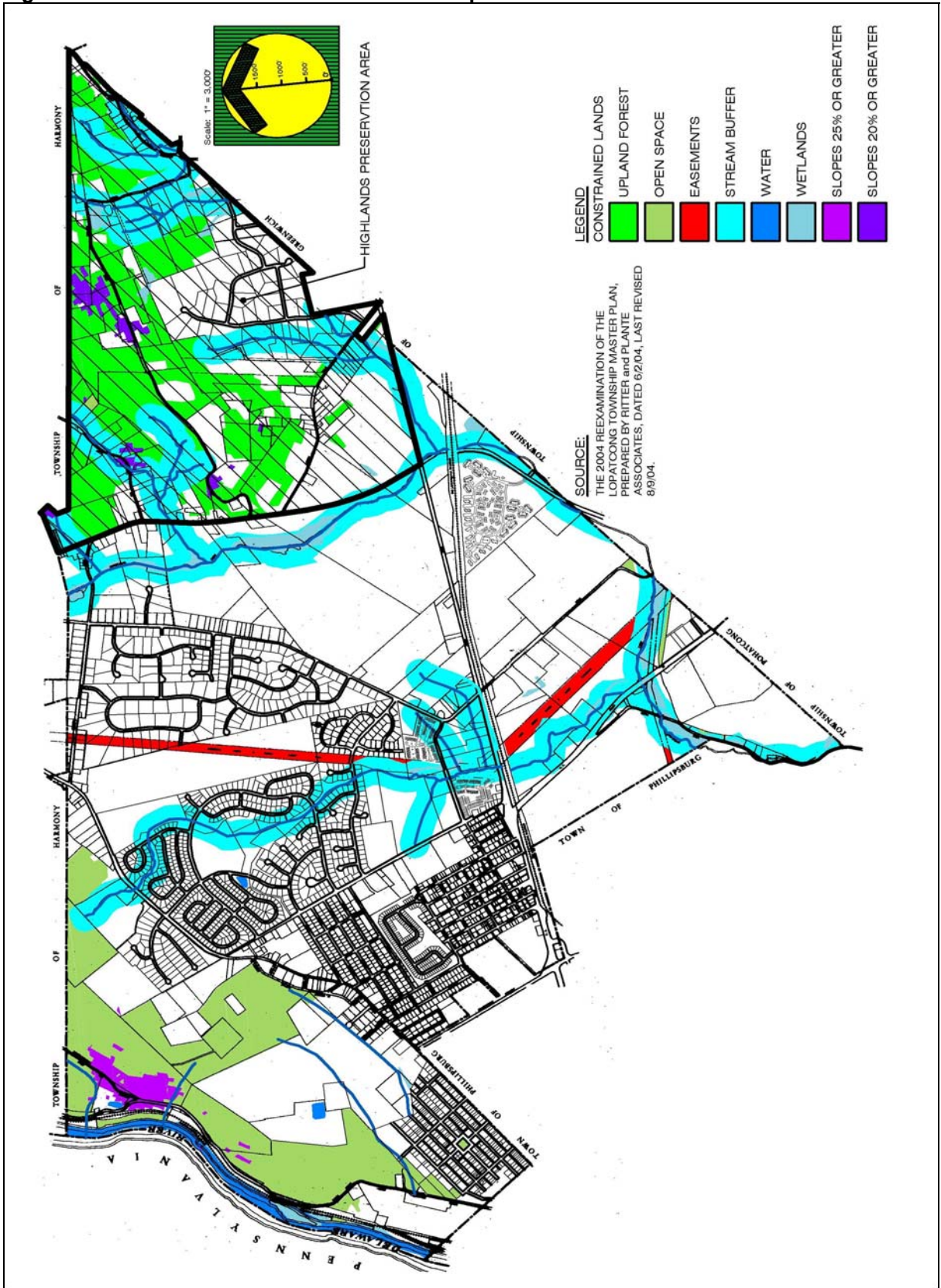


Figure 9: Constrained Land within the Township



**Table 3: Build-Out Calculations for HUC14s**

HUC14 and Zone	Total Area (acres)	Existing Impervious (%)	Constrained Area (acres)	Developable Area (acres)	Allowable Impervious (%)	Build-Out Impervious (acres)
<b>02040105140040</b>						
R-5/2	27	19	0.5	26.5	3	0.8
R-10/2	248	4	223	25	3	6
TOTALS	275		223.5	51.5		6.8
<b>02040105120010</b>						
R-150	125	23	0.7	124.3	60	74.6
R-2	108	20	8	100	20	20
R-3/2	638	4	198.1	439.9	20/3*	101.2
R-5/2	271	11	127.8	143.2	20/3*	32.9
R-10/2	296	4	230.4	65.6	20/3*	15.1
HB	31	10	12.1	18.9	50	9.5
ROM	32	13	20.8	11.2	50	5.6
TOTALS	1501		597.9	903.1		258.9
<b>02040105120020</b>						
R-75	116	34	0	116	65	75.4
R-100	56	27	0	56	50	28
R-120	383	26	90.9	292.1	50	146.1
R-120A	57	23	0.2	56.8	30	17.0
R-150	81	20	4.7	76.3	60	45.8
R-2	122	3	22	100	20	20
R-3/2	77	18	34.7	42.3	20	8.5
R-5/2	162	4	71.8	90.2	20	18.0
R-MF	92	35	54.1	37.9	60	22.7
AH	68	29	5.9	62.1	20	12.4
RB	38	53	0	38	65	24.7
HB	299	21	73.3	225.7	50	112.9
PO	42	43	1.9	40.1	65	26.0
ROM	363	10	104.7	258.3	50	129.2
TOTALS	1956		464.2	1491.8		686.7
<b>02040105110030</b>						
R-75	169	28	9	160	65	104
R-100	80	20	0.7	79.3	50	39.7
R-150	112	3	33.7	78.3	60	47.0
R-120A	12	0	0.2	11.8	30	3.5
R-5/2	99	1	34.2	64.8	20	13.0
R-10/2	326	2	276.3	49.7	20	9.9
ROM	68	21	14.9	53.1	50	26.6
TOTALS	866		369	497		243.7

\*20% in Planning Area/3% in Preservation Area. Build-Out Impervious (acres) is the total for the zone.

**Table 4: Pollutant Loads by Land Cover**

Land Cover	Total Phosphorous Load (lbs/acre/year)	Total Nitrogen Load (lbs/acre/year)	Total Suspended Solids Load (lbs/acre/year)
High, Medium Density Residential	1.4	15	140
Low Density Rural	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

**Table 5: Nonpoint Source Loads at Build-Out for HUC14s**

HUC14 and Zone	Build-Out Zoning	Developable Area (acres)	TP (lbs/ac/year)	TP (lbs/year)	TN (lbs/ac/year)	TN (lbs/year)	TSS (lbs/ac/year)	TSS (lbs/year)
02040105140040								
R-5/2	Rural Residential	26.5	0.6	16.0	5	132.5	100	2650
R-10/2	Rural Residential	25	0.6	15	5	125	100	2500
TOTALS		51.5		31.0		257.5		5150
02040105120010								
R-150	Rural Residential	124.3	0.6	74.5	5	621.5	100	12430
R-2	Rural Residential	100	0.6	60	5	500	100	10000
R-3/2	Rural Residential	439.9	0.6	263.9	5	2199.5	100	43990
R-5/2	Rural Residential	143.2	0.6	85.9	5	716	100	14320
R-10/2	Rural Residential	65.6	0.6	39.4	5	328	100	6560
HB	Commercial	18.9	2.1	39.7	22	415.8	200	3780
ROM	Industrial	11.2	1.5	16.8	16	179.2	200	2240
TOTALS		903.1		580		4960		93320
02040105120020								
R-75	Medium Density	116	1.4	162.4	15	1740	140	16240
R-100	Medium Density	56	1.4	78.4	15	840	140	7840
R-120	Medium Density	292.1	1.4	408.9	15	4381.5	140	40894
R-120A	Medium Density	56.8	1.4	79.5	15	852	140	7952
R-150	Rural Residential	76.3	0.6	45.8	5	381.5	100	7630
R-2	Rural Residential	100	0.6	60	5	500	100	10000
R-3/2	Rural Residential	42.3	0.6	25.4	5	211.5	100	4230
R-5/2	Rural Residential	90.2	0.6	54.1	5	451	100	9020
R-MF	High Density	37.9	1.4	53.1	15	568.5	140	5306
AH	High Density	62.1	1.4	86.9	15	931.5	140	8694
RB	Commercial	38	2.1	79.8	22	836	200	7600
HB	Commercial	225.7	2.1	474	22	4965.4	200	45140
PO	Commercial	40.1	2.1	84.2	22	882.2	200	8020
ROM	Industrial	258.3	1.5	387.5	16	4132.8	200	51660
TOTALS		1491.8		2080		21673.9		230226
02040105110030								
R-75	Medium Density	160	1.4	224	15	2400	140	22400
R-100	Medium Density	79.3	1.4	111	15	1189.5	140	11102
R-150	Rural Residential	78.3	0.6	47	5	391.5	100	7830
R-120A	Medium Density	11.8	1.4	16.5	15	177	140	1652
R-5/2	Rural Residential	64.8	0.6	38.9	5	324	100	6480
R-10/2	Rural Residential	49.7	0.6	29.8	5	248.5	100	4970
ROM	Industrial	53.1	1.5	79.7	16	849.6	200	10620
TOTALS		497		546.9		5580.1		65054



## Mitigation

The major waterways that flow through the Township are Lopatcong Creek and Merrill Creek. These waters and the associated tributaries located in Lopatcong are classified as Category 1 trout production waters. The State has declared that Category 1 waters are a vital resource to the State's drinking water supply and NJDEP has implemented stringent regulations to protect Category 1 waters.

The Warren County Planning Department has sought to acquire, through outright purchase or acquisition of easements, portions of Lopatcong Creek for its planned greenway that will link open space parcels in the County and provide access to the Creek for recreation. The County has identified the Lopatcong Creek corridor through Lopatcong Township in its open space plan as a target for acquisition.

The Lopatcong Township Planning Board also recognizes the importance of these waterways not only to the State as a whole but to the Township and its citizenry. Lopatcong Creek has been identified in the Township Master Plan as a major area of environmental concern. Merrill Creek and its tributaries run through the Highlands Preservation Area in the Township, an environmentally sensitive area of low-density residential zoning districts where development should be severely restricted.

Due the significance of the waterways located in Lopatcong Township, the quality and quantity of these water resources should be protected from development by all means available to the Township. The Planning Board has determined that it is in the best interest of the State, County and Lopatcong Township that variances or exemptions from the stormwater management design and performance standards contained in this plan shall not be an option. Therefore, this Municipal Stormwater Management Plan does not contain a mitigation plan.

## List of Acronyms and Abbreviations

AMNET	: Ambient Biological Monitoring Network
ASMN	: Ambient Stream Monitoring Network
BMP	: Best Management Practice
CAB	: County Agricultural Board
CFR	: Code of Federal Regulations
DPM	: Diameter at Point of Measurement
EPA	: Environmental Protection Agency
GIS	: Geographic Information Systems
GSR	: Geological Survey Report
FW1	: Fresh Water Category 1
HUC	: Hydrologic Unit Code
MSWMP	: Municipal Stormwater Management Plan
N.J.A.C.	: New Jersey Administrative Code
NJDEP	: New Jersey Department of Environmental Protection
NJIS	: New Jersey Impairment Score
N.J.S.A.	: New Jersey Statutory Authority
NJDOT	: New Jersey Department of Transportation
NRCS	: Natural Resources Conservation Service
RSIS	: Residential Site Improvement Standards
RSWMP	: Regional Stormwater Management Plan
SADC	: State Agricultural Development Committee
TMDL	: Total Maximum Daily Load
TSS	: Total Suspended Solids
USDA	: United States Department of Agriculture
USGS	: United States Geological Survey