MUNICIPAL STORMWATER MANAGEMENT REPORT

BYRAM TOWNSHIP
SUSSEX COUNTY, NEW JERSEY

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ACKNOWLEDGEMENTS

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INTRODUCTION

As a result of the U.S. Environmental Protection Agency's "Phase II" rules published in December 1999, the New Jersey Department of Environmental Protection has developed a Municipal Stormwater Regulation Program, N.J.A.C. 7:14A-25, aimed at addressing the problem of pollutants entering our waters from storm drainage systems owned and operated by local government agencies. These systems, also called "municipal separate storm sewer systems,or MS4s for short, are currently conduits for pollutants and sediments to enter into existing water systems. According to federal and state studies, it is now believed that up to 60% of our existing water pollution problems are attributable to stormwater/nonpoint pollution. The fundamental principal of this program is that by regulating the condition of stormwater entering into the MS4 (called nonpoint discharges) the stormwater exiting the MS4 pipe network (called point discharges) into the impaired waterways can be a way of improving the quality of said waterways. Through public education programs explaining the problems associated with garbage disposal, lawn fertilizing and pet waste control as they relate to non-point discharges to the diligence of the municipality in its review, approval and implementation of new development and re-development projects, the Municipal Stormwater Regulation Program, over time, will have a positive affect on the quality of existing water systems.

The first step initiated by the Municipal Stormwater Regulation Program is to develop and institute a Municipal Stormwater Management Plan (MSWMP). This MSWMP is an instructional document intended to provide guidance for Byram Township ("the Municipality") in the many facets of the regulation plan as how to address stormwater-related impacts to existing waterways as required by the Municipal Stormwater Regulations. This plan contains all of the required elements described in N.J.A.C. 7:8 Stormwater Management Rules including how to address groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating stormwater design and performance standards for new major developments. These projects are defined as those new projects or redevelopment projects that disturb one or more acres of land or those projects that increase the impervious site coverage by 0.25 acres. This plan describes standards to be initiated that are intended to minimize the adverse impact of stormwater run off on water quality and water quantity and the loss of groundwater recharge that provides base flow in receiving water bodies. This plan also describes long-term operation and maintenance measures for existing and future stormwater facilities.

The final component of the plan is a mitigation strategy for when variances or exemptions of the design and performance standards are sought when the required standard procedures cannot be met. As part of the mitigation section of the stormwater management plan, specific stormwater management measures are identified to lessen the impact of existing development. These mitigation measures suggest reducing impervious area in previously developed lots to reduce the impact of stormwater runoff within various watersheds in the Township. It is anticipated that this mitigation procedure will be a dynamic process requiring timely re-evaluation to ensure that the needs of the municipality are met by an applicant requesting such waivers.

GOALS

As indicated previously, the general purpose of the Municipal Stormwater Regulation Program is to regulate stormwater/non-point discharge pollution from entering into existing waterways. Nine (9) specific implementation goals of this program are as follows:

1. *to reduce flood damage, including damage to life and property;*
2. *to minimize, to the extent practical, any increase in stormwater run off from any new development;*
3. *to reduce soil erosion from any development or construction project;*
4. *to assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;*
5. *to maintain groundwater recharge;*
6. *to prevent, to the greatest extent feasible, an increase in nonpoint pollution;*
7. *to maintain the integrity of stream channels for biological and drainage function;*
8. *to minimize pollutants in stormwater run off from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water; and*
9. *to protect public safety through the proper design and operation of stormwater basins.*

To achieve these goals, this plan outlines specific stormwater design and performance standards for new development and re-development activities. 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.

PURPOSE

The specific purpose of this Municipal Stormwater Management Plan (MSWMP) is to provide a guidance document for the implementation of the N.J.D.E.P. Municipal Stormwater Regulation Program in order to protect our waterways from pollution related to point discharges as well as non-point discharges. Through the implementation of the aforementioned plan goals, it is believed that the quality of our existing waterways will be substantially improved.

BACKGROUND

ByramTownship, known as the Township of Lakes, is located in the southeastern corner of Sussex County. It encompasses approximately 22.2 square mile area (14,235 acres) and is positioned within the New Jersey Highlands Region. The Township is rural in character and is bordered by Sparta Township to the Northeast, Andover Township and Andover Borough to the North, Green Township to the Northwest, Frelinghuysen Township to the West, Mount Olive Township and Stanhope Borough to the South and Hopatcong Borough to the East.

The landscape is generally made up of undeveloped forested lands, steep hills and environmentally sensitive lands with intermittent single-family homes and developments situated between. Commercial and retail developments are located along the major thoroughfare situated in the Township known as Route U.S. 206. As of 2002, approximately 37.5% of the Township consisted of agricultural lands (5,337 acres), 14.9% consisted of residential development (2,125 acres), 10.2% consisted of non-residential development (1,451 acres), 28.1% consisted of public property (3,997 acres) and approximately 9.3% was vacant land (1,325 acres). The market for homes in this area is attractive to commuters who work in areas along Interstate Routes 80, 287, and 280 in New Jersey.

The population of the Township has increased by 11.3% during the period from 1980 to 2010 according to the U.S. Bureau of the Census. The 2010 population was 8,350; the 2000 population was 8,254; the 1990 population was 8,048; and the 1980 population was 7,502. In 2010, the population was housed in 2,926 units. This yields an average 2.85 persons per unit. This trend of increasing population is expected to continue until the Township reaches a build-out condition, whereas the amount of unconstrained land cannot sustain the market demand for increased housing. The estimated future population for Byram Township in the year 2020 is 9,600 as indicated in the Sussex County Strategic Growth Report. This indicates a future increase of 15%.

According to the Byram Township Master Plan, the current planning goals for development in the Township are meant to “retain the natural features and environmental resources that give the Township its rural character and that provides for open space and recreation, protection of water quality and maintenance of wildlife habitat” as well as “ Develop a Village Center that combines residential, commercial and civic spaces, creating a viable focus for carefully controlled growth and a community hub for planned activities”.

The “Village Center” approach to development allows for residential components to be directly integrated with the commercial/retail/industrial components in a “walk to work” atmosphere. This innovative planning technique, which was the standard for original city and town planning, will negate the intense need for motor vehicle usage, and will lend to a more environmentally friendly atmosphere. Also, by concentrating development in such a village center approach, more open space can be preserved in the Township.

The core “Village Center” boundaries within the Township encompass land directly fronting on Route U.S. 206 and lands on the southern side of Lackawana Drive and are referred to as the

Village Center (VC) Zone. Concentration of future development in this Village Center will aid in supporting the State Development and Redevelopment Plan and the Highlands Act, which directs carefully planned growth to such areas. This guidance of concentrated development to specifically planned areas helps to limit disturbance of sensitive areas of the Township thereby preserving natural resources and avoiding sprawl. The clustering and planned development of residential, commercial and industrial uses are to be encouraged in the Village Center with the overall goal to "preserve the Township's rural appearance and protect scenic views throughout Byram, especially along roadways".

There are three (3) named major waterways located within Byram Township. These are the Musconetcong River (classified as a FW2-Trout Maintenance waterway), Lubbers Run (classified as a FW2-Trout Maintenance waterway) and Dragon Brook (classified as a FW2-Non-Trout C1 waterway). There are eighteen (18) major water bodies located within the Byram Township. These are Lake Mohawk (not listed), Lake Waterloo (not listed), Jefferson Lake (not listed), Cranberry Lake (classified as a FW2-Trout Maintenance C1 waterbody), Lake Musconetcong (not listed), Panther Lake (not listed), Johnson Lake (not listed), Forest Lake (not listed), Lake Lackawanna (not listed), Dallis Pond (not listed), Wolf Lake (not listed), Wright Pond (not listed), Frenches Pond (not listed), Tomahawk Lake (not listed), Kofferls Lake (not listed), Hughs Pond (not listed) and Stag Pond (not listed). The listed designations associated with the aforementioned waterways and waterbodies are as published in the N.J.D.E.P. Surface Water Quality Standards N.J.A.C. 7:9B.

Almost all of the waterways and water bodies located in the Township are present within the Upper Delaware Watershed Management Area (WMA#1) and are associated with both the Musconetcong Watershed and the Pequest Watershed. Association with the Wallkill Watershed Management Area (WMA#2) and the Wallkill Watershed also occurs. All of the waterways and water bodies classified as Category 1 Waters (C1), as well any tributary thereto, as indicated on the U.S.G.S. mapping or Soil Conservation District Mapping, would be subject to a Special Resource Protection Area (SRPA). This SRPA, measured 300' outwards from the banks associated with said waters, is meant to protect near stream vegetation that buffers pollutants from entering into waterways as well as environmentally sensitive areas associated with stream corridors.

It is evident from the Non-Trout and Trout Maintenance classification assigned to most of the aforementioned waterways and waterbodies, that said waters can be reasonably assumed to be impaired from an ecological and biological standpoint. This impairment is further acknowledged by the placement of major segment of the Musconetcong River on a list of impaired waters due to elevated pathogens as well as the placement of Cranberry Lake and Lake Musconetcong on a similar list of impaired waterbodies due to elevated levels of phosphorus causing eutrophication of said lakes.

STORMWATER DISCUSSION

Land development can dramatically alter the hydrologic cycle of a site and, ultimately, an entire watershed (see Figure 1). In a pre-developed condition, existing native vegetation acts to intercept precipitation falling on the site and draws that portion of this precipitation into the ground towards the root line. A portion of this intercepted rainfall is then returned back to the atmosphere through plant evapo-transpiration. Natural micro-topography of the lands surface creates depressions and gullies where accumulated rainfall temporarily collects as the infiltrative properties of the undisturbed soils allow this collected water to infiltrate back into the ground where it is stored as base flow for adjacent streams and ponds. In a developed condition, this beneficial vegetation and the natural make up of the topography and soil composition are usually removed. The mature growth vegetation is replaced with lawns or impervious cover, the natural imperfection of the landscape is graded to remove the natural depressions, and the undisturbed soil properties allowing infiltration are removed through construction disturbance and compaction. All of these processes experienced during typical construction operations can and do have a negative affect on the normal hydrologic cycle and affect run off quantity, run off quality and recharge potential of lands within a watershed.

RUN OFF QUANTITY

As indicated previously, rainfall is intercepted by vegetation, land topography and soil composition. The amount of rainfall during a storm event which is not intercepted, but is allowed to accumulate in the natural drainage basin and run off the sites in question is referred to as *Run off Quantity*. This run off quantity naturally drains across the lands through sheet flow and shallow concentrated flow where it is discharged into streams, channels and other waterways. During pre-developed conditions, the amount of rainfall introduced into these waterways is naturally mitigated through years of evolution of the natural drainage system. The established environmental properties of these systems allows for the proper distribution of accumulated stormwater through the system without severe detriment to the environment by flooding and erosion due to the natural environmental balance achieved.

When a site is disturbed, the amount of the initial interception of rainfall is reduced allowing a greater percentage of the accumulated "run off" to enter into the waterways. Through the modifications to natural vegetation (i.e. forests to lawns) and the placement of impervious areas that are connected to each other through gutters, channels, and storm sewers, the transport of run off from developed conditions occurs more quickly and at greater rates than that of the pre-developed natural conditions. This shortening of the transport or travel time quickens the rainfall-run off response of the drainage area, causing flow in downstream waterways to peak faster, higher and for greater lengths of time than natural conditions would permit. This process tends to increase and aggravate existing downstream flooding and erosion problems.

Historically, this increase in run off from developed sites was thought to be mitigated by controlling the release or rate of flow from the developed site to revert to that of pre-development conditions. Simply stated, the rate of run off from the site in the developed condition was to be

equal to or less than the rate of run off from the pre-developed site. It was believed that if the peak rate of run off was maintained, the downstream waterways could assimilate the run off in the same manner as before development. This feat was accomplished through the use of detention/retention basins to temporarily store the excess stormwater generated from the site and release it at the calculated pre-developed rates.

This design approach to controlling the addition run off from developed sites has been shown to be incorrect since it only attenuates the rate of flow and does nothing to control the amount or volume of stormwater generated by the site. Watershed studies in New Jersey have demonstrated that by controlling the stormwater rate of discharge only, the contributing flows from these basins have actually extended the duration of the peak flows and actually have increased flooding and erosion problems downstream. These same watershed studies determined that, by reducing peak post-development site run off to rates less than pre-developed site conditions throughout the watershed, the volume of post-development run off was redistributed and pre-development peaks were maintained or reduced throughout the watershed.

RUN OFF QUALITY

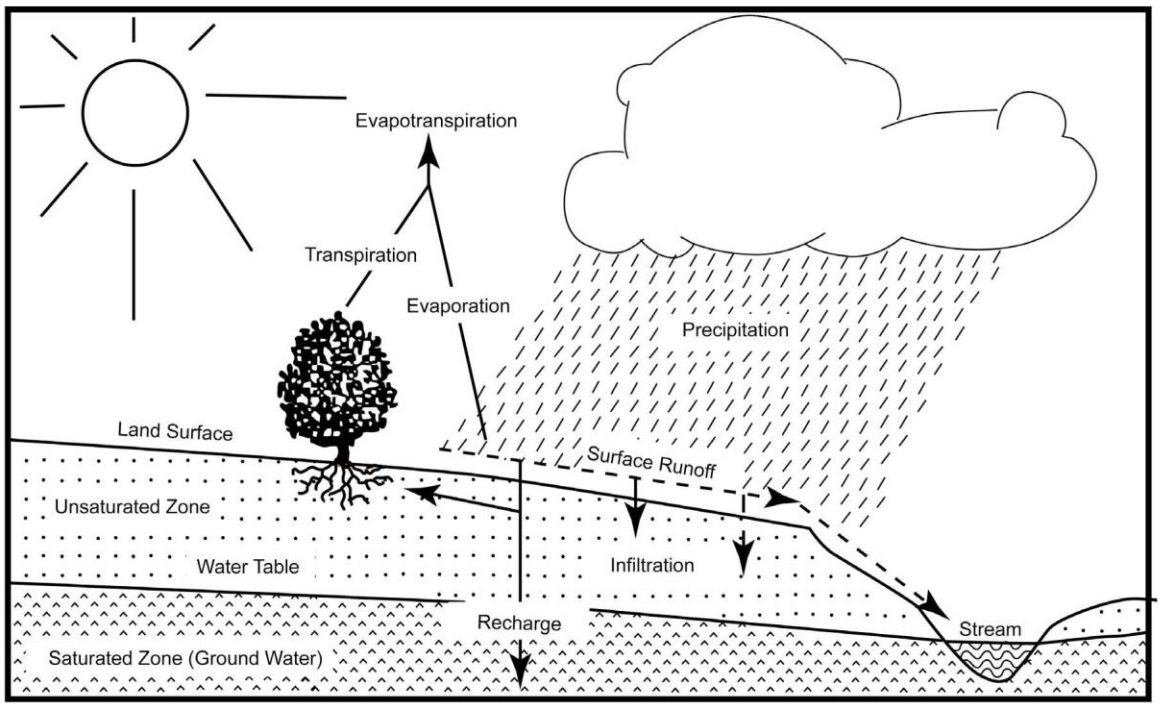
Land development often results in the accumulation of pollutants on the land surface that stormwater run off mobilizes and transports into streams and other water bodies. This action is found to degrade the *Water Quality* of the stormwater system. New impervious surfaces and cleared areas created by development can accumulate a variety of pollutants such as acidic deposits from the atmosphere, fertilizers, animal wastes, and leakage and wear from vehicles and man-made products. A listing of common pollutants includes the following:

- solids & floatable debris (bulk garbage)
- sediment (material from erosion)
- nutrients (nitrates & phosphates)
- pesticides (insecticides, herbicides, rodenticides and fungicides)
- heavy metals (lead, arsenic, copper, cadnium, mercury, etc.)
- road salt & grit
- petroleum hydrocarbons from oils and gasoline
- pathogens (viral and bacterial)

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 which are ultra-sensitive to changes in water temperature in relation to maintenance and production. Development can also remove trees along stream banks that normally provide shading, stabilization, filtration and leaf litter that falls into streams and becomes food for the aquatic community.

INFILTRATIVE RECHARGE

As indicated previously, part of the hydrologic cycle is for the absorption of rainfall through the soil into the underlying geology where it is stored in the soil's saturated zone as ground water. This process is known as "infiltrative recharge". The role of groundwater is commonly thought to be solely for the supply of water supply wells in human development. More importantly and in addition to this supply purpose, groundwater is a provider of base flows to streams, wetlands and other water bodies and has a direct affect on the ecology and germorphology of these resources. When lands are developed, increases in impervious areas along with decreases of naturally infiltrative areas are created. This creates a condition where a larger volume of stormwater leaves the site creating a deficit of the underlying groundwater and a subsequent decrease in the base flow potential for streams and wetlands. A cascading affect ensues allowing for wetland areas and streams to dry up, vegetation to die due to lack of substantial nutrients and the subsequent erosion and deposit of eroded material downstream due to lack of stabilized stream banks.



Source: New Jersey Geological Survey Report GSR-32.

Figure 1: Groundwater Recharge in the Hydrologic Cycle

DESIGN AND PERFORMANCE STANDARDS

As part of this Municipal Stormwater Management Plan, the municipality will adopt the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8. This is done to minimize the adverse impact of stormwater run off generated from all projects classified as "major development" on water quality and water quantity as well as loss of groundwater recharge in receiving water bodies. These design and performance standards include the language for water quality control as indicated in N.J.A.C. 7:8-5.5, for water quantity control as indicated in N.J.A.C. 7:8-5.4(a)3, for groundwater recharge as indicated in N.J.A.C. 7:8-5.4(a)2, for maintenance of stormwater management measures as indicated in N.J.A.C. 7:8-5.8, and for safety standards as indicated in N.J.A.C. 7:8-8.6.

APPLICABILITY

A potential project is considered to be a "major development" if it provides for the ultimate disturbance of one or more acres of land or the increase in impervious surface by one-quarter acre or more as defined in N.J.A.C. 7:8. Disturbance for the purpose of this rule is defined as the placement of impervious surfaces or exposure and/or movement of soil or bedrock, or the clearing, cutting or removing of vegetation. Projects undertaken by any government agency which otherwise meet the definition of "major development" but which do not require approval under the Municipal Land Use Law, N.J.S.A. 40:55D-1 et seq. are also considered to be major developments.

The following linear type development projects are exempt from these standards, even if they are found to be consistent with the definition of a "major project":

- The construction of an underground utility line provided that the disturbed areas are revegetated upon completion;
- The construction of above ground utility lines provided that the existing conditions are maintained to the maximum extent practicable;
- The construction of pedestrian access such as a sidewalk or trail with a maximum width of 14 feet provided that the access is made of a permeable material.

A waiver from strict compliance with these standards may be obtained from the administrative authority for the enlargement of an existing public roadway or railroad; or the construction or enlargement of a public pedestrian access, provided that the following conditions are met:

- The applicant should demonstrate that there is a public need for the project that cannot be accomplished by any other means;

- The applicant should demonstrate through an alternative analysis that the design option selected complies with these standards to the maximum extent practicable through the use of nonstructural and structural stormwater management measures;

- The applicant should demonstrate that in order to meet these standards, existing structures currently in use, such as homes and buildings, would need to be condemned; and
- The applicant should demonstrate that it does not own or have legal rights to areas, including potential to obtain said areas through condemnation excluding the aforementioned structures, within the upstream drainage area of the receiving water bodies affected, that would provide additional opportunities to mitigate the standards found to be unachievable on-site.

LOW IMPACT DEVELOPMENT

With increasing emphasis on non-point source pollution and concerns over the environmental impacts of land development, it has become necessary to develop effective alternatives to the centralized conveyance and treatment strategy that has been the basis for much of the stormwater management systems and programs in the state. Simply directing stormwater along curbed gutters to drainage inlets where piping conveys this stormwater to open detention basins for attenuation is no longer an acceptable means of treating stormwater. Implementation of new strategies is essential to minimize and even prevent adverse stormwater impacts from occurring while also providing for the necessary water quality treatment of pollutants at the source of these stormwater flows. Such strategies, referred to as l*ow impact development*, seek to reduce and/or prevent adverse run off impacts through sound site planning and through both non-structural and structural management techniques that preserve or closely mimic the site's natural or pre-developed hydrologic responses to precipitation. As such, low impact development promotes the concept of designing with nature.

Effective low impact development includes non-structural and structural techniques referred to as Best Management Practices (BMP's). The non-structural BMP's utilized in low impact development concentrate on the following practices to be utilized in site development:

- Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss;

- Minimize impervious surfaces and disconnect or break up flow of run off over impervious surfaces;

- Maximize the protection of natural drainage features and vegetation;

- Minimize the "decrease" in the time of concentration of stormwater generated from project drainage areas from the pre-construction condition to the post-construction condition;

- Minimize land disturbance including clearing and grading;

- Minimize soil compaction;

- Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides;

- Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas;

- Provide drainage source controls to prevent or minimize the use or exposure of pollutants at the site in order to prevent or minimize the release of these pollutants into stormwater run off.

The structural BMP's utilized in low impact development concentrate on the following practices to be utilized in site development in conjunction with the non-structural methods described above:

- Bio-retention Systems – A bioretention system consists of a soil bed planted with native vegetation located above an underdrained sand layer. The system consists of a soil bed planted with vegetation; it can be underdrained, or runoff can infiltrate into the subsoil. It can be configured either as a basin or a swale. Pollutants are treated through the processes of settling and uptake and filtration by the vegetation. Pollutants are also treated within the soil bed through infiltration. The total suspended solids (TSS) removal rate is 80 - 90%; this rate will depend on the depth of the soil bed and the type of vegetation selected.

- Standard Constructed Wetlands – Standard constructed wetlands are stormwater management systems designed to maximize the removal of pollutants from stormwater runoff. Flow is directed through an engineered, open marsh system where pollutants are removed through settling and vegetative uptake/filtration. The total suspended solids (TSS) removal rate is 90%.

- Dry Wells - Dry wells are subsurface stormwater facilities that are used to collect and temporarily store runoff from clean rooftops; runoff is discharged through infiltration into the subsoil. Dry wells may be used to comply with the groundwater recharge design and performance standard of the Stormwater Management rules. Additionally, they may also be used to reduce the volume of clean, roof runoff.

- Extended Detention Basins - An extended detention basin is a stormwater management facility that temporarily stores and attenuates stormwater runoff. In addition, extended detention basins provide pollutant treatment for runoff from the Water Quality Design Storm through settling. When designed in accordance with this chapter, the total suspended solids (TSS) removal rate is 40 - 60%, depending on the duration of runoff detention.

- Infiltrative Basins – Infiltration basins are stormwater management systems constructed with highly permeable components designed to both maximize the removal of pollutants from stormwater and to promote groundwater recharge. Pollutants are treated through settling, filtration of the runoff through, and biological and chemical activity within, the components. The total suspended solids (TSS) removal rate is 80%.

- Manufactured Treatment Devices – A manufactured treatment device is a pre-fabricated stormwater treatment structure utilizing settling, filtration, absorptive materials, vortex separation, vegetative components, and/or other appropriate technology to remove pollutants from stormwater run-off. Currently, the total suspended solids (TSS) removal rate is either 50 or 80%, depending upon the individual certification of the device.

- Pervious Paving Systems – A pervious paving system is a stormwater management facility used to address the impacts of land development. The system consists of a durable, permeable surface course, which allows stormwater to move through it; this surface course is placed over a transition layer and a storage bed of open-graded, meaning devoid of fine particles, aggregate. There are two types: underdrained systems and systems designed to infiltrate into the subsoil. The total suspended solid (TSS) removal rate is 80%.

- Blue Roofs - Blue roofs are systems that are designed to provide stormwater detention. Rainfall onto the roof is managed using orifices, weirs, or other outlet devices that control the discharge rate of rooftop runoff. By reducing flow rates from rooftops, blue roofs are effective in reducing the size of downstream detention basins.

- Sand Filters – A sand filter is a stormwater management system designed to maximize the removal of pollutants from stormwater. It consists of a pre-treatment zone and a treatment zone, which includes the sand bed, and in underdrained systems, and the underlying components. Pollutants are treated through settling, filtration, and adsorption by the sand bed. The total suspended solids (TSS) removal rate is 80%.

- Vegetative Filter Strip – A vegetative filter strip is a stable, evenly graded area that removes pollutants from stormwater runoff through filtration and biological uptake. In order to provide pollutant treatment, runoff must enter and move through the filter strip as sheet flow; therefore, vegetative filter strips must have shallow enough slopes to maintain sheet flow. The total suspended solid (TSS) removal rate is 60 - 80%, depending on the type of vegetation.

- Wet Ponds - Wet ponds, also known as retention basins, are used to address the stormwater quantity and quality impacts of land development. This type of stormwater facility has an elevated outlet structure that creates a permanent pool where stormwater runoff is detained and attenuated. Wet ponds can be designed as multi-stage, multi-function systems; extended detention in the permanent pool provides pollutant treatment for runoff from the Water Quality Design Storm through sedimentation and biological processing; detention and attenuation are also provided for larger storm event through the higher elevation outlets. The total suspended solids (TSS) removal rate is 50 - 90%, depending upon the storage volume in the permanent pool and the duration of detention time, if extended detention is provided.

- Grass Swales - A grass swale is a stable, parabolic or trapezoidal channel that is lined with turf; it is used to improve water quality and convey stormwater runoff. Grass swales do not rely on the permeability of the underlying soil for pollutant removal; instead, pollutants are removed by settling and filtration through the grass. The maximum total suspended solids (TSS) removal rate is 50%.

- Subsurface Gravel Wetlands - A subsurface gravel wetland is a stormwater management system designed to maximize the removal of pollutants from stormwater; the system is a combination of a surface marsh and a subsurface gravel bed. Pollutants are treated through settling, both uptake and filtration by vegetation, and chemical transformation in the subsurface bed, specifically denitrification. Both the total suspended solids (TSS) removal rate and the nitrogen removal rate are 90%.

- Green Roofs - A green roof, also known as a vegetated roof, is a roof that has been covered with a growing medium and vegetation. Green roofs are effective for reducing the amount of stormwater runoff leaving a site. A green roof consists of vegetation planted in growing media on top of a drainage layer that intercepts stormwater and reduces the total volume of runoff through evapotranspiration.

- Cisterns - Cisterns are stormwater facilities that temporarily store stormwater runoff from rooftops, which is subsequently reused for non-potable uses, such as toilet flushing and vehicle washing. Cisterns can either be indoors or outdoors and above, at, or below grade. The reuse of the stormwater reduces the volume of

stormwater runoff that makes it to downstream facilities. Take note that cisterns are not a viable stormwater management choice for sites with little or no demand for reuse.

All structural stormwater management measures (structural BMP's) shall be designed according to the following conditions:

- They should to take into account the existing site conditions, including, for example, environmentally critical areas; wetlands; flood-prone areas; slopes; depth to seasonal high water table; soil type, permeability and texture; drainage area and drainage patterns; and the presence of solution-prone carbonate rocks (limestone).

- They should be designed to minimize maintenance, facilitate maintenance and repairs, and ensure proper functioning. Trash racks shall be installed at the intake to the outlet structure as appropriate, and shall be parallel bars with one-inch (1") spacing between the bars to the elevation of the water quality design storm. For elevations higher than the water quality design storm, the parallel bars at the outlet structure shall be spaced no greater than one-third (1/3) the width of the diameter of the orifice or one-third (1/3) the width of the weir, with a minimum spacing between bars of one-inch and a maximum spacing between bars of six inches. In addition, the design of trash racks must comply with the requirements of N.J.A.C. 7:8-7.D.

- They should be designed, constructed, and installed to be strong, durable, and corrosion resistant. Measures that are consistent with the relevant portions of the Residential Site Improvements Standards at N.J.A.C. 5:21-7.3, 7.4, and 7.5 shall be deemed to meet this requirement.

- At the intake to the outlet from the stormwater management basin, the orifice size shall be a minimum of two and one-half inches in diameter.

- Stormwater management basins shall be designed to meet the minimum safety standards for stormwater management basins at Section N.J.A.C. 7:8-7.

- Stormwater management measure guidelines are available in the New Jersey Stormwater Best Management Practices Manual. Other stormwater management measures may be utilized provided the design engineer demonstrates that the proposed measure and its design will accomplish the required water quantity, groundwater recharge and water quality design and performance standards established by this subchapter.

- Manufactured treatment devices may be used to meet the requirements of this subchapter, provided the pollutant removal rates are verified by the New Jersey Corporation for Advanced Technology and certified by the N.J.D.E.P.

- In order to ensure adequate long term operation as well as preventative and corrective maintenance of stormwater management measures and structural BMP's, the designers of such facilities should submit to the municipality a *Maintenance Plan* indicating specific maintenance tasks and schedules as indicated in N.J.A.C. 7:8-5.8 "Maintenance Requirements". This maintenance plan will require the ultimate user of said structural BMP's to provide an annual certification that the stormwater management measures approved are functioning as designed and that the proper maintenance and inspection of said measures have been performed. Random spot inspections by the municipality will be conducted to ensure compliance along with appropriate enforcement actions such as fines to be levied should non-compliance result.

DESIGN STANDARDS

The following specific stormwater management performance standards will be met:

Run off Quantity

Peak flow reductions requirements are to be implemented into the stormwater system design in order to mitigate the expected stormwater flow and volume increases created through proposed development. The peak flow reduction requirements, which are similar to those previously published in the N.J.D.E.P. Flood Hazard Area Control Act Rules and the New Jersey Department of Community Affairs Residential Site Improvement Standards (R.S.I.S.), are as follows:

2 year design storm	allowable peak rate for proposed development is 50% of existing peak rate (or 50% reduction)
10 year design storm	allowable peak rate for proposed development is 75% of existing peak rate (or 25% reduction)
100 year design storm	allowable peak rate for proposed development is 80% of existing peak rate (or 20% reduction)

Run off Quality

Stormwater management measures implemented during land development shall be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater run off generated from the water quality design storm by 80% of the anticipated load from the developed site, expressed as an annual average. Table 2 in N.J.A.C.7:8-5.5 presents the presumed TSS removal rates for certain BMP's designed in accordance with the New Jersey Best Management Practices Manual. It shall also be designed to reduce, to the maximum extent feasible, the post-construction nutrient load from the developed site in stormwater run off generated from the water quality storm.

Recharge:

Groundwater recharge shall be designed in accordance with the following:

100% of the development site's average annual pre-developed groundwater recharge volume will be maintained as calculated using the New Jersey Regional Groundwater Spreadsheet (N.J.G.R.S.) provided by the New Jersey Geological Society (N.J.G.S.)

or

100% of the difference between the development site's pre-developed and post-developed 2 year design storm run off amounts as calculated by utilizing current engineering design

practices such as the Rational Method, Modified Rational Method, S.C.S. TR-55 Method as appropriate.

This groundwater recharge requirement does not apply to projects within "urban redevelopment areas" or to projects subject to the following types of stormwater:

- Stormwater from areas of high pollutant loading. High pollutant loading areas are areas in industrial and commercial developments where solvents and/or petroleum products are loaded/unloaded, stored, or applied, areas where pesticides are loaded/unloaded or stored, areas where hazardous materials are expected to be present in greater than "reportable quantities" as defined by the United States Environmental Protection Agency (EPA) at 40 CFR 302.4, and areas where recharge would be inconsistent with Department approved remediation action work plan or landfill closure plan and areas with high risks for spills of toxic material, such as gas stations and vehicle maintenance facilities

- Industrial stormwater exposed to source material. "Source Material" means any material(s) or machinery located at an industrial facility that is directly or indirectly related to process, manufacturing or other industrial activities, which could be a source of pollutants in any industrial stormwater discharge to groundwater. Source materials include, but are not limited to, raw materials, intermediate products, final products, waster material, by-products, industrial machinery and fuels, and lubricants, solvents and detergents that are related to process, manufacturing, or other industrial activities that are exposed to stormwater.

The project shall be designed in regard to recharge such that the hydraulic impact on the groundwater table is avoided. Potential adverse hydraulic impacts include, but are not limited to, exacerbating a naturally or seasonal high water table so as to cause surficial ponding, flooding of basements or interference with the proper operation of subsurface disposal systems and other subsurface structures in the vicinity or down gradient of the recharge area.

PLAN CONSISTENCY

Residential Site Plan Improvement Standards

The Municipal Stormwater Management Plan will be consistent with the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21 or any amendments thereto. 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.

Soil Erosion and Sediment Control Standards

The Municipality's Stormwater Management Ordinance will require all new development and redevelopment plans to comply with New Jersey's Soil Erosion and Sediment Control Standards. Because the municipality is not an exempt municipality, review, approval, and inspections related to Soil Erosion and Sediment Control are provided by the Sussex County Soil Conservation District. However, during construction activities, municipal inspectors will observe land disturbance as well as on-site soil erosion and sediment control measures and will report any inconsistencies to the local Soil Conservation District.

Stream Corridor Studies

The Byram Township Environmental Commission was instrumental in preparing a Stream Corridor Study for Lubbers Run entitled "Lubbers Run Greenway Project" prepared by March Associates Landscape Architects, P.C. Recommendations of this study include the establishment of Headwater Protection Ordinances, Forest Preservation Ordinances and Development Alternative Ordinances in the Lubbers Run Greenway Project area defined in the stream corridor study. These newly established ordinances, in conjunction with the stormwater control ordinances to be developed as part of this stormwater management plan, will be implemented by Township and all development taking place within the limits of the study area will be consistent with said plan.

Regional Stormwater Management Plans

Because the municipality is not located within an adopted Regional Stormwater Management Planning Area, conformance to a regional stormwater management plan (RSWMP) is not required. Any RSWMPs proposed in the future will require an update to this Municipal Stormwater Management Plan as appropriate in order for conformance to take place.

Total Maximum Daily Loads (TMDL's)

TMDLs represent the assimilative or carrying capacity of the receiving water taking into consideration point and nonpoint sources of pollution, natural background, and surface water withdrawals. A TMDL is developed as a mechanism for identifying all the contributors to surface water quality impacts and setting goals for load reductions for specific pollutants as necessary to meet surface water quality standards. TMDLs are required, under Section 303(d) of the federal Clean Water Act, to be developed for water bodies that cannot meet surface water quality standards

after the implementation of technology-based effluent limitations. TMDLs may also be established to help maintain or improve water quality in waters that are not impaired.

A TMDL establishes Waste Load Allocations and Load Allocations for point and nonpoint sources, respectively. Regulations concerning TMDLs are contained in EPA's Water Quality Planning and Management Regulations (40 CFR 130). "A TMDL is established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality." (40 CFR 130.7(c)).

Where TMDLs are required to address documented surface water quality impairment, allocations are made to the varying sources contributing to the water quality problem in order to reduce the total pollutant load received by the waterbody. Load reduction goals established through TMDLs are achieved through the issuance of waste load allocations for point source discharges and load allocations for nonpoint source discharges. Since nonpoint source pollution, by definition, does not come from discrete, identifiable sources, load allocations would consist of the identification of categories of nonpoint sources that contribute to the parameters of concern. The load allocation would also include specific load reduction measures for those categories of sources, to be implemented through best management practices (BMPs), including local ordinances for stormwater management and nonpoint source pollution control, headwaters protection practices, or other mechanisms for addressing the priority issues of concern.

A TMDL is considered "proposed" when NJDEP publishes the TMDL Report as a proposed Water Quality Management Plan Amendment in the New Jersey Register (NJR) for public review and comment. A TMDL is considered to be "established" when NJDEP finalizes the TMDL Report after considering comments received during the public comment period for the proposed plan amendment and formally submits it to EPA Region 2 for thirty (30)-day review and approval. The TMDL is considered "approved" when the NJDEP-established TMDL is approved by EPA Region 2. The TMDL is considered to be "adopted" when the EPA-approved TMDL is adopted by NJDEP as a water quality management plan amendment and the adoption notice is published in the NJR.

The following table(s) references the TMDL's observed in the municipality:

Report entitled: Total Maximum Daily Loads for Fecal Coliform to Address 28 Streams in the Northwest Water Region, Approved: September 29, 2003.

TMDL No.	Station Name / Waterbody	Site ID	River Miles
8	Musconetcong River at Lockwood	1455801	2.0 mi.
9	Musconetcong River at Beattystown	1456200	17.9 mi.

Report entitled: Total Maximum Daily Loads for Fecal Coliform to Address 10 Streams in the Northwest Water Region, Approved: September 15, 2005.

TMDL No.	Station Name / Waterbody	Site ID	River Miles
3	Musconetcong River at Lockwood	1455801	2.0 mi.

Report entitled: Total Maximum Daily Loads for Pathogens to Address 11 Lakes in the Northwest Water Region, Adopted: October 19, 2009.

TMDL No.	Lake Assessment Unit Name	Lake Assessment Unit ID
4	Forest Lake	Forest Lake - 01
6	Lackawanna Lake	Lackawanna Lake - 01
10	Lake Mohawk	Lake Mohawk - 01

The pollutant of concern for these TMDL's is pathogens, the presence of which is indicated by elevated concentrations of fecal coliform bacteria. A subset of total coliform, fecal coliform originates from the intestines of warm-blooded animals and is therefore found in accumulated feces from said animals. Because fecal coliform concentrations were found to exceed New Jersey's Surface Water Quality Standards for the segment of waterway specified, this segment of waterway is viewed to be impaired requiring remediation.

In order to remedy the indicated impairment, sources of the increased levels of fecal-coliform must be assessed. The contributing sources include non-stormwater point discharges such as discharges from sanitary sewer treatment facilities, stormwater point discharges such as discharges from stormwater pipes and detention systems, and non-point run off such as storm-driven loading from various land uses that transport fecal coliform from sources such as geese, farms, domestic pets, as well as illicit discharges from failing or inappropriately located septic systems.

Indirect remediation for this TMDL will include public education of residents pertaining to problems associated with improper disposal of pet and animal waste, septic system operation and maintenance, adherence to the new stormwater regulations in regard to water quality provisions for new development, and funding programs for agricultural activities coordinated through the local Soil Conservation District. Direct remediation will occur through required implementation of activities enacted to provide water quality from lands draining to this stream. This would be accomplished through the municipal approvals process for any owner/applicant requesting municipal action or approval on such lands for proposed development pertaining to building permits, zoning permits or land use board permits. These water quality actions could range from the reforestation of stream buffers directly adjacent to the stream in order to provide filtration of non-point source discharges from farmlands to the requirement that applicants ensure the proper function and continued maintenance of subsurface disposal systems through an established maintenance plan as part of a land use application. The non-stormwater point discharge remediation would be provided through the re-examination and re-issuance of the N.J.D.E.P. discharge permits associated with the sanitary sewer treatment facilities discharging to this stream segment.

Report entitled: Total Maximum Daily Loads for Phosphorus to Address 4 Eutrophic Lakes in the Northwest Water Region, Approved: September 17, 2003.

TMDL No.	Lake Name	WMA	Acres
1	Cranberry Lake	01	190
4	Lake Musconetcong	01	314

The pollutant of concern for these TMDLs is total phosphorus. The mechanism by which phosphorus can cause use impairment is via excessive primary productivity. Phosphorus is an essential nutrient for plants and algae, but is considered a pollutant because it can stimulate excessive growth (primary production). Phosphorus is most often the major nutrient in shortest supply relative to the nutritional requirements of primary producers in freshwater lakes; consequently, phosphorus is frequently a prime determinant of the total biomass in a lake. Furthermore, of the major nutrients, phosphorus is the most effectively controlled through engineering technology and land use management (Holdren *et al*, 2001). Eutrophication has been described as the acceleration of the natural aging process of surface waters. It is characterized by excessive loading of silt, organic matter, and nutrients, causing high biological production and decreased basin volume (Cooke et al, 1993). Symptoms of eutrophication (primary impacts) include oxygen super-saturation during the day, oxygen depletion during night, and high sedimentation (filling in) rate. Algae and aquatic plants are the catalysts for these processes. Secondary biological impacts can include loss of biodiversity and structural changes to communities. Phosphorus is generally the nutrient responsible for overfertilization of inland lakes leading to eutrophication.

In order to prevent excessive primary productivity and consequent impairment of recreational, water supply and aquatic life designated uses, the Surface Water Quality Standards (SWQS, N.J.A.C. 7:9B) define both numerical and narrative criteria that address eutrophication in lakes due to overfertilization. The total phosphorous (TP) criterion for freshwater lakes at N.J.A.C. 7:9B – 1.14(c)5 indicates that for freshwater 2 classified lakes, "Phosphorus as total phosphorus shall not exceed 0.05 mg/l in any lake, pond or reservoir or in a tributary at the point where it enters such bodies of water, except where site-specific criteria are developed to satisfy N.J.A.C. 7:9B-1.5(g)3." N.J.A.C. 7:9B-1.5(g)3 states that the New Jersey Department of Environmental Protection may establish site-specific water quality criteria for nutrients in lakes, ponds, reservoirs or streams, in addition to or in place of the criteria in N.J.A.C. 7:9B-1.14, when necessary to protect existing or designated uses. Such criteria shall become part of the Surface Water Quality Standards. Presently, no site-specific criteria apply to any of these lakes.

In order to remedy the indicated impairment, sources of the increased levels of phosphorus must be assessed. The contributing sources include non-stormwater point discharges such as discharges from sanitary sewer treatment facilities, stormwater point discharges such as discharges from stormwater pipes and detention systems, and non-point run off such as storm-driven loading from various land uses that transport phosphorus from adjacent lands, as well as illicit discharges from failing or inappropriately located septic systems.

The State of New Jersey has adopted a watershed approach to water quality management. That plan divides the state into five watershed management regions, one of which is the Northwest Region. The Department recognizes that lake restoration requires a watershed approach. Lake Restoration Plans will be used as a basis to address overfertilization and sedimentation issues in watersheds that drain to these sensitive lakes. In addition, the Department will direct research funds to understand and demonstrate biomanipulation and other techniques that can be applied in New Jersey lakes to promote the establishment of healthy and diverse aquatic plant communities in shallow lakes. Finally, public education efforts will focus on the benefits of aquatic plants in shallow lakes and the balance of aquatic life uses with recreational uses of these lakes.

The Department has also initiated a renewed ambient lake monitoring network designed to provide the water quality data necessary to assess the ecological health of the State's lentic water resource. This program will involve the testing of randomly selected lakes from the state's approximately 1100 named lakes. The water quality measurements conducted at each lake will include parameters such as dissolved oxygen, pH, nutrients, and chlorophyll a. Such testing will assist New Jersey in determining the status and trends in lake water quality, to meet our Clean Water Act requirements and our Total Maximum Daily Load (TMDL)-related water quality assessment needs.

Report entitled:

Unit ID	Lake Name	WMA
02040105150060	Cranberry Lake/Jefferson Lake & Tribs.	01

Mercury is a persistent, bio-accumulative toxin that can be found in solid, liquid, or vapor form. Mercury can cause a variety of harmful health effects including damage to the brain, central nervous system, and kidneys and is particularly harmful to children and pregnant and nursing women. Mercury comes from various natural and anthropogenic sources, including volcanic activity, burning of some forms of coal, use in dental procedures and manufacturing, use and disposal of products containing mercury. Most often, mercury enters the environment in gas or particulate form and is deposited on surfaces, often through precipitation, which washes deposited mercury into waterways. There it undergoes a natural chemical process and is converted to a more toxic form – methyl mercury. The methyl mercury builds up in the tissues of fish and animals, increasing its concentration as it moves up through the food chain, which results in high levels of mercury in some of the foods we eat. At certain levels, fish consumption advisories are triggered.

Mercury contamination in the environment is ubiquitous, not only in New Jersey, but worldwide. Mercury contamination is a global issue because the overwhelming source of mercury is air deposition. Consequently, mercury pollution will not be abated on a state by state basis alone, but must be controlled by regional, national and international efforts. In recognition of this, the New England Interstate Water Pollution Control Commission (NEIWPCC) established the *Northeast Regional Mercury Total Maximum Daily Load* dated October 24, 2007 (Northeast

Regional TMDL), a regional TMDL for the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont which addressed impairments due to mercury contamination of waterbodies where the main source of mercury contamination is air deposition. It was approved by EPA on December 20, 2007. As EPA has approved establishment of regional TMDLs for mercury impairments where the primary source is air deposition using the NEIWPCC approach, the Department has determined that it is appropriate for New Jersey to develop a similar TMDL for comparable impairments in New Jersey, not only to recommend a course of action to reduce mercury contamination in New Jersey, but to further emphasize that substantial source reductions from outside New Jersey will be needed to achieve water quality objectives. Therefore, New Jersey has developed a statewide TMDL that will complement the Northeast Regional TMDL developed for the northeast states.

With the combination of New Jersey's strong commitment to the collection and use of high quality data to support environmental decisions and regulatory programs, including TMDLs, and Lake Restoration Plans, implementation of the newly adopted Stormwater Regulations introduced as part of this Stormwater Management Report, and reliance on municipalities' distribution of public educational information regarding non-point and point source pollutions to stormwater, the Department is reasonably assured compliance with the total phosphorus criteria applicable to these eutrophic lakes will occur. If any additional TMDLs are developed in the future, this Municipal Stormwater Management Plan will be updated to be consistent with this feature.

ACHIEVEMENT OF GOALS

Specific examples of utilizing the aforementioned stormwater management design and performance standards in achieving the nine (9) goals of this plan are as follows:

1. Reduction of flood damage, including damage to life and property;

   By instituting the design practices found in N.J.A.C. 7:8-5 regarding stormwater collection and control, as well as requiring groundwater recharge requirements of proposed development to match that of existing lands, flood damage potential is greatly reduced. By limiting the quantity of stormwater leaving the site and controlling the rate of discharge, overburden of downstream areas is eliminated. Also, by controlling the rate of groundwater infiltration into the ground, "base flows" associated with amounts of groundwater available to streams and ponds are preserved, thereby allowing the ecological functions of the streams to continue rather than "dry up", leaving un-vegetated stream banks and non-ecological areas susceptible to channel and stream erosion.

2. Minimize, to the extent practical, any increase in stormwater run off from any new development;

   Through the implementation of the aforementioned performance standards, increases in stormwater run off from development sites will be prevented, reducing the potential for flooding and flood damage along receiving water bodies and downstream properties. By reducing the amount of connected impervious surfaces, utilization of low impact development techniques including conservation of native vegetation, increasing the time of concentration for storm events through site manipulation and preservation of existing infiltrative soil properties, the amount, duration and peak discharge of stormwater run off can be maintained without increase from the pre-development to post-development conditions.

3. Reduce soil erosion from any development or construction project;

   As a condition of any approval for private development in the municipality as well as during the process of design and implementation of capital improvements, a Soil Erosion & Sediment Control permit is required prior to the start of any construction on-site. In order to receive this permit, review and certification of the construction plans by local Soil Conservation District must be obtained. Through this process and adherence to State Soil Conservation Standards, this objective is met.

4. Adequacy of existing and proposed culverts and bridges, and other in-stream structures;

   As a condition of any approval for private development in the municipality as well as for proposed culverts and bridges, the municipality will adhere to current design practices for the implementation of these structures during the design of all capital improvements

projects undertaken as well as during the review of all private development conducted within the municipality. The municipality will ensure that the proper jurisdictional agency is properly notified of the design process including both the N.J.D.E.P. Land Use Regulation Program for wetlands and stream encroachment permitting and the local Soil Conservation District for the control of soil erosion and sediment control. In regard to existing culverts and bridges, the municipality, in part through their public works department, already examines the adequacy of these structures and provides for the appropriate capital improvement schedule to repair problem areas.

5. Maintain groundwater recharge;

Through the implementation of the aforementioned performance standards, the preservation of existing groundwater recharge amounts will be maintained during site development. This will directly lead to groundwater base flows remaining at current levels and will indirectly lead to the preservation of existing watercourse vegetation and soil erosion prevention.

6. Prevent, to the greatest extent feasible, an increase in nonpoint pollution;

Through the implementation of the aforementioned performance standards, the minimization of nonpoint source pollutants will occur. Through public education programs specifically introduced to instill a sense of civic responsibility in regard to garbage and litter management, responsible lawn care and fertilizer use, as well as prevention of wildlife feeding, non-point pollution control will be realized by the residents of the municipality.

7. Maintain the integrity of stream channels for biological and drainage function;

Through the preservation of ground water recharge amounts affecting ground water base flow, the control of stormwater run off quantity on-site through low impact development, and the treatment and removal of pollutants affecting stormwater quality, the biological integrity and drainage function of the receiving water bodies will be maintained and ultimately improve over time.

8. Minimize pollutants in stormwater run off from new and existing development

Through the implementation of the aforementioned performance standards, the minimization of nonpoint and point source pollutants will occur. In order to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the municipality, to protect the public health and well being of residents, to safeguard fish, aquatic life, scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of existing waterways, the minimization of pollutant loading within the waterways as well as on the lands adjacent to said waterways must be accomplished.

Pollutant transport from new development may be controlled through water quality provisions implemented in the design of stormwater control. These provisions include the establishment of 80% suspended solids removal from accumulated stormwater as indicated the "Best Management Practices" manual as well as strict adherence to any TMDL's specified for specific receiving water bodies within the municipality. Other areas of pollutant control from new development will be regulated through adherence to soil erosion and sediment control practices and adherence to the new stormwater inlet design standards.

Existing pollutant transport may be eliminated through public education programs aimed at educating citizens to everyday pollution prevention practices. Informational mailings detailing the pitfalls of improper disposal of waste, improper yard maintenance, septic system care, water conservation and improper wildlife feeding will be provided to municipal residents to bring about a long term solution for pollutant transport.

9. Protect public safety through the proper design and operation of stormwater basins;

In order to provide protection of the public during design of stormwater basins, design standards will be implemented according to current engineering practices for the design and construction of detention basins. These standards will be required as part of the design process and will be utilized as a reference during the municipal review process. In order to provide protection of the public during operation of stormwater basins, all new stormwater basins will be required to be registered with the municipality with data such as emergency contacts, ownership responsibilities and maintenance responsibilities/schedules provided on approved plans and documents for enforcement purposes. An examination of existing stormwater basins in the municipality will be performed to isolate problem basins and to obtain information regarding the existing ownership and maintenance responsibility. Based upon this information, the municipality will have current data as to the number of stormwater basins in municipality as well as the knowledge of problem sites that might degrade due to non-maintenance. A maintenance plan will be developed for all sites with problematic areas noted for quick reference.

LAND USE / BUILD-OUT ANALYSIS

The Highlands rules implement the Highlands Water Protection and Planning Act signed on August 10, 2004. The rules incorporate the requisite standards of various land use, water resource and environmental protection statutes and establish a consolidated Highlands permitting review and approval process for activities constituting major Highlands development proposed in the Preservation Area. The Highlands Regional Master Plan (RMP) guides implementation of the Highlands Water Protection and Planning Act of 2004.

Plan Conformance includes the revision of local planning and regulatory documents to integrate the land use and resource management requirements of the Highlands Act so those documents will conform to the goals, requirements and provisions of the RMP. Plan Conformance is required by the Highlands Act throughout the Preservation Area and is voluntary in the Planning Area. In 2011 Byram Township petitioned the Highlands Council for Plan Conformance for the Planning Area, thus making the entire Township conforming to the RMP.

The RMP requires that conforming municipalities develop a local build-out analysis that incorporates the policies and objectives of the RMP. Specifically, conforming municipalities are required to "use the Highlands Build-Out Model to develop a local build-out analysis that incorporates RMP policies and objectives to evaluate land use capability and capacity planning" (Objective 6G4c). The "Byram Township Municipal Build-out Report" prepared by the Highlands Water Protection and Planning Council is attached as Appendix B of this report.

MITIGATION PLANS

When it is found that a proposed development cannot meet the design and performance standards specified in this plan, a variance or exemption from these standards will be permitted subject to the following conditions:

Justification of the variance or exemption should be provided to the administrative authority detailing the reasoning why that portion of the standards cannot be met. An alternatives analysis should be provided detailing how the proposed development is affected if strict compliance with the standards is enforced.

Off-site Mitigation of existing stormwater systems within the same watershed is to be provided for the area(s) of the standards which have not been met at a magnitude equivalent to the impacts felt by the project.

Specific mitigation projects are outlined in the "Impervious Cover Reduction Action Plan for Byram Township, Sussex County, New Jersey," attached as Appendix C of this report. The plan lists 13 potential projects sites where green infrastructure practices could be installed.

The municipality will also accept proposals from applicants seeking variances and exemptions for mitigation projects recommended by the applicant not specifically listed above. General examples of mitigation proposals are as follows:

- Re-establishment of vegetated cover and buffers to provide shading of water bodies and pollutant filtration.
- Wildlife management measures to prevent the excessive depositing of nutrients on lawn areas.
- Retrofit of existing stormwater management systems to provide for water quantity, water quality and groundwater recharge.
- Reconditioning of existing paved areas with pervious pavement.
- Conservation of off-site lands adjacent to water bodies through deed restrictions.

Should mitigation potential not be available in the same drainage area as the proposed project, the municipality will entertain mitigation projects conducted in other drainage areas at a magnitude greater than the impacts felt by the project.

The municipality may allow a developer to provide funding or partial funding to the municipality for an environmental enhancement project that has been identified by the municipality in the Municipal Stormwater Management Plan above, or towards the development of a future Regional

Stormwater Management Plan. The contributed funding must be equal to or greater than the cost to implement the mitigation as indicated by the municipality with said funding being used exclusively for the mitigation project identified.

Considerations of mitigation proposals for approval of variances or exemptions sought will be accomplished by the administrative authority on a case by case basis.

REFERENCES

1) Byram Township Master Plan, December 2004, prepared by Heyer, Gruel and Associates

2) Byram Township, Natural Resources Inventory, dated June 1994, prepared by the Byram Environmental Commission

3) Lubbers Run Greenway Project, A Stream Corridor Study, Byram Township New Jersey, prepared by March Associates Landscape Architects, P.C., dated June 1997 and updated December 18, 2000.

4) Sussex County Strategic Growth Plan

5) N.J.D.E.P. Best Management Practices Manual - April 2004 and last revised Nov. 2018

6) Tier A – Municipal Stormwater Guidance Document - 2018

7) Residential Site Plan Improvement Standards – 2011

8) Total Maximum Daily Loads for Fecal Coliform to Address 28 Streams in the Northwest Water Region, Approved: September 29, 2003.

9) Total Maximum Daily Loads for Fecal Coliform to Address 10 Streams in the Northwest Water Region - Approved: September 15, 2005.

10) Total Maximum Daily Loads for Pathogens to Address 11 Lakes in the Northwest Water Region - Adopted: October 19, 2009.

11) Total Maximum Daily Loads for Phosphorus to Address 4 Eutrophic Lakes in the Northwest Water Region - Approved: September 17, 2003.

12) Total Maximum Daily Loads for Mercury Impairments Based on Concentration in Fish Tissue Caused Mainly by Air Deposition to Address 122 HUC 14's Statewide, - Adopted: June 10, 2010.

APPENDICES

A. Total Maximum Daily Load Reports

B. Byram Township Municipal Build-Out Report

C. Mitigation Plan – Impervious Cover Reduction Action Plan

A. Total Maximum Daily Load Reports

B. Byram Township Municipal Build-Out Report

C. Mitigation Plan – Impervious Cover Reduction Action Plan

Figure 3: Township of Byram Land Use Inventory

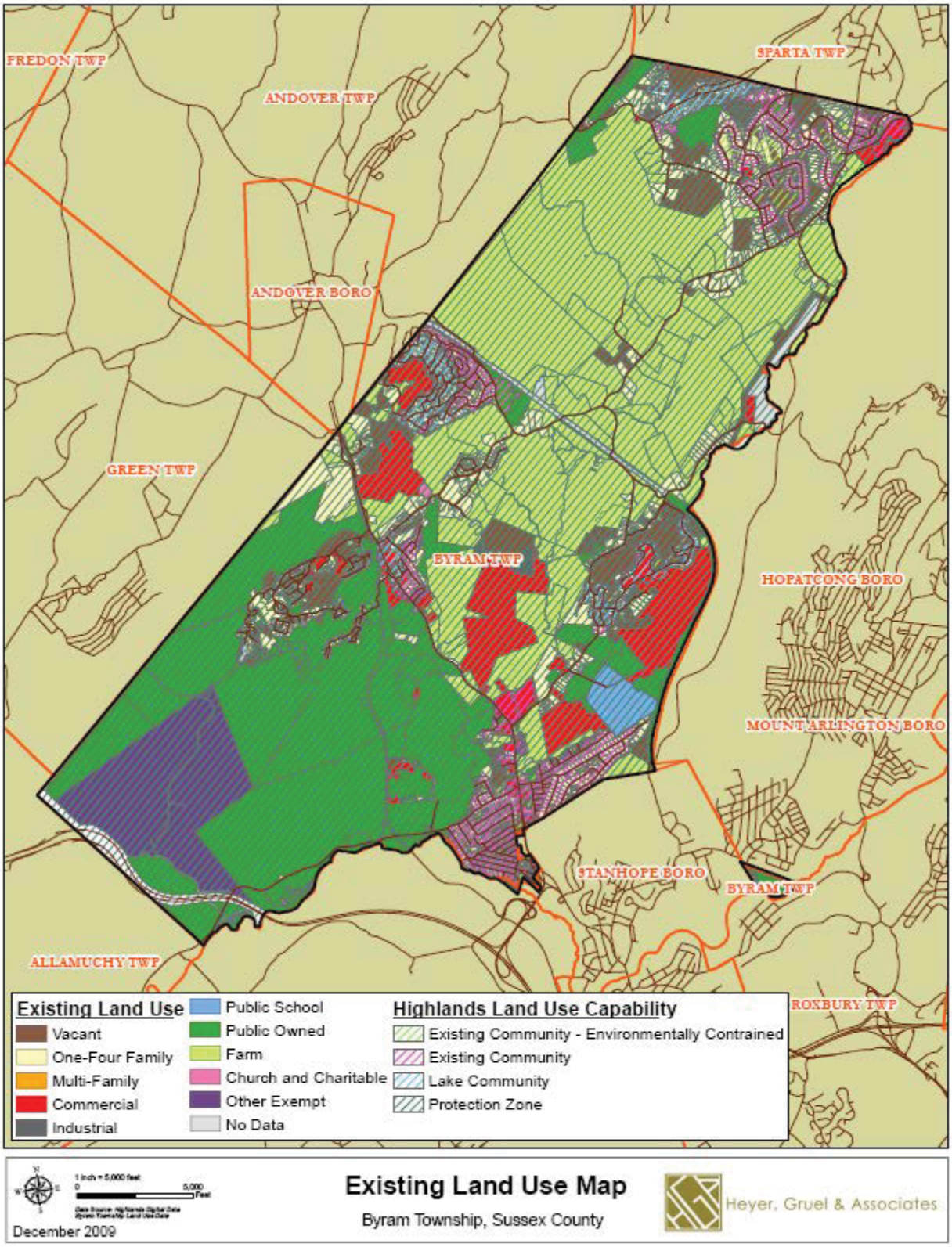


Figure 4: Highlands Open Waters

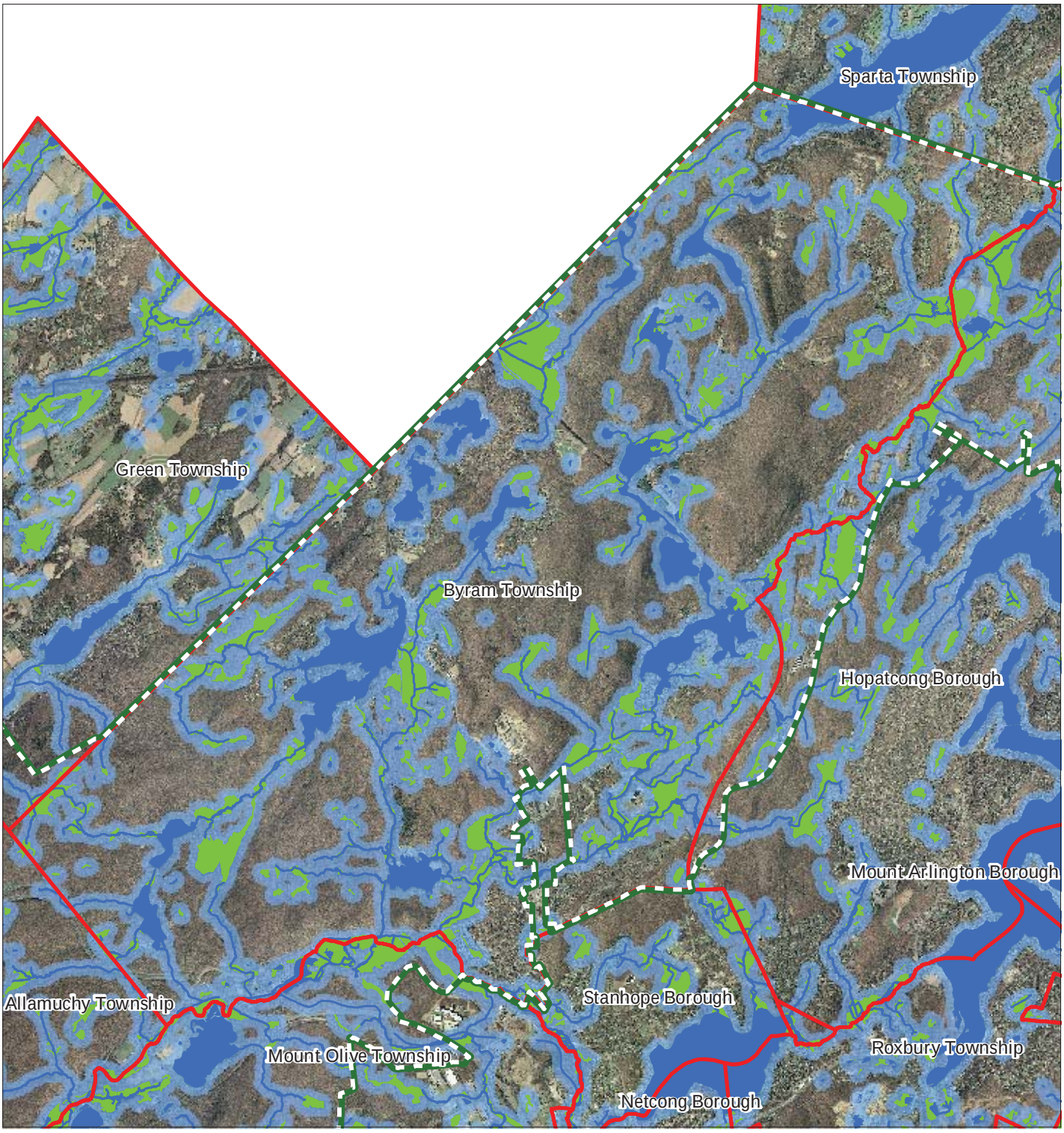


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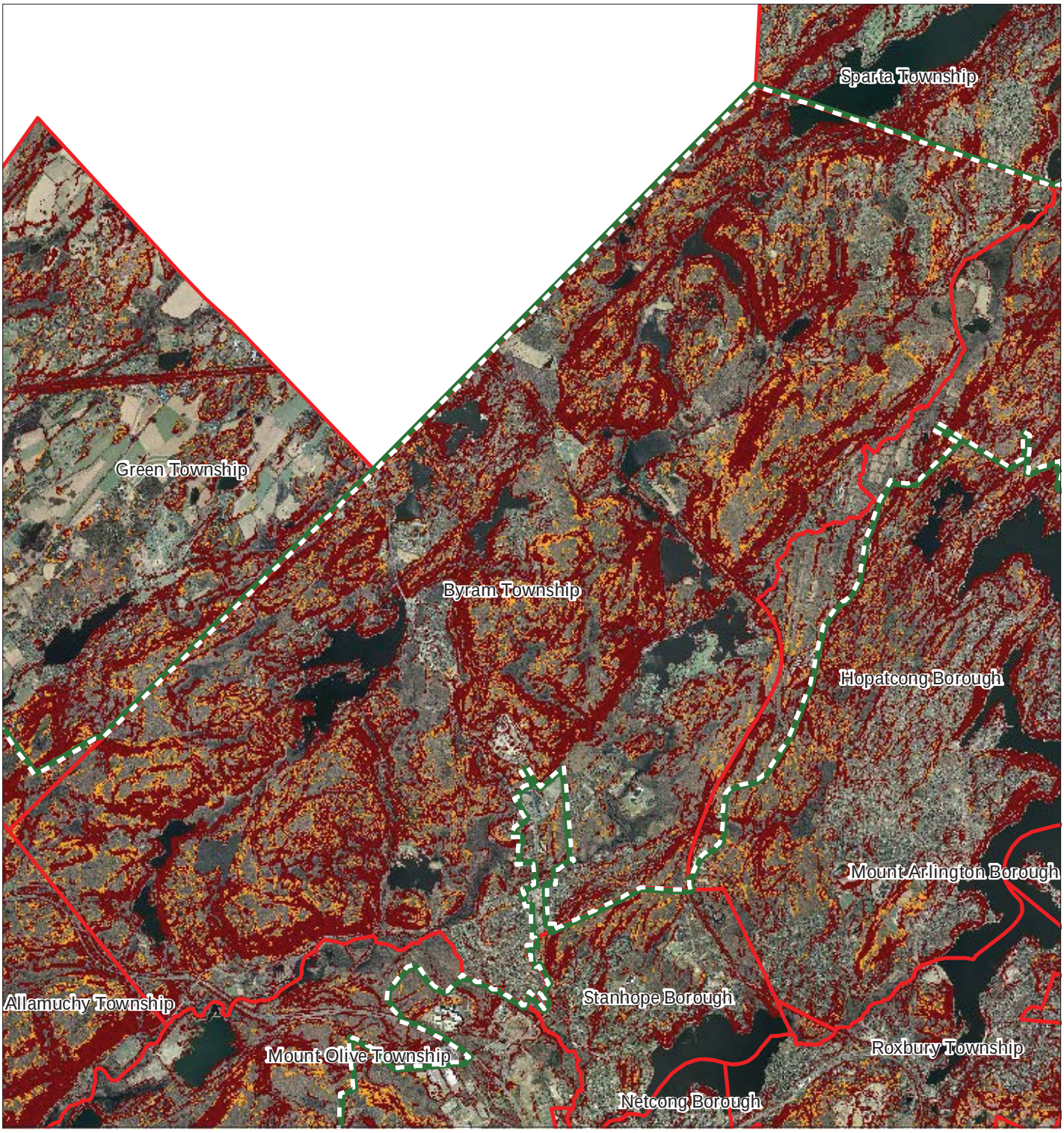
Figure 5: Steep Slope Protection Areas



Steep Slopes
- *Moderate*
- *Severe*
- Preservation Area
- Municipal Boundaries

Byram Township

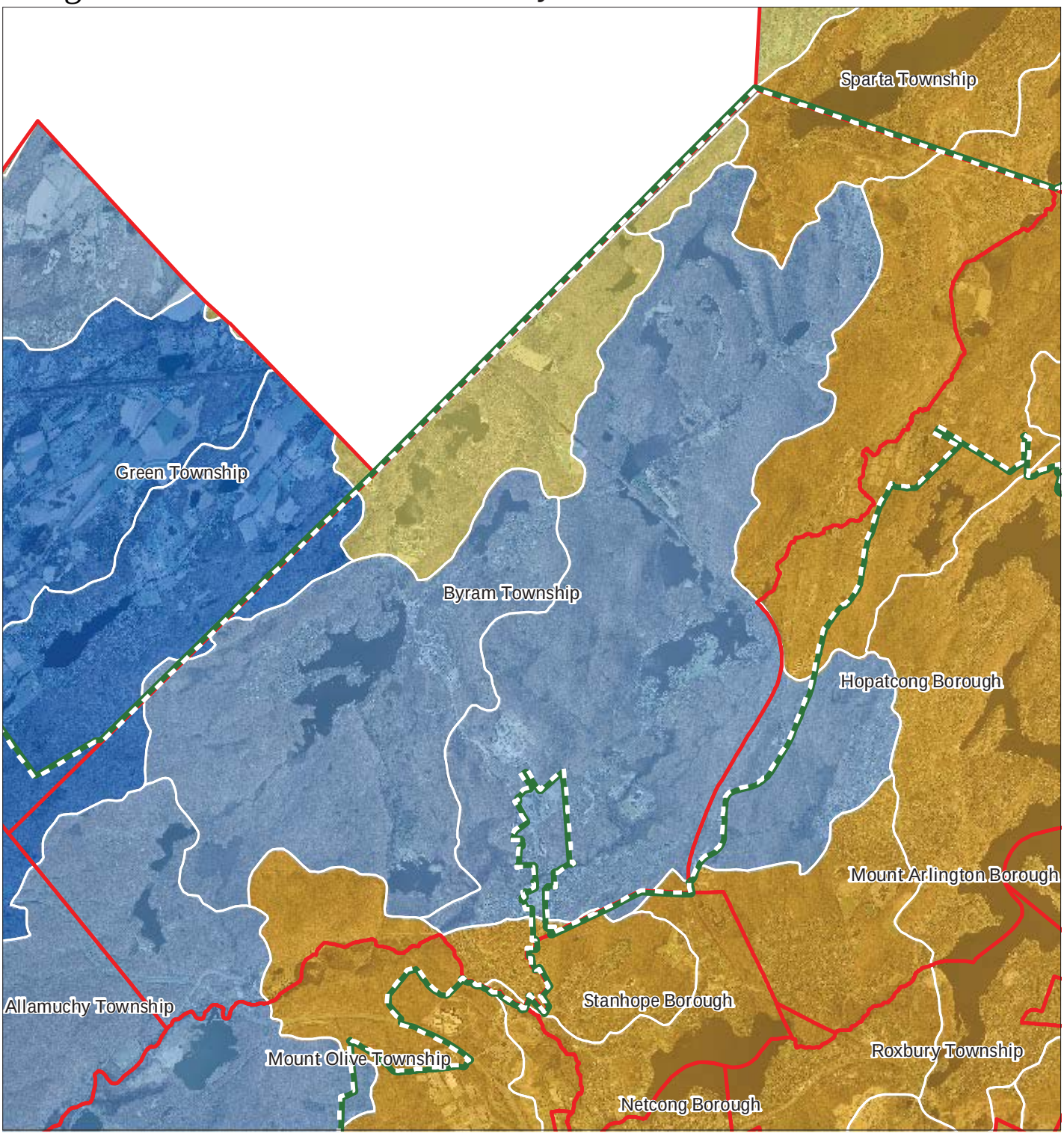
1 inch = 0.946 miles

Highlands Council
New Jersey

N

SEPTEMBER 2014

Figure 6: Net Water Availability



Net Water Availability By HUC14

Million Gallons Per Day (MGD)

- 0.10 - 0.39
- 0.05 - 0.09
- 0.00 - 0.04
- -0.09 - 0.00
- -0.99 - -0.10
- -7.10 - -1.00

Preservation Area

Municipal Boundaries

Byram Township

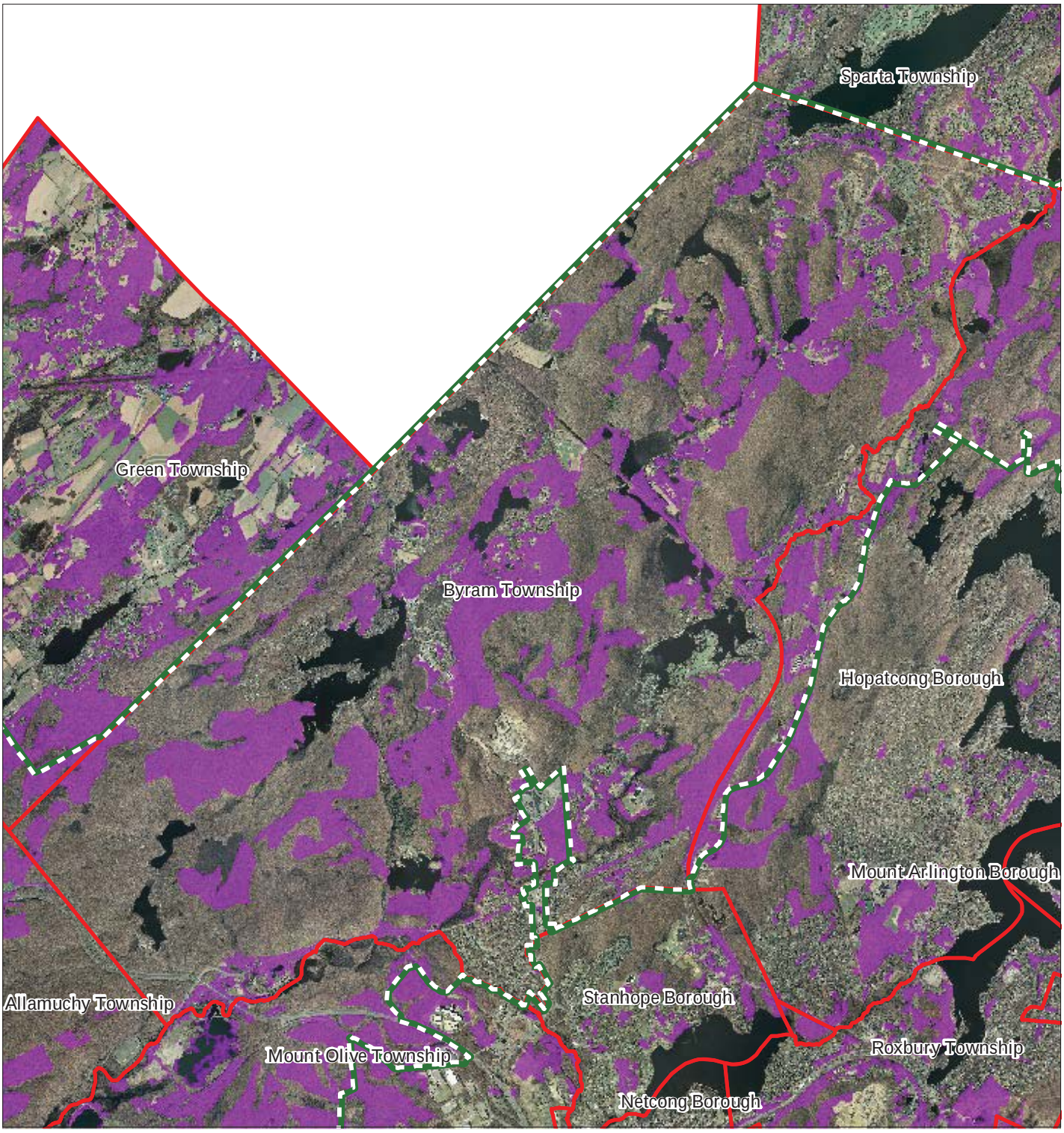
1 inch = 0.946 miles

Highlands Council
New Jersey

N

SEPTEMBER 2014

Figure 7: Prime Ground Water Recharge Areas



Prime Ground Water Recharge Areas
Preservation Area
Municipal Boundaries

Byram Township

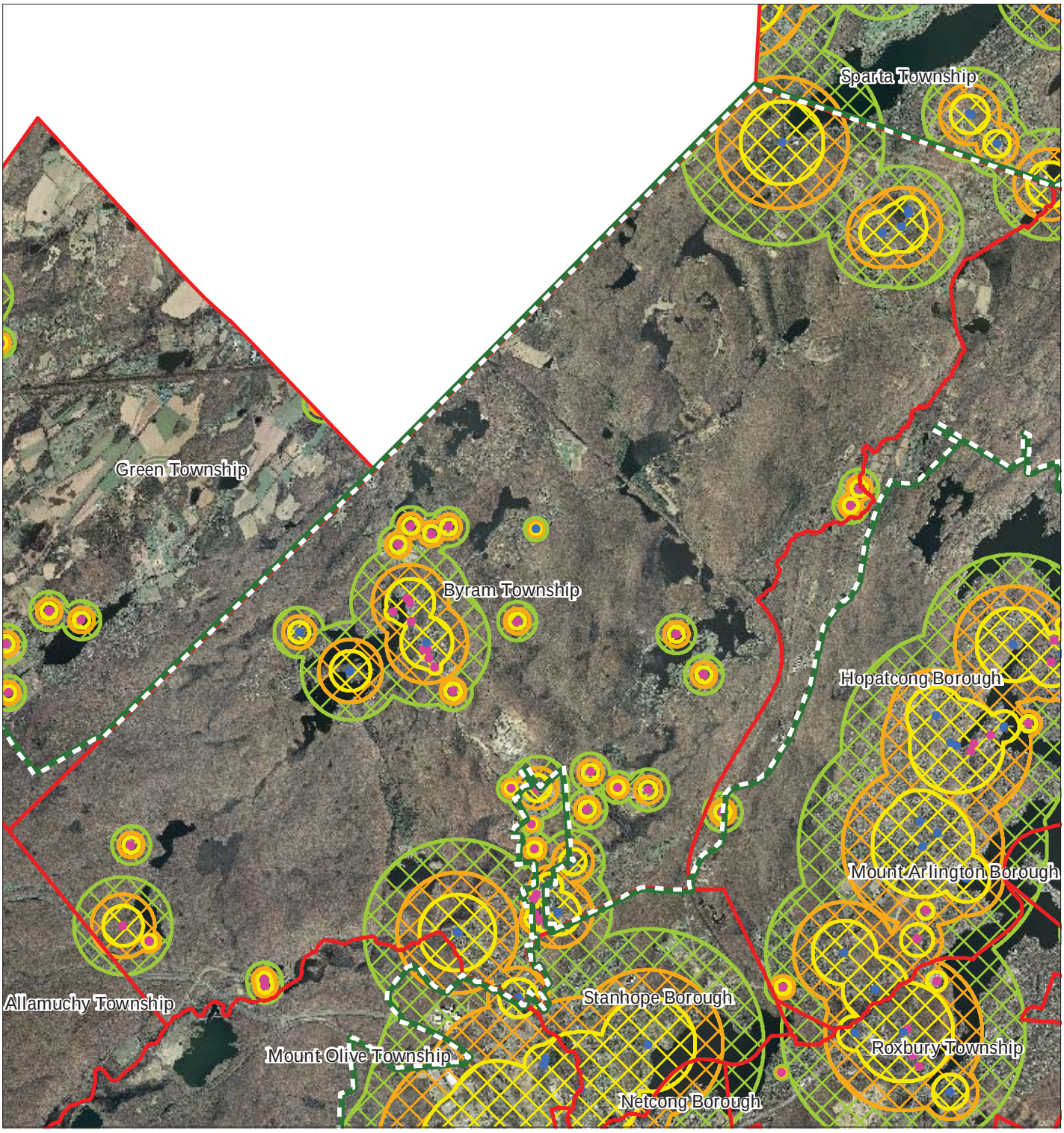
1 inch = 0.946 miles

Highlands Council
New Jersey

N

SEPTEMBER 2014

Figure 8: Wellhead Protection Areas



- Public Community Wells
- Public Non-Community Wells

Wellhead Protection Areas

- *2-Year Tier*
- *5-Year Tier*
- *12-Year Tier*

- Preservation Area
- Municipal Boundaries

Byram Township

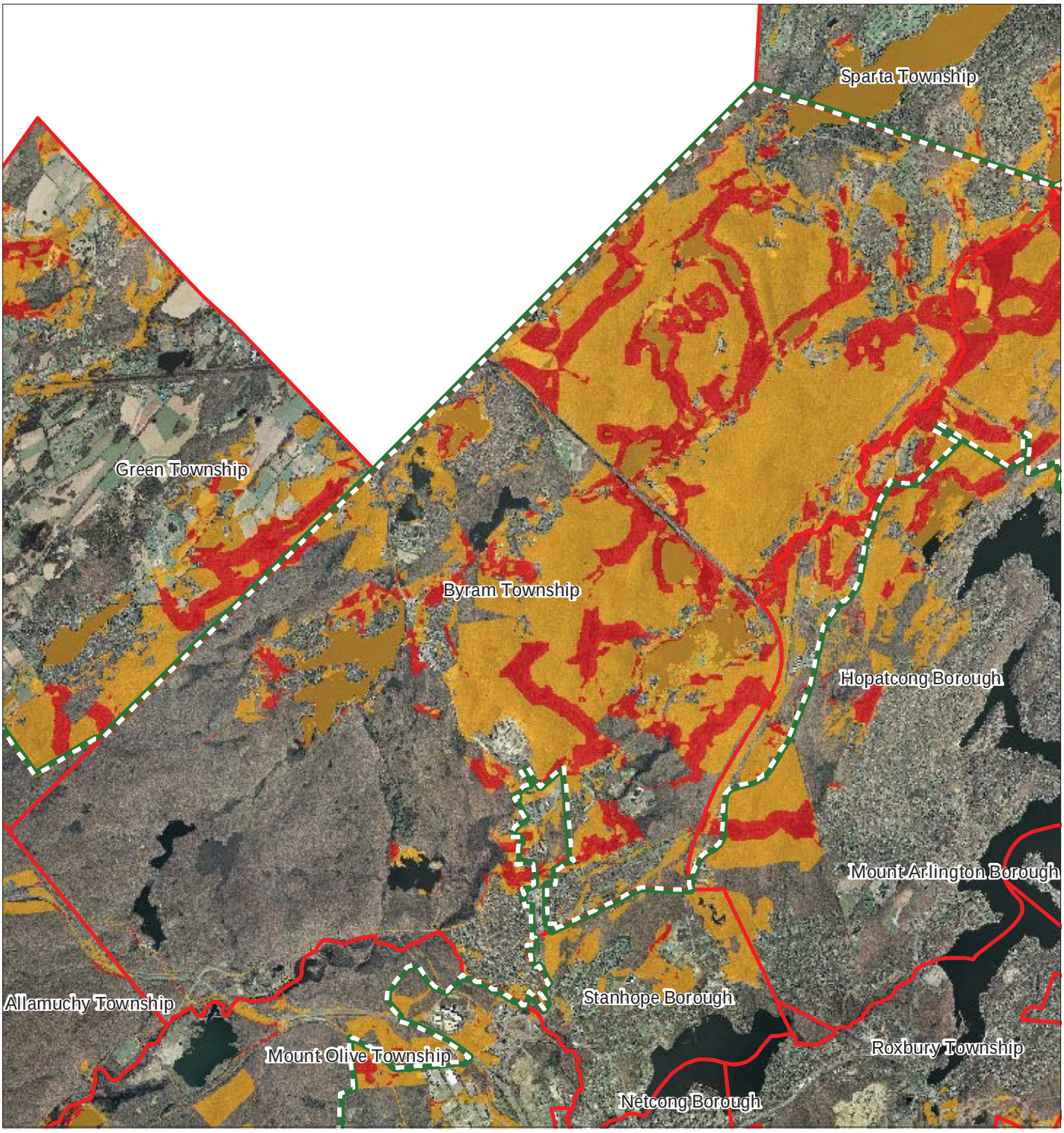
1 inch = 0.946 miles

Highlands Council
New Jersey

N

SEPTEMBER 2014

Figure 9: Highlands Conservation Priority Areas



Conservation Priority Area
- *Moderate*
- *High*
- Preservation Area
- Municipal Boundaries

Byram Township

1 inch = 0.946 miles

Highlands Council
New Jersey

N

SEPTEMBER 2014