

**TOWNSHIP OF ROXBURY**

**Morris County, New Jersey**

**Municipal Stormwater Management Plan**

**April 2006**

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**Township of Roxbury Planning Board**

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## Introduction

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

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

## Goals

The goals of this MSWMP are to achieve the following to the greatest extent possible:

- **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.**
- **comply with State mandated regulations.**

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 C-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 stream channels. 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. The result of this development is the ultimate degradation of water quality and quantity, decreased groundwater recharge abilities, and damage to natural flora and fauna communities.

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.

## Groundwater Recharge in the Hydrologic Cycle

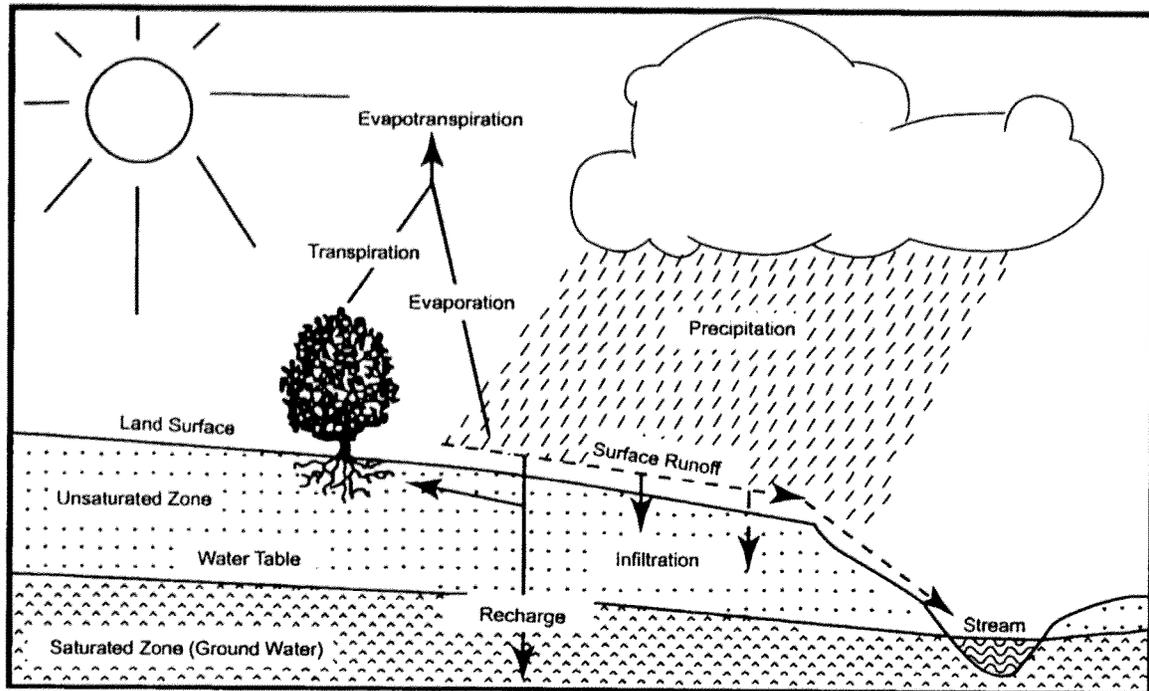


FIGURE C-1

Source: New Jersey Geological Survey Report GSR-32.

In addition to increased pollutant loading, land development can adversely affect water quality and stream biota in more subtle ways. For example, stormwater falling on impervious surfaces or stored in detention or retention basins can become heated and raise the temperature of the downstream waterway, adversely affecting cold water fish species such as trout. Development can remove trees along stream banks that normally provide shading, stabilization, and leaf litter that falls into streams and becomes food for the aquatic community.

## **Background**

Roxbury Township encompasses approximately 22 square miles in western Morris County, New Jersey. In recent years, the Township has experienced moderate growth from development. The population of the Township has increased from 18,878 in 1980, to 20,429 in 1990, to 23,883 in 2000. This population increase has resulted in some additional demand for new commercial and services related development. The associated changes in the landscape have likely increased stormwater runoff volumes and pollutant loads to some waterways of the municipality. Figure C-2 illustrates the waterways in the Township as defined by the United States Geological Survey (U.S.G.S.). Figure C-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 is used to generate a New Jersey Impairment Score (NJIS), which is based on a number of biometrics related to benthic macroinvertebrate community dynamics. The river that borders the northwestern portion of the Township is the Musconetcong River which is within the Upper Delaware Watershed Management Area 01. Two major water bodies exist along the river within Roxbury Township, known as Lake Hopatcong and Lake Musconetcong. The AMNET station located on the Musconetcong River below Lake Hopatcong shows its' biological condition to be moderately impaired, while the station just below Lake Musconetcong in Stanhope shows it to be nonimpaired.

There are five (5) other major waterways in the Township. They are as follows: Stephens Brook which is within the Rockaway Watershed Management Area 06. There is no AMNET data available for this waterway. The other major waterways are all within the South Branch of the Raritan River Watershed Management Area 08 and are known as: the Lamington River, Drakes Brook, Ledgewood Brook and Flanders Brook. AMNET data is available for the Lamington River at a station located just downstream of Roxbury in Chester Township. This station shows the biological condition to be moderately impaired. The only other waterway data available is for Drakes Brook which shows it to be moderately impaired.

The Lake Hopatcong Commission has authorized Princeton Hydro, LLC to conduct a pollutant loading analysis for the Lake Hopatcong Watershed. This analysis entitled "Refined Phosphorus TMDL and Restoration Plans for Lake Hopatcong and Lake Musconetcong, Upper Musconetcong River Watershed, Morris and Sussex Counties, New Jersey [DRAFT]" dated January 2005 is being used to develop a Restoration Plan to achieve compliance with the phosphorus Total Maximum Daily Load (TMDL) for the lake. The Restoration Plan for Roxbury Township identifies that compliance with the TMDL is to be obtained through stormwater management, since this watershed area within Roxbury Township is almost entirely sewered.

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

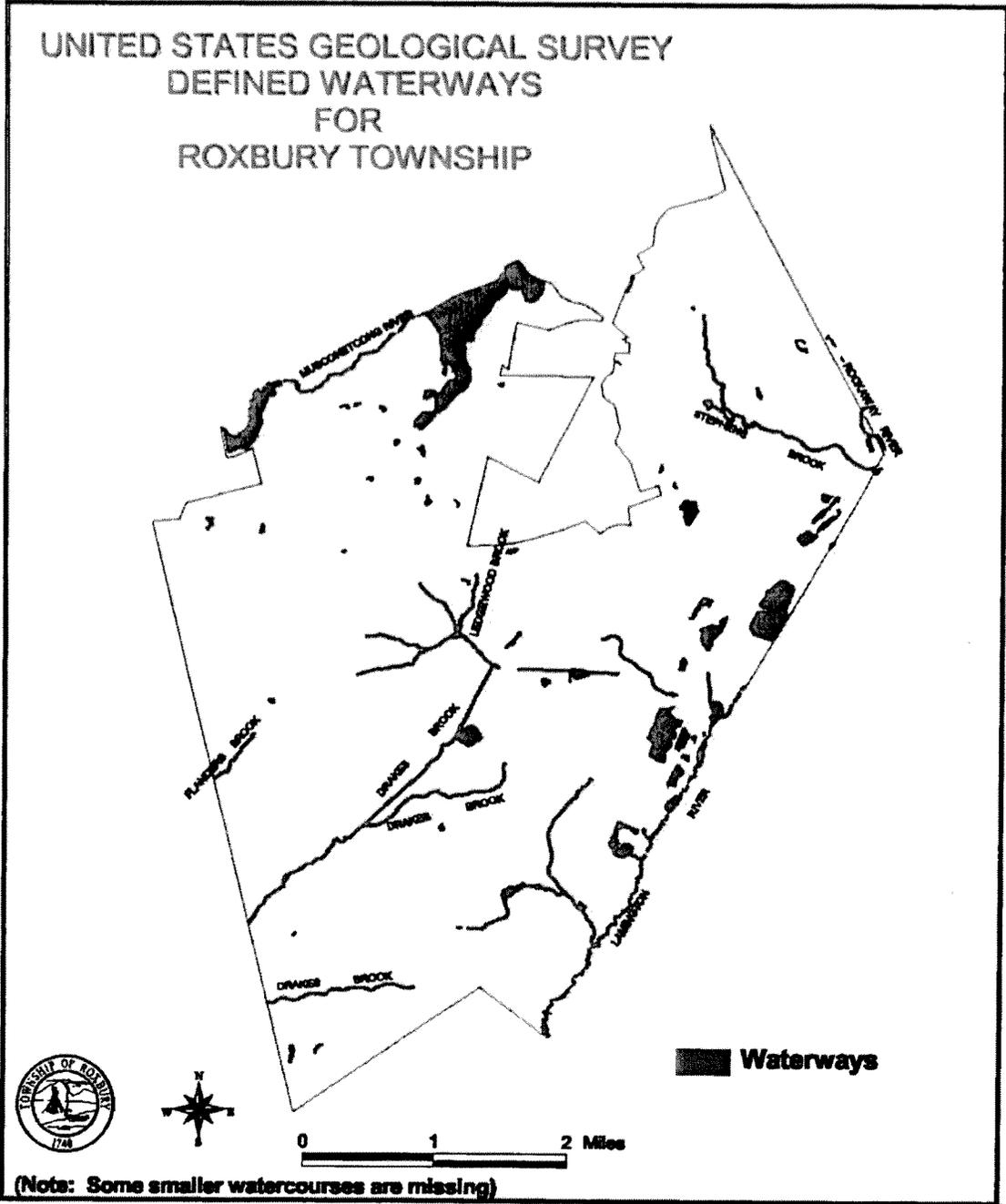


Figure C-2

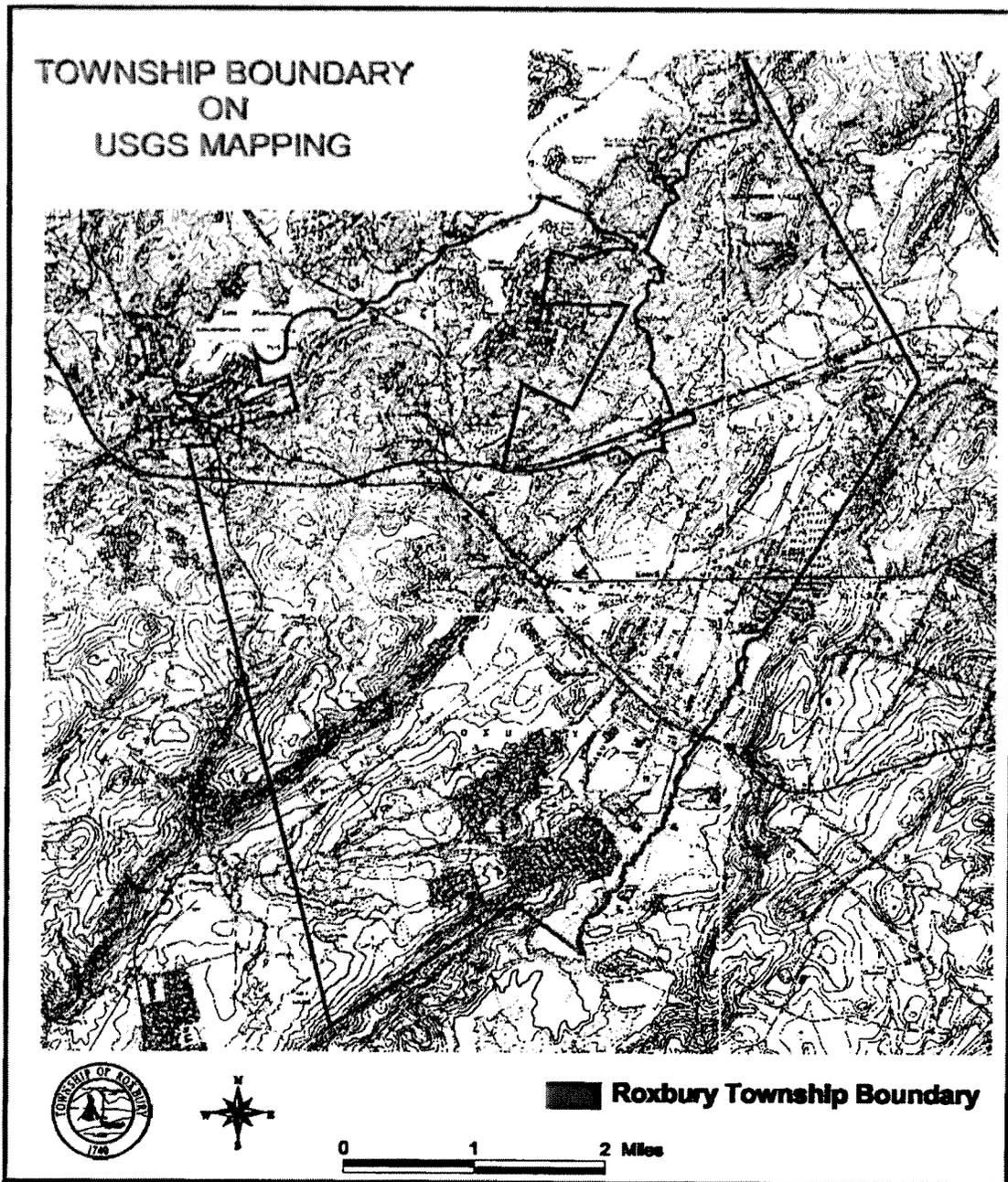


Figure C-3

Roxbury Township acknowledges that the "Refined Phosphorus TMDL and Restoration Plans for Lake Hopatcong and Lake Musconetcong, Upper Musconetcong River Watershed, Morris and Sussex Counties, New Jersey [DRAFT]", dated January 2005 has established standards and developed methods to attempt to reduce the phosphorus loading. However, the Township has not adopted the plan, nor is it in a position to adopt the plan, until there is a consistent method of applying the proposed standards. This is especially true considering that all of the contributing communities have not already reduced their TMDL's, as Roxbury Township has, by providing public sanitary sewer systems in the lake watershed area.

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 Musconetcong River at Lake Hopatcong is identified on this list in Roxbury Township.

In addition to water quality issues, the Township has exhibited some water quantity problems including localized flooding, and stream bank erosion. The localized flooding can be attributed to roadside ditches being clogged with sediment, insufficient roadway shoulder areas and inadequate storm sewer infrastructure in various areas of the Township. There are a small number of locations in the Port Morris, Kenvil and Succasunna areas of the Township which utilize "seepage pit" type catch basins in the storm sewer system which rely on soil permeability to dissipate the stormwater. Intense storm events tend to surcharge these systems and contribute to localized street and yard flooding until such time as the storm event ends and the water levels recede. The culverts associated with road crossings in the Township appear to be capable of passing most storm events. The Township does not have any record of major flooding problems caused by undersized culverts. This will continue to be monitored and reported should any flooding problems be identified.

However, the amount of impervious area has increased in the Township, and the peak rates and volumes of stream flows have also increased. The increased amount of water has resulted in some stream bank erosion, resulting in unstable areas in some areas along waterways and degraded stream habitats. The Township has previously authorized an evaluation of the Drakes Brook Greenway property in 2002 to determine the need for physical restoration of this portion of the stream. A study prepared by Aqua-Niche entitled "Drakes Brook Restoration Plan, A Headwaters of the South Branch Raritan River" dated October 2003 resulted in the conclusion that this portion of Drakes Brook was in good condition and that physical restoration of this area was not necessary. However, other areas along Drakes Brook contained within private properties have been identified as being negatively impacted by an increase in siltation and bank erosion. The increasing imperviousness of the Township is also decreasing the ability for groundwater recharge, which may decrease base flows in streams during dry weather periods. Lower base flows can have a negative impact on instream habitat during the summer months. A map of the groundwater recharge areas are shown in Figure C-4. Wellhead protection areas, also required as part of the MSWMP, are shown in Figure C-5.

# Groundwater Recharge Areas for Roxbury Township



- Groundwater Recharge**
- 17+ in/yr
  - 13 to 16 in/yr
  - 10 to 12 in/yr
  - 1 to 9 in/yr
  - 0 in/yr
  - Hydric Soils
  - Highland Preservation Area
  - Municipal Boundary
  - Streams

**Source:**  
The paper and digital boundary layers were produced by the GIS Section of the  
Monte County Department of Planning, Development, and Technology.

The digital preservation areas is a digital representation of the "Highland Water Planning and Planning Act"  
enacted by the Monte County Department of Planning, Development, and Technology. Further documentation  
can be obtained at <http://www.monte-county.com/highland/waterplanning.html>

The water layers and groundwater recharge areas were obtained from the MDEP website: <http://www.gis.montecounty.com>

The general information contained on this map is used to obtain, identify and describe parcels of land in Monte County for  
subdivision, ordinary, and reproduction purposes (MEX) and is NOT to be considered or used as a legal document. Your  
dependence is limited to the accuracy, but recovery is not guaranteed. Any errors or omissions should be reported to the  
Monte County Department of Planning, Development & Technology, GIS Division. To be correct all Monte County GIS users  
for any programs, including those of data, text, public, business information, based on location information or other nature any  
how they might arise from the use of this map or the information it contains.



**Figure C-4**

# WellHead Protection Areas for Roxbury Township

**Wellhead Protection Area**

**TIER**

0

1

2

3

Highlands Preservation Area

Municipal Boundary

Streams

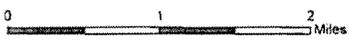
**Source:**

The point and polygon boundary layers were produced by the GIS Section of the  
Starks County Department of Planning, Development, and Technology.

The highlands preservation area is a digital representation of the "Highlands Water Protection and Planning Act"  
enacted by the Starks County Department of Planning, Development, and Technology. Best of Documentation  
can be accessed at: <http://www.starkscountyga.gov/highlands/>

The water layers and wellhead protection areas were obtained from the HUSBP website: <http://www.gis.starkscountyga.gov/>

The general information contained on this map is used to locate, identify and describe systems of land in Starks County for  
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loss that might arise from the use of this map or the information contained thereon.



**Figure C-5**

## Design and Performance Standards

The Township will adopt the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies. The design and performance standards include the language for maintenance of stormwater management measures consistent with the stormwater management rules at N.J.A.C. 7:8-5.8 Maintenance Requirements, and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The ordinances will be submitted to the Morris County Planning Department for review and approval within 24 months of the effective date of the Stormwater Management Rules.

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

## Plan Consistency

The Township is not within any adopted Regional Stormwater Management Planning Area. Therefore, this plan does not need to be consistent with any regional stormwater management plans (RSWMPs). As the RSWMPs are developed and/or adopted in the future, this Municipal Stormwater Management Plan will be updated to be consistent with said plans. Currently the State watershed management plans that have been developed but not adopted within Roxbury Township are as follows:

- The Upper Delaware Watershed (WMA01). The northwesterly border of the Township contains the Musconetcong River and the Lake Hopatcong and Lake Musconetcong waterbodies. The Upper Delaware Watershed Management Project identified seven program goals, associated objectives and action items with the ultimate goal of developing a Watershed Management Plan. The project funding was ended prior to development/completion of the Watershed Management Plan. Continued efforts by the project group and ultimate completion of this plan will be based on the availability of future funding.
- The Rockaway River Watershed (WMA06). The Rockaway River meanders around a small area at the easterly portion of the Township in the Berkshire Valley area. Stephens Brook is a tributary to the Rockaway River. The Rockaway River Watershed Management Plan was developed and includes model ordinances for six environmental categories including: soil erosion control, steep slopes protection, stream corridor protection, stormwater management, tree protection and wetlands protection. The Rockaway River Watershed Cabinet is working to implement the plan with the member communities.
- The Raritan Basin Watershed (WMA08). The majority of Roxbury (central and southerly portions) lies within the Raritan Basin. Tributary waterways include the Lamington River, Drakes Brook, Ledgewood Brook and Flanders Brook. The Raritan

Basin Watershed Management Plan has been developed which identified six major issues to be addressed to protect the region's water resources as follows: surface water pollution, loss of riparian areas, stream habitat degradation, groundwater losses, water supply limitations and stormwater impacts. The Raritan Alliance was formed to foster implementation of the Raritan Plan.

The Township will continue to work closely with these and other groups in the development and implementation of stormwater management programs.

Similarly, no TMDLS have been developed for waters within the Township except for Lake Hopatcong. As previously discussed, the Lake Hopatcong Commission has authorized a Restoration Plan be developed for compliance with the phosphorus Total Maximum Daily Load (TMDL) for the Lake. No other TMDLS have been developed within the Township. However, if any additional TMDLS are developed in the future, each will be evaluated to ensure a consistent method of applying the proposed standards by all contributing communities prior to adoption of the plan and incorporation into this Municipal Stormwater Management Plan.

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

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

## **Nonstructural Stormwater Management Strategies**

The Township has reviewed its Master Plan and ordinances, and has provided a list of the sections in the Township land use and zoning ordinances that are to be modified to incorporate nonstructural stormwater management strategies. These are the ordinances identified for revision. Once the ordinance revisions are completed, they will be submitted to the County review agency for review and approval within 24 months of the effective date of the Stormwater Management Rules. A copy will be sent to the Department of Environmental Protection at the time of submission.

Chapter XIII of the Revised General Ordinances entitled Land Development Ordinance, was reviewed with regard to incorporating nonstructural stormwater management strategies. Several changes are being proposed to this ordinance to incorporate these strategies.

**Section 13-4.6: Off-tract Improvements** describes essential off-site and off-tract

improvements. Language is proposed to be added to this section to require that any off-site and off-tract stormwater management and drainage improvement must conform to the "Design and Performance Standards" described in this Plan.

**Section 13-8.406: Design Standards for Collection & Conveyance** requires that all streets be provided with inlets and pipes where the same are necessary for proper drainage. This section is proposed to be amended to encourage the use of natural vegetated swales in lieu of inlets and pipes.

**Section 13-8.608: Curbs** requires that concrete curb, or Belgian block curb be installed along every street within and fronting on a development. This section is being proposed 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.

**Section 13-8.610: Sidewalks** describe sidewalk requirements for the Township. Although sidewalks are not required along all streets, the Township can require them in areas where the probable volume of pedestrian traffic, the development's location in relation to other populated areas and high vehicular traffic, pedestrian access to bus stops, schools, parks, and other public places, and the general type of improvement intended indicate the advisability of providing a pedestrianway. Sidewalks are to be a minimum of four feet wide and constructed of concrete. Language is being considered to be added to this section to require developers to design sidewalks to discharge stormwater to neighboring lawns where feasible to disconnect these impervious surfaces, or use permeable paving materials where appropriate.

**Section 13-8.612 Non-Residential and Residential Driveways** describes the procedure for construction of any new driveway along any street. This section is proposed to be amended to allow the use of pervious paving materials to minimize stormwater runoff and promote groundwater recharge. Driveway widths will be reviewed for possible reduction and the idea of shared driveways in residential developments will be evaluated.

**Section 13-7.7 and 13-7.8: Nonconforming Uses and Buildings and General Provisions for all Zones** requires a variance for existing single family homes proposing additions that exceed the maximum percent impervious. The homeowner must mitigate the impact of the additional impervious surfaces unless the stormwater management plan for the development provided for these increases in impervious surfaces. This mitigation effort must address water quality, flooding, and groundwater recharge as described in the Stormwater Management Plan. A detailed description of how to develop a mitigation plan will also be provided in the Municipal Stormwater Management Plan.

**Section 13-8.101: General** is a subsection of the ordinance that relates to the Subdivision and Site Plan Design Guidelines which lists broad objectives and guidelines for development within the Township. Additional language will be added to specify that applicants shall utilize Low Impact Development Techniques and Non-structural Stormwater Management Strategies to the greatest extent possible in the design of site plan and subdivisions.

**Section 13-8.103: Residential Cluster Subdivision Development** provides for a cluster development option to protect the character of the Township, environmentally sensitive areas, and open space. Additional Sections 13-7.827 Cluster Residential Development,

Section 13-7.827A Cluster Development Option in the R-R, OS, and RR-5 Districts and Section 13-7.828 Lot Averaging in Industrial Districts will all be reviewed to provide flexible site design incentives for developers that utilize open space or cluster design options, review limitations on the allowable disturbance of existing vegetated areas in open space, review requirements to re-establish vegetation in disturbed areas dedicated for open space, and review the maximum allowable impervious cover criteria applicable to open space areas. The ordinance language is proposed to be amended to promote the use of native vegetation, which requires less fertilization and watering than non-native ornamental plants. Although the cluster option requires public concrete sidewalks to be installed along all streets, the option requires paths in open space. The materials for these paths are proposed to be mulched or stoned to decrease the impervious area.

**Section 13-8.3: Soil Erosion and Sediment Control Standards** addresses soil erosion and sediment control by requiring developers to comply with the “Standards and Specifications for Soil Erosion and Sediment Control” adopted by the Morris County Soil Conservation District and outlines some general design principles, including: whenever possible, retaining and protecting natural vegetation; minimize and retain water runoff to facilitate groundwater recharge; and, installing diversions, sediment basins, and similar required structures prior to any on-site grading or disturbance. Also, the restoration of compacted areas will be proposed to be included in this section.

**Section 13-8.4 Stormwater Management** will address stormwater runoff which will be updated to include all requirements outlined in N.J.A.C.7:8-5.

**Section 13-8.602: Right-of-Way and Cartway Widths** describes the requirements for streets in the Township. The Township has several street classifications, ranging from “Secondary Arterial,” which has a minimum right-of-way of 66 feet, to “Residential Access (Local),” which has a minimum right-of-way of 50 feet. Street pavement widths vary from 40 feet to 30 feet for the secondary arterial to residential access (local) respectively. Street paving widths should be established considering the number of units served, whether a street is curbed, whether on-street parking is permitted, whether the interior streets serve lots of two acres or larger, and whether on-site topographical constraints allow design flexibility. Depending on these factors, the paving width for Residential Access local streets has a range from 20 to 32 feet. This section is being proposed to encourage developers to limit on-street parking to allow for narrower paved widths. This section also requires that cul-de-sacs have a minimum radius of 50 feet. Language is being proposed to this section to reduce the minimum radius of cul-de-sac designs. Cul-de-sac standards will be developed to address a number of design considerations.

**Section 13-8.7: Parking, Loading, Solid Waste and Lighting Standards** details off-street parking and loading requirements. All parking lots and loading areas are required to have concrete or Belgian block curbing around the perimeter of the parking and loading areas. This section also requires that concrete or Belgian block curbing be installed around all landscaped areas within the parking lot or loading areas. This section is proposed to be amended to allow for flush curb with curb stops, or curbing with curb cuts to encourage developers to allow for the discharge of impervious areas into landscaped areas for stormwater management. Also, language is proposed to be added to allow for the use of

natural vegetated swales for the water quality design storm, with overflow for larger storm events into storm sewers. This section also provides guidance on minimum parking space requirements. These requirements are based on the number of dwelling units and/or gross floor area. The section allows a developer to demonstrate that fewer spaces would be required, provided area is set aside for additional spaces if necessary. This section is proposed to be amended to allow pervious paving to be used in areas to provide overflow parking, vertical parking structures, smaller parking stalls, and shared parking.

**Section 13.7-818: Regualtions for Development within Steep Slope Areas** sets restrictions for development within steep slope and ridgeline areas of the Township in order to minimize the adverse impact caused by the development of such areas, including, but not limited to, erosion, siltation, flooding, surface water runoff, pollution of potable water supplies, and destruction of unique natural land forms scenic vistas. This current Township Ordinance accomplihes many of the goals of this MSWMP.

**Section 13-7.819: Stream, Lake and Pond Buffers** requires that no disturbance including grading and the erection, construction or expansion of any building or structure shall be permitted within 50 feet from the bank of any stream or from the edge of any pond or lake in the Township of Roxbury or within such greater distance as subsequent studies may demonstrate as being reasonably necessary. A conservation easement shall be required at a minimum width of 50 feet along the bank of any stream or from the edge of any pond or lake in the Township of Roxbury. This requirement provides a buffer area around waterways that are not regulated by the NJDEP, to limit additional impervious coverage, to provide an area for either natural filtration and groundwater recharge. The Township may consider increasing the width of these buffers.

**Section 13-8.8: Landscaping, Fences, Walls and Site Furniture** describes landscaping requirements for all developments while preserving and enhancing the existing identity/character of the site. The ordinance language will be proposed to include vegetation which is more beneficial for stormwater quality and quantity, and groundwater recharge, promote the use of bioretention islands and other stormwater practices within landscaped areas and setbacks and require vegetative screening before the use of walls or berms.

**Section 13-8.804: Street (Shade) Trees** requires shade trees be planted at a spacing of 40 feet on center in the front yard. In addition to Section 13-8.804, the Township has a Tree Conservation Ordinance (Section 13-11) that restricts and otherwise controls the removal of mature trees throughout the Township. This ordinance 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. These sections are proposed to establish a "critical footprint area" that extends 20 feet beyond the driveway and building footprint where clearing of trees cannot occur. This would comply with minimizing land disturbance, which is a nonstructural stormwater management strategy. These sections are being proposed to require the identification of forested areas, and that a certain percentage of forested areas be protected from disturbance.

**Section 13-8.806: Landscape Buffers** requires buffer areas along street lines separating all uses which back onto any street, separating a nonresidential use from either a residential use or when any multi-family use abuts a single family zone, and along any lot line or street line

where loading and off-street parking areas can be seen from the street. The landscape requirements for these buffer areas in the existing section do require the existing vegetation be preserved. However, the language of this section is being proposed to require the use of native vegetation, which requires less fertilization and watering than non-native species. Additionally, language will be proposed to allow buffer areas to be used for stormwater management by disconnecting impervious surfaces and treating runoff from these impervious surfaces. Other proposed changes will include a layout of the existing vegetated areas with a description of those areas, restrictions from enlarging existing turf lawn areas and the requirements for a specific percentage of permanently preserved open space as part of an evaluation of "cluster" development. This section currently requires the preservation of natural wood tracts and limits land disturbance for new construction.

**Natural Features** This new section will be proposed to require that natural features, such as trees, brooks, swamps, hilltops, and views, be preserved whenever possible, and that care be taken to preserve selected trees to enhance soil stability, and landscaped treatment of the area to ensure that leaf litter and other beneficial aspects of the forest are maintained.

**Pollution Source Control** This new section will be proposed to require pollution source control. The intent is to prohibit materials or wastes from being deposited upon a lot in such form or manner that they can be transferred off the lot, directly or indirectly, by natural forces such as precipitation, evaporation or wind. It will also require that all materials and wastes that might create a pollutant or a hazard be enclosed in appropriate containers.

**Article XI Tree Conservation** regulates and controls indiscriminate and excessive cutting of trees and preserves the maximum number of trees during the development of a site, encourages innovative design and grading and provides a plan for tree replacement. The ordinance language will be proposed to include a forest protection ordinance and discuss an appropriate required percentage of the stand of trees to be preserved.

Other proposed ordinance revisions will include the following items to be discussed/considered for inclusion: setback requirements, sites of endangered species identified on sensitive area mapping, maximum turf grass or impervious cover limits in setback areas, limiting heavy construction vehicles to specific areas, and the requirement of identifying compacted areas on site as-builts.

Several changes are also being proposed to Article VII of the Township Land Development Ordinance entitled "Zoning Regulations." The Township has 10 types of residential districts. Each district has a maximum percent impervious surface allocation, ranging from 15 percent for the RR-5 District, which has a minimum lot size of five acres for detached single-family homes, to 35 percent for the R-4 District, which has a minimum lot size of 7,500 square feet for single-family homes. The Township also has 9 types of commercial/industrial districts. Each of these districts has a maximum percent impervious surface allocation, ranging from 50 percent for the I-5 District to 65 percent for the B-3 District. Although each zone has a maximum allowable percent impervious surface, the Township Code is proposed to 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. The Township is evaluating the maximum allowable impervious cover for each zone to determine whether a reduction in impervious cover is

appropriate.

Also, if a developer is given a variance to exceed the maximum allowable percent imperviousness, the developer must mitigate the impact of the additional impervious surfaces. The mitigation effort must address water quality, flooding, and groundwater recharge as described in the Stormwater Management Plan. A detailed description of how to develop a mitigation plan will also be provided in the Municipal Stormwater Management Plan.

## Land Use/Build-Out Analysis Land Use

A land use and build-out analysis was performed in preparation of the MSWMP assuming full development under existing conditions for each HUC14 drainage area within the Township.

The four steps that were utilized to prepare the detailed build-out analysis are as follows:

1. The total land area within each of the HUC14s of the municipality was determined.
2. The total area of environmentally constrained lands within each HUC14 was determined.
3. The land available for development was determined by subtracting the constrained lands from the total land area for each HUC 14. Agricultural, forest, and/or barren lands are considered for development along with existing residential, commercial and industrial areas. The developed areas were considered since they are also eligible for redevelopment.
4. The municipal zoning map and land development ordinances were used to determine the acreage of new development. Nonpoint source loadings were determined for each HUC14 drainage area.

The Township of Roxbury contains nine HUC14 drainage areas as indicated on Figure C-7. A list of these areas is as follows:

1. 2030103030040 – Rockaway River from the Stephens Brook to Longwood Lake
2. 2030103030070 – Rockaway River from (74 degrees 33 minutes 30 seconds to Stephens Brook)
3. 2030105010010 – Drakes Brook above Eyland Avenue
4. 2030105010020 – Drakes Brook below Eyland Avenue
5. 2030105050010 – Lamington River (above Route 10)
6. 2030105050020 – Lamington River (Hillside Avenue to Route 10)
7. 2040105150020 – Lake Hopatcong
8. 2040105150030 – Musconetcong River (Willis Brook to Lake Hopatcong)
9. 2040105150070 – Musconetcong River (Waterloo to include Willis Brook)

A detailed land use analysis for the Township was conducted. Figure C-6 illustrates the existing land use in the municipality based upon 1995/1997 GIS information from the NJDEP. The zoning map is illustrated on Figure C-8 and Figure C-9 depicts the constrained areas.

Tables C-1 and C-3 provide the results of the analysis. Table C-1 contains the total land area, impervious coverage, constrained areas, developable area, and build-out impervious area per the zoning districts within each HUC14.

Table C-3 calculates the annual non-point source loading at build-out in each HUC14 for Total Phosphorous (P), Nitrogen (N) and Total Suspended Solids (TSS) in each drainage area based upon the developable area and the NJDEP loading factors listed in Table C-2.

Table C-1: Build-Out Calculations for HUC14's

HUC14 and Zone	Total Area (Acres)	Existing Impervious (%)	Existing Impervious (Acres)	Constrained Area (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-Out Impervious (Acres)
<b>2030103030040 - Rockaway River (Stephens Bk to Longwood Lk)</b>							
LI/OR - Light Industrial/Office Research District	9.47	24%	2.25	0.18	9.29	50%	4.64
OS - Open Space District	583.24	1%	7.19	101.89	481.35	20%	96.27
R-1 - Residential District	20.33	11%	2.29	0.11	20.21	20%	4.04
R-2 - Residential District	89.74	18%	16.48	2.23	87.51	25%	21.88
RR - Rural Residential District	117.05	3%	4.00	24.64	92.42	20%	18.48
<b>Totals</b>	<b>819.83</b>	<b>4%</b>	<b>32.21</b>	<b>129.05</b>	<b>690.78</b>		<b>145.32</b>

<b>2030103030070 - Rockaway River (74d 33m 30s to Stephens Bk)</b>							
GU - Government Use District	1.75	42%	0.73	0.38	1.38	70%	0.96
LI/OR - Light Industrial/Office Research District	59.56	8%	4.75	7.56	52.01	50%	26.00
OS - Open Space District	821.23	2%	18.96	115.11	706.13	20%	141.23
PO/LI - Planned Office/Light Industrial District	91.84	0%	0.16	8.68	83.16	55%	45.74
R-1 - Residential District	43.74	10%	4.20	3.51	40.23	20%	8.05
R-2 - Residential District	33.04	16%	5.39	0.35	32.70	25%	8.17
R-4 - Residential District	16.08	21%	3.39	0.51	15.57	35%	5.45
RR - Rural Residential District	179.41	1%	2.49	38.16	141.25	15%	21.19
<b>Totals</b>	<b>1246.66</b>	<b>3%</b>	<b>40.06</b>	<b>174.24</b>	<b>1072.42</b>		<b>256.79</b>

<b>2030105010010 - Drakes Brook (above Eyland Ave)</b>							
AH-2 - Affordable Housing Residential District	42.99	27%	11.68	19.71	23.28	50%	11.64
AH-3 - Affordable Housing Residential District	60.54	34%	20.51	21.02	39.51	50%	19.76
AH-3A - Affordable Housing Residential District	6.61	2%	0.15	5.17	1.44	50%	0.72
B-1 - Limited Business District	18.82	30%	5.57	1.40	17.42	60%	10.45
B-1/A - Limited Business District	42.45	5%	1.97	3.20	39.26	50%	19.63
B-2 - Highway Business District	224.61	53%	119.12	12.00	212.61	60%	127.57
B-3 - Planned Shopping Center District	169.40	67%	112.97	2.00	167.41	65%	108.82
GU - Government Use District	51.01	25%	12.56	3.98	47.03	70%	32.92
I-1 - Limited Industrial District	35.56	24%	8.67	0.00	35.56	55%	19.56
I-3 - Limited Industrial District	35.31	40%	14.01	2.87	32.45	55%	17.85
LI/OR - Light Industrial/Office Research District	510.48	11%	57.97	44.29	466.18	50%	233.09
MFR - Multi-Family Residential District	46.00	33%	15.21	12.11	33.89	50%	16.95
OB - Office Building Research	56.14	26%	14.72	24.60	31.55	55%	17.35
OR-5 - Office Research District	109.44	4%	4.66	0.77	108.67	40%	43.47
OS - Open Space District	1442.27	1%	9.84	404.88	1037.39	20%	207.48
PO/LI - Planned Office/Light Industrial District	13.20	7%	0.97	0.00	13.20	55%	7.26
PO/R - Professional Office/Residential District	69.76	19%	13.15	12.59	57.17	55%	31.44
R-1 - Residential District	878.17	13%	118.17	39.77	838.40	20%	167.68
R-1.8 - Residential District	143.09	24%	34.64	0.05	143.04	35%	50.07

Table C-1: Build-Out Calculations for HUC14's

HUC14 and Zone	Total Area (Acres)	Existing Impervious (%)	Existing Impervious (Acres)	Constrained Area (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-Out Impervious (Acres)
<b>2030105010010 - Drakes Brook (above Eyland Ave)</b>							
R-2 - Residential District	85.73	27%	22.81	0.67	85.06	25%	21.26
R-2.5 - Residential District	113.70	26%	29.59	1.34	112.36	35%	39.33
R-3 - Residential District	247.59	27%	66.66	1.66	245.92	25%	61.48
R-5 - Residential District	0.21	10%	0.02	0.00	0.21	25%	0.05
R-6 - Residential District	51.23	0%	0.12	2.08	49.15	20%	9.83
RR - Rural Residential District	349.75	5%	17.11	5.92	343.82	20%	68.76
RR-5 - Rural Residential District	53.72	4%	2.17	1.81	51.91	15%	7.79
<b>Totals</b>	<b>4857.80</b>	<b>15%</b>	<b>715.02</b>	<b>623.89</b>	<b>4233.92</b>		<b>1352.20</b>

<b>2030105010020 - Drakes Brook (below Eyland Ave)</b>							
OS - Open Space District	342.61	1%	3.14	178.43	164.19	20%	32.84
R-1 - Residential District	452.29	16%	73.82	31.73	420.56	20%	84.11
R-2 - Residential District	0.13	21%	0.03	0.00	0.13	25%	0.03
R-3 - Residential District	86.61	28%	24.15	1.15	85.46	25%	21.36
RR-5 - Rural Residential District	81.74	2%	1.76	3.12	78.62	15%	11.79
<b>Totals</b>	<b>963.39</b>	<b>11%</b>	<b>102.90</b>	<b>214.42</b>	<b>748.97</b>		<b>150.14</b>

<b>2030105050010 - Lamington River (above Route 10)</b>							
B-1 - Limited Business District	1.05	44%	0.46	0.00	1.05	60%	0.63
B-1/A - Limited Business District	20.83	32%	6.72	0.00	20.83	50%	10.41
B-2 - Highway Business District	107.37	57%	60.80	1.52	105.85	60%	63.51
B-3 - Planned Shopping Center District	1.66	71%	1.17	0.00	1.66	65%	1.08
GU - Government Use District	53.41	22%	11.57	12.02	41.39	70%	28.97
I-10 - Limited Industrial District	47.14	14%	6.54	0.00	47.14	50%	23.57
I-3 - Limited Industrial District	43.18	34%	14.49	0.00	43.18	55%	23.75
LI/OR - Light Industrial/Office Research District	51.08	4%	2.01	0.41	50.66	50%	25.33
OB - Office Building Research	26.70	37%	9.99	0.00	26.70	55%	14.69
OR-5 - Office Research District	74.90	19%	14.06	0.24	74.65	40%	29.86
OS - Open Space District	538.33	3%	15.53	191.41	346.91	20%	69.38
PO/LI - Planned Office/Light Industrial District	827.42	1%	8.37	140.43	687.00	55%	377.85
PO/R - Professional Office/Residential District	18.79	16%	2.99	8.13	10.66	55%	5.86
R-1 - Residential District	10.75	9%	1.02	0.00	10.75	20%	2.15
R-2 - Residential District	70.49	17%	12.33	0.00	70.49	25%	17.62
R-3 - Residential District	311.29	22%	67.25	18.81	292.48	25%	73.12
R-4 - Residential District	153.54	31%	48.10	2.55	150.99	35%	52.85
R-6 - Residential District	69.69	0%	0.04	6.05	63.64	20%	12.73
RR - Rural Residential District	112.71	1%	0.96	35.52	77.20	20%	15.44
<b>Totals</b>	<b>2540.32</b>	<b>11%</b>	<b>284.39</b>	<b>417.09</b>	<b>2123.23</b>		<b>848.80</b>

Table C-1: Build-Out Calculations for HUC14's

HUC14 and Zone	Total Area (Acres)	Existing Impervious (%)	Existing Impervious (Acres)	Constrained Area (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-Out Impervious (Acres)
<b>2030105050020 - Lamington River (Hillside Avenue to Route 10)</b>							
B-2 - Highway Business District	46.67	58%	27.14	5.41	41.27	60%	24.76
GU - Government Use District	116.44	23%	26.26	44.87	71.57	70%	50.10
OS - Open Space District	359.56	3%	10.63	202.80	156.75	20%	31.35
PO/R - Professional Office/Residential District	4.34	56%	2.42	0.00	4.34	55%	2.39
R-1 - Residential District	50.92	18%	9.04	0.14	50.79	20%	10.16
R-2 - Residential District	385.16	24%	91.06	17.44	367.72	25%	91.93
R-3 - Residential District	517.05	27%	140.80	9.84	507.21	25%	126.80
R-4 - Residential District	0.08	59%	0.04	0.00	0.08	35%	0.03
RR-5 - Rural Residential District	29.50	6%	1.82	0.02	29.48	15%	4.42
<b>Totals</b>	<b>1509.71</b>	<b>20%</b>	<b>309.20</b>	<b>280.51</b>	<b>1229.19</b>		<b>341.93</b>

<b>2040105150020 - Lake Hopatcong</b>							
B-1 - Limited Business District	209.44	3%	6.28	191.61	17.84	60%	10.70
GU - Government Use District	8.84	36%	3.15	0.00	8.84	70%	6.19
OS - Open Space District	151.07	2%	3.66	19.27	131.81	20%	26.36
PO/R - Professional Office/Residential District	13.62	13%	1.78	5.47	8.15	55%	4.48
R-1 - Residential District	3.45	4%	0.14	0.44	3.01	20%	0.60
R-2 - Residential District	0.20	22%	0.04	0.00	0.20	25%	0.05
R-3 - Residential District	366.58	27%	98.86	7.33	359.25	25%	89.81
R-6 - Residential District	58.84	0%	0.21	4.49	54.35	20%	10.87
RR - Rural Residential District	20.75	1%	0.14	3.64	17.11	20%	3.42
<b>Totals</b>	<b>832.80</b>	<b>14%</b>	<b>114.26</b>	<b>232.24</b>	<b>600.56</b>		<b>152.49</b>

<b>2040105150030 - Musconetcong (Willis Bk to LkHopatcong)</b>							
B-1 - Limited Business District	21.02	58%	12.12	0.23	20.78	60%	12.47
B-1/A - Limited Business District	150.02	11%	16.53	15.95	134.06	50%	67.03
B-2 - Highway Business District	19.77	39%	7.77	0.04	19.73	60%	11.84
B-3 - Planned Shopping Center District	23.25	30%	7.05	1.73	21.53	65%	13.99
GU - Government Use District	10.73	44%	4.68	1.14	9.59	70%	6.71
I-1 - Limited Industrial District	3.23	3%	0.10	0.00	3.23	55%	1.77
I-5 - Limited Industrial District	139.13	22%	30.63	4.44	134.68	50%	67.34
LI/OR - Light Industrial/Office Research District	208.00	1%	1.09	3.49	204.50	50%	102.25
OR-5 - Office Research District	39.90	7%	2.88	6.42	33.48	40%	13.39
OS - Open Space District	129.72	6%	7.79	57.64	72.08	20%	14.42
R-1 - Residential District	28.32	4%	1.25	0.00	28.32	20%	5.66
R-2 - Residential District	14.82	20%	2.98	0.55	14.26	25%	3.57
R-3 - Residential District	35.63	13%	4.63	0.68	34.95	25%	8.74
R-4 - Residential District	73.37	28%	20.42	4.60	68.77	35%	24.07
R-5 - Residential District	29.35	27%	7.95	7.08	22.28	25%	5.57
RR - Rural Residential District	40.41	8%	3.21	9.38	31.03	20%	6.21
<b>Totals</b>	<b>966.67</b>	<b>14%</b>	<b>131.10</b>	<b>113.39</b>	<b>853.28</b>		<b>365.03</b>

Table C-1: Build-Out Calculations for HUC14's

HUC14 and Zone	Total Area (Acres)	Existing Impervious (%)	Existing Impervious (Acres)	Constrained Area (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-Out Impervious (Acres)
<b>2040105150070 - Musconetcong River (Waterloo to/incl Willis Brook)</b>							
B-1/A - Limited Business District	65.04	28%	18.04	11.45	53.59	50%	26.79
B-3 - Planned Shopping Center District	23.94	0%	0.09	4.48	19.46	65%	12.65
OR-5 - Office Research District	69.56	5%	3.45	22.58	46.98	40%	18.79
OS - Open Space District	26.41	1%	0.18	7.26	19.15	20%	3.83
R-1 - Residential District	55.54	12%	6.91	4.26	51.29	20%	10.26
RR - Rural Residential District	29.56	1%	0.42	4.76	24.80	20%	4.96
RR-5 - Rural Residential District	9.90	0%	0.03	0.00	9.90	15%	1.48
<b>Totals</b>	<b>279.95</b>	<b>10%</b>	<b>29.14</b>	<b>54.79</b>	<b>225.16</b>		<b>78.77</b>

Table C-2: Pollutant Loads by Land Cover

Land Cover	Total Phosphorus Load (lbs/acre/year)	Total Nitrogen Load (lbs/acre/year)	Total Suspended Solids Load (lbs/acre/yr)
High, Medium Density Residential	1.4	15	140
Low Density, Rural Residential	0.6	5	100
Commercial	2.1	22	200
Industrial	1.5	16	200
Urban, Mixed Urban, Other Urban	1	10	120
Agricultural	1.3	10	300
Forest, Water, Wetlands	0.1	3	40
Barrenland/Transitional Area	0.5	5	60

Table C-3: Non-point Source Loads at Build-Out

HUC14 and Zone	Build-Out Zoning	Developable Area (acres)	Total P. Load (lbs/acre/yr)	Total P (lbs/yr)	Total N Load (lbs/acre/yr)	Total N (lbs/yr)	TSS Load (lbs/acre/yr)	TSS Load (lbs/yr)
<b>2030103030040 - Rockaway River (Stephens Bk to Longwood Lk)</b>								
LI/OR - Light Industrial/Office Research District	Industrial	9	2	14	16	149	200	1857
OS - Open Space District	Urban, Mixed Urban, Other Urban	481	1	481	10	4814	120	57762
R-1 - Residential District	High, Medium Density Residential	20	1	28	15	303	140	2830
R-2 - Residential District	High, Medium Density Residential	88	1	123	15	1313	140	12251
RR - Rural Residential District	Low Density, Rural Residential	92	1	55	5	462	100	9242
<b>Totals</b>		<b>691</b>		<b>702</b>		<b>7040</b>		<b>83942</b>

<b>2030103030070 - Rockaway River (74d 33m 30s to Stephens Bk)</b>								
GU - Government Use District	Urban, Mixed Urban, Other Urban	1	1	1	10	14	120	165
LI/OR - Light Industrial/Office Research District	Industrial	52	2	78	16	832	200	10401
OS - Open Space District	Urban, Mixed Urban, Other Urban	706	1	706	10	7061	120	84735
PO/LI - Planned Office/Light Industrial District	Urban, Mixed Urban, Other Urban	83	1	83	10	832	120	9979
R-1 - Residential District	High, Medium Density Residential	40	1	56	15	603	140	5632
R-2 - Residential District	High, Medium Density Residential	33	1	46	15	490	140	4578
R-4 - Residential District	High, Medium Density Residential	16	1	22	15	234	140	2180
RR - Rural Residential District	Low Density, Rural Residential	141	1	85	5	706	100	14125
<b>Totals</b>		<b>1072</b>		<b>1077</b>		<b>10772</b>		<b>131795</b>

<b>2030105010010 - Drakes Brook (above Eyland Ave)</b>								
AH-2 - Affordable Housing Residential District	High, Medium Density Residential	23	1	33	15	349	140	3260
AH-3 - Affordable Housing Residential District	Urban, Mixed Urban, Other Urban	40	1	40	10	395	120	4741
AH-3A - Affordable Housing Residential District	High, Medium Density Residential	1	1	2	15	22	140	202
B-1 - Limited Business District	Commercial	17	2	37	22	383	200	3484
B-1/A - Limited Business District	Commercial	39	2	82	22	864	200	7851
B-2 - Highway Business District	Commercial	213	2	446	22	4678	200	42523
B-3 - Planned Shopping Center District	Commercial	167	2	352	22	3683	200	33482
GU - Government Use District	Urban, Mixed Urban, Other Urban	47	1	47	10	470	120	5644
I-1 - Limited Industrial District	Industrial	36	2	53	16	569	200	7111
I-3 - Limited Industrial District	Industrial	32	2	49	16	519	200	6490

Table C-3: Non-point Source Loads at Build-Out

HUC14 and Zone	Build-Out Zoning	Developable Area (acres)	Total P. Load (lbs/acre/yr)	Total P (lbs/yr)	Total N Load (lbs/acre/yr)	Total N (lbs/yr)	TSS Load (lbs/acre/yr)	TSS Load (lbs/yr)
<b>2030105010010 - Drakes Brook (above Eyland Ave)</b>								
LI/OR - Light Industrial/Office Research District	Industrial	466	2	699	16	7459	200	93237
MFR - Multi-Family Residential District	High, Medium Density Residential	34	1	47	15	508	140	4745
OB - Office Building Research	Commercial	32	2	66	22	694	200	6309
OR-5 - Office Research District	Commercial	109	2	228	22	2391	200	21735
OS - Open Space District	Urban, Mixed Urban, Other Urban	1037	1	1037	10	10374	120	124487
PO/LI - Planned Office/Light Industrial District	Urban, Mixed Urban, Other Urban	13	1	13	10	132	120	1584
PO/R - Professional Office/Residential District	Urban, Mixed Urban, Other Urban	57	1	57	10	572	120	6860
R-1 - Residential District	High, Medium Density Residential	838	1	1174	15	12576	140	117376
R-1.8 - Residential District	High, Medium Density Residential	143	1	200	15	2146	140	20026
R-2 - Residential District	High, Medium Density Residential	85	1	119	15	1276	140	11908
R-2.5 - Residential District	High, Medium Density Residential	112	1	157	15	1685	140	15730
R-3 - Residential District	High, Medium Density Residential	246	1	344	15	3689	140	34429
R-5 - Residential District	High, Medium Density Residential	0	1	0	15	3	140	29
R-6 - Residential District	High, Medium Density Residential	49	1	69	15	737	140	6882
RR - Rural Residential District	Low Density, Rural Residential	344	1	206	5	1719	100	34382
RR-5 - Rural Residential District	Low Density, Rural Residential	52	1	31	5	260	100	5191
<b>Totals</b>		<b>4234</b>		<b>5590</b>		<b>58152</b>		<b>619699</b>

<b>2030105010020 - Drakes Brook (below Eyland Ave)</b>								
OS - Open Space District	Urban, Mixed Urban, Other Urban	164	1	164	10	1642	120	19703
R-1 - Residential District	High, Medium Density Residential	421	1	589	15	6308	140	58879
R-2 - Residential District	High, Medium Density Residential	0	1	0	15	2	140	19
R-3 - Residential District	High, Medium Density Residential	85	1	120	15	1282	140	11964
RR-5 - Rural Residential District	Low Density, Rural Residential	79	1	47	5	393	100	7862
<b>Totals</b>		<b>749</b>		<b>920</b>		<b>9627</b>		<b>98426</b>

Table C-3: Non-point Source Loads at Build-Out

HUC14 and Zone	Build-Out Zoning	Developable Area (acres)	Total P. Load (lbs/acre/yr)	Total P (lbs/yr)	Total N Load (lbs/acre/yr)	Total N (lbs/yr)	TSS Load (lbs/acre/yr)	TSS Load (lbs/yr)
<b>2030105050010 - Lamington River (above Route 10)</b>								
B-1 - Limited Business District	Commercial	1	2	2	22	23	200	210
B-1/A - Limited Business District	Commercial	21	2	44	22	458	200	4166
B-2 - Highway Business District	Commercial	106	2	222	22	2329	200	21170
B-3 - Planned Shopping Center District	Commercial	2	2	3	22	36	200	332
GU - Government Use District	Urban, Mixed Urban, Other Urban	41	1	41	10	414	120	4966
I-10 - Limited Industrial District	Industrial	47	2	71	16	754	200	9429
I-3 - Limited Industrial District	Industrial	43	2	65	16	691	200	8636
LI/OR - Light Industrial/Office Research District	Industrial	51	2	76	16	811	200	10133
OB - Office Building Research	Commercial	27	2	56	22	587	200	5340
OR-5 - Office Research District	Commercial	75	2	157	22	1642	200	14931
OS - Open Space District	Urban, Mixed Urban, Other Urban	347	1	347	10	3469	120	41630
PO/LI - Planned Office/Light Industrial District	Urban, Mixed Urban, Other Urban	687	1	687	10	6870	120	82439
PO/R - Professional Office/Residential District	Urban, Mixed Urban, Other Urban	11	1	11	10	107	120	1279
R-1 - Residential District	High, Medium Density Residential	11	1	15	15	161	140	1505
R-2 - Residential District	High, Medium Density Residential	70	1	99	15	1057	140	9868
R-3 - Residential District	High, Medium Density Residential	292	1	409	15	4387	140	40948
R-4 - Residential District	High, Medium Density Residential	151	1	211	15	2265	140	21138
R-6 - Residential District	High, Medium Density Residential	64	1	89	15	955	140	8910
RR - Rural Residential District	Low Density, Rural Residential	77	1	46	5	386	100	7720
<b>Totals</b>		<b>2123</b>		<b>2652</b>		<b>27403</b>		<b>294750</b>

Table C-3: Non-point Source Loads at Build-Out

HUC14 and Zone	Build-Out Zoning	Developable Area (acres)	Total P. Load (lbs/acre/yr)	Total P (lbs/yr)	Total N Load (lbs/acre/yr)	Total N (lbs/yr)	TSS Load (lbs/acre/yr)	TSS Load (lbs/yr)
<b>2030105050020 - Lamington River (Hillside Avenue to Route 10)</b>								
B-2 - Highway Business District	Commercial	41	2	87	22	908	200	8253
GU - Government Use District	Urban, Mixed Urban, Other Urban	72	1	72	10	716	120	8588
OS - Open Space District	Urban, Mixed Urban, Other Urban	157	1	157	10	1568	120	18810
PO/R - Professional Office/Residential District	Urban, Mixed Urban, Other Urban	4	1	4	10	43	120	521
R-1 - Residential District	High, Medium Density Residential	51	1	71	15	762	140	7110
R-2 - Residential District	High, Medium Density Residential	368	1	515	15	5516	140	51481
R-3 - Residential District	High, Medium Density Residential	507	1	710	15	7608	140	71010
R-4 - Residential District	High, Medium Density Residential	0	1	0	15	1	140	11
RR-5 - Rural Residential District	Low Density, Rural Residential	29	1	18	5	147	100	2948
<b>Totals</b>		<b>1229</b>		<b>1633</b>		<b>17269</b>		<b>168731</b>

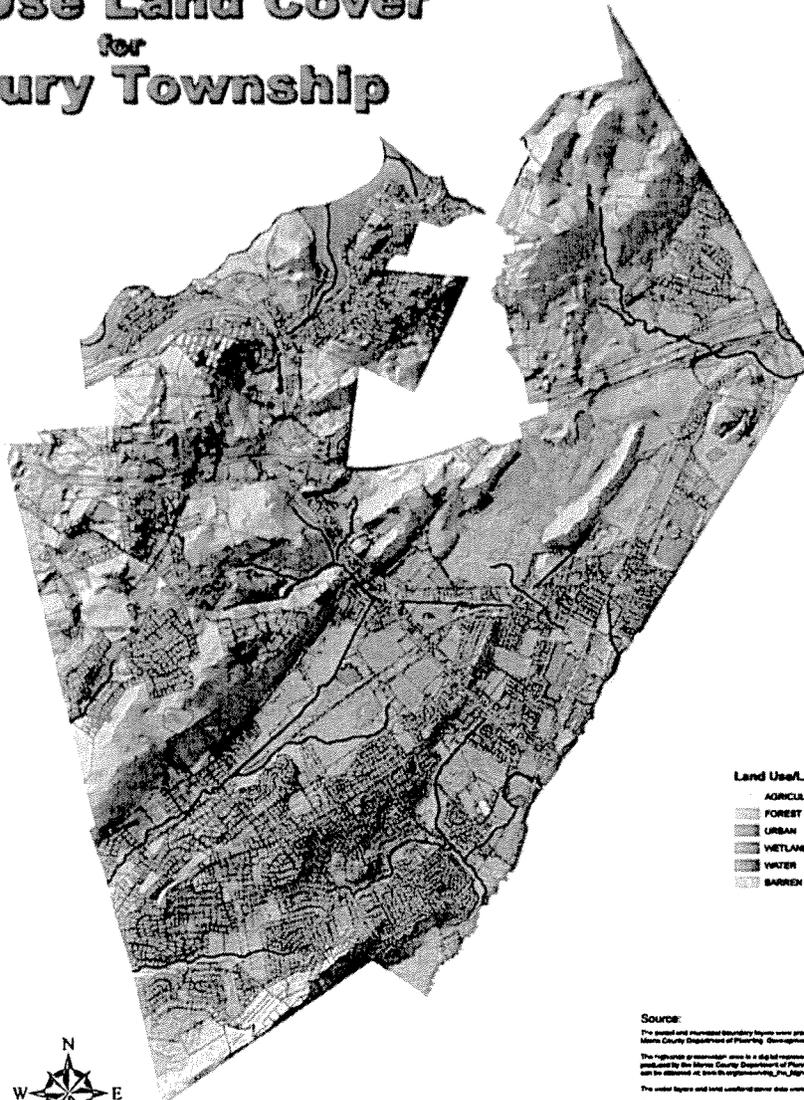
<b>2040105150020 - Lake Hopatcong</b>								
B-1 - Limited Business District	Commercial	18	2	37	22	392	200	3567
GU - Government Use District	Urban, Mixed Urban, Other Urban	9	1	9	10	88	120	1061
OS - Open Space District	Urban, Mixed Urban, Other Urban	132	1	132	10	1318	120	15817
PO/R - Professional Office/Residential District	Urban, Mixed Urban, Other Urban	8	1	8	10	81	120	978
R-1 - Residential District	High, Medium Density Residential	3	1	4	15	45	140	422
R-2 - Residential District	High, Medium Density Residential	0	1	0	15	3	140	28
R-3 - Residential District	High, Medium Density Residential	359	1	503	15	5389	140	50295
R-6 - Residential District	High, Medium Density Residential	54	1	76	15	815	140	7610
RR - Rural Residential District	Low Density, Rural Residential	17	1	10	5	86	100	1711
<b>Totals</b>		<b>601</b>		<b>780</b>		<b>8218</b>		<b>81489</b>

Table C-3: Non-point Source Loads at Build-Out

HUC14 and Zone	Build-Out Zoning	Developable Area (acres)	Total P. Load (lbs/acre/yr)	Total P (lbs/yr)	Total N Load (lbs/acre/yr)	Total N (lbs/yr)	TSS Load (lbs/acre/yr)	TSS Load (lbs/yr)
<b>2040105150030 - Musconetcong (Willis Bk to LkHopatcong)</b>								
B-1 - Limited Business District	Commercial	21	2	44	22	457	200	4156
B-1/A - Limited Business District	Commercial	134	2	282	22	2949	200	26813
B-2 - Highway Business District	Commercial	20	2	41	22	434	200	3946
B-3 - Planned Shopping Center District	Commercial	22	2	45	22	474	200	4305
GU - Government Use District	Urban, Mixed Urban, Other Urban	10	1	10	10	96	120	1150
I-1 - Limited Industrial District	Industrial	3	2	5	16	52	200	645
I-5 - Limited Industrial District	Industrial	135	2	202	16	2155	200	26936
LI/OR - Light Industrial/Office Research District	Industrial	205	2	307	16	3272	200	40901
OR-5 - Office Research District	Commercial	33	2	70	22	737	200	6696
OS - Open Space District	Urban, Mixed Urban, Other Urban	72	1	72	10	721	120	8650
R-1 - Residential District	High, Medium Density Residential	28	1	40	15	425	140	3965
R-2 - Residential District	High, Medium Density Residential	14	1	20	15	214	140	1997
R-3 - Residential District	High, Medium Density Residential	35	1	49	15	524	140	4894
R-4 - Residential District	High, Medium Density Residential	69	1	96	15	1032	140	9628
R-5 - Residential District	High, Medium Density Residential	22	1	31	15	334	140	3119
RR - Rural Residential District	Low Density, Rural Residential	31	1	19	5	155	100	3103
<b>Totals</b>		<b>853</b>		<b>1332</b>		<b>14030</b>		<b>150904</b>

<b>2040105150070 - Musconetcong River (Waterloo to/incl Willis Brook)</b>								
B-1/A - Limited Business District	Commercial	54	2	113	22	1179	200	10717
B-3 - Planned Shopping Center District	Commercial	19	2	41	22	428	200	3892
OR-5 - Office Research District	Commercial	47	2	99	22	1034	200	9397
OS - Open Space District	Urban, Mixed Urban, Other Urban	19	1	19	10	191	120	2298
R-1 - Residential District	High, Medium Density Residential	51	1	72	15	769	140	7180
RR - Rural Residential District	Low Density, Rural Residential	25	1	15	5	124	100	2480
RR-5 - Rural Residential District	Low Density, Rural Residential	10	1	6	5	49	100	990
<b>Totals</b>		<b>225</b>		<b>364</b>		<b>3775</b>		<b>36954</b>

# Land Use Land Cover for Roxbury Township



**Land Use/Land Cover**

AGRICULTURE	Highlands Preservation Area
FOREST	Municipal Boundary
URBAN	Streams
WETLANDS	
WATER	
BARREN LAND	

**Source:**  
 The aerial and municipal boundary layer cover provided by the GIS Division of the  
 Macon County Department of Planning, Development, and Technology.  
 The Highlands preservation area is a digital representation of the "Highlands Water Protection and Planning Act"  
 provided by the Macon County Department of Planning, Development, and Technology. Technical Documentation  
 can be obtained at: [www.maconcountyga.gov/HighlandsBoundary](http://www.maconcountyga.gov/HighlandsBoundary)  
 The aerial layers and land use/land cover data were obtained from the NLEP website. (See Source by geographic area.)  
 The parcel information mentioned on this map is used to locate, identify and inventory parcels of land in Macon County for  
 planning, advisory and consultative purposes ONLY and is NOT to be construed or used as a legal description. Map  
 information is intended to be prepared and updated as it becomes available. Any errors or omissions should be reported to the  
 Macon County Department of Planning, Development & Technology, GIS Division. In no event shall Macon County be held  
 liable for any damages, including loss of data, lost profits, business interruption, loss of business information or other proprietary  
 data that might occur from the use of this map or the information it contains.

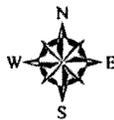


Figure C-6

# Hydrological Units (HUC14s) for Roxbury Township

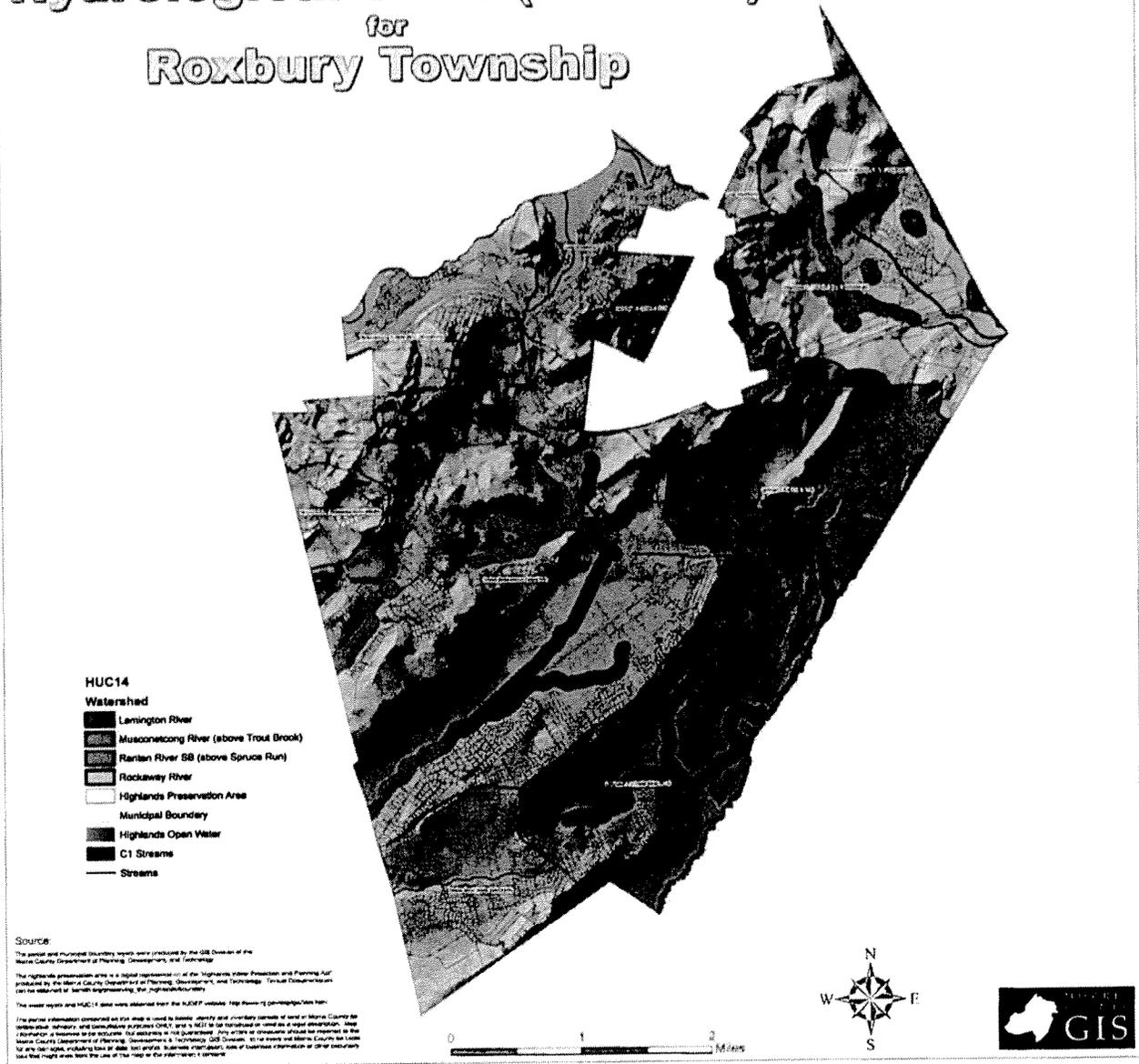


Figure C-7

# Zoning Districts for Roxbury Township

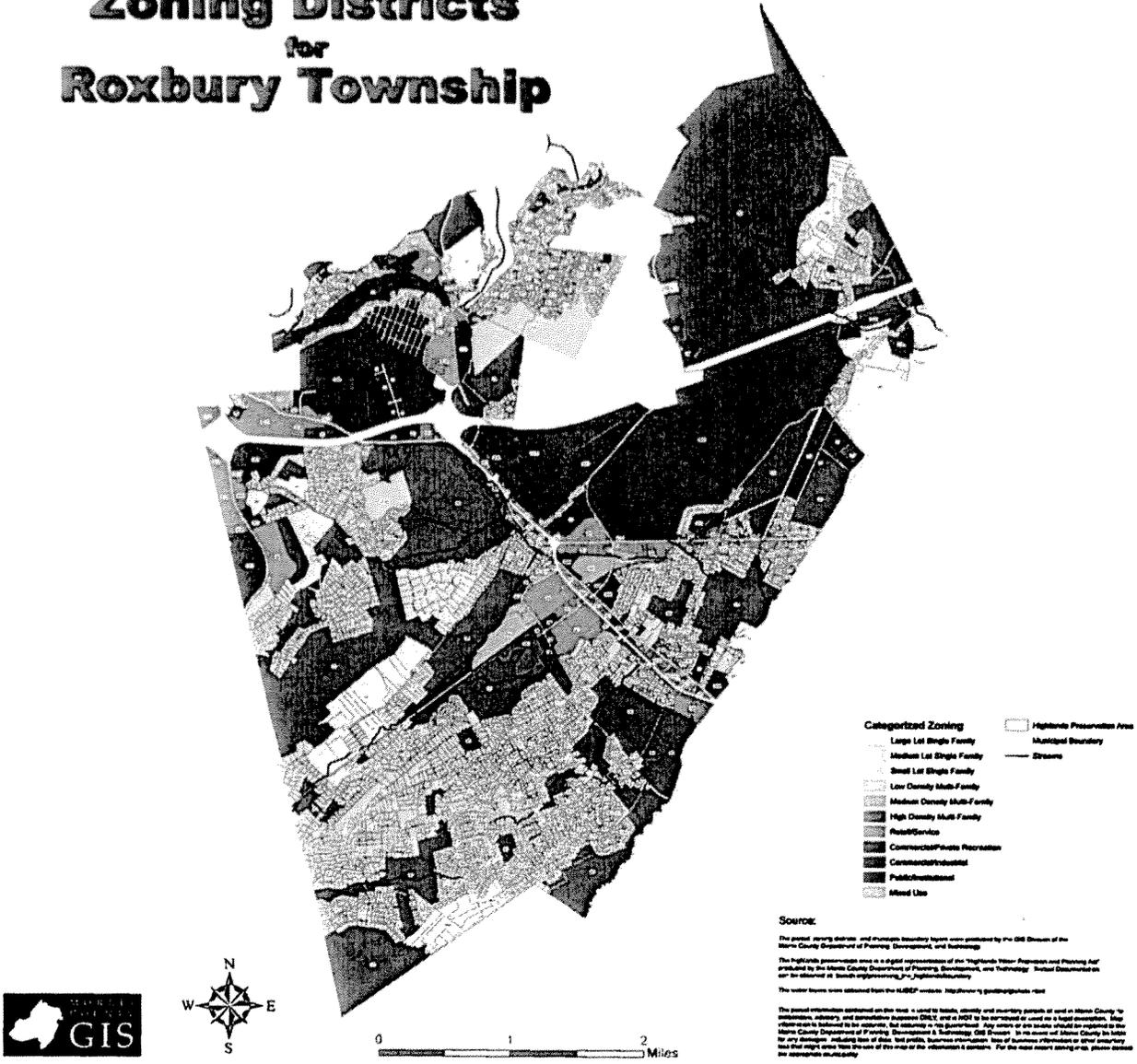


Figure C-8

Constrained Lands  
for  
Roxbury Township

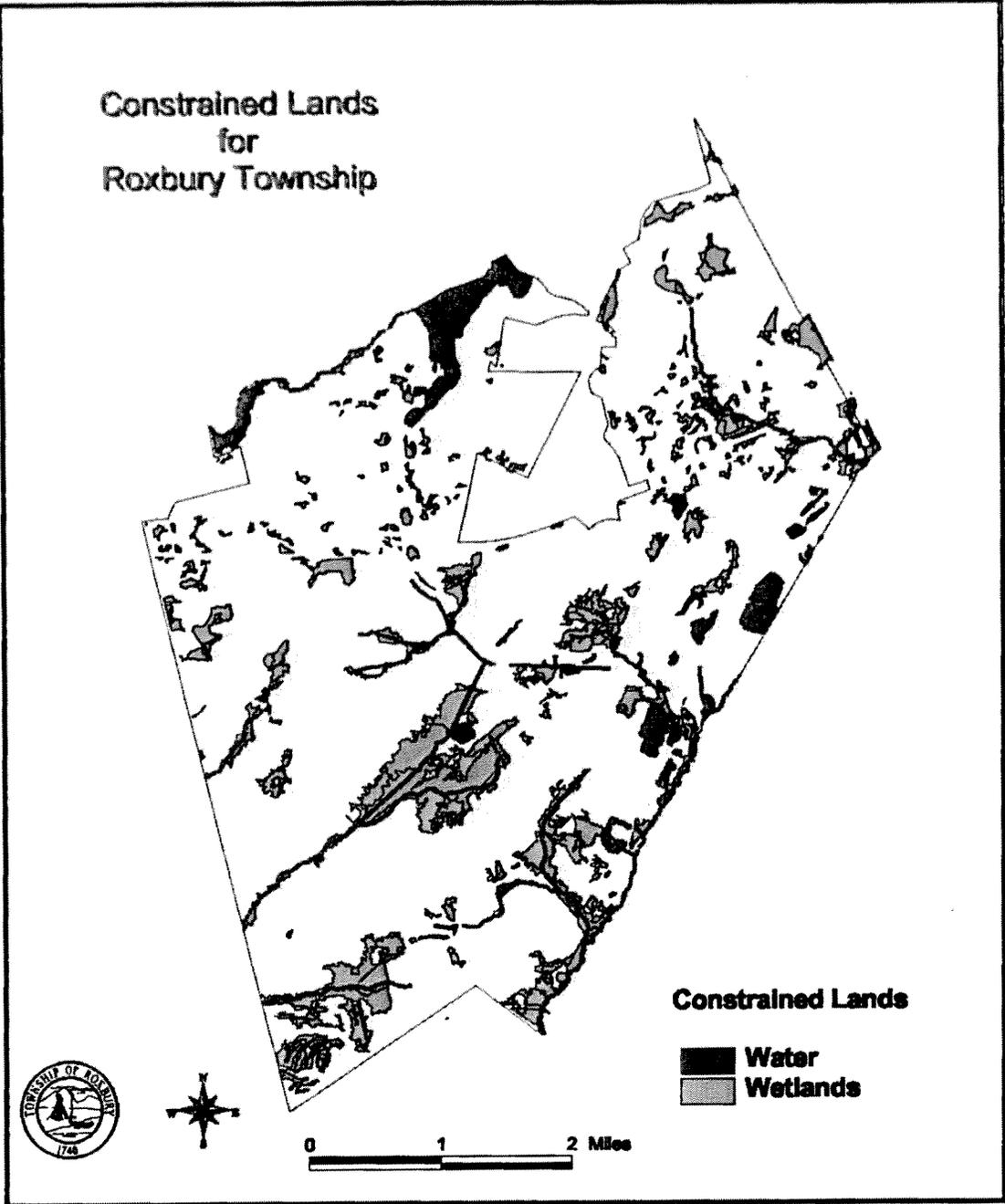


Figure C-9

# USGS Soil Survey of Roxbury Township

**SOIL TYPES**

Am	Pruc	UdRAC
Amc	Prus	UdRACc
Amu	Prusl	UdRACu
Amv	Prusv	UdRACv
Amw	Prusw	UdRACw
Amx	Prusx	UdRACx
Amz	Prusz	UdRACz
Am1	Prus1	UdRAC1
Am2	Prus2	UdRAC2
Am3	Prus3	UdRAC3
Am4	Prus4	UdRAC4
Am5	Prus5	UdRAC5
Am6	Prus6	UdRAC6
Am7	Prus7	UdRAC7
Am8	Prus8	UdRAC8
Am9	Prus9	UdRAC9
Am10	Prus10	UdRAC10
Am11	Prus11	UdRAC11
Am12	Prus12	UdRAC12
Am13	Prus13	UdRAC13
Am14	Prus14	UdRAC14
Am15	Prus15	UdRAC15
Am16	Prus16	UdRAC16
Am17	Prus17	UdRAC17
Am18	Prus18	UdRAC18
Am19	Prus19	UdRAC19
Am20	Prus20	UdRAC20
Am21	Prus21	UdRAC21
Am22	Prus22	UdRAC22
Am23	Prus23	UdRAC23
Am24	Prus24	UdRAC24
Am25	Prus25	UdRAC25
Am26	Prus26	UdRAC26
Am27	Prus27	UdRAC27
Am28	Prus28	UdRAC28
Am29	Prus29	UdRAC29
Am30	Prus30	UdRAC30
Am31	Prus31	UdRAC31
Am32	Prus32	UdRAC32
Am33	Prus33	UdRAC33
Am34	Prus34	UdRAC34
Am35	Prus35	UdRAC35
Am36	Prus36	UdRAC36
Am37	Prus37	UdRAC37
Am38	Prus38	UdRAC38
Am39	Prus39	UdRAC39
Am40	Prus40	UdRAC40
Am41	Prus41	UdRAC41
Am42	Prus42	UdRAC42
Am43	Prus43	UdRAC43
Am44	Prus44	UdRAC44
Am45	Prus45	UdRAC45
Am46	Prus46	UdRAC46
Am47	Prus47	UdRAC47
Am48	Prus48	UdRAC48
Am49	Prus49	UdRAC49
Am50	Prus50	UdRAC50
Am51	Prus51	UdRAC51
Am52	Prus52	UdRAC52
Am53	Prus53	UdRAC53
Am54	Prus54	UdRAC54
Am55	Prus55	UdRAC55
Am56	Prus56	UdRAC56
Am57	Prus57	UdRAC57
Am58	Prus58	UdRAC58
Am59	Prus59	UdRAC59
Am60	Prus60	UdRAC60
Am61	Prus61	UdRAC61
Am62	Prus62	UdRAC62
Am63	Prus63	UdRAC63
Am64	Prus64	UdRAC64
Am65	Prus65	UdRAC65
Am66	Prus66	UdRAC66
Am67	Prus67	UdRAC67
Am68	Prus68	UdRAC68
Am69	Prus69	UdRAC69
Am70	Prus70	UdRAC70
Am71	Prus71	UdRAC71
Am72	Prus72	UdRAC72
Am73	Prus73	UdRAC73
Am74	Prus74	UdRAC74
Am75	Prus75	UdRAC75
Am76	Prus76	UdRAC76
Am77	Prus77	UdRAC77
Am78	Prus78	UdRAC78
Am79	Prus79	UdRAC79
Am80	Prus80	UdRAC80
Am81	Prus81	UdRAC81
Am82	Prus82	UdRAC82
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Am84	Prus84	UdRAC84
Am85	Prus85	UdRAC85
Am86	Prus86	UdRAC86
Am87	Prus87	UdRAC87
Am88	Prus88	UdRAC88
Am89	Prus89	UdRAC89
Am90	Prus90	UdRAC90
Am91	Prus91	UdRAC91
Am92	Prus92	UdRAC92
Am93	Prus93	UdRAC93
Am94	Prus94	UdRAC94
Am95	Prus95	UdRAC95
Am96	Prus96	UdRAC96
Am97	Prus97	UdRAC97
Am98	Prus98	UdRAC98
Am99	Prus99	UdRAC99
Am100	Prus100	UdRAC100



**Source:**  
 The aerial and mapmaker boundary maps were prepared by the GIS Division of the  
 Mono County Department of Planning, Development, and Sustainability.  
 The geographic information was a digital representation of the "Highlands Water Protection and Planning Act"  
 prepared by the Mono County Department of Planning, Development, and Sustainability. Further documentation  
 can be obtained at: <http://www.mono-county.ca.gov/planning/development/sustainability>  
 The vector layers were obtained from the USGS Soil Survey Geospatial Data.  
 Data information was obtained from the USGS Soil Survey Geospatial Data.  
 The parcel information contained on this map is used to locate identify and inventory parcels of land in Mono County for  
 information, advisory and compliance purposes only and is not to be construed or used as a legal description. These  
 information is not based on the accuracy, but reliability is not guaranteed. Any errors or omissions should be reported to the  
 Mono County Department of Planning, Development & Sustainability, GIS Division. In no way will Mono County be liable  
 for any third party, including loss of sales, lost profits, business interruption, loss of business information or other damages  
 that may result from the use of the map or the information it contains.

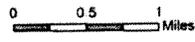


Figure C-10

# Municipal Stormwater Mitigation Plan

## Introduction

The Township recognizes that situations may arise in which the design and performance standards may be impossible to meet on the site of a proposed project because of site constraints such as soils, steep slopes, or adjacent structures such as basements. Therefore, this MSWMP in accordance with N.J.A.C. 7:8-4 developed the following municipal mitigation plan to accommodate these special cases. This municipal mitigation plan applies only to non-residential zones. Applicants for residential projects that have a need for mitigation may request use of this mitigation plan provided that they are consistent with and conform to the relevant requirements included in the Residential Site Improvement Standards (RSIS).

It is important to differentiate between a Municipal Mitigation Plan and a Project Mitigation Plan:

Municipal Mitigation Plans perform the following functions:

- Outlines circumstances that lead to the need for a project specific mitigation plan;
- Provides guidelines via submittal requirements for technical and administrative criteria;
- Provides lists of potential projects;
- Provides a format for implementation and follow-up;
- Provides likely areas of the municipality that would require mitigation;
- Supports the MSWM Ordinance.

The Project mitigation plan will perform the following with the guidance of the Municipal Plan:

- Establishes the need for a waiver;
- Documents potential impacts;
- Proposes mitigation projects or selects a project from the list provided in the municipal plan;
- Outlines the follow-up process.

The existence of this municipal mitigation plan does not supersede an applicant's responsibility to meet the design and performance standards for groundwater recharge, stormwater quantity, and stormwater quality for a given project to the maximum extent practicable. In limited circumstances, strict compliance with one or more of the design or performance standards can be waived provided there is a method to offset the effect of the deficiency in accordance with this mitigation plan. The test of the effectiveness of a proposed project mitigation plan includes reducing the size, scale or layout of the proposed project in order to meet the design and performance standards on the site and thereby avoid the need to seek a waiver. The waiver cannot be granted due to conditions created by the applicant.

Also, a waiver cannot be granted if the applicant requesting a waiver will result in a project that causes a localized adverse impact or creates a compliance deficit that cannot be compensated for by off-site mitigation.

It should be noted that the standards for the Special Water Resource Protection Area (SWRPA) established under the Stormwater Management rules N.J.A.C. 7:8-5.5 (h) cannot be waived by the Township.

In cases where the NJDEP issues a permit that includes a stormwater management review and an associated waiver under the provisions of the specific permit, the municipality is not required to further consider the project under the provisions of the municipal mitigation plan. However, the municipality may choose to require mitigation for projects receiving a waiver from the NJDEP.

The Township may grant a waiver for projects undertaken by the Township that are not subject to the MLUL. Any waiver granted by the Township for its own projects must include a report for the project addressing the requirements for mitigation projects. A summary of each waiver granted must be included in the Annual Report prepared by the Township as part of the compliance with the Township's NJPDES General Permit. Waivers for linear development projects must be evaluated using the requirements under N.J.A.C. 8:8-5.2(e), which includes the requirements to address mitigation for the performance standard for which compliance was not obtained.

The mitigation project must provide additional groundwater recharge benefits, or protection from stormwater runoff quality and quantity from previously developed property that does not currently meet the design and performance standards outlined in the MSWMP. The applicant must ensure the long-term maintenance of the mitigation project, including the maintenance requirements under Chapters 8 and 9 of the NJDEP Stormwater BMP Manual. If a suitable mitigation site cannot be located in the same drainage area as the proposed development, the mitigation project may provide mitigation that is not equivalent to the impacts for which the waiver or exemption is sought, but that addresses the same issue. For example, if a waiver is given because the 80% TSS removal requirement is not met; the selected project may address water quality impacts due to a fecal impairment.

### **General Requirements**

In order for a waiver from the stormwater management design and/or performance standards to be considered, an assessment of the impact that results from the requested deviation from full compliance with the standard(s) in the drainage area affected by the proposed project is required.

Selection of an appropriate mitigation project for a requested waiver/exception must adhere to the following requirements, which were developed by utilizing the NJDEP publication entitled "Guidance for the Development of Municipal Mitigation Plans – February 2006:

1. The project must be within the same area that would contribute to the receptor impacted by the project. If there are no specific sensitive receptors that would be impacted as the result of the grant of the waiver, then the location of the mitigation project can be located anywhere within the municipality, and should be selected to

provide the most benefit relative to an existing stormwater problem in the same category (quality, quantity or recharge).

2. Legal authorization must be obtained to construct the proposed mitigation project at the location selected. This includes construction access and maintenance and any access for the project in the future.
3. The project should be close to the location of the original project, and if possible, be located upstream at a similar distance from the identified sensitive receptor. This distance should not be based on actual location, but on a similar hydraulic distance to the sensitive receptor. For example, if the project for which the waiver is obtained discharges to a tributary, but the closest potential mitigation location discharges to the main branch, it may be more beneficial to identify a location discharging into the same tributary.
4. For ease of administration, if sensitive receptors are addressed, it is preferable to have one location that addresses any and all of the performance standards waived, rather than one location for each performance standard.
5. It must be demonstrated that implementation of the mitigation project will result in no adverse impacts to other properties.
6. Mitigation projects that address stormwater runoff quantity can provide storage for proposed increases in runoff volume, as opposed to a direct peak flow reduction.
7. A certificate of occupancy or final approval by the municipality for the project requiring mitigation cannot be issued until the mitigation project or measure receives final approval. This requirement does not apply to a funding option in which case the applicant must pay the designated amount to the municipality prior to receiving final approval or a building permit. Any mitigation projects proposed by the municipality to offset the stormwater impacts of that municipality's own projects must be completed within 6 months of the completion of the project.
8. The applicant must present a cost analysis prepared by a Professional Engineer that the cost of the mitigation project is equal to or greater than the cost of the waiver request.

### **Specific Mitigation Projects**

The different performance standards require different ways to look at mitigation projects for each performance standard identified. Stormwater quality is intended to prevent an increase in pollutants from entering the water bodies. Stormwater quantity focuses on the impacts of increased runoff on flooding, and groundwater recharge maintains the water that feeds base flow in streams and aquifers. Mitigation projects can be retrofits to an existing system, such as pre-existing development where stormwater management was not sufficiently addressed based on the new performance standards. They may also be new projects designed to provide control of stormwater runoff where none previously existed.

Sensitive receptors are areas with specific sensitivity to impacts of stormwater, whether through changes to stormwater runoff quality, stormwater runoff quantity, and groundwater recharge. Examples of sensitive receptors are trout associated waters, threatened and endangered species, impaired waterways, inadequate culverts, property subject to flooding, Category One waters, and aquifers. The sensitive receptor that is affected by the performance standard for which a variance is sought should be identified and considered when selecting the mitigation project.

#### Mitigation Projects for Stormwater Quality

Stormwater quality is regulated for the purpose of minimizing/preventing non-point pollution from reaching a waterway. Mitigation for stormwater quality can be achieved by directing the runoff from the water quality design storm into a natural area where it can be filtered and/or infiltrated into the ground; by constructing a new BMP to intercept previously untreated runoff; or by retrofitting existing stormwater systems that previously did not provide sufficiently for water quality.

Existing forested and other vegetated non-wetland areas can also be used as a water quality mitigation area if runoff is discharged as sheet flow through the area in a non-erosive manner, and the vegetated area is restricted from future development. A discussion of the appropriate widths for these vegetative filters is provided in Chapter 9 of the New Jersey Stormwater Best Management Practices Manual (BMP Manual).

If a mitigation project cannot be identified that would compensate for a waiver related to water quality, and provided the project requiring a waiver would not result in measurable change in water quality relative to TSS and nutrients, the mitigation project could be designed to address another parameter of concern in the watershed (as indicated by an impairment listing and/or an adopted TMDL) for which stormwater is a source, such as fecal coliform.

Some examples of areas or features sensitive to water quality changes include:

- *Trout Associated waters* – chemical pollutants and temperature effects can diminish viability of trout populations;
- *Lakes, ponds or other impoundments* – these waterways are sensitive to the addition of nutrients;
- *Threatened and endangered species or their habitats* – sensitive to both water quality changes;
- *Drinking water supplies* – adverse affects on quality can increase the cost of treatment or threaten the use of drinking water supplies;
- *Category One waters* – an issue for those streams where quality was the basis for the designation; and
- *Waterways with water quality or use impairment* – non-point pollution may result in further deterioration of water quality.

#### Mitigation Projects for Stormwater Quantity

Increased stormwater runoff volume from new development can cause damage to property and habitat due to increased flood elevations and/or flood velocities. Mitigation project areas can include locations that will provide for additional storage and slower the release of excess stormwater. Mitigation of stormwater quantity can be accomplished by increasing existing

ponding areas along a waterway, creating new BMP's to control previously uncontrolled runoff, or by retrofitting existing stormwater structures to decrease the volume and peak of stormwater runoff.

In areas adjacent to a stream, a hydrologic and hydraulic analysis can be performed to determine if increasing storage capacity would offset the additional volume of runoff from sites upstream of the storage area. Areas that may provide storage are lakes, ponds, parkland, or other land upstream of constrictions such as inadequately sized bridges or culverts. Increases in the storage capacity of an existing structure, such as upstream of a bridge or culvert, can also be considered provided that it is demonstrated that such an increase does not exacerbate flooding in other areas.

Note that work in regulated areas, such as floodplains and wetlands must be performed in accordance with applicable regulations such as the Flood Hazard Area Control Act Rules and the Freshwater Wetland Act Rules. Also, many areas of open space in New Jersey have received funding from the Department's Green Acres Program and many of those encumbered lands have restrictions placed on them as a result of that funding. Any and all restrictions placed on these lands must be investigated by the municipality before these areas can be utilized for mitigation to ensure that there are no conflicts.

Some examples of areas or features sensitive to changes with regard to flooding include:

- *Culverts and bridges* – these features may constrict flow and cause flooding or may provide storage that, if lost, would cause downstream flooding problems;
- *Property subject to flooding* – areas of concern include those where there is historical evidence of recurrent problems, particularly if exacerbated over time because of increasing the impervious surface in the contributing watershed;
- *Eroding/widening stream banks or channels* – particularly if due to changes in hydrology due to the effects of development;
- *Category One water* – flooding affects could alter habitat that was the basis for the designation; and
- *Wetlands* – changes in hydrology can affect viability of wetlands, either by increasing or decreasing volumes and velocities of water discharging to the wetlands.

#### Mitigation Projects for Groundwater Recharge

Groundwater recharge is regulated to maintain the groundwater hydrology of the project area. Recharge is the portion of the infiltrated stormwater runoff that permeates below the root mass and becomes groundwater. There are two (2) options in which to demonstrate compliance with the groundwater recharge standards. The first is that 100% of the site's average annual pre-developed groundwater recharge volume be maintained after development, and the second is that 100% of the difference between the sites pre-and post –development 2-year runoff volumes be infiltrated. To mitigate for groundwater recharge, either computational method can be utilized to determine the deficit that needs to be provided by the mitigation project.

Some examples of areas or features sensitive to groundwater recharge changes include:

- *Springs, seeps, wetlands, white cedar swamps* – these features are sensitive to changes in ground water level/hydrology;
- *Threatened and endangered species or their habitats* – some are sensitive to changes in ambient groundwater levels;
- *Streams with low base flow or passing flow requirements* – these features may be particularly sensitive to changes in hydrology;
- *Aquifer recharge zones* – loss of recharge in these areas can adversely affect groundwater supply; and
- *Category One waters* – loss of base flow may affect the basis for the designation.

### **Options for Mitigation Projects**

Applicants requesting waivers from stormwater design and/or performance standards can develop a mitigation project from the following options:

1. A mitigation project can be selected from the list of projects provided within this plan.
2. The applicant can propose a mitigation of project that is not on the current list in this plan, provided it meets the criteria that are specified in this MSWMP.
3. An applicant may be permitted to fund or partially fund a municipal environmental enhancement project that has been identified by the MSWMP. However, the funding option will only be allowed where the applicant requesting a waiver is proposing a mitigation project that will have no measurable impact with respect to flooding, erosion, water quality degradation. The Board should solicit input from the Township/Board Professionals when considering this type of project mitigation plan.

The funding option must be equal to or greater than the avoided cost to implement the stormwater facility that the waiver is being granted for, including the costs associated with purchasing any property or easement for mitigation, also engineering fees, permit fees, legal fees and the costs associated with the long-term maintenance requirements of the mitigation measure.

4. There is also a separate funding option for small projects and single-family homes. In the appropriate situation when an individual project requesting the waiver is small or is for the construction of a single family home and the degree of deficit in complying with the design and performance is small, a financial contribution may be a preferred option. In these situations, it may not be practical to implement a commensurate mitigation project for these circumstances. The intent of this Municipal Mitigation Plan is to serve as a method to accumulate funds to implement a larger mitigation project in the future. The Board may grant such a waiver on the recommendation of the Township/Board Professionals.

The municipality becomes responsible to ensure that the mitigation occurs in a timely fashion under Options Nos. 3 and 4.

## Guidance for the Selection of Mitigation Projects

The following is a list of mitigation projects that the municipality has identified that are eligible for mitigation:

1. Groundwater Recharge
  - a. Water Supply Well Field No. 4 located on Center Street in the Port Morris section of the Township – To include, but not be limited to removal of the existing pavement that surrounds the existing water supply well with pervious material to increase the potential for infiltration to the aquifer. In combination with retrofitting the existing stormwater collection system to promote on-site recharge.
  
2. Water Quality
  - a. Retrofit the existing municipal stormwater outfalls as designated by the Township Engineer with an appropriate BMP to reduce the discharge of Total Suspended Solids to a given receptor.
  - b. Retrofit and/or renovate one or more of the listed existing detention basins to provide 80 percent removal of total suspended solids.
  - c. Retrofit the existing stormwater management system of the Municipal Building to provide removal of 80% TSS.
  
3. Water Quantity
  - a. Retrofit one or more of the listed existing detention basins to provide increased storage capacity.

Table C-4: Detention Basin Inventory

Basin	Location	General Size	Depth
Lookout Mtn. No. 1	Vanover Dr, behind pump house	Large	10'-12'
Lookout Mtn. No. 2	Vanover Dr, across from pump house	Large	10'-12'
Poet's Peak No. 1	Lazaraus Dr., gated driveway	Large	12'-15'
Poet's Peak No. 2	Lazarus Dr., next to pump house	Large	10'-12'
Poet's Peak No. 3	Dickinson Ct., gated driveway	Large	12'-15'
Hunter's Ridge	Mooney Rd. & Fox Chase Rd.	Large	12'-15'
Hampton Ct.	Adjacent to pump station	Medium	unknown
Rivendell Road; Block 3301, Lot 28	Pond to the east of Rivendell	Large	4'-6'

Table C-4: Detention Basin Inventory

Basin	Location	General Size	Depth
Applewood Drive; Block 3402, Lot 7	East side of Applewood	Large	4'-6'
Whitegate Rd.; Block 1001, Lot 7	Dead end, south of Holly Dr.	Small	3'-4'
Colonial Way; Block 901, Lot 1	End of cul-de-sac	Medium	5'-6'
Wright Ct.; Block 201, Lot 10	End of cul-de-sac	Medium	5'-6'
Melissa Ln.; Block 4801, Lot 1	Behind houses #3 & #5	Medium	3'-4'
Tania Ct.; Block 4801, Lot 1	Left end of cul-de-sac	Medium	4'-5'
Lisa Ct.; Block 4801, Lot 1	Left end of cul-de-sac	Small	8'-10'
Forest Hollow; Block 4401, Lot 4	North side of Jessica Ln	Large	5'-6'
Schindler Drive; Block 5501, Lot 3	Between Schindler & Emmans Rd.	Medium	5'-6'
Pleasant Village.; Block 5403, Lot 12	Left side Pleasant Village Dr.	Large	3'-4'
Cliff Street	Next to house #16	Small	6'-8'
Horseshoe Lake	Corner of Eyland & E. Mapledale	Small	3'-5'
St. Therese	Corner of Main St. & Commerce Blvd.	Large	3'-4'
King Cove	Between King Rd. & Mt. Arlington Blvd.	Medium	6'-8'
Auriemma Court	In cul-de-sac	Small	6'-8'

If a suitable site cannot be located in the same drainage area as the proposed development, as discussed in Options Nos. 1 and 2, the mitigation project may provide mitigation to the impacts for which the waiver is sought, but that addresses the same issue. Listed are Environmental Enhancement projects that can be used to address the mitigation option.

1. Provide goose management measures, including public education at all one or more of the municipal parks.
2. Re-establish a vegetative buffer at the shoreline of the municipal parks.
3. Provide erosion control measures within areas selected by the Municipal Engineer to limit or prevent stream bank erosion.

## Administrative Requirements

The municipality must indicate in the Annual Report and Certification as required by the NJPDES Municipal Stormwater General Permit, any variance, exceptions, and related information from the stormwater management standards. The reporting of such occurrences including all documentation must be performed in accordance with the Administrative Standards listed in the NJDEP guidelines.

The following information is required to be submitted by the Applicant for any proposed mitigation project:

1. Provide a table quantifying what would be required for the project to achieve the standards, the extent to which this value will be achieved on site and the extent to which the value must be mitigated.
2. Provide a discussion and supporting documentation of the site conditions peculiar to the subject property that prevent the construction of a stormwater management facility which would achieve full compliance with the design and performance standards. Site conditions may include soil type, the presence of Karst Geology, acid soils, a groundwater table, unique conditions that would create an unsafe design, as well as conditions that may provide a detrimental impact to public health, welfare and safety.
3. Provide a discussion that demonstrates that the grant of the requested waiver/exemption would not result in an adverse impact that would not be compensated for by off site mitigation.
4. Identify the sensitive receptor(s) related to the performance standard from which a waiver is sought. Demonstrate that the mitigation site contributes to the same sensitive receptor.
5. Provide the design details of the mitigation project. This includes, but not limited to, drawings, calculations, and other information needed to evaluate the mitigation project. Also provide copies of all required Local, State or applicable permits for the mitigation measures.
6. List the party or parties responsible for the construction and the maintenance of the mitigation project. Documentation must be provided to demonstrate that the responsible party is aware of, has authority to, and accepts the responsibility for construction and maintenance. Under no circumstances shall the responsible party be an individual single-family homeowner. Selection of a project location that is under municipal authority avoids the need to obtain authority from a third party for the construction and future maintenance of the project.
7. Include a maintenance plan that addresses the maintenance criteria at N.J.A.C. 7:8-5.8. In addition, if the maintenance responsibility is transferred to the municipality or another entity, the entity responsible for the cost of the maintenance must be identified. The municipality may provide the option for the applicant to convey the mitigation project to the municipality, if the applicant provides for the cost of maintenance in perpetuity.

8. Demonstrate that the construction of the mitigation project coincides with the construction of the proposed project.