

# **LIBERTY TOWNSHIP**

## **MUNICIPAL STORMWATER MANAGEMENT PLAN**

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Prepared for

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Maps prepared by the Warren County Planning Department

# **LIBERTY TOWNSHIP STORMWATER MANAGEMENT PLAN**

## **Introduction**

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

A “build-out” analysis has been included in this plan based upon existing zoning and land available for development. The plan also addresses the review and update of existing ordinances, the Township Master Plan, and other planning documents to allow for project designs that include low impact development techniques. The final component of this plan is a mitigation strategy for when a 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 non-point source pollution;
- maintain the integrity of stream channels for their biological functions, as well as for drainage;

- minimize pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water; and

- protect public safety through the proper design and operation of stormwater basins.

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

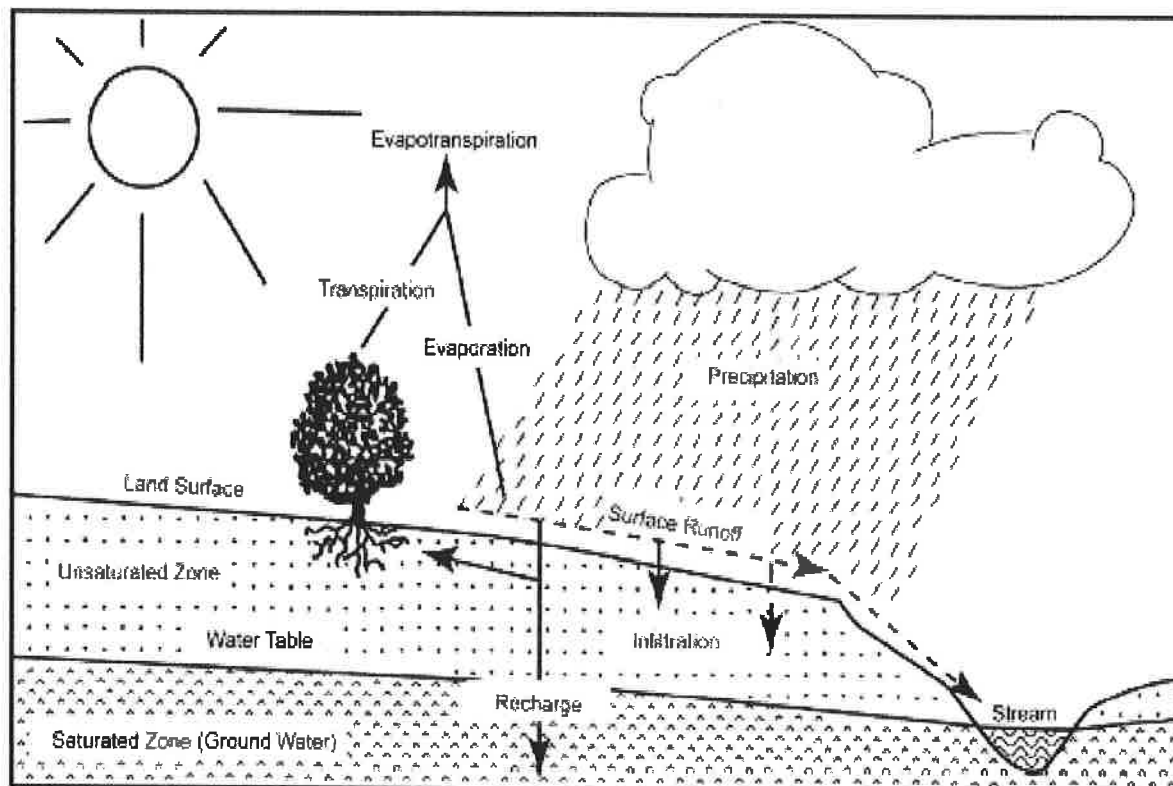
## **Stormwater Discussion**

Land development can dramatically alter the hydrologic cycle (See Figure C-1) of a site and, ultimately, an entire watershed. Prior to development, native vegetation can either directly intercept precipitation or draw that portion that has infiltrated into the ground and return it to the atmosphere through evapotranspiration. Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. Impervious areas that are connected to each other through gutters, channels, and storm sewers can transport runoff more quickly than natural areas. This shortening of the transport or travel time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher than natural conditions. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration, which, in turn, reduces stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuations between normal and storm flow rates, which can increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can destroy habitat from which some species cannot adapt.

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

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

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



Source: New Jersey Geological Survey Report GSR-32.

## Background

Liberty Township encompasses a 12 square mile area in Warren County, New Jersey. In recent years, the township has been under significant development pressure. The population of the Township has increased from 1,730 in 1980 to 2,493 in 1990, (a 41% increase) to 2,765 in 2000 (an additional 10.9% increase). This population increase has resulted in considerable demand for new development; changes in the landscape have most likely increased stormwater runoff volumes and pollutant loads to the waterways of the municipality. The watershed of Mountain Lake, the largest natural glacial lake in Warren County, lies entirely within the boundaries of Liberty Township.

In 1992 a study of this watershed was prepared by the Warren County Soil Conservation District in cooperation with the Liberty Township Planning Board, the USDA Soil

Conservation Service, and the Warren County Planning Board to analyze the contributory runoff to the Lake, and to determine what effect new development would have on the Lake and stream corridors if the area was developed to its maximum allowable amounts under existing development ordinances. Through 1998 and 2001 the Environmental Commission performed a series of studies including; Water Quality Study of Mountain Lake by Amy Greene Assoc., a Bathymetric Map of Mountain Lake by Aquatic Analysts, Inc., Phase I Storm Water Study of Mountain Lake by Aquatic Analysts, Inc. and Phase II NPS Loading of Phosphorous Modeling by Aquatic Analysts, Inc. These studies led up to a Clean Water Act 319h grant for installation of filtering storm drains at Mountain Lake in 2003. Educational brochures concerning non-point source pollution were developed and distributed to residents. Ordinances controlling use of phosphate fertilizer, prohibiting feeding of waterfowl, and requiring clean up of pet waste have been adopted.

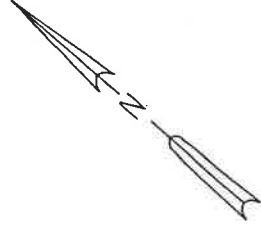
Other watersheds in the Township include the Pequest River and Beaver Brook. The Pequest River, as it runs through Liberty is classified as a Category 1 waterway. Mountain Lake Brook below Mountain Lake is considered moderately impaired based on AMNET data. No TDML has been yet determined.

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

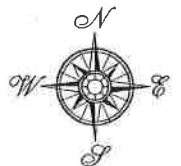
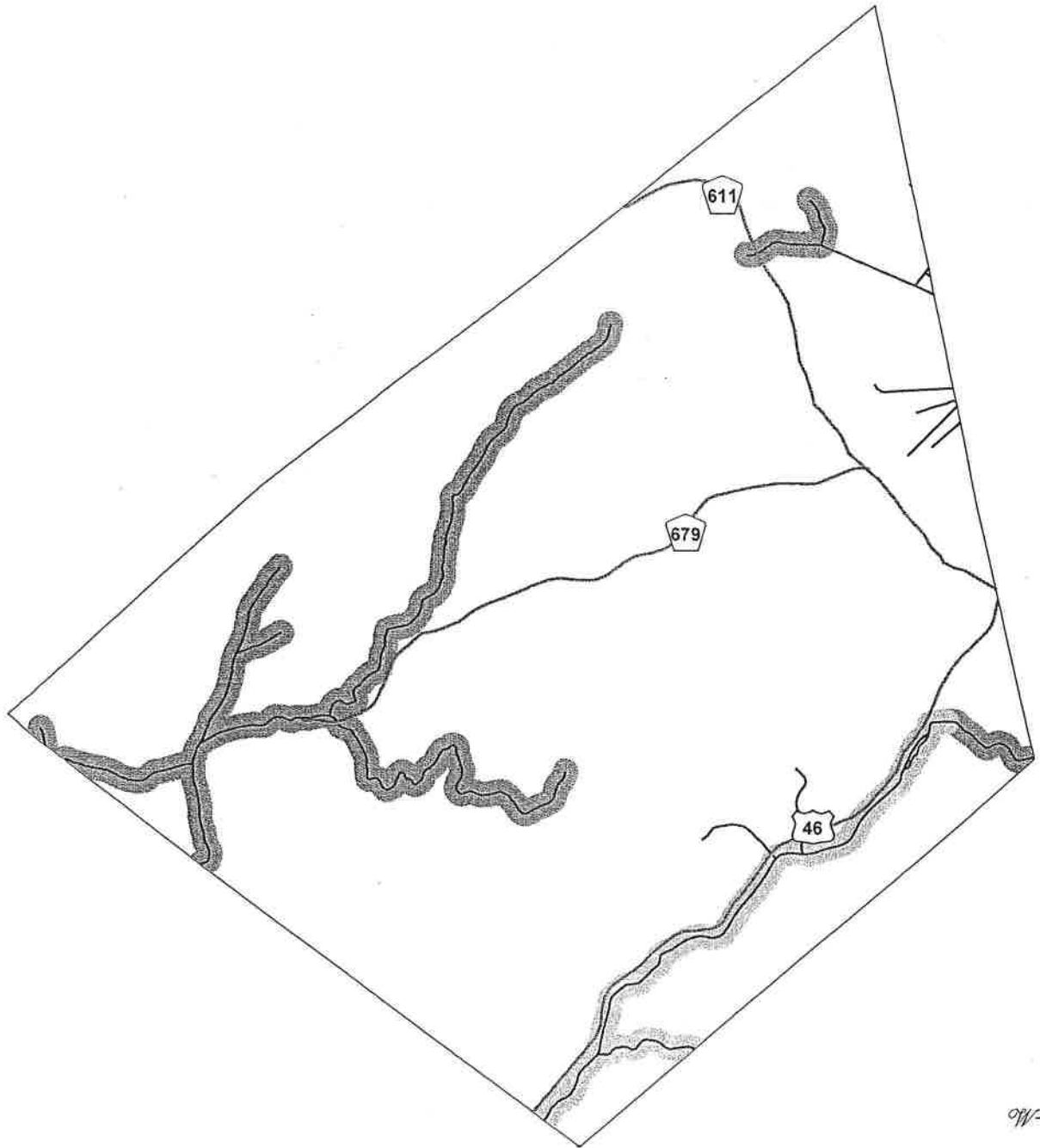
A TMDL is the amount of a pollutant that can be accepted by a water body without causing an exceedance of water quality standards or interfering with the ability to use a water body for one or more of its designated uses. The allowable load is allocated to the various sources of the pollutant, such as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

The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b)and 303(d)) (Integrated List)is required by the federal Clean Water Act to be prepared biennially and is a valuable source of water quality information. This combined report presents the extent to which New Jersey waters are attaining water quality standards, and identifies waters that are impaired. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more TMDLs are needed.

Township of Liberty



# Liberty Township Waterways Map



## Legend

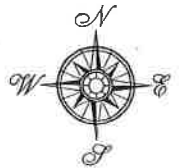
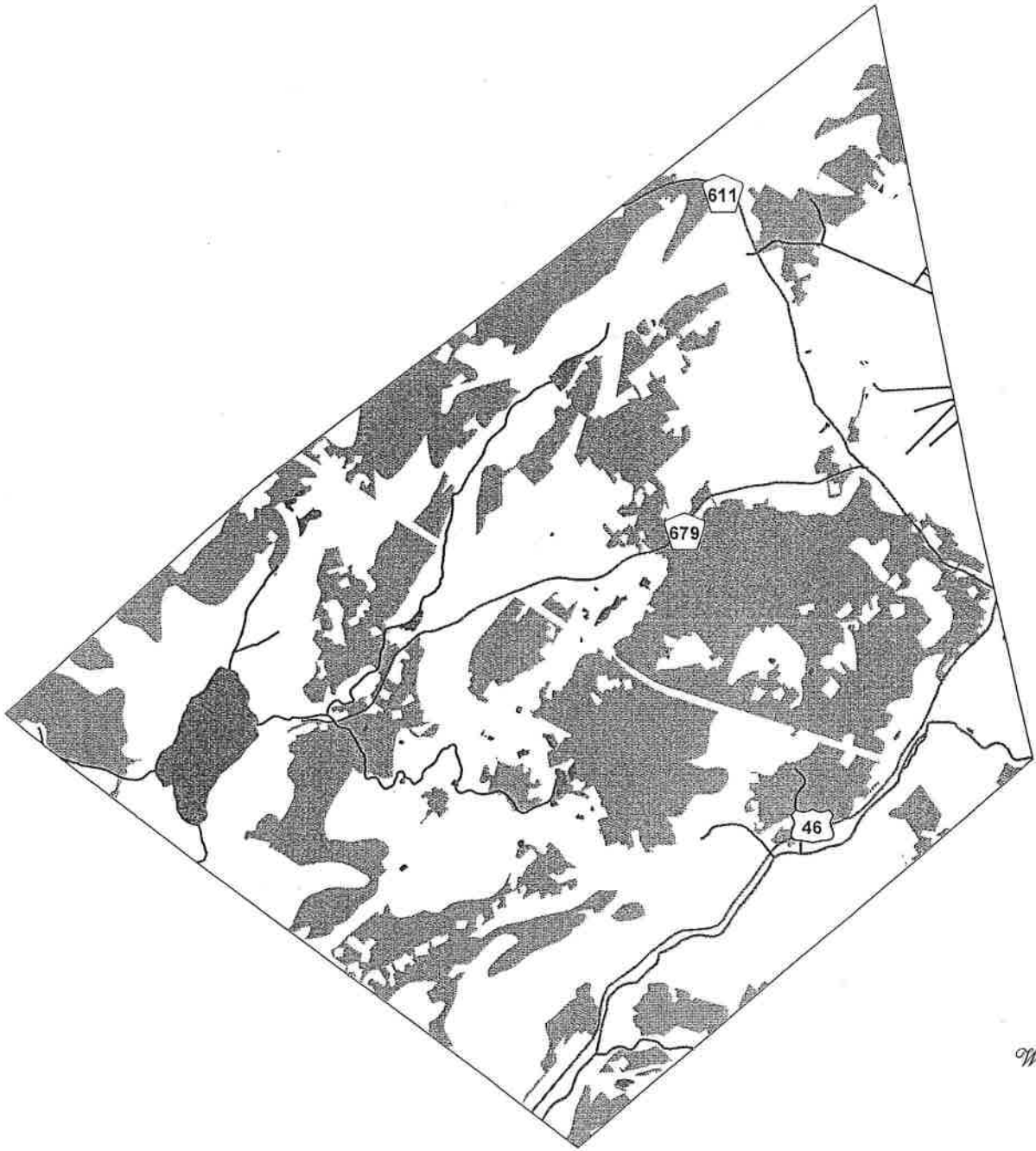
- Streams
- ⋯ Buffer of C-1 Streams
- 300' Buffer on Highlands Area Streams

Sources: New Jersey Department of Environmental Protection  
Produced By: Warren County Planning Department, August 2004








# Liberty Township Ground Water Recharge Map



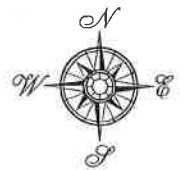
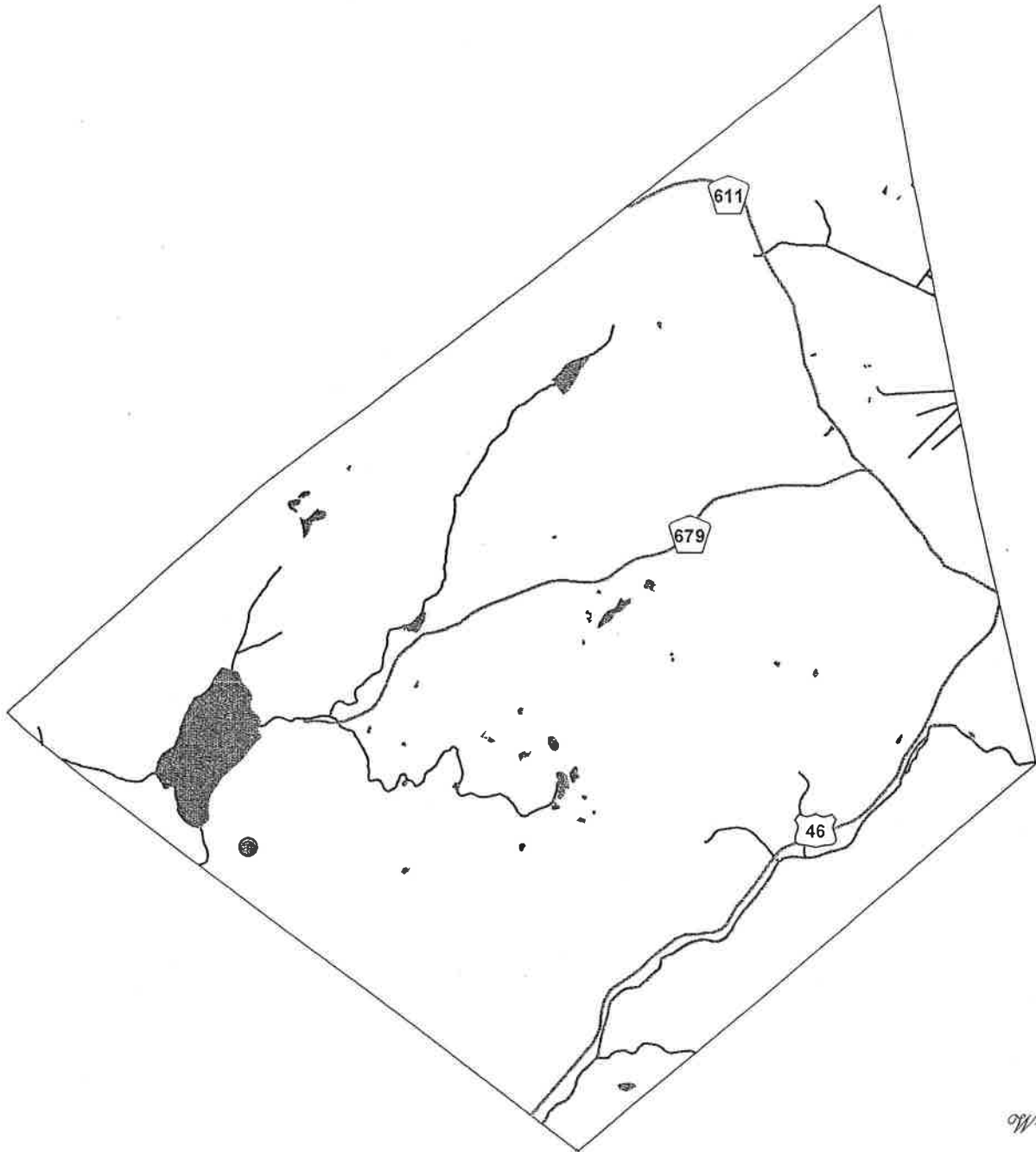
## Legend

-  Lakes
-  Streams
-  Ground Water Recharge Area




Sources: New Jersey Department of Environmental Protection and  
New Jersey Geological Survey  
Produced By: Warren County Planning Department, August 2004



# Liberty Township Public Community Well Map



## Legend

-  Lakes
-  Streams
-  Public Community Well

Sources: New Jersey Department of Environmental Protection  
Produced By: Warren County Planning Department, August 2004



Figure 2 – Base Map of Liberty Township

Figure 3- Waterways in the Township.

The Township has exhibited severe water quantity problems including flooding and stream bank erosion. This was extremely evident after Hurricane Ivan in 2004 when over six inches of rain fell in less than eight hours. Four homes along Mountain Lake Brook were flooded near the inlet to Mountain Lake. Scouring of streambeds occurred, along with stream bank erosion.

There are three dams in the Township. The Douglas Dam is on an unnamed tributary to Mountain Lake Brook on property managed by Jenny Jump State Park. The Lake Just It dam served historically for a mill pond. The dam at Liberty Lake near the headwaters of Mountain lake Brook was breached during Hurricane Floyd in 1996.

Figure 4 - Groundwater recharge areas

Figure 5- Location of the public ground water well

## **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 project 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 areas. This Municipal Stormwater Management Plan will be updated to be consistent with any future updates to the RSIS.

The Township 's Stormwater Management Ordinance requires all new development and redevelopment plans to comply with New Jersey 's Soil Erosion and Sediment Control

Standards. During construction, Township inspectors will observe on-site soil erosion and sediment control measures and report any inconsistencies to the local Soil Conservation District.

## **Nonstructural Stormwater Management Strategies**

The master plan and ordinances have been reviewed, and following is a list of the sections in the Township land use and zoning ordinances that are to be modified to incorporate nonstructural stormwater management strategies. These are the ordinances identified for revision. Once the ordinance texts are completed, they will be submitted to the county review agency for review and approval within 24 months of the effective date of the Stormwater Management Rules. A copy will be sent to the Department of Environmental Protection at the time of submission.

Chapters 72, 90, and 105 of the Liberty Township Combined Land Use Code were reviewed with regard to incorporating nonstructural stormwater management strategies.

**Section 90-12: Soil erosion and sediment control:** Additional language should be added to address the re-establishment of vegetation and slope stabilization in area where development does occur in addition to language that requires soil compaction to be minimized.

**Section 90-13: Surface water run off control:** Should be updated to include all requirements outlined in N.J.A.C.7:8-5.

**Section 90-15 (5): Buffering:** This section should be amended to require the use of native vegetation, which needs less fertilizer and watering than non-native species. Language should also be added to allow buffer area to be used for stormwater management by disconnecting impervious surfaces and treating run-off from these surfaces.

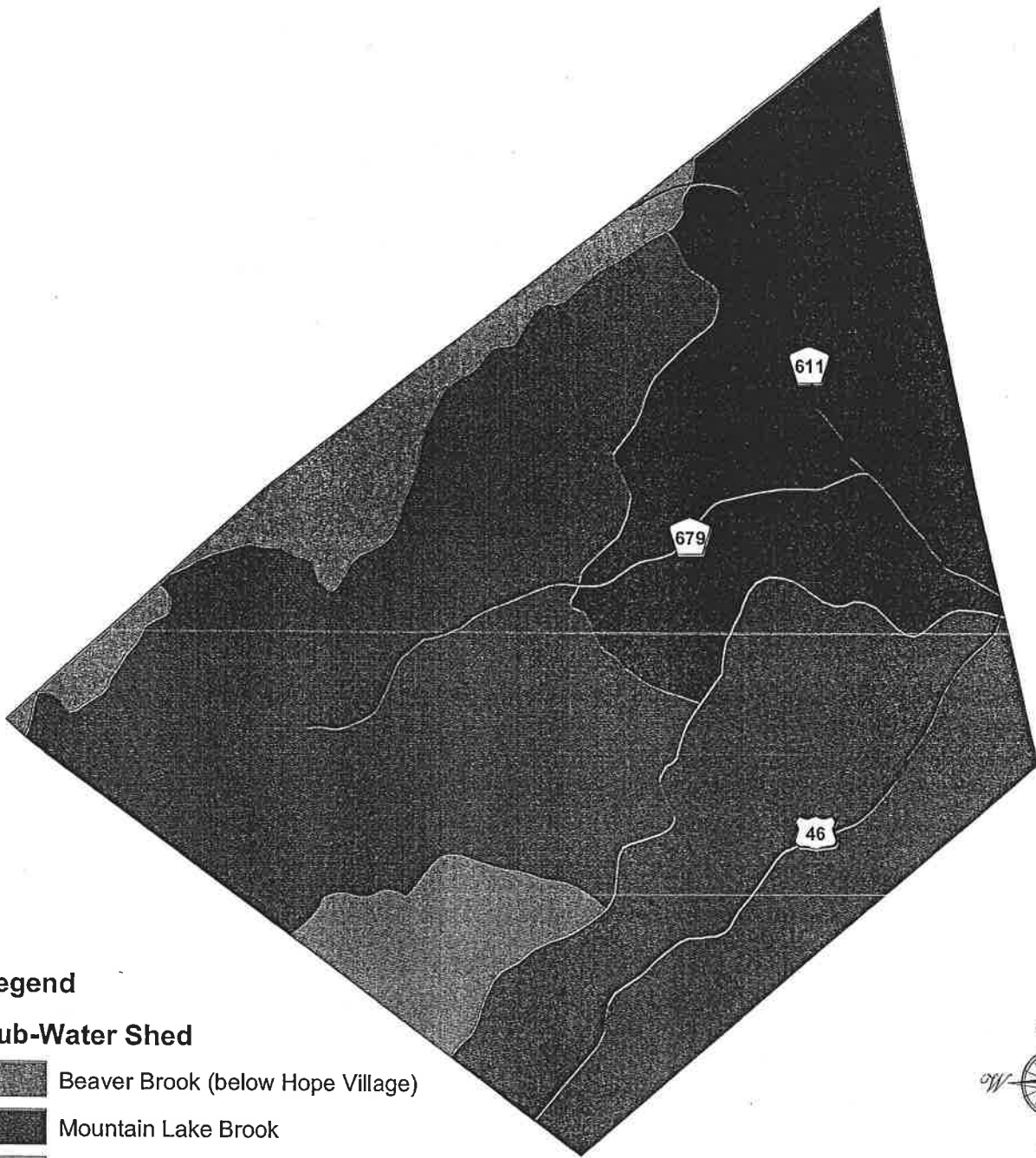
**Section 90-15 (7) (a): Paving materials:** Language should be added allowing use of pervious paving materials to minimize stormwater run-off and promote ground water recharge.

**Section 90-16 (3): Surface and storm water drainage facilities:** Language that promotes the use of natural vegetated swales to decrease flow velocity and allow for infiltration instead of pipes and inlets should be added. Design criteria for vegetated channels should be incorporated in this section.

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







The Township is mostly in the Preservation Area determined by the Highlands Water Protection and Planning Act. Current zoning will change as per these new regulations. The Calculations for the HUC 14s were prepared by the Warren County Planning Department.

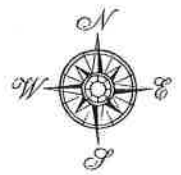
# Liberty Township HUC 14 Map



## Legend

### Sub-Water Shed

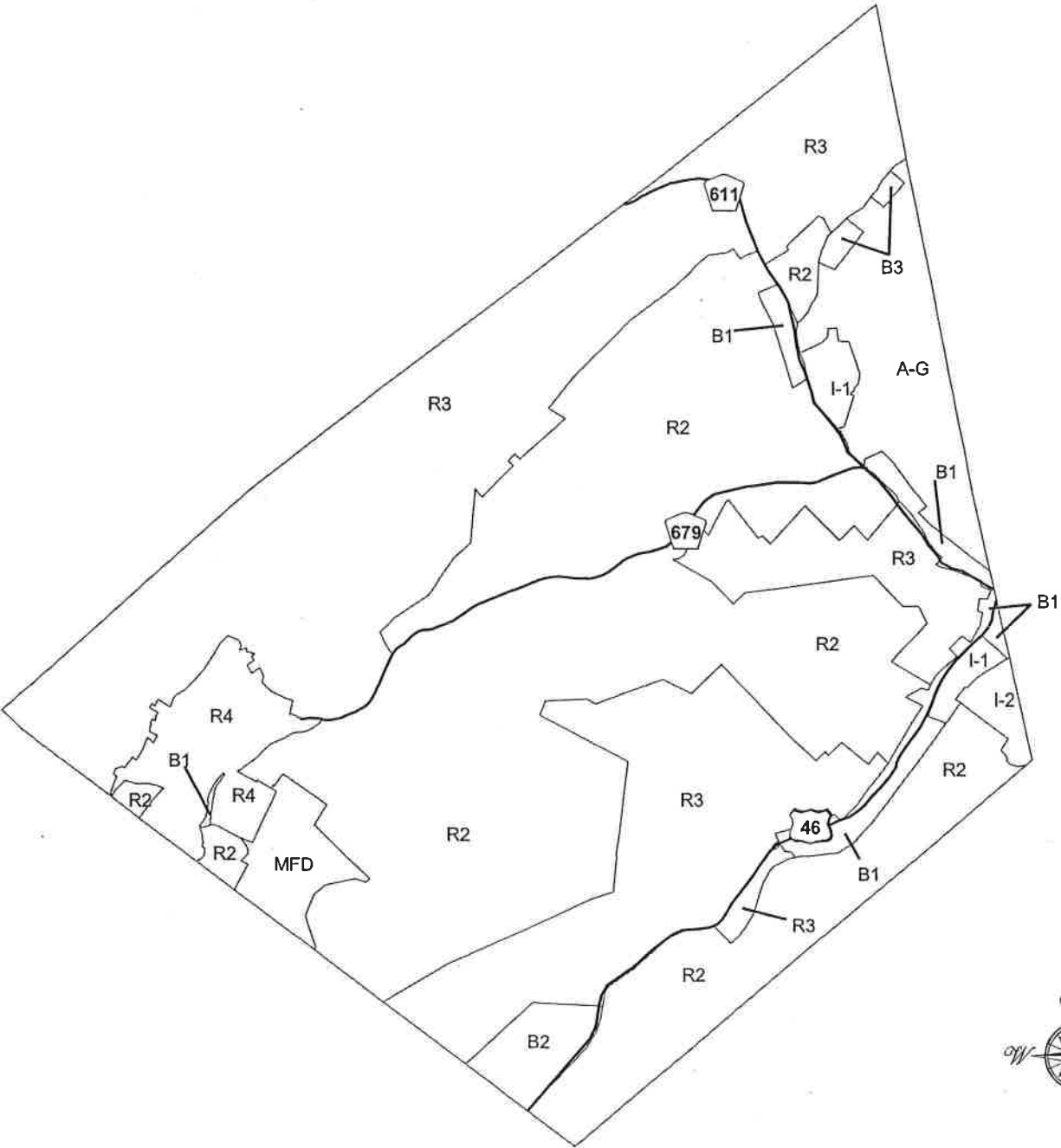
-  Beaver Brook (below Hope Village)
-  Mountain Lake Brook
-  Pequest R (Drag Strip--below Bear Swamp)
-  Pequest R (Furnace Bk to Cemetary Road)
-  Pequest R (below Furnace Brook)
-  Union Church trib



Sources: New Jersey Department of Environmental Protection  
Produced By: Warren County Planning Department, August 2004



# Liberty Township Zoning Map



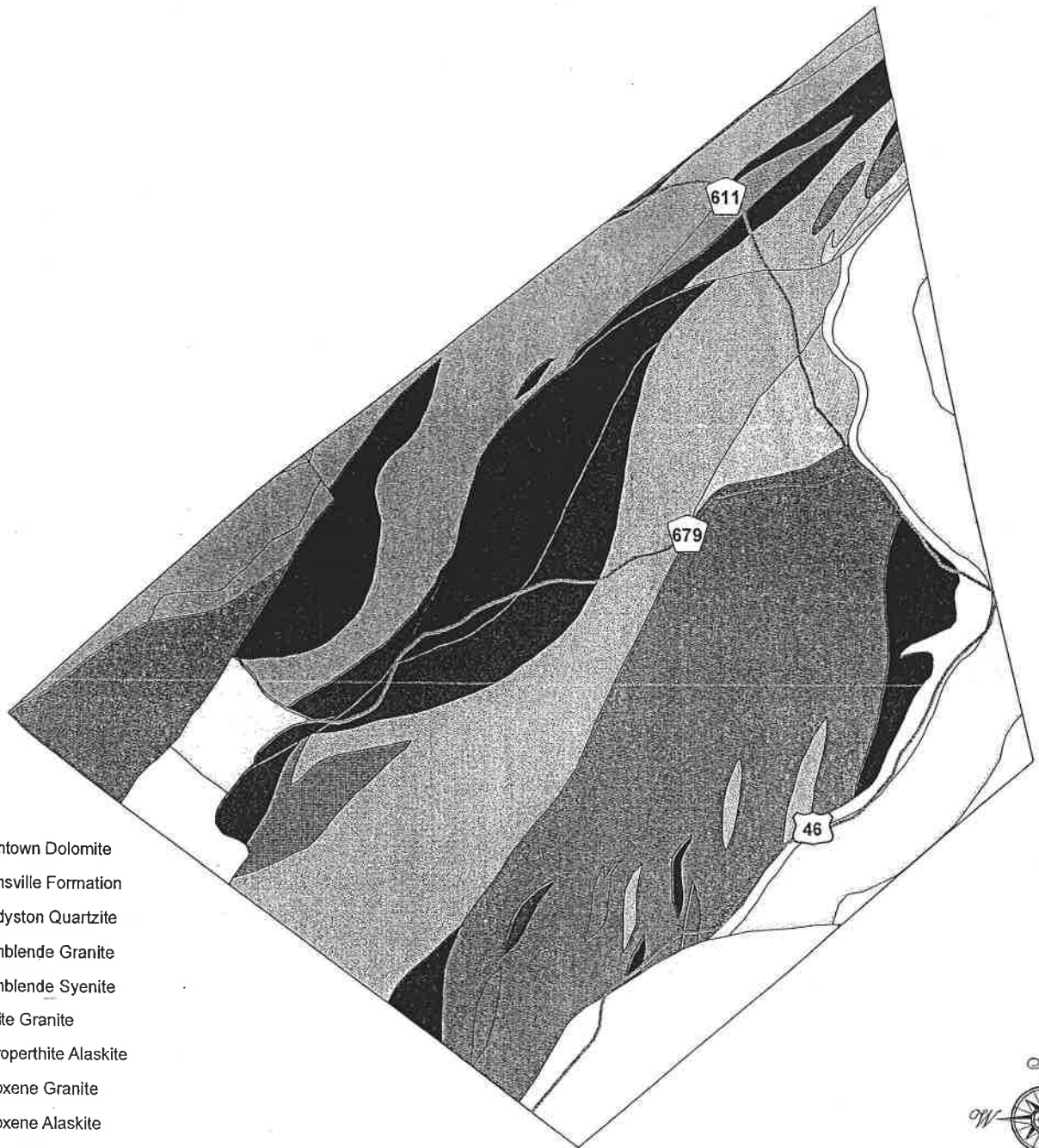
Sources: Municipal Zoning Ordinance, New Jersey  
Department of Environmental Protection  
Produced By: Warren County Planning Department, August 2004




















## Liberty Township Calculations for HUC 14s

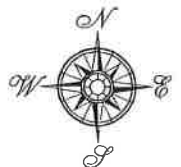
HUC14 and Zone	ACRES	Existing Impervious (%)	Existing Impervious (Acres)	Critical Areas (Acres)	Developed Areas (Acres)
02040105100040 - Beaver Brook (below Hope Village)					
R3	482.622	0.80%	3.876	138.014	36.835
<b>Totals</b>	482.622	0.80%	3.876	138.014	36.835
02040105090040 - Mountain Lake Brook					
B1	3.105	11.95%	0.371	0.068	3.037
MFD	125.725	0.42%	0.526	75.591	2.631
R2	1,357.381	2.76%	37.491	203.180	260.864
R3	1,139.238	0.38%	4.274	533.949	32.205
R4	266.107	10.44%	27.771	195.562	98.184
<b>Totals</b>	2,891.556	2.44%	70.433	1,008.350	396.921
02040105090060 - Pequest R (below Furnace Brook)					
MFD	7.261	0.00%	0.000	2.089	0.000
R2	301.822	2.67%	8.064	48.198	42.294
R3	86.552	0.62%	0.538	23.077	2.870
<b>Totals</b>	395.635	2.17%	8.602	73.364	45.164
02040105090010 - Pequest R (Drag Strip--below Bear Swamp)					
AG	404.405	1.75%	7.093	356.217	19.491
B1	68.845	7.94%	5.465	19.305	23.691
B3	21.995	55.75%	12.263	6.401	15.439
I-1	45.495	1.59%	0.725	8.216	0.021
R2	868.064	3.65%	31.708	155.249	203.410
R3	647.040	1.28%	8.293	209.783	50.306
<b>Totals</b>	2,055.844	3.19%	65.547	755.171	312.358
02040105090030 - Pequest R (Furnace Bk to Cemetary Road)					
B-1	94.946	12.67%	12.029	64.305	34.722
B-2	102.353	0.68%	0.694	64.156	3.162
I-1	30.947	2.88%	0.892	2.881	6.951
I-2	47.767	0.10%	0.047	6.623	16.352
R2	895.506	2.90%	25.997	216.627	157.910
R3	703.629	1.03%	7.230	319.430	58.439
<b>Totals</b>	1,875.148	2.50%	46.889	674.022	277.536

# Liberty Township Geology Map



## Legend

-  Allentown Dolomite
-  Leithsville Formation
-  Hardyston Quartzite
-  Hornblende Granite
-  Hornblende Syenite
-  Biotite Granite
-  Microperthite Alaskite
-  Pyroxene Granite
-  Pyroxene Alaskite
-  Potassic Feldspar Gneiss
-  Biotite-Quartz-Feldspar Gneiss
-  Pyroxene Gneiss
-  Pyroxene-Epidote Gneiss
-  Franklin Marble
-  Quartz-Oligoclase Gneiss
-  Biotite-Quartz-Oligoclase Gneiss
-  Hypersthene-Quartz-Oligoclase Gneiss



Sources: New Jersey Department of Environmental Protection and  
New Jersey Geological Survey  
Produced By: Warren County Planning Department, August 2004



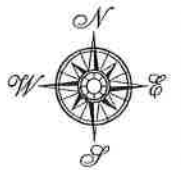
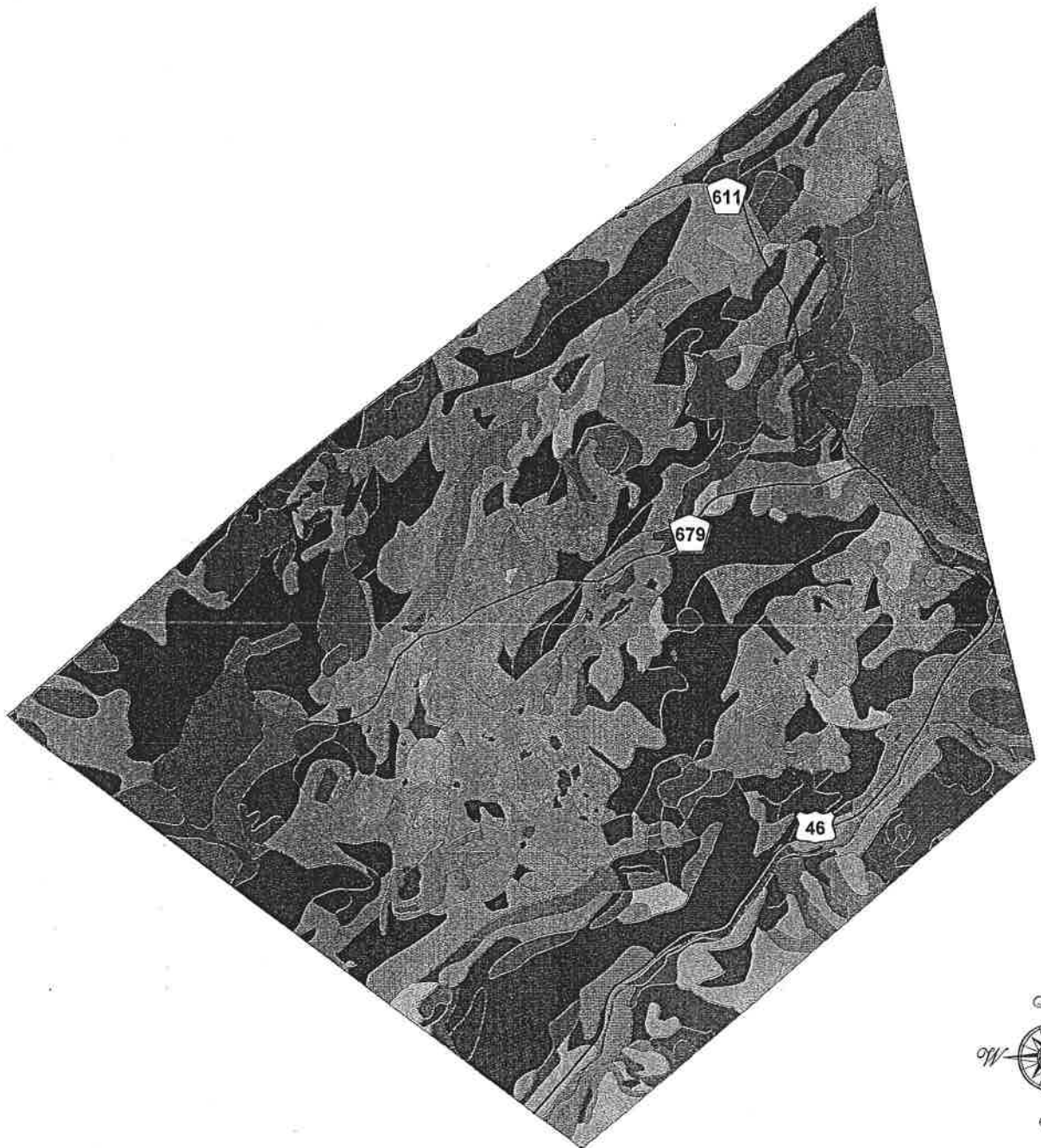


# Liberty Township Soils Map

## Legend

### LABEL

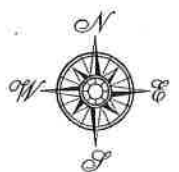
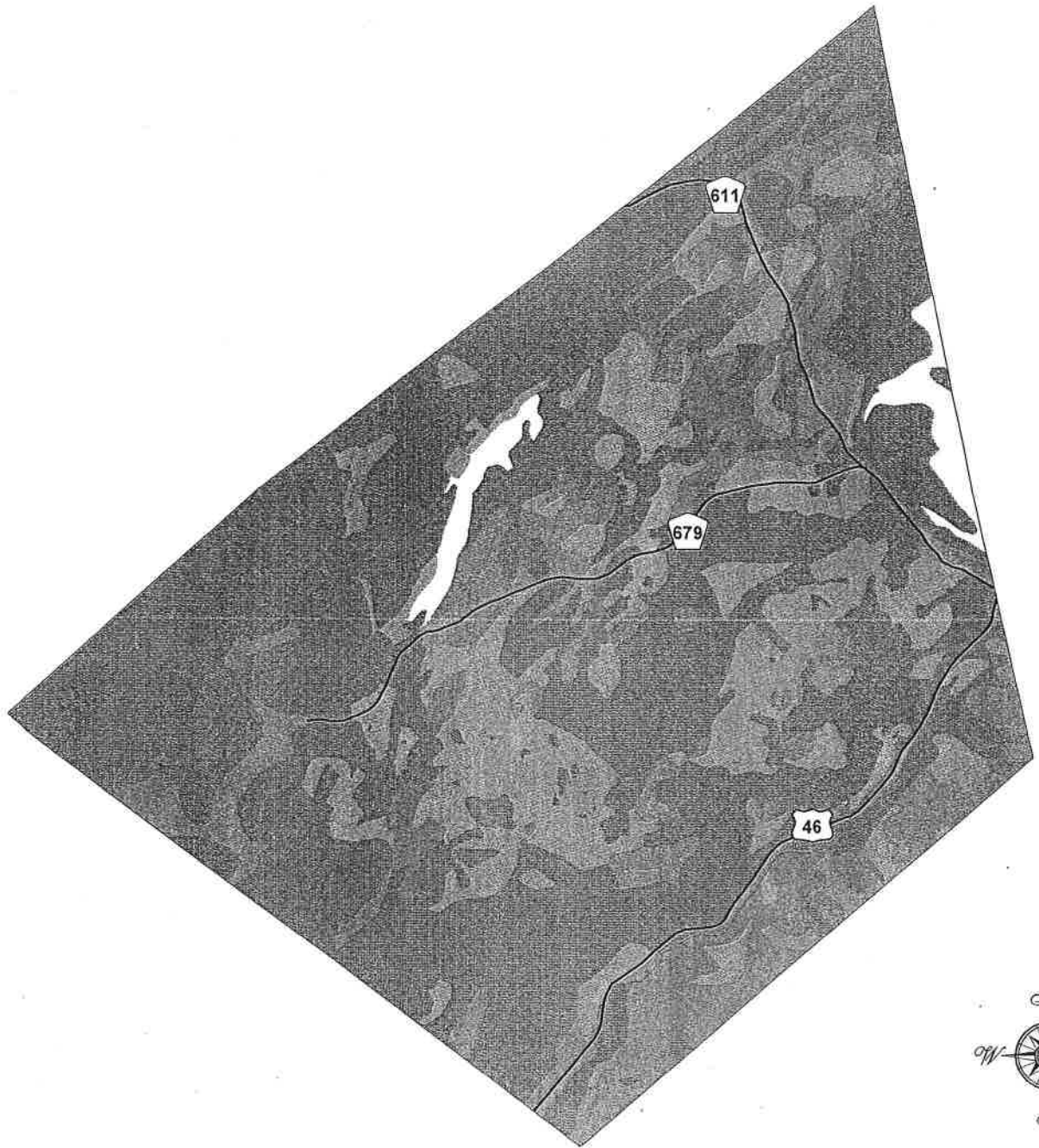
- Ad
- AnB2
- AnC2
- AnD2
- AsB
- AsC
- AsD
- BaA
- BaB
- BbC
- BdB
- CbB
- CbC2
- CcB
- Ck
- EPD
- EdB
- EdC
- Ee
- EeC
- FrA
- Ha
- HbB
- HcB
- HfA
- HfB
- HfC
- HfD
- HfE
- HkA
- HkB
- HrA
- HrB
- LyA
- LzB
- Md
- PaA
- PaB
- PbE
- Pd
- QUA
- RPF
- UNK
- WOD
- WaD2
- Water
- WgB
- WgC
- WgD
- WkB
- WkC
- WkD
- WkE
- Wp



Sources: New Jersey Department of Environmental Protection and  
New Jersey Geological Survey  
Produced By: Warren County Planning Department, August 2004



# Liberty Township Soils Map



## Legend

### Agricultural Category

-  Prime Farmland
-  Statewide Importance
-  Unique Farmlands
-  Other

Sources: New Jersey Department of Environmental Protection and  
New Jersey Geological Survey  
Produced By: Warren County Planning Department, August 2004



Figure 6- HUC 14s within the Township.

Figure 7- Current Zoning

Figure 8-Geology

Figure 9- Soils

Figure 10-Agricultural Soils

Figure 11-Highlands Preservation Area

Table 1- Calculations for HUC 14s

Table 2- Pollutant loading coefficients by land cover

Table 3- Pollutant loads for HUC 14s

## **Mitigation Plans**

A mitigation plan is required to grant a variance or exemption from the design and performance standards of the MSWMP.

### **Mitigation Project Criteria**

1. The mitigation project must be implemented in the same drainage area as the proposed development. The project must provide additional groundwater recharge benefits, or protection from stormwater runoff quality and quantity from previously developed property that does not currently meet the design and performance standards outlined in the Municipal Stormwater Management Plan. The developer must ensure the long-term maintenance of the project, including the maintenance requirements under Chapters 8 and 9 of the NJDEP Stormwater BMP Manual.

The applicant can select one of the following project types listed to compensate for the deficit from the performance standards resulting from the proposed project. More detailed information on the projects can be obtained. Listed below are types of projects that can be used to address the mitigation requirement.

### **Groundwater Recharge**

- Retrofit a site and detention basin to provide additional annual groundwater recharge.
- Replace an existing impervious parking lot with permeable paving to provide additional average annual groundwater recharge.

### **Water Quality**

- Retrofit an existing stormwater management facility to provide the removal of 80 percent of the total suspended solids from parking lot runoff.

### **Water Quantity**

- Install stormwater management measures in an open space area to reduce the peak flow from the upstream development.

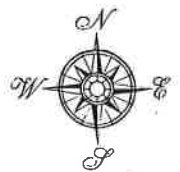
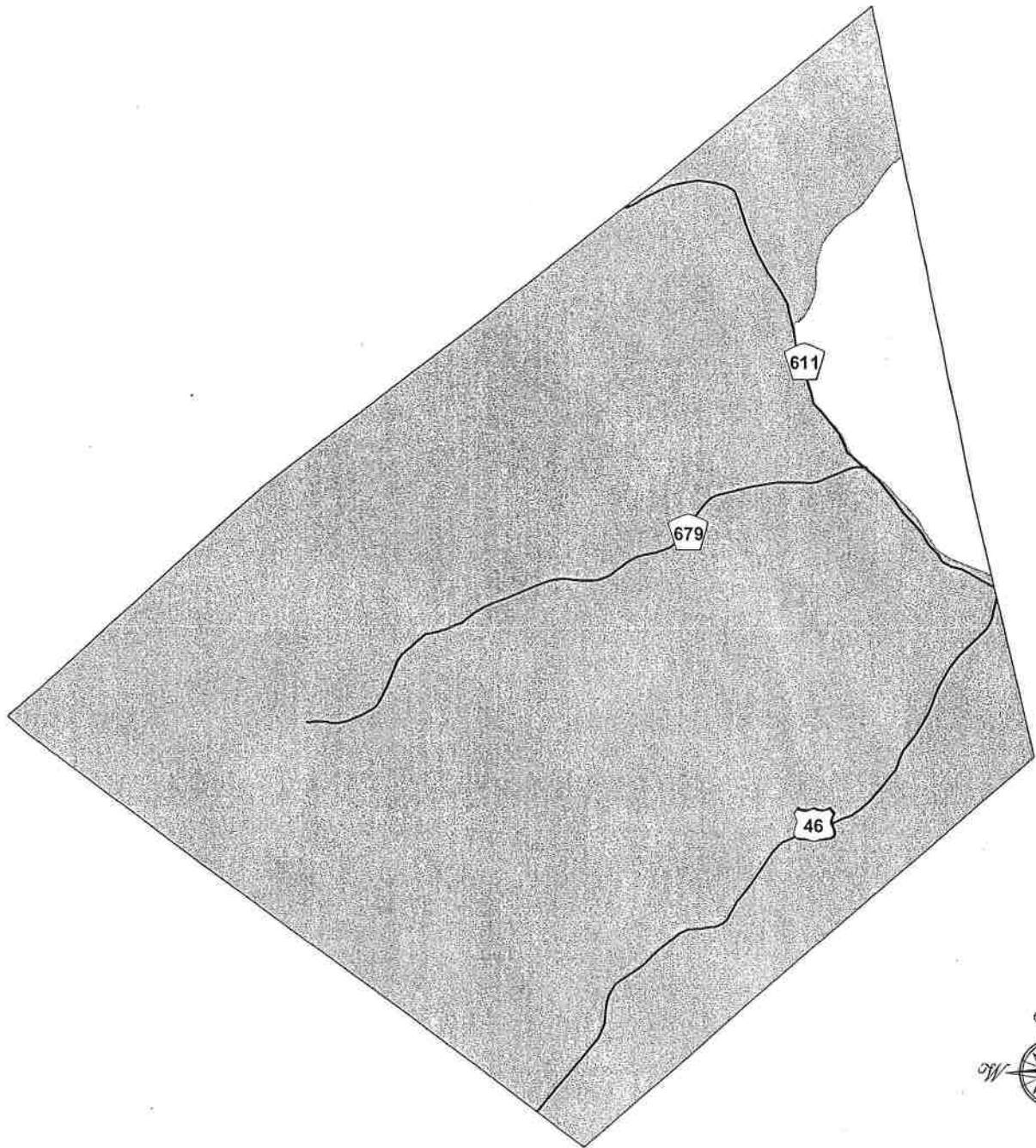
2. If a suitable site cannot be located in the same drainage area as the proposed development, as discussed in Option 1, the mitigation project may provide mitigation that is not equivalent to the impacts for which the variance or exemption is sought, but that addresses the same issue. For example, if a variance is given because the 80 percent TSS requirement is not met, the selected project may address water quality impacts due to a fecal impairment. Listed below are specific projects that can be used to address the mitigation option.

### **Water Quality**



- Re-establish a vegetative buffer (minimum 50 foot wide) along shoreline of Mountain Lake as a goose control measure and to filter stormwater runoff from the high goose traffic areas.

- Provide goose management measures, including public education at Mountain Lake.

# Liberty Township Highlands Preservation Area Map



## Legend

-  Highlands Preservation Area
-  Highlands Preservation Planning Area

Sources: New Jersey Department of Environmental Protection  
Produced By: Warren County Planning Department, August 2004

