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# M u n i c i p a l S t o r m w a t e r M a n a g e m e n t P l a n

For the Township of Allamuchy  
Warren County, New Jersey  
March 2005  
Adopted April 28, 2005

**Prepared By:**

A handwritten signature in cursive script that reads 'Paul M. Sterbenz'.

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**And**

A handwritten signature in cursive script that reads 'Joseph J. Layton'.

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MC Project No. ALT-094

The original of this report was signed and sealed in accordance with N.J.S.A. 45:14a-12



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## **Introduction**

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

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

## **Goals**

The goals of this MSWMP are to:

- reduce flood damage, including damage to life and property;
- minimize, to the extent practical, any increase in stormwater runoff from any new development;
- reduce soil erosion from any development or construction project;
- assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
- maintain groundwater recharge;
- prevent, to the greatest extent feasible, an increase in nonpoint pollution;



- maintain the integrity of stream channels for their biological functions, as well as for drainage;
- minimize pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water; and
- protect public safety through the proper design and operation of stormwater basins.

To achieve these goals, this plan outlines specific stormwater design and performance standards for new development. Additionally, the plan proposes stormwater management controls to address impacts from existing development. Preventative and corrective maintenance strategies are included in this plan to ensure long-term effectiveness of stormwater management facilities. The plan also outlines safety standards for stormwater infrastructure to be implemented to protect public safety.

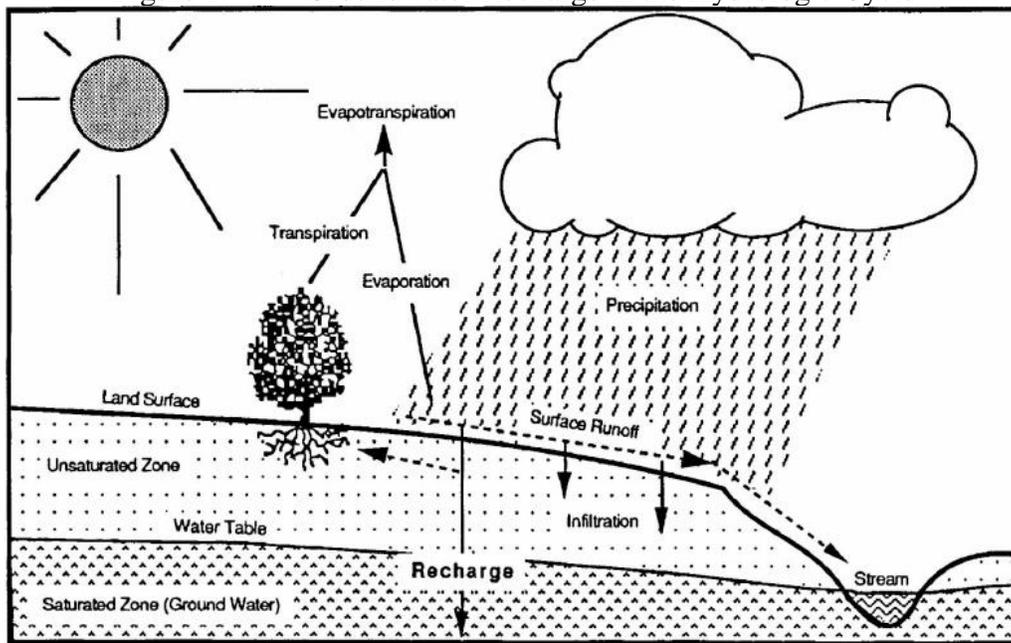
### **Stormwater Discussion**

Land development can dramatically alter the hydrologic cycle (See Figure 1) of a site and, ultimately, the entire watershed. Prior to development, native vegetation can either directly intercept precipitation or draw from 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, causing flow in downstream waterways to peak faster and higher than natural conditions. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease



opportunities for infiltration which, in turn, reduces stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuation between normal and storm flow rates, which increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can destroy habitat from which some species cannot adapt.

Figure 1: Groundwater Recharge in the Hydrologic Cycle



Source: New Jersey Geological Survey GSR-32

In addition to increase in runoff peaks and volumes and the loss of groundwater recharge, land development often results in the accumulation of pollutants on the land surface that runoff can mobilize and transport to streams. New impervious surfaces and cleared areas created by development can accumulate a variety of pollutants from the atmosphere, fertilizers, animal wastes, and leakage and wear from vehicles. Pollutants can include metals, suspended solids, hydrocarbons, pathogens and nutrients.

In addition to increased pollutant loading, land development can adversely affect water quality and stream biota in more subtle ways. For example, stormwater falling on impervious surfaces or stored in detention or retention basins can become heated and raise the temperature of the downstream waterway, adversely affecting cold water fish species such as trout.



Development can remove trees along stream banks that normally provide shading, stabilization, and leaf litter that falls into streams and becomes food for the aquatic community.

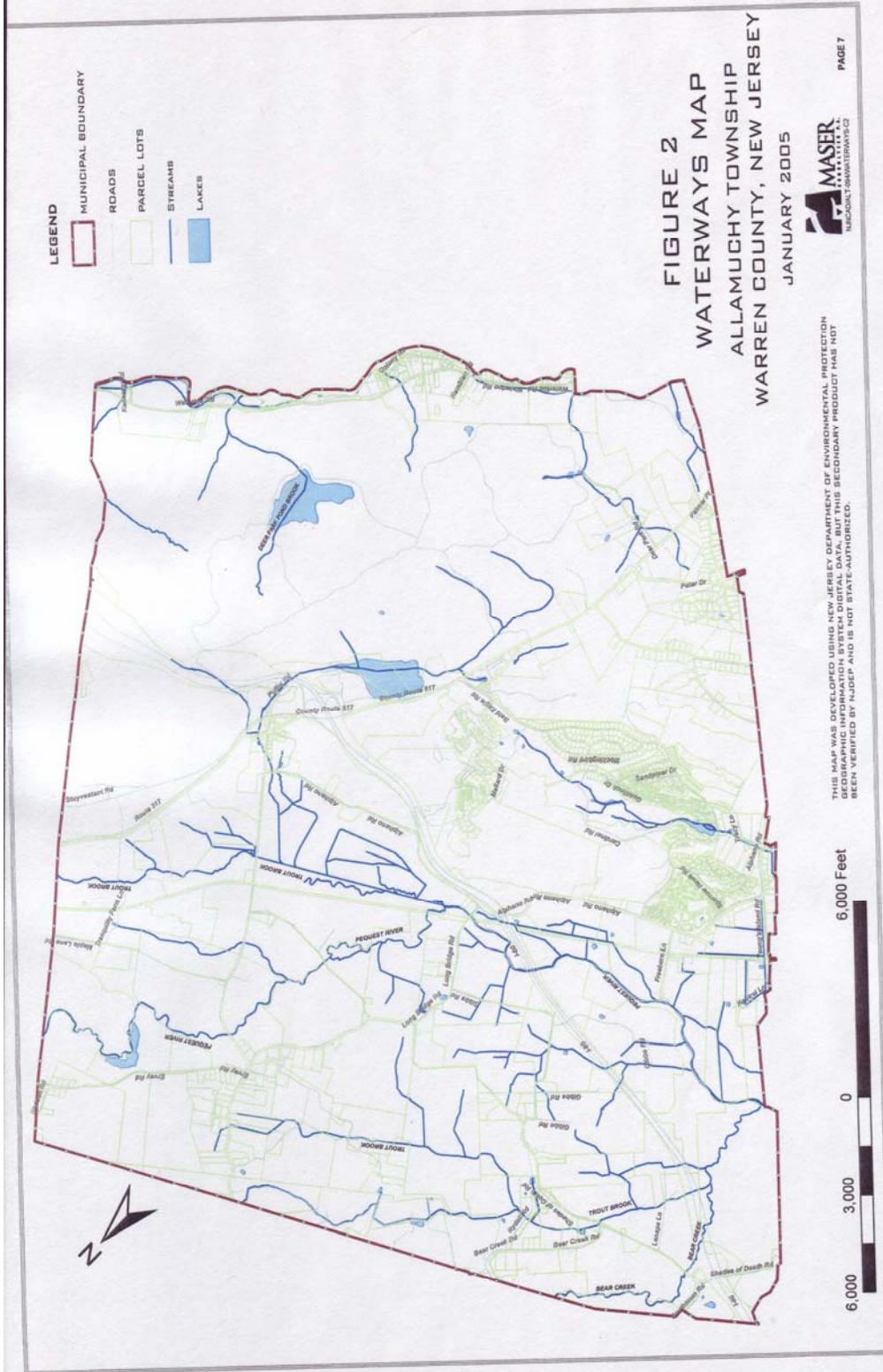
## **Background**

The Township encompasses 20.3 square miles in Warren County, New Jersey. In recent years, the Township has been under significant development pressure. The population of the Township increased from 2,560 in 1980 to 3,484 in 1990, a 36% increase. The rate of increase slowed to 11% between 1990 and 2000, resulting in a total population of 3,877 in 2000.

Changes in the landscape due to housing development have increased stormwater runoff volumes and pollutant loads to the waterways of the municipality. Additional residential development is planned and approved that will further increase impacts. Figure 2 illustrates the waterways in the Township. The Musconetcong River bounds the Township along the east, which separates the municipality from Morris County. The Pequest River flows through the northerly portion of the Township. Bear Creek and Trout Brook are major tributaries of the Pequest River in the Township. Figure 3 depicts the Township boundary on the USGS quadrangle maps.

The New Jersey Department of Environmental Protection (NJDEP) has established an Ambient Biomonitoring Network (AMNET) to document the health of the State's waterways. There are over 800 AMNET sites throughout the state of New Jersey. These sites are sampled for benthic macroinvertebrates by NJDEP on a five-year cycle. Streams are classified as non-impaired, moderately impaired, or severely impaired based on the AMNET data. The data is used to generate a New Jersey Impairment Score (NJIS), which is based on a number of biometrics related to the benthic macroinvertebrate community dynamics.

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 Total Maximum Daily Load (TMDL) standards are needed. Table 1 shows the AMNET data for Sublist 5 sites within the Township.

Table 1  
Sublist 5 Sites for Allamuchy Township

<b>Station Name / Waterbody</b>	<b>Site ID</b>	<b>Parameters</b>	<b>Data Source</b>
Bear Creek near Alphano in Allamuchy	AN0040	Benthic Macroinvertebrates	NJDEP AMNET
Bear Creek at Dark Moon Rd in Frelinghuysen	AN0040A	Benthic Macroinvertebrates	NJDEP AMNET
Musconetcong River at Rt 604 (abv Saxton Lk) in Mt Olive	AN0069E	Benthic Macroinvertebrates	NJDEP AMNET
Musconetcong River blw Waterloo Village lower dam in Mt Olive	AN0069C	Benthic Macroinvertebrates	NJDEP AMNET

Source: *New Jersey 2004 Integrated Water Quality Monitoring and Assessment Report* prepared by NJDEP  
<http://www.state.nj.us/dep/wmm/sgwqt/wat/integratedlist/docs/Appendix%201A%20Sublists%201-5.xls>

The AMNET data show that the Pequest and Musconetcong Rivers and their tributaries may not have acceptable total benthic macroinvertebrates concentrations, but according to New Jersey 2004 Integrated Water Quality Monitoring and Assessment Report, the development of a TMDL for each waterway is of low urgency.

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 point discharges, which require an NJPDES permit to discharge, and nonpoint sources, 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

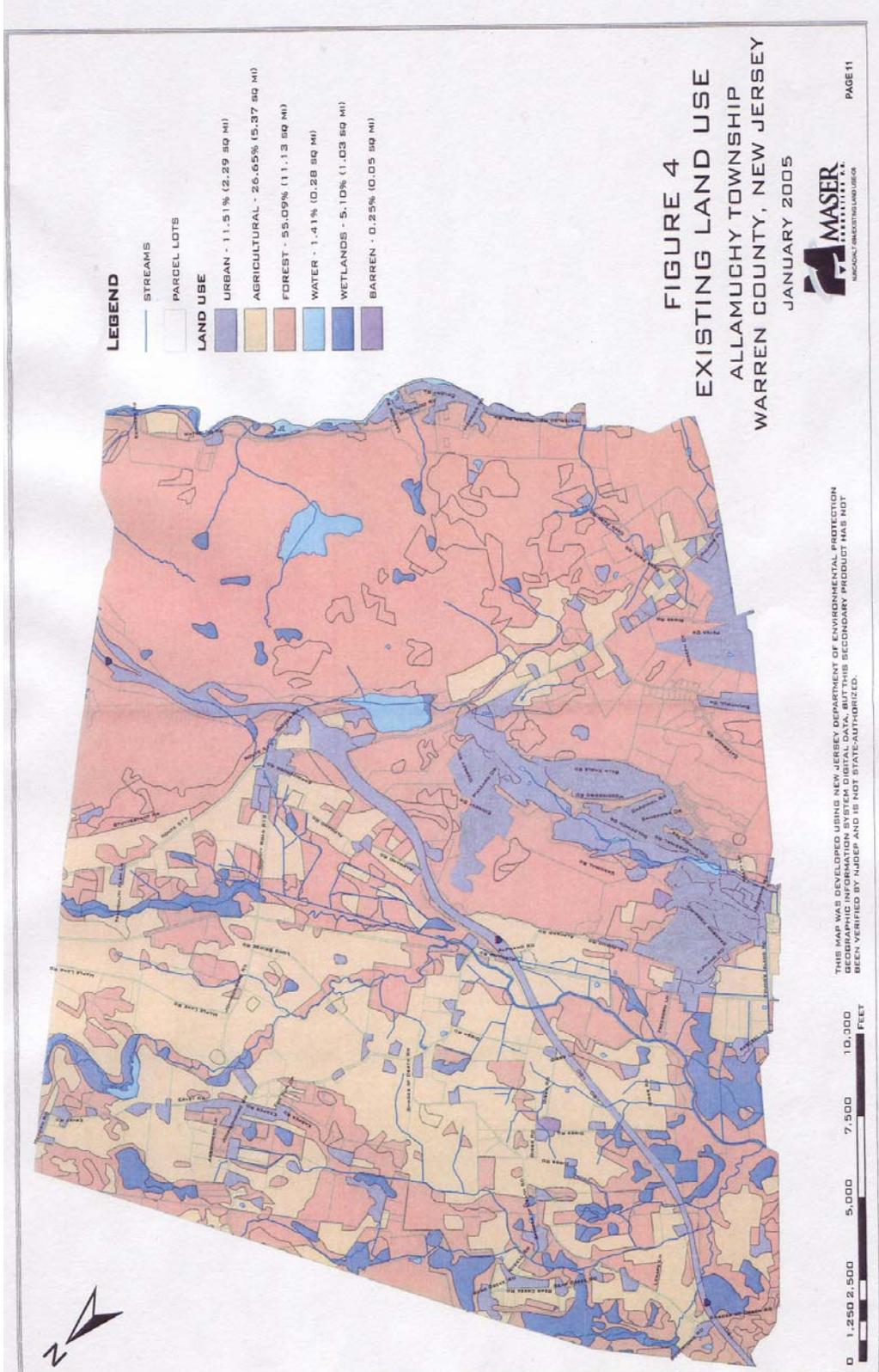


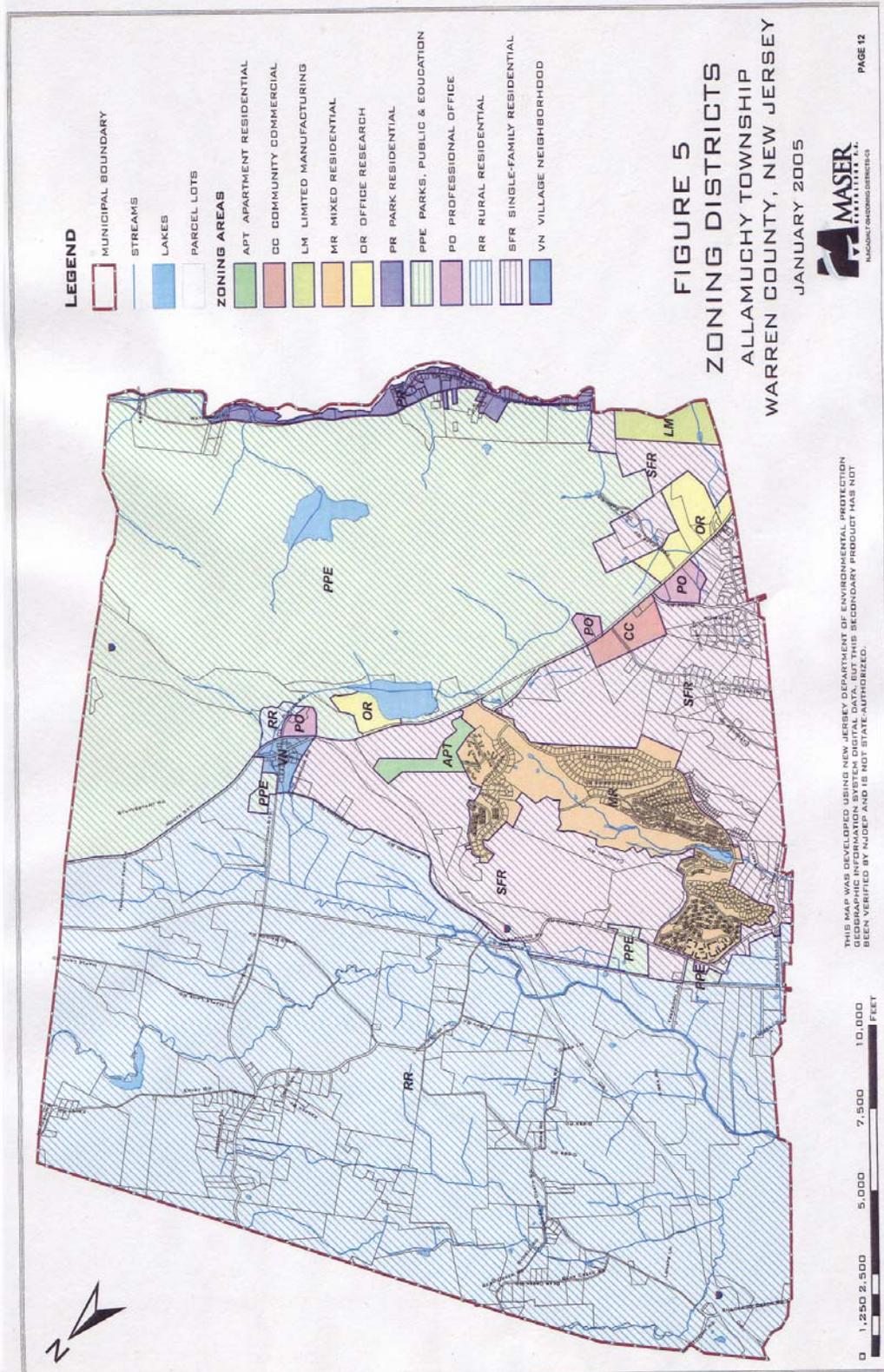
strategies may include improved stormwater treatment facilities, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems, and other BMPs.

The Township is less than 20% developed. The existing land use, based on 2002 aerial photography, is shown in Figure 4. The existing zoning is shown in Figure 5. The vast majority of the developed land is residential. The groundwater recharge rates for native soils in this area are generally between 13 and 22 inches annually with the exception of the low lying lands in the western half of the Township where the water table is high and there are many wetlands. The average annual groundwater recharge rates are shown graphically in Figure 6.

According to NJDEP, “A Well Head Protection Area (WHPA) in New Jersey is a mapped area calculated around a Public Community Water Supply (PCWS) well in New Jersey that delineates the horizontal extent of ground water captured by a well pumping at a specific rate over a two- (Tier 1), five- (Tier 2), and twelve- (Tier 3) year period of time for unconfined wells. The confined wells have a fifty foot radius delineated around each well serving as the well head protection area to be controlled by the water purveyor in accordance with Safe Drinking Water Regulations (see NJAC 7:10 – 11.7 (b)1).”

WHPA delineations are conducted in response to the Safe Drinking Water Act Amendments of 1986 and 1996 as part of the Source Water Area Protection Program (SWAP). The delineations are the first step in defining the sources of water to a public supply well. Within these areas, potential contamination will be assessed and appropriate monitoring will be undertaken as subsequent phases of the NJDEP SWAP. As shown in Figure 7, the Township has two wellhead protections areas. The areas are a Tier 3 area located in the extreme southeastern portion of the Township (HMUA well) and a Tier 1, Tier 2 and Tier 3 area centered on two Township wells located adjacent to Freeborn Lane.

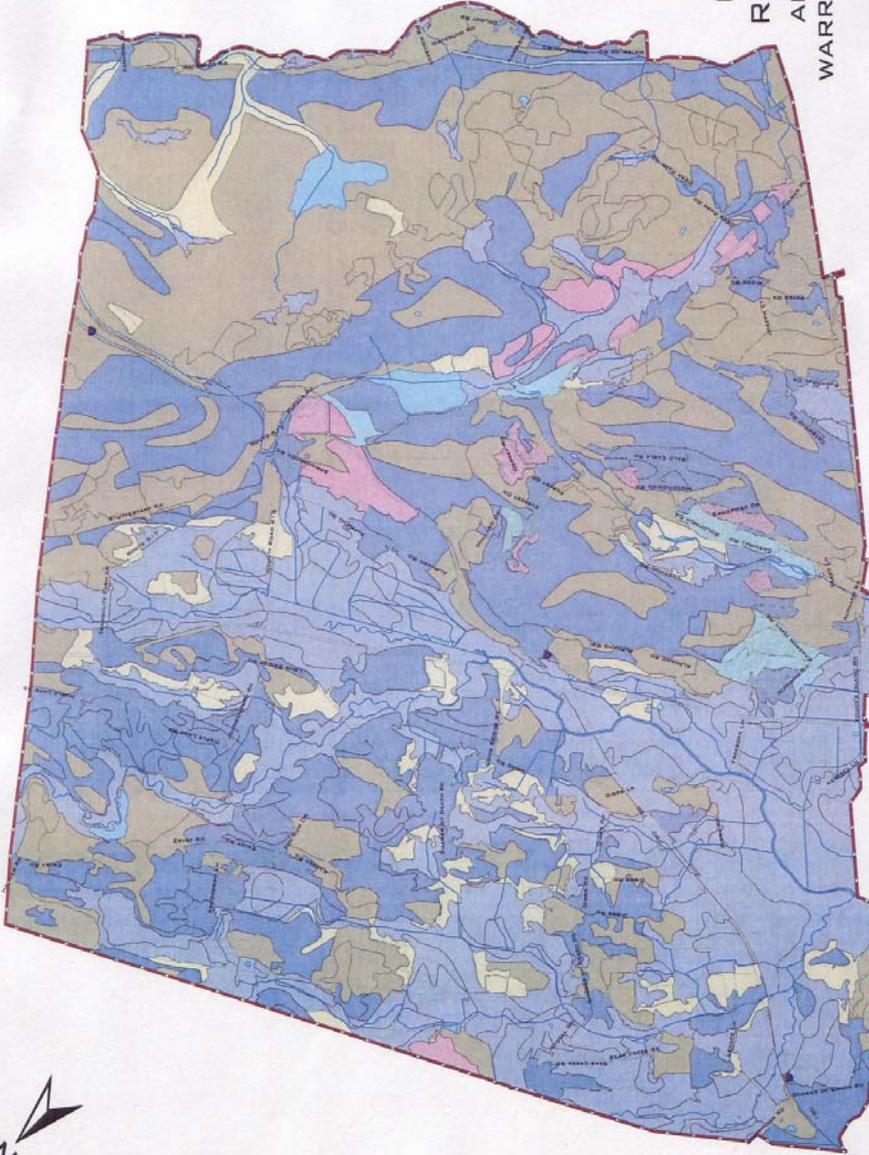






**LEGEND**

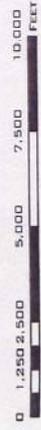
- MUNICIPAL BOUNDARY
- STREAMS
- LAKES
- PARCEL LOTS
- GROUND WATER RECHARGE**
- 16 TO 22 IN/YR
- 13 TO 15 IN/YR
- 10 TO 12 IN/YR
- 1 TO 9 IN/YR
- HYDRIC SOILS
- WETLANDS AND OPEN WATER

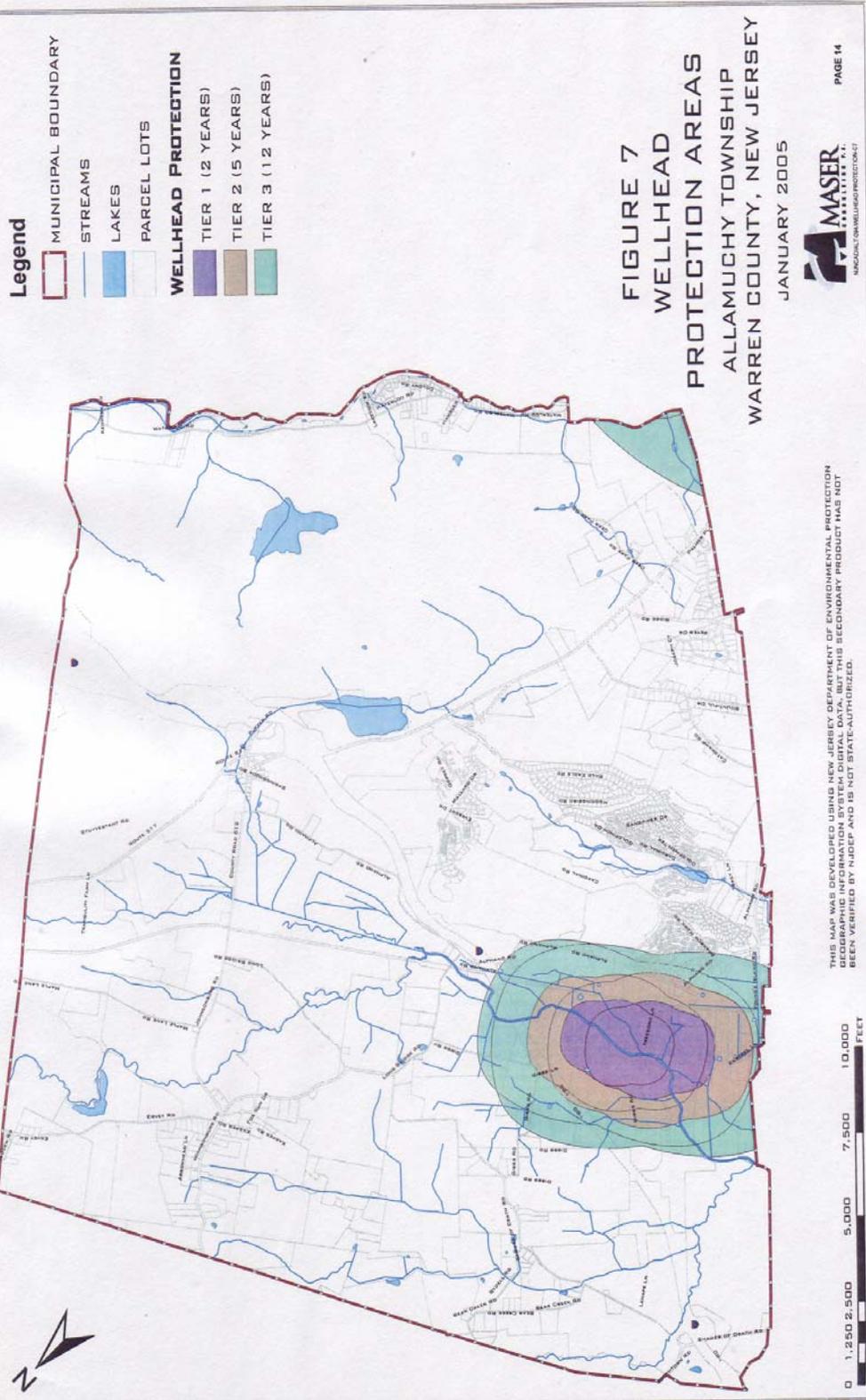


**FIGURE 6**  
**GROUND-WATER**  
**RECHARGE AREAS**  
 ALLAMUCHY TOWNSHIP  
 WARREN COUNTY, NEW JERSEY  
 JANUARY 2005



THIS MAP WAS DEVELOPED USING NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION DATA, BUT THIS SECONDARY PRODUCT HAS NOT BEEN VERIFIED BY NJDEP AND IS NOT STATE AUTHORIZED.







## **Design and Performance Standards**

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

During construction, Township inspectors will observe the construction of the site improvements including drainage to ensure that the stormwater management measures are constructed and function as designed.

## **Plan Consistency**

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

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

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



## **Nonstructural Stormwater Management Strategies**

The Township has reviewed the master plan and ordinances, and has provided a list of the sections in the Township land use and zoning ordinances that are to be modified to incorporate nonstructural stormwater management strategies. These are the ordinances identified for revisions. Once the ordinance texts are completed, they will be submitted to the county review agency for 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 submissions.

Section 500 of the Township Land Development Ordinance, entitled General Provisions and Design Standards was reviewed with regard to incorporating nonstructural storm water management strategies. The following standards are in place:

**Section 504 “Drainage”** This section mentions that where non-structural means of controlling runoff are feasible and adequate, they can be used if approved by the Township Engineer. Lots shall be graded to assure drainage away from buildings. Detention or retention basins must be incorporated into each site or regionally and must hold storm water runoff such that the discharge from the site will not exceed pre-development rates for the 2 through 100 year storms. If the applicant demonstrates that the additional runoff will be negligible, the requirement for basins may be waived. If basins are deemed necessary, they must be designed to the satisfaction of the Township Engineer and the outlet must meet the water quality standards of the NJDEP. Retention basins must be designed so that there is a minimum two foot vertical separation between the seasonal high ground water table and the bottom of the basin or recharge facility. Detention basins must be designed so that there is a minimum one foot vertical separation between the seasonal high ground water table and the bottom of the basin or detention facility. Swales must be constructed to promote drainage, and must be seeded and maintained in lawn areas. The intent of the landscaping plan must be to ensure that the grading and plantings in and around the basins make these areas appear as a park-like setting and also provide a screen between the basin and nearby dwellings. Detention basins for storm water management that are in excess of two acres may be designed to include a flat area of 40,000 square feet for passive recreational use. Maintenance of storm water management facilities shall be the responsibility of the property owner or the homeowners' association who are beneficiaries of the system.



**These standards are to be replaced by the design and performance standards for stormwater management in N.J.A.C. 7:8-5, the safety standards for stormwater Best Management Practices (BMP's) in N.J.A.C. 7:8-6, and the drainage design criteria in the R.S.I.S. (N.J.A.C. 5:21-7.1).**

**Section 509 “Natural Features and Landscaping”** stipulates that natural drainage ridge lines shall be preserved to the maximum extent possible, and unnecessary alteration of existing topography should be avoided. Where found necessary by the Board, seeding, sodding, rip rapping or other activities necessary to carry out the soil erosion and sedimentation control plan shall be made. Also, the section recommends that a conscious effort be made to preserve the existing vegetation on site during the design, planning, and construction of a development. In stream corridor areas, as defined in Section 606, where existing vegetation is sparse, additional plantings of indigenous species shall be required.

**The language in this ordinance section is consistent with the State’s goals and is not proposed to be changed except as indicated below.**

**Section 509(I) “Buffers and Buffer Screening”** allows natural wooded tracts to be preserved to meet buffer requirements, but does not currently allow buffers to be used for storm water management.

**The section should be amended to require the use of native vegetation, which requires less fertilization and watering than non-native species. Additionally, language should be included to allow buffer areas to be used for stormwater management by disconnecting impervious surfaces and treating runoff from these impervious surfaces.**

**Section 510 “Off-Street Parking, Loading Areas, and Driveways”** stipulates that the drainage system for the site shall be designed to accommodate the surface water runoff from all parking and driveway areas, considering all such areas to be paved. All points of access to nonresidential and multi-family development must be graded and equipped with adequate drainage facilities to prevent any storm water from draining onto the public road. All parking, loading areas, access drives, and driveways must be paved according to Township specifications. All paved parking and loading areas and access drives must be curbed, except single-family residential drives.

**This section will be amended to allow permeable paving materials on driveways to lessen runoff and Total Suspended Solids (TSS). Furthermore, this section should be amended to allow for flush curb with curb stops, or curbing with curb cuts to encourage developers to discharge runoff from impervious areas into landscaped areas to reduce TSS, lessen runoff rates, and encourage recharge. In addition, pervious paving materials should be permitted to minimize stormwater runoff and promote groundwater recharge.**



**Section 511 “Performance Standards For All Uses”** prohibits the deposition of materials or waste on a lot where they may be transferred off the lot by natural causes or forces or where they can contaminate an underground aquifer.

**No changes are proposed to this section of the ordinance.**

**Section 515(A) “Streets”** describes the requirements for streets within Township developments. It requires that all developments be served with paved streets. The Township has several street classification, ranging from “Rural Minor Arterial,” which has a minimum right-of-way of 66 feet, to “Secondary Local,” which has a minimum right-of-way of 50 feet.

**This ordinance section should be amended to reference the street design criteria in the R.S.I.S. since more flexibility in the cross-section of a street is offered. For example, curbs are not always required and can be replaced by roadside swales, which will help treat runoff and promote recharge.**

**Section 515(C) “Curbs and Gutters”** requires that Belgian Block or concrete curbing, and gutters, must be installed on both sides of all streets. This requirement can be waived in some cases by the Board, but is strongly suggested in any development generating large volumes of vehicular traffic, in multi-family residential developments, in single-family subdivisions having average lot sizes of more than one-half acre (unless all new surface runoff from the development will be disposed of on site), in any case where low gradients, unusual soil, structural problems or other conditions indicate susceptibility to poor surface water flow, or along any road where proposed development would contribute to an adverse drainage condition.

**This section should be amended per the previous recommendation for Section 515(A).**

**Section 515(D) “Sidewalks, Pathways and Bikeways”** describes sidewalk requirements for the Township.

Sidewalks may not be required provided that an alternate comprehensive plan for the movement of people and bicycles within the proposed development and between the proposed development and adjacent lands is submitted to and reviewed and approved by the board. Township guidelines indicate that sidewalks should be required in developments lying in close proximity to schools or other pedestrian movement generators. Sidewalks must be at least four feet wide and constructed of concrete or another approved material.

**This section should be amended to require sidewalks to be graded to discharge to lawn areas where feasible to disconnect impervious surfaces. In addition, the ordinance should allow permeable paving materials to lessen TSS.**



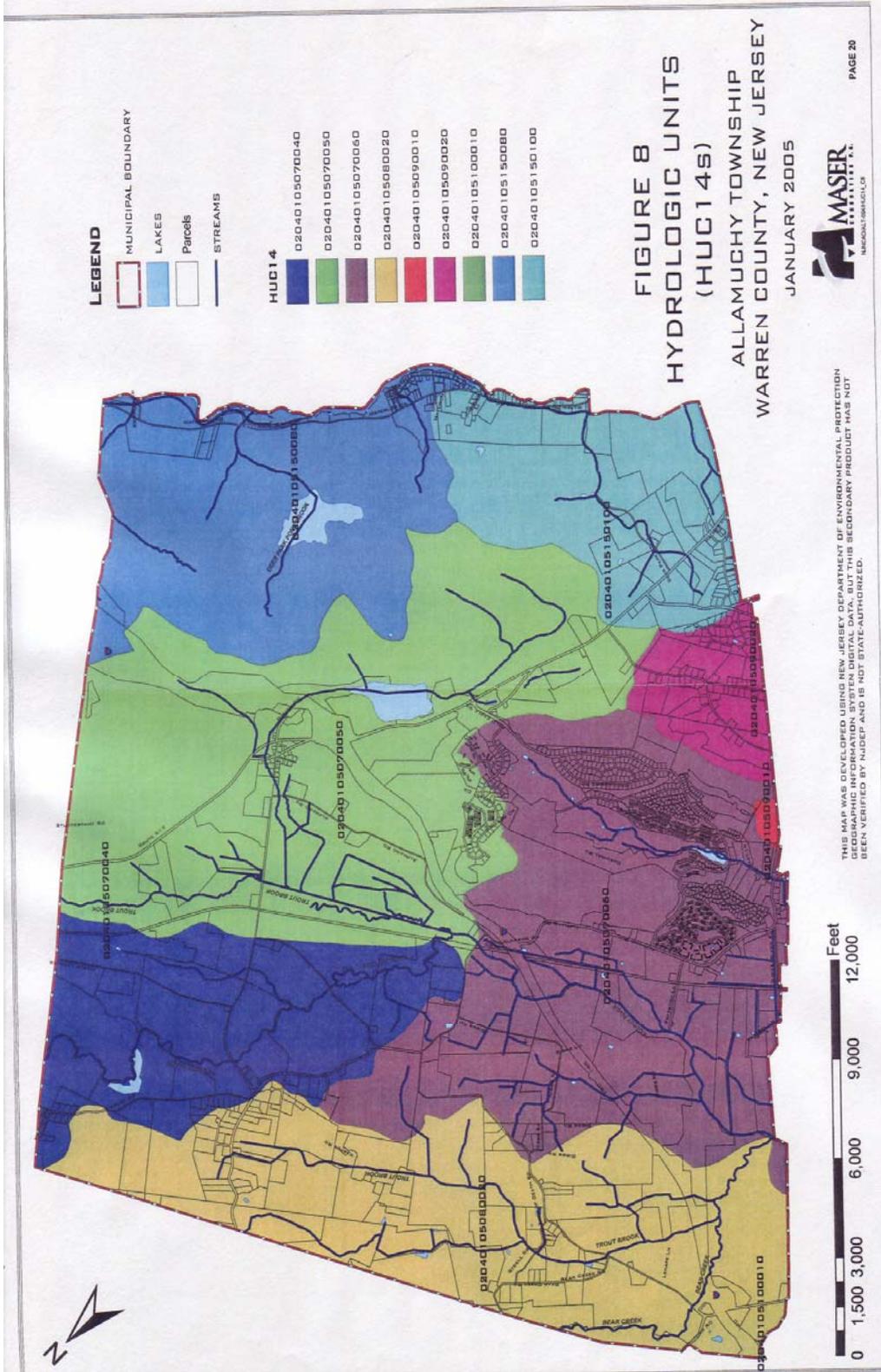
**Section 519 “Grading of Lots”** requires that sites be graded to ensure proper drainage and to prevent undesirable ponding of surface water. Grading shall be performed in a manner which minimizes the destruction of trees. The grade of land located within the dripline of a tree shall not be raised or lowered.

**This section should be amended to include language that requires land disturbance and clearing to be minimized and soil compaction to be minimized.**

### **Land Use / Build – Out Analysis**

A detailed land use analysis for the Township was conducted. Figure 4 illustrates the existing land use in the Township based on current GIS information from NJDEP. Figure 8 illustrates the HUC14s (watersheds) within the Township. The Township zoning map is shown in Figure 5. Figure 9 illustrates the wetlands within the Township. The build-out calculations for impervious coverage are shown in Table 2. The Total Acres, Existing Impervious (%), Existing Impervious (Acres), Critical Areas (Acres), and Existing Developed Areas (Acres) were provided by the Warren County Planning Department. It is important to note that this Build – Out Calculation provides only an estimate for potential additional impervious coverage. In isolated cases, a portion of the critical areas has been developed, thus the remaining developable areas may also be somewhat underestimated and the total of Critical Areas (Acres) and Existing Developed Areas (Acres) may exceed the Total Acres of a given zone within a HUC14 location. Under this circumstance, a negative number appears in the Remaining Developable Areas (Acres) column, which leads to the assumption that no additional impervious coverage will result. In any case, when developing agricultural and forestlands, the build-out of these HUC14s will result in a significant increase in impervious surfaces.

Table 3 presents the pollutant loading coefficients by land cover. The pollutant loads at full build-out are presented in Table 4.



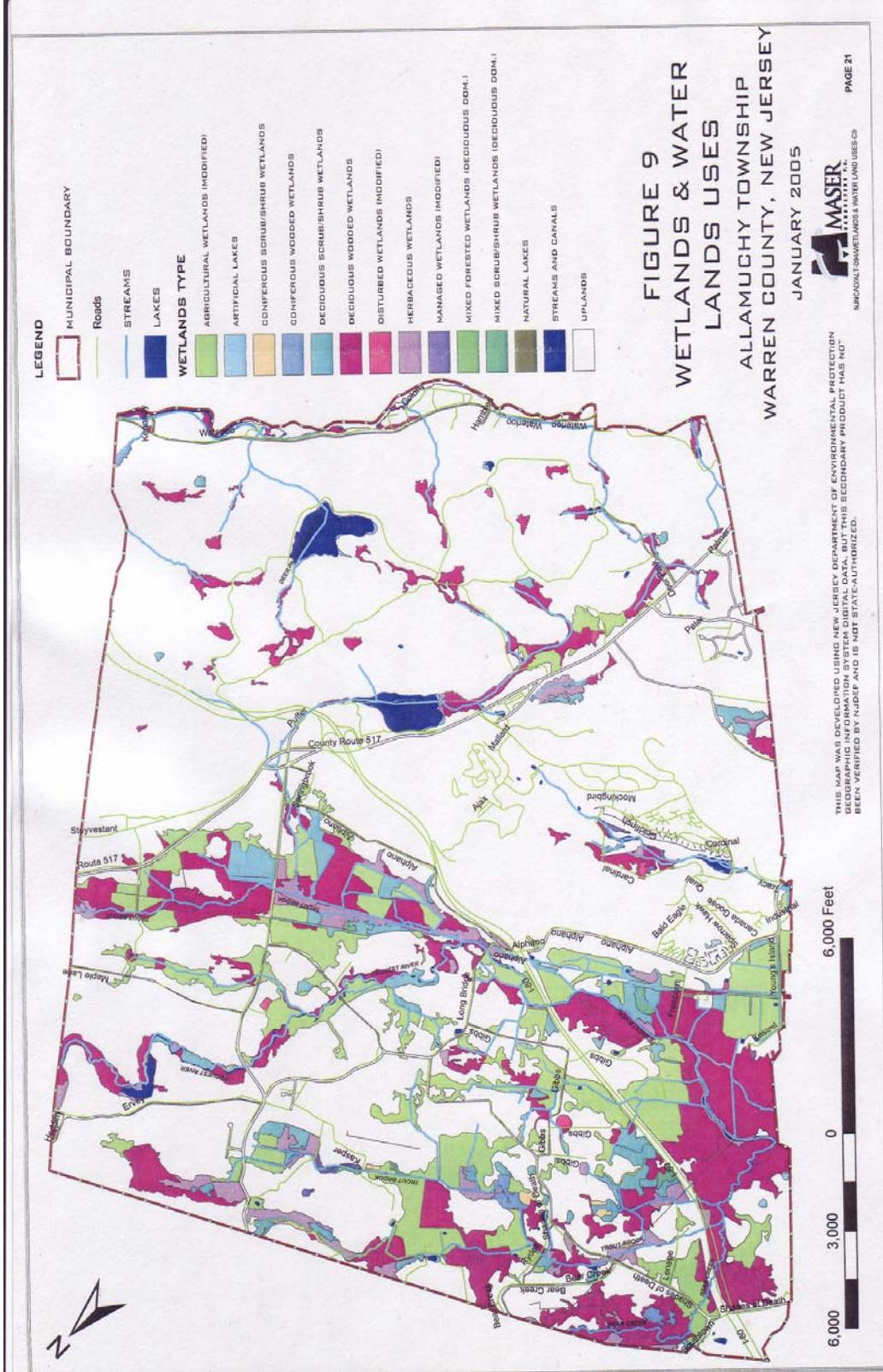




Table 2: Build – Out Calculations for HUC14s

HUC14 and Zone*	Total Acres*	Existing Impervious (%)*	Existing Impervious (Acres)*	Critical Areas (Acres)*	Existing Developed Areas (Acres)*	Remaining Developable Areas (Acres) <sup>1</sup>	Allowable Impervious (%) <sup>2</sup>	Build-Out Impervious (Acres) <sup>3</sup>
2040105150100 - Musconetcong R (Trout Bk to SaxtonFalls)								
CC	19.678	3.10%	0.610	0.000	3.625	16.053	55%	8.829
LM <sup>4</sup>	51.310	0.00%	0.000	14.845	2.115	34.350	0%	0.000
OR	97.652	0.97%	0.947	22.469	12.231	62.952	40%	25.181
PO	30.922	8.22%	2.543	1.105	7.920	21.897	60%	13.138
PPE <sup>5</sup>	541.061	0.25%	1.370	142.495	14.677	383.889	0%	0.000
PR	41.367	5.10%	2.109	26.257	14.931	0.179	30%	0.054
SFR1	305.734	1.03%	3.162	87.766	23.641	194.327		
<b>Totals</b>	<b>1,087.724</b>		<b>10.741</b>	<b>294.937</b>	<b>79.140</b>	<b>713.647</b>		<b>47.202</b>
2040105090010 - Pequest R (Drag Strip--below Bear Swamp)								
RR	13.285	0.00%	0.000	12.611	0.000	0.674	10%	0.067
SFR1	19.664	0.02%	0.003	4.111	0.000	15.553	Half at 12% and Half at 15%	2.100
<b>Totals</b>	<b>32.949</b>		<b>0.003</b>	<b>16.722</b>	<b>0.000</b>	<b>16.227</b>		<b>2.167</b>
2040105090020 - Pequest R (Cemetery Road to Drag Strip)								
CC	3.017	0.00%	0.000	0.000	0.000	3.017	55%	1.659
SFR1	324.247	3.00%	9.741	109.864	53.454	160.929	Half at 12% and Half at 15%	21.725
<b>Totals</b>	<b>327.264</b>		<b>9.741</b>	<b>109.864</b>	<b>53.454</b>	<b>163.946</b>		<b>23.385</b>
2040105150080 - Musconetcong R (SaxtonFalls to Waterloo)								
PPE <sup>5</sup>	1,699.627	1.11%	18.863	488.323	42.562	1,168.742	0%	0.000
PR	123.886	2.57%	3.182	79.488	20.469	23.929	30%	7.179
<b>Totals</b>	<b>1,823.513</b>		<b>22.045</b>	<b>567.811</b>	<b>63.031</b>	<b>1,192.671</b>		<b>7.179</b>
2040105100010 - Union Church Tributary								
RR	5.748	0.84%	0.048	3.948	0.050	1.750	10%	0.175
<b>Totals</b>	<b>5.748</b>		<b>0.048</b>	<b>3.948</b>	<b>0.050</b>	<b>1.750</b>		<b>0.175</b>
2040105070060 - Pequest R (below Bear Swamp to Trout Bk)								
MR	575.870	23.31%	134.262	152.769	381.849	41.252	35%	14.438
PPE	46.186	7.87%	3.637	25.048	13.318	7.820	60%	4.692
RR	1,485.023	1.80%	26.774	1,065.540	74.886	344.597	10%	34.460
SFR1	757.144	3.70%	28.005	383.828	44.682	328.634	Half at 12% and Half at 15%	44.366
<b>Totals</b>	<b>2,864.223</b>		<b>192.678</b>	<b>1,627.185</b>	<b>514.735</b>	<b>722.303</b>		<b>97.955</b>



2040105070050 - Trout Brook/Lake Tranquility								
APT <sup>6</sup>	44.359	0.01%	0.006	11.676	0.131	32.552	0%	0.000
CC	60.430	21.14%	12.777	2.809	19.281	38.340	55%	21.087
MR	66.616	28.50%	18.986	40.927	40.190	(14.501)	35%	0.000
OR	28.073	7.18%	2.015	0.795	10.530	16.748	40%	6.699
PO	28.163	7.41%	2.087	5.185	7.569	15.409	60%	9.245
PPE <sup>7</sup>	15.617	20.00%	3.123	0.781	3.123	11.712	60%	7.027
RR	902.083	0.75%	6.723	660.064	14.640	227.379	10%	22.738
SFR1	537.090	4.79%	25.744	215.396	45.153	276.541	Half at 12% and Half at 15%	37.333
VN	46.675	11.82%	5.518	6.785	18.261	21.629	30%	6.489
<b>Totals</b>	<b>1,729.106</b>		<b>76.979</b>	<b>944.418</b>	<b>158.878</b>	<b>625.809</b>		<b>110.619</b>
2040105080020 - Bear Creek								
RR	2,352.799	1.75%	41.091	1,373.320	169.423	810.056	10%	81.006
<b>Totals</b>	<b>2,352.799</b>	<b>1.75%</b>	<b>41.091</b>	<b>1,373.320</b>	<b>169.423</b>	<b>810.056</b>		<b>81.006</b>
2040105070040 - Pequest River (Trout Brook to Brighton)								
RR	1,432.512	0.67%	9.604	407.404	53.999	971.109	10%	97.111
<b>Totals</b>	<b>1,432.512</b>		<b>9.604</b>	<b>407.404</b>	<b>53.999</b>	<b>971.109</b>		<b>97.111</b>
<b>Totals</b>				<b>4,401.191</b>		<b>4,591.709</b>		<b>356.179</b>
* Information Provided by Warren County Planning Department								
<b>1</b> Remaining Developable Areas (Acres) = Total Acres - Critical Areas (Acres) - Existing Developed Areas (Acres)								
<b>2</b> Allowable Impervious (%) is the Maximum Impervious Coverage permitted by the Zoning Ordinance								
<b>3</b> Build - Out Impervious (Acres) = Remaining Developable Areas (Acres) x Allowable Impervious (%)								
<b>4</b> The remaining LM Zone has been acquired by Green Acres and no additional impervious coverage will result								
<b>5</b> The remaining PPE Zone along the Musconetcong has been acquired by the Division of Parks and Forestry and no additional impervious coverage will result								
<b>6</b> The remaining APT Zone has been purchased by the Township to serve as Open Space and no additional impervious coverage will result								
<b>7</b> The only developable area within the PPE Zone in the Musconetcong basin is the Allamuchy Elementary School site, which is approximately 15.61 acres.								



Table 3: Pollutant Loads by Land Cover

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

Source: NJDEP Stormwater BMP Manual 2004

Table 4: Nonpoint Source Loads at Build – Out for HUC14s

HUC14 and Zone	Build - Out Zoning	Remaining Developable Areas (Acres)	Total Phosphorous lbs/acre/year	Total Phosphorous lbs/year	Total Nitrogen lbs/acre/year	Total Nitrogen lbs/year	Total Suspended Solids lbs/acre/year	Total Suspended Solids lbs/year
2040105150100 - Musconetcong R (Trout Bk to Saxton Falls)								
CC	Commercial	16.053	2.1	34	22	353	200	3,211
LM <sup>1</sup>	Industrial	34.350	1.5	0	16	0	200	0
OR	Commercial	62.952	2.1	132	22	1,385	200	12,590
PO	Commercial	21.897	2.1	46	22	482	200	4,379
PPE <sup>2</sup>	Forest, Water, Wetlands	529.060	1.0	529	10	5,291	120	63,487
PR	High, Medium Density Residential	0.179	1.4	0	15	3	140	25
SFR1	Low Density, Rural Residential	194.327	0.6	117	5	972	100	19,433
<b>Totals</b>		858.818		858		8,485		103,125
2040105090010 - Pequest R (Drag Strip--below Bear Swamp)								
RR	Low Density, Rural Residential	0.674	0.6	0	5	3	100	67



SFR1	Low Density, Rural Residential	15.553	0.6	9	5	78	100	1,555
<b>Totals</b>		16.227		10		81		1,623
2040105090020 - Pequest R (Cemetary Road to Drag Strip)								
CC	Commercial	3.017	2.1	6	22	66	200	603
SFR1	Low Density, Rural Residential	160.929	0.6	97	5	805	100	16,093
<b>Totals</b>		163.946		103		871		16,696
2040105150080 - Musconetcong R (SaxtonFalls to Waterloo)								
PPE <sup>2</sup>	Forest, Water, Wetlands	1,549.580	0.1	155	3	4,649	40	61,983
PR	High, Medium Density Residential	23.929	1.4	34	15	359	140	3,350
<b>Totals</b>		1,573.509	1.5	188	18	5,008		65,333
2040105100010 - Union Church Tributary								
RR	Low Density, Rural Residential	1.750	0.6	1	5	9	100	175
<b>Totals</b>		1.750		1		9		175
2040105070060 - Pequest R (below Bear Swamp to Trout Bk)								
MR	High, Medium Density Residential	41.252	1.4	58	15	619	140	5,775
PPE	Other Urban	7.820	1.0	8	10	78	120	938
RR	Low Density, Rural Residential	344.597	0.6	207	5	1,723	100	34,460
SFR1	Low Density, Rural Residential	328.634	0.6	197	5	1,643	100	32,863
<b>Totals</b>		722.303		470		4,063		74,037
2040105070050 - Trout Brook/Lake Tranquility								



APT <sup>3</sup>	High, Medium Density Residential	32.552	1.4	0	15	0	140	0
CC	Commercial	38.340	2.1	81	22	843	200	7,668
MR	High, Medium Density Residential	(14.501)	1.4	0	15	0	140	0
OR	Commercial	16.748	2.1	35	22	368	200	3,350
PO	Commercial	15.409	2.1	32	22	339	200	3,082
PPE	Other Urban	11.712	1.0	12	10	117	120	1,405
PPE	Forest, Water, Wetlands	1,529.410	0.1	153	3	4,588	40	61,176
RR	Low Density, Rural Residential	227.379	0.6	136	5	1,137	100	22,738
SFR1	Low Density, Rural Residential	276.541	0.6	166	5	1,383	100	27,654
VN	High, Medium Density Residential	21.629	1.4	30	15	324	140	3,028
<b>Totals</b>		2,155.219		645		9,100		130,101
2040105080020 - Bear Creek								
RR	Low Density, Rural Residential	810.056	0.6	486	5	4,050	100	81,006
<b>Totals</b>		810.056		486		4,050		81,006
2040105070040 - Pequest River (Trout Brook to Brighton)								
RR	Low Density, Rural Residential	971.109	0.6	583	5	4,856	100	97,111
<b>Totals</b>		2,591.221		583		4,856		97,111
<b>Totals</b>				3,343		36,523		569,207
<b>1</b> The remaining LM Zone has been acquired by Green Acres and no additional impervious coverage will result.								



2 The remaining PPE Zone along the Musconetcong has been acquired by the Division of Parks and Forestry and no additional impervious coverage will result.

3 The remaining APT Zone has been purchased by the Township to serve as Open Space and no additional impervious coverage will result.

### **Mitigation Plans**

Due to the significance of the Pequest and Musconetcong Rivers and their tributaries to the Township from recreation and aesthetic perspectives, water quality must be safeguarded from development activities. Because of the language in the Master Plan, the Township does not believe it is in their interest to vary the design and performance standards in the stormwater rules. Thus, no variances and exemptions from the standards shall be granted. Applicants for development will be expected to mitigate the impacts of development on stormwater at their own site or other sites within the subject watershed that it controls.

It should also be noted that there is little or no land area within the Township at strategic locations and owned by the municipality or other governmental agencies that would even allow for a flood control or water quality enhancement project if mitigation were to be allowed in the plan by the municipality. The majority of the remaining developable areas within the Township are scattered throughout Rural Residential and Single-Family Residential zones. Hence, it is more practical for any new development to provide on-site stormwater facilities rather than implementing a municipal system that would disrupt the existing built environment.