Municipal Stormwater Management Plan

For

Borough of Kinnelon
130 Kinnelon Road
Kinnelon NJ 07035
Morris County, New Jersey

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Introduction

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for the Borough of Kinnelon 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 base flow in receiving water bodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities. The requirement of a "build-out" analysis and the implementation of a mitigation plan are also components of this plan.

Goals

The goals of this MSWMP are to:

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

In addition, it is the purpose of Section 176-37G(10)(c) of the Borough of Kinnelon Subdivision of Land and Site Plan Ordinance to establish minimum stormwater management requirements and controls to serve the purposes expressed in the state's Stormwater Management Act (NJSA 40:55D-93) and Stormwater Management Rules (NJAC 7:8). The current ordinances may need to be updated to include all of the state's requirements.

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

Stormwater Discussion

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

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

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

Background

Borough Description

Kinnelon encompasses 19.5 square miles in the northeasterly section of Morris County, New Jersey. Kinnelon is bordered by Boonton Township, Montville Township and Lincoln Park Borough to the south; Pequannock Township to the east; Butler Borough to the northeast; West Milford Township (Passaic County) to the north; and, Rockaway Township to the west. A small portion of Kinnelon borders Riverdale Borough along a portion of Matthews Avenue and at the intersection of NJ State Route 23 and Cutlass Road.

The population of Kinnelon has increased by 895 persons; from 8,470 in 1990, to 9,365 in 2000, an increase of 9.6 percent. This population increase has resulted in considerable demand for new development. Changes in the landscape have likely increased stormwater runoff volumes and pollutant loads to the waterways of the municipality. Figure 2 illustrates the Kinnelon municipal boundary on a copy of the USGS Quadrangles for Pompton Plains, Newfoundland, Boonton and Wanaque.

Watersheds

A watershed is the area of land that drains into a body of water such as a river, lake, stream or bay. It is separated from other systems by high points in the area such as hills or slopes. It includes not only the waterway itself but also the entire land area that drains to it. For example, the watershed of a lake would include not only the streams entering the lake but also the land area that drains into those streams and eventually the lake. The NJDEP Division of Watershed Management manages our valuable water resources, and administers a variety of programs aimed at protecting and restoring water quality, controlling water pollution and ensuring adequate water supplies. The NJDEP has divided the state into 20 watershed management areas. Two of these watershed management areas cross through the Borough of Kinnelon; Watershed Management Area (WMA) 3 and WMA 6. These watershed management areas encompass several smaller drainage basins. Figure 6 shows the Hydrologic Unit Code (HUC) 14 area within the Borough. The HUC14 and HUC11 information for this watershed are shown on Tables 1 and 2, respectively.

WMA 3 is located within the water-rich Highlands Province of New Jersey. The Pequannock, Wanaque and Ramapo Rivers all flow into the Pompton River. The Pompton River is, in turn, a major tributary to the Upper Passaic River. WMA 3 contains some of the state's major water supply reservoir systems including the Wanaque Reservoir, the largest surface water reservoir in New Jersey. There are four watersheds in WMA 3: Pompton, Ramapo, Pequannock and Wanaque River Watersheds. WMA 3 lies mostly in Passaic County but also includes parts of Bergen, Morris and Sussex Counties. The northerly and easterly portions of Kinnelon contain tributaries to the Pequannock River and Pompton River, are located within WMA 3.

WMA 6 represents the area drained by waters from the upper reaches of the Passaic River Basin including the Passaic River from its headwaters in Morris County to the confluence of the Pompton River. WMA 6 is characterized by extensive suburban development and reliance upon ground water sources for water supply. WMA 6 lies in portions of Morris, Somerset, Sussex and Essex Counties and includes the Upper and Middle Passaic River, Whippany River and Rockaway River Watersheds. The southerly and westerly portions of Kinnelon contain tributaries to the Rockaway River and are therefore located within WMA 6.

Drainage basins generally refer to large watersheds that encompass the watersheds of many smaller rivers and streams. There are three major watersheds (HUC11s) within the Borough of Kinnelon including: the Pequannock River watershed (HUC11 = 2030103050); the Pompton River watershed (HUC11 = 2030103110); and, the Rockaway River watershed (HUC11 = 2030103030). The Pequannock River and Pompton River watersheds are both located within WMA 3. The Rockaway River watershed is located in WMA 6 and includes tributaries to the Rockaway River.

A majority of the Borough is located within the Pequannock River watershed which extends from the northwesterly border of Rockaway Township, running in an easterly direction along West Milford Township and Butler Borough, and ending at the northeasterly borders of Riverdale Borough and Pequannock Township. The Rockaway River watershed is the second largest watershed in the Borough of Kinnelon, running from the southwesterly border of Rockaway Township and extending along the southerly borders with Boonton Township and Montville Township. A relatively small portion of the Borough of Kinnelon at the southeasterly corner is located within the Pompton River watershed along the borders of Pequannock Township, Lincoln Park Borough, and Montville Township.

The NJDEP has designated a special level of protection, known as "Category One," for a number of waterways in New Jersey. This protection targets water bodies which provide drinking water, habitat for endangered and threatened species, and popular recreational and/or commercial species, such as trout or shellfish. Waterways can be designated Category One because of exceptional ecological significance, exceptional water supply significance, exceptional recreational significance, exceptional shellfish resource, or exceptional fisheries resource. The Category One designation provides additional protections to water bodies that help prevent water quality degradation and discourage development where it would impair or destroy natural resources and environmental quality. The maintenance of water quality resources is important to all residents, particularly to the many communities that depend upon surface waters for public, industrial, and agricultural water supplies, recreation, tourism, fishing, and shellfish harvesting.

Within the Borough of Kinnelon, the Pequannock River flows east along the northerly municipal boundary. It runs between the Charlotteburg Reservoir and the border of Butler Borough in an area north of the NJ State Route 23 between Hamburg Turnpike and Maple Lake Road. The Charlotteburg Reservoir has been designated as a "Category One" water body by the NJDEP. The Charlotteburg Reservoir's has been given a fish assemblage classification of FW2-TM. Stream sampling (fish survey) data was used by the NJDEP to determine that this water body should be classified to protect trout maintenance (TM) uses. When adult trout are found in a water body and 'young of the year' (YOY) trout are absent, the classification of the stream as trout maintenance (FW2-TM) is given.

Two portions of the main stem of the Pequannock River have also been designated as Category One water bodies, including: the main stem between the Outlet of the Charlotteburg Reservoir to, but not including, Macopin Reservoir, or the Green Pond Junction tributary; and, between the Macopin Reservoir outlet, through the Borough's of Butler and Riverdale and continuing to the Hamburg Turnpike bridge in Pompton Lakes Borough. Both of theses sections of the Pequannock River's main stem have been given a fish assemblage classification of FW2-TP. Fish survey data was used by the NJDEP to determine that these sections of the Pequannock River should be classified to protect trout production uses since naturally reproduced trout in their first year of life (young of the year or YOY) were found. These portions of the main stem of the Pequannock River are classified as trout production waters or FW2-TP. There are also two unnamed tributaries of the Pequannock River which have been designated FW2-TP. One of the tributaries begins just north of the intersection of Gravel Hill Road and Echo Valley Road in the Smoke Rise Club, and

the second tributary begins at approximately 11 Cherry Tree Lane in the Smoke Rise Club. These two tributaries converge at approximately 300-ft southwest from the intersection of North Road and Northgate Road in the Smoke Rise Club, and then continue to flow in a northeasterly direction until convergence with the main stem of the Pequannock River just south of the intersection of NJ State Route 23 and the Northgate Road ramp.

Waterway Health

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

The 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. The USEPA Guidance for developing Integrated Reports of water quality and listings of impaired water segments recommends placing the assessment results into one of five specific categories as follows:

Sublist 1: A water body is attaining for all designated uses and no uses are threatened;

Sublist 2: Water body is attaining the designated use;

Sublist 3: Insufficient or no data and information to determine if the designated use is attained;

Sublist 4: Impaired or threatened for one or more designated uses but does not require the development of a TMDL (3 sub-categories).

- A. TMDL has been completed.
- B. Other enforceable pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future.
- C. Impairment is not caused by a pollutant.

Sublist 5: The designated use is not attained. The water body is impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL.

Several water bodies within the Borough of Kinnelon have been placed on Sublist 4 and/or Sublist 5 due to the elevated levels of pollutants. A summary of the 2006 Integrated Water Quality Monitoring & Assessment Report (May 15, 2006) can be found on Table 3 and a summary of Sublist 4 and Sublist 5 pollutants can be found on Table 4. The following is a written summary of the results:

1. Beaver Brook (HUC14 = 2030103030110) is a sub-watershed draining to the Split Rock Reservoir (Rockaway Township) which is located within WMA 6. The Beaver Brook sub-watershed is located along the westerly corporate limits of Kinnelon. This sub-watershed has not attained acceptable levels of pH and mercury (tissue), and has been placed on Sublist 5 which indicates TMDLs are required. Elevated levels of fecal coliform have also been identified in Beaver Brook and a Sublist 4 classification has been given by NJDEP, indicating TMDLs are not required at this time.

2. Stony Brook – Boonton (HUC14 = 2030103030130) is a sub-watershed which drains in a southwesterly direction towards Boonton Township and Montville Township, encompassing several water bodies along a majority of the southerly corporate limits of Kinnelon. The Stony Brook (Boonton) sub-watershed is located in WMA 6 and includes: 1) an unnamed tributary in the southwesterly section of Kinnelon which flows to Koehler Pond in Boonton Township; 2) tributaries known as Carters Pond, Stony Brook, Jay's Pond, Lake Juliet, Rickabear Lake, and an unnamed tributary at the end of Miller Road, which all flow south-southwest to Boonton Township; and tributaries known as Fayson Lakes, Lake Reality, Taylortown Reservoir and Boonton Reservoir flowing south to Montville Township. This sub-watershed has not attained acceptable levels of an unknown pollutant and has been placed on Sublist 5 which indicates TMDLs are required. Elevated levels of fecal coliform have been identified in the Stony Brook (Boonton) sub-watershed and a Sublist 4 classification has been given by NJDEP, indicating that TMDLs are not required at this time. West Fayson Lake (Sabeys Beach, West Fayson Lake Main Beach) has not attained levels of fecal coliform and has been placed on Sublist 5 which requires that TMDLs be established.

3. The Pequannock River (Charlotteburg to Oak Ridge; HUC14 = 2030103050050) sub-watershed is located in the Pequannock River watershed (WMA 3) and drains in a westerly direction toward the southerly tip of the Charlotteburg Reservoir. This sub-watershed includes a tributary known as Timber Brook which collects water from the northwesterly section of the Smoke Rise Club (Springwood Terrace). This sub-watershed has been placed on Sublist 4 due to elevated temperature levels. TMDLs are not required at this time.

4. The Pequannock River (Macopin Gage to Charlotteburg; HUC14 = 2030103050060) sub-watershed is located in the Pequannock River watershed (WMA 3). This sub-watershed includes two unnamed tributaries. The first unnamed tributary drains in a westerly direction, originating from lands to the north of Black Oak Lane in the Smoke Rise Club to the Charlotteburg Reservoir. The second unnamed tributary flows in a northerly direction from the intersection of Green Hill Road and Pepperidge Tree Lane in the Smoke Rise Club to the Pequannock River along NJ State Route 23. Elevated levels of temperature and fecal coliform have been identified and both parameters have been given a Sublist 4 classification by NJDEP. TMDLs are not required at this time.
5. The Pequannock River (below Macopin gage; HUC14 = 2030103050080) sub-watershed is located in the Pequannock River watershed (WMA 3). This sub-watershed includes two sets of

tributaries. The first tributary consists of two streams, one originating from Echo Valley Road in the Smoke Rise Club and one originating from Cherry Tree Lane in the Smoke Rise Club, which ultimately connect and flow north-northeast to the Pequannock River at the North Gate entrance ramp. The other set of tributaries include the Silas Condict Pond which flows easterly then northerly to Maple Lake, which ultimately flows in a northerly direction to the Pequannock River. Four parameters, including mercury (tissue), PCBs (tissue), DDX (tissue) and Chlordane (tissue) have all been given Sublist 5 classifications and will require TMDLs. Temperature has been given a Sublist 4 classification in this tributary and no TMDLs are required at this time.

6. The Lincoln Park Tributaries (HUC14 = 2030103110010) to the Pompton River (WMA 3) originate in two separate sections of Kinnelon. The areas north of Surprise Lake drain to an unnamed tributary which flows in an easterly direction towards Voorhis Road then northerly where it connects with another unnamed tributary that originates on the southwesterly side of a JCP&L easement, southwest of Carriage Way (Round Hill Road). These two tributaries connect at the border of Kinnelon and Pequannock, just south of the Sunset Valley Golf Course. After their convergence, these two tributaries become known as West Ditch in Pequannock. The Untermeyer Lake and Sawmill Pond tributaries originate at the intersection of Round Hill Road and Sawmill Road. These tributaries flow in a general easterly direction, north of the Sunset Valley Golf Course in Pequannock and eventually form what is known as the East Ditch tributary. Both East Ditch and West Ditch ultimately converge to for Beaver Brook in the Borough of Lincoln Park. The 'Lincoln Park Tributaries' have elevated levels of total phosphorus and pH, and these parameters have been placed on Sublist 5 which indicates that TMDLs are required. Fecal coliform and e-coli have also been identified in these tributaries and both parameters have been placed on Sublist 4 which does not require TMDLs at this time.

7. The Montville Tributaries (HUC14 = 2030103030160) is a sub-watershed to the Rockaway River (WMA 6) and includes Crooked Brook. Crooked Brook originates in a large wetland area located between Alize Drive and Chilhowie Drive, then flows southerly through the Brook Valley section of Kinnelon and continues to Lake Valhalla in Montville Township. These water bodies have been listed on Sublist 1 and full attainment has been obtained for all designated uses.

8. The Stone House Brook (HUC14 = 2030103050070) sub-watershed is tributary to the Pequannock River (WMA 3) and includes the following water bodies: New Pond, Lake Kinnelon (Stickle Pond), Stone House Brook, Forge Pond, Decker Pond and the Butler Reservoir. The Stone House Brook sub-watershed has been placed on Sublist 3 for the following uses: drinking water, primary contact (recreation), secondary contact (recreation), agricultural water supply, and industrial water supply. Water bodies are placed on Sublist 3 when the designated use assessment indicated insufficient or no data to assess the designated use. The Stone House Brook sub-watershed has also been placed on Sublist 2 for general aquatic life. Water bodies are placed on Sublist 2 when an assessment for an individual designated use is complete and results for that assessment indicates full attainment but other designated uses are not assessed, assessed as non attain or have an approved TMDL. When all designated uses are assessed as full attain, these water bodies will be moved to Sublist 1.

As of September 15, 2005, an amendment to the Northeast Water Quality Management Plan that creates TMDLs for fecal coliform in WMAs 3 and 6 has been "approved". However, they have not yet been "adopted." In September 2004, an amendment to the Northeast Water Quality Management Plan has

been “established” for a temperature in the Pequannock River; an amendment has not been “adopted” as of the date of this report.

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 Department is in the process of adopting each of the approved TMDLs to the appropriate management plan and does not anticipate that there will be significant, if any change to TMDL implementation plans upon its adoption.

Flooding

There are no areas of special flood hazard identified by the Federal Insurance Administration.

Wellhead Protection Areas

According to the NJDEP, there are five Public Community Water Supply (PCWS) wells within the Borough of Kinnelon that are owned and operated by the Fayson Lake Water Company. All five wells are located in close proximity at 160 Boonton Avenue. The New Jersey Geological Survey (NJGS) has delineated Wellhead Protection Areas (WHPAs) for this PCWS well. As described below, a WHPA is a calculated area around a production well that defines the portion of an aquifer that contributes water to a well over a specified time interval. The locations of the delineated Wellhead Protection Areas for the five PCWS are shown on Figure 3.

A WHPA is divided into three sequential tiers based on the Time of Travel (TOT) to a production well. TOT is the time it takes for a given particle of groundwater to flow to a pumping well. It is directly related to the distance the groundwater must travel to arrive at the well once well pumping starts. For a given TOT, the distance will vary from well to well depending on the rate of pumping and aquifer characteristics. WHPA Tier 1 is derived from a 2-Year TOT and is based on findings that bacteria have polluted wells and viruses have survived in groundwater for up to 270 days. WHPA Tier 2, derived from a 5-year TOT, is based on the lag time of a pollution plume caused by adsorption/desorption, the variable rate of pollutant travel, and the acceleration of groundwater once it comes close to a pumping well. WHPA Tier 3 is derived from a 12-year TOT, and is established to provide sufficient time so that monitoring and cleanup of a potential pollution source or release can be completed before contamination reaches a pumping well. All three WHPA Tiers are defined using line boundaries and polygon areas generated with the ARC/INFO Geographic Information System.

Groundwater Recharge

A map of the various annual groundwater recharge rates in the Borough are depicted in Figure 4. As can be seen in the Figure, the annual recharge rates in the Borough range from essentially no recharge to an annual rate of 17 inches per year. These annual recharge rates were obtained from the New Jersey Geological Survey (NJGS) and are based on New Jersey Geological Survey Report GSR-32 – A Method for Evaluating Ground-Water-Recharge Areas in New Jersey. These rates are presented as guidance for identifying both general groundwater recharge rates and areas for potential recharge measures and are not intended for design purposes.

Geology

Figure 5 depicts the different soil types within the Borough. According to the Soil Survey of Morris County, prepared by the USDA National Resource Conservation Service and the NJ Agricultural Experiment Station, "Rockaway" is the major soil type within the Borough. Soils within the Borough of Kinnelon consist of soils formed in young glacial till and are generally classified as Rockaway-Hibernia-Urban land association and Rockaway-Rock outcrop association. Rockaway-Hibernia-Urban land association soils are deep, well drained to somewhat poorly drained, gently sloping to steep gravelly sandy loams and stony to extremely stony loams and sandy loams that overlie granitic gneiss. Rockaway-Rock outcrop association soils are deep, well drained and moderately well drained, strongly sloping to very steep slop, very stony and extremely stony sandy loams that overlie granitic gneiss, and strongly sloping to very steep rock outcrops.

Design and Performance Standards

Any major residential land development proposed subject to review and approval by the Borough of Kinnelon will also be reviewed in accordance with the stormwater management requirements of the New Jersey Residential Site Improvement Standards (NJAC 5:21). These standards may be supplemented where permitted by additional stormwater design and performance standards developed by the Borough. In addition, any application for a new agricultural development that meets the definition of major development shall be submitted to the Morris County Soil Conservation District for review and approval in accordance with the requirements of this section and the Standards for Soil Erosion and Sediment Control in New Jersey.

In accordance with the requirements of the New Jersey Stormwater Management Rules (NJAC 7:8), major land developments within the Borough of Kinnelon will be required to meet specific stormwater design and performance standards. The stormwater design and performance standards will be applied to major developments through the forthcoming Stormwater Control Ordinance that will be developed and adopted by the Borough following the adoption of this Municipal Stormwater Management Plan. Complete details of each standard can be found in Subchapter 5 of the New Jersey Stormwater Management Rules and summaries of these design and performance standards are presented below:

Soil Erosion and Sediment Control: All major developments shall meet the requirements of the Soil Erosion and Sediment Control Standards for New Jersey. The Morris County Soil Conservation District has review authority for compliance with these standards.

Groundwater Recharge: Unless otherwise exempted by the Stormwater Management Rules, all major developments must either maintain 100% of the development site's pre-developed annual groundwater recharge under post-developed site conditions or infiltrate the runoff increase between pre- to post-developed site conditions for a 2-Year, 24-hour III storm. Compliance with this standard must consider certain designated redevelopment areas, WHPAs, and known contaminated sites within the Borough.

Stormwater Quality: All major developments must reduce the total suspended solids (TSS) load in the development site's post-construction runoff by a minimum of 80%. In addition, the post-construction nutrient load from the site must be reduced by the maximum extent feasible. Additional stormwater quality requirements are described below for land developments that drain to a Category One watercourse or its mapped tributaries.

Stormwater Quantity: All major developments must demonstrate compliance with one of three alternative stormwater quantity requirements for the 2, 10, and 100-Year storm events. These alternatives are: 1) preservation of existing development site runoff volumes and rates, 2) preservation of existing downstream peak runoff rates under full watershed development, or 3) reduction in existing site peak runoff rates by 50%, 25%, and 20%, respectively.

Nonstructural Stormwater Management - Compliance with the groundwater recharge and stormwater quality and quantity standards described above must be achieved through the use of nonstructural stormwater management measures to the maximum extent feasible. If the standards cannot be met through the exclusive use of nonstructural measures, then structural stormwater management measure shall be utilized to complete compliance.

Special Water Resource Protection Areas: All major developments must maintain a 300-foot buffer measured from the top of bank of all Category One watercourses, as designated by the NJDEP, and their tributaries, as mapped by the USGS and the Soil Survey of Morris County. At the present time, the entire length of the Pequannock River within the Borough's corporate limits is designated as a Category One watercourse. As such, this requirement will apply to any waterway within the Borough designated as a Category One watercourse by the NJDEP in the future. According to Appendix B (Classification of New Jersey Waters as Related to Their Suitability for Trout) of the Coldwater Fisheries Management Plan, prepared by the New Jersey Division of Fish and Wildlife, dated December 2003, Stone House Brook is currently listed as a non-trout water body but has a "potential classification" to be listed as a trout production water body. Therefore, Stone House Brook will be likely be classified as a Category One water body in the future and would be subject to 300-ft buffers, similar to the Pequannock River.

Threatened and Endangered Species Searches: All major developments subject to review by NJDEP's Land Use Regulation Program must conduct a Threatened and Endangered Species search using the Natural Heritage Database.

Plan Consistency

The Borough is not within a Regional Stormwater Management Planning Area; therefore, this plan does not need to be consistent with any regional stormwater management plans. This Municipal Stormwater Management Plan will be updated to be consistent with all TMDLs after they have been adopted.

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 Borough'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, Borough inspectors will observe on-site soil erosion and sediment control measures and report any inconsistencies to the Morris County Soil Conservation District.

Nonstructural Stormwater Management Strategies

In order to meet the design and performance standards for major land developments described in Subchapter 5 of the Stormwater Management Rules, the Borough will allow the utilization of a range of nonstructural management measures. In general, the design, construction, and maintenance of these measures, which are also known as Best Management Practices or BMPs, will be based upon the guidance provided by the current version of the NJDEP Stormwater Best Management Practices Manual. In particular, the guidance provided in Chapter Two of the Manual will be used for nonstructural stormwater management measures. As a result, the NJDEP Stormwater Best Management Practices Manual is incorporated by reference into the Borough of Kinnelon Municipal Stormwater Management Plan.

The Borough's ordinances are currently being reviewed to determine the proper amendments to implement the principles of nonstructural stormwater management. This plan and the revised ordinances will be submitted to Morris County for review with a copy to the NJDEP, along with a copy of the master plan, maps, and an adoption schedule.

Land Use/Build-Out Analysis

Approximately 97.3% of the Borough of Kinnelon is located within the Highlands Preservation Area. The remaining 2.7% of the Borough is located within the Highlands Planning Area. The areas of the Borough within the Highlands Planning Area are lands located southeast of Route 287. These lands are highly impacted by freshwater wetlands and buffer areas, as well as being mostly land locked due to the location of Route 287, the existing of utility easements and the location of bordering municipalities.

Figure 7 shows the current land use within the Borough and Figure 8 shows the current zoning districts within the Borough. A significant portion of the Borough is zoned as low density residential (one dwelling unit per 60,000 square feet) with commercial areas mainly located along the Route 23 corridor.

The Highlands rules require 88 acres for a septic system on a forested lot and 25 acres per septic system on a non-forested lot. In addition, the extension of sanitary sewer or water lines to lots in the preservation area is prohibited under the Highlands Act. A significant majority of the Borough does not have existing sanitary sewer lines.

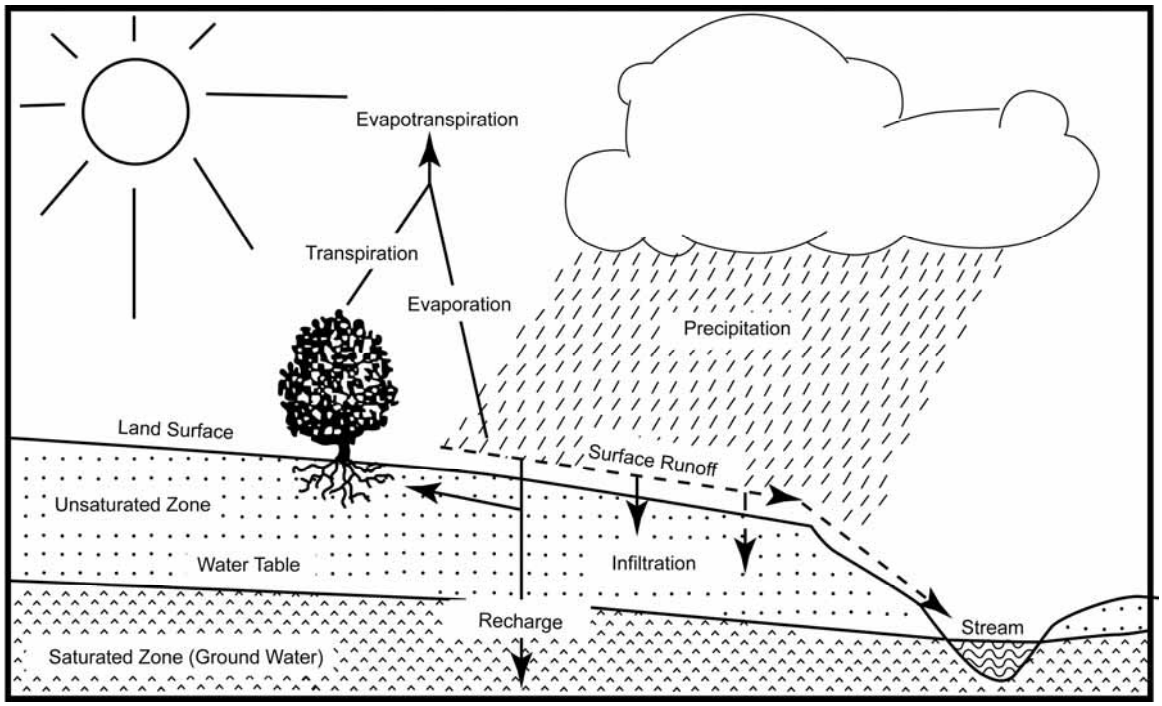
Because of the Highlands Preservation Act, it is extremely unlikely there will be any new development of residential or commercial property within the Borough of Kinnelon. Any redevelopment of existing commercial properties along the Route 23 corridor will be reviewed by NJDEP.

Mitigation Plans

The Borough will utilize the waiver criteria contained in Subchapter 5 of the Stormwater Management Rules to develop a Mitigation Plan in order to grant necessary waivers from the design and performance standards at major land developments on a case-by-case basis. Development of this Mitigation Plan will be done concurrently with the development of the Borough's Stormwater Control Ordinance and will be based upon the Mitigation Plan requirements contained in Subchapter 4 of the Stormwater Management Rules.

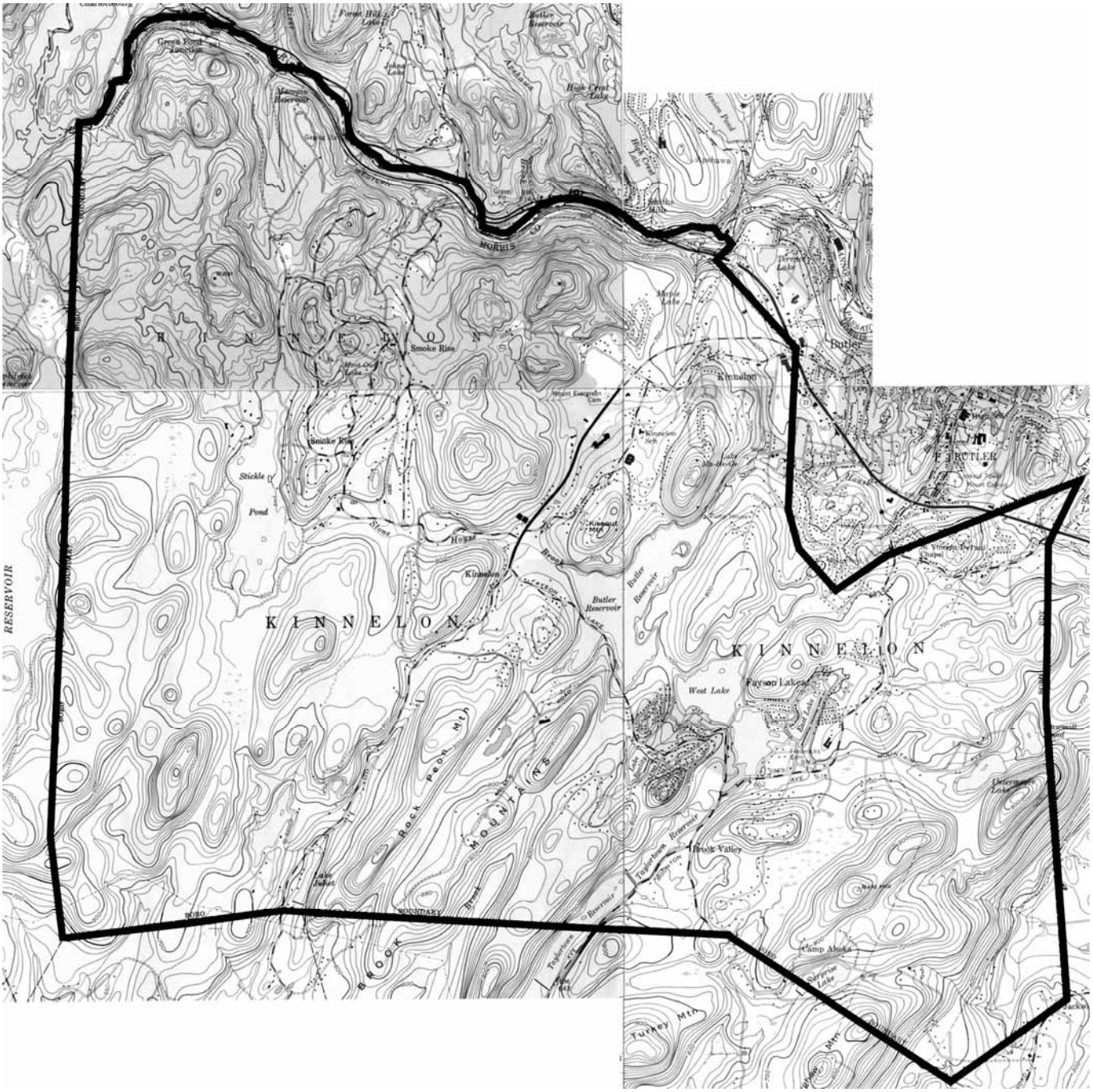
The details of the redevelopment requirements within the Highlands Preservation Area have not been revealed and the regional stormwater management plan details have not been finalized. A mitigation plan will be implemented as soon as the details have been finalized by NJDEP.

FIGURE 1



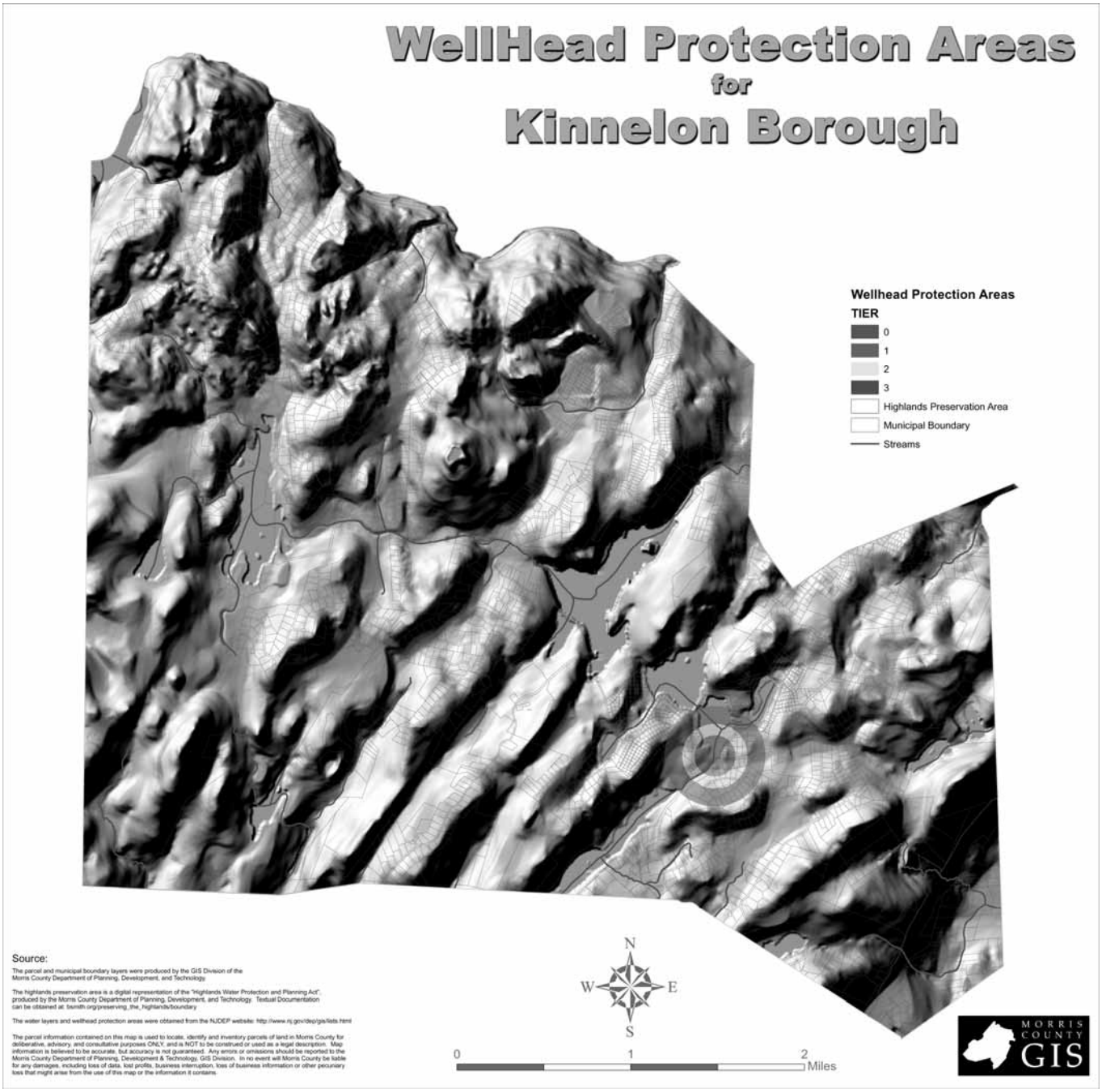
Source: New Jersey Geological Survey Report GSR-32.

FIGURE 2



Source: Newfoundland, Boonton, Wanaque and Pompton Plains USGS Quadrangles

FIGURE 3


WellHead Protection Areas
for
Kinnelon Borough
Wellhead Protection Areas
TIER
0
1
2
3
Highlands Preservation Area
Municipal Boundary
Streams
Source:
N
W
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0
1
2
Miles
MORRIS COUNTY GIS

FIGURE 4


Groundwater Recharge Areas
for
Kinnelon Borough
Groundwater Recharge
17+ in/yr
13 to 16 in/yr
10 to 12 in/yr
1 to 9 in/yr
0 in/yr
Hydric Soils
Highlands Preservation Area
Municipal Boundary
Streams
Source:
The parcel and municipal boundary layers were produced by the GIS Division of the Morris County Department of Planning, Development, and Technology.
The highlands preservation area is a digital representation of the "Highlands Water Protection and Planning Act", produced by the Morris County Department of Planning, Development, and Technology. Textual Documentation can be obtained at: bamith.org/preserving_the_highlands/boundary
The water layers and groundwater recharge areas were obtained from the NJDEP website: http://www.nj.gov/dep/gis/bsis.html
The parcel information contained on this map is used to locate, identify and inventory parcels of land in Morris County for deliberative, advisory, and consultative purposes ONLY, and is NOT to be construed or used as a legal description. Map information is believed to be accurate, but accuracy is not guaranteed. Any errors or omissions should be reported to the Morris County Department of Planning, Development & Technology, GIS Division. In no event will Morris County be liable for any damages, including loss of data, lost profits, business interruption, loss of business information or other pecuniary loss that might arise from the use of this map or the information it contains.
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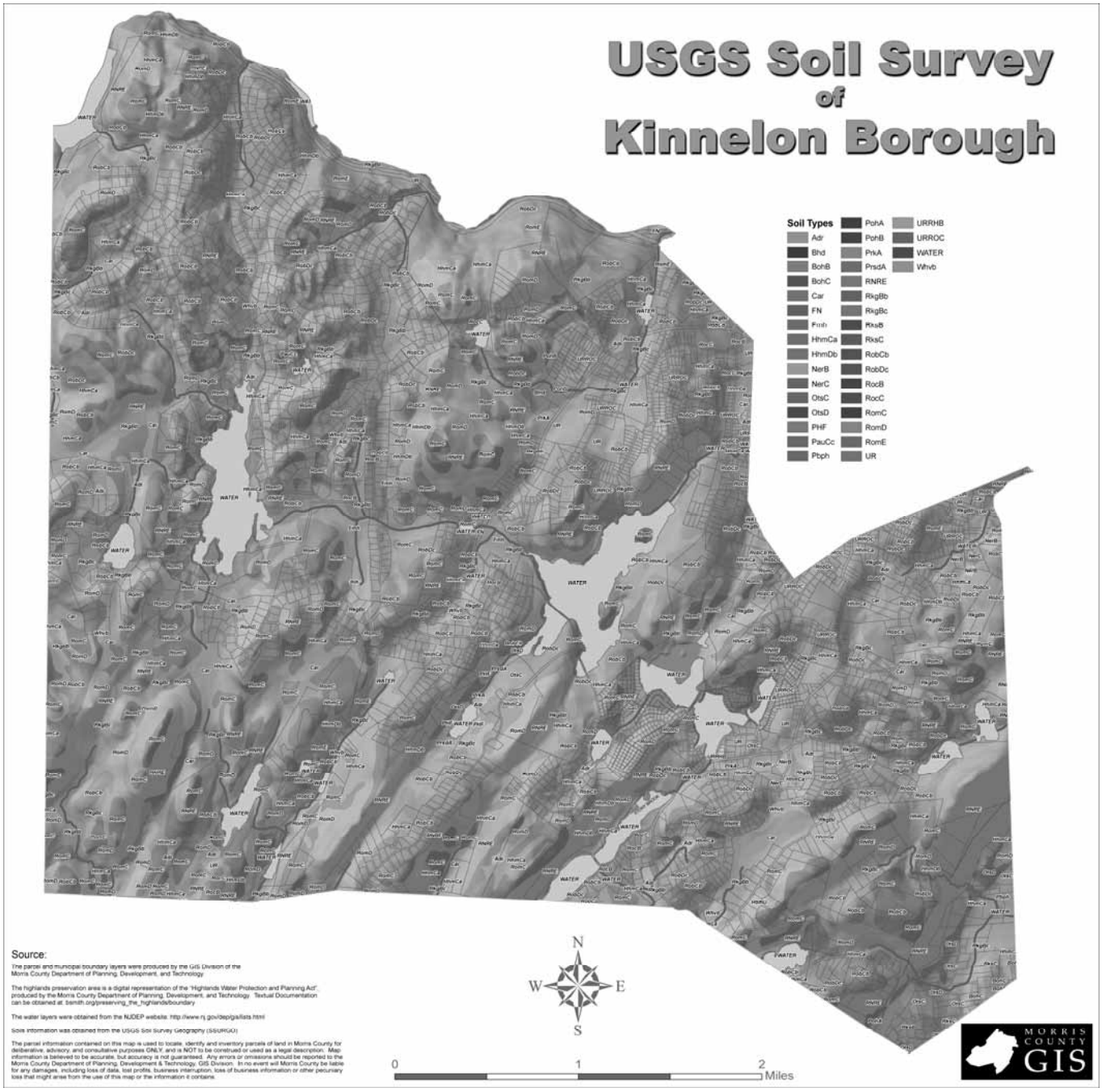
Miles
MORRIS COUNTY GIS

FIGURE 5


USGS Soil Survey
of
Kinnelon Borough
Soil Types
Adr
Bhd
BohB
BohC
Car
FN
Fnh
HhmCa
HhmDb
NerB
NerC
OtsC
OtsD
PHF
PauCc
Pbph
PohA
PohB
PrkA
PrsdA
RNRE
RkgBb
RkgBc
RksB
RksC
RobCb
RobDc
RocB
RocC
RomC
RomD
RomE
UR
URRHB
URROC
WATER
Whvb
Source:
The parcel and municipal boundary layers were produced by the GIS Division of the Morris County Department of Planning, Development, and Technology
The highlands preservation area is a digital representation of the "Highlands Water Protection and Planning Act", produced by the Morris County Department of Planning, Development, and Technology. Textual Documentation can be obtained at: bsmith.org/preserving_the_highlands/boundary
The water layers were obtained from the NJDEP website: http://www.nj.gov/dep/gis/lists.html
Soils information was obtained from the USGS Soil Survey Geography (SSURGO)
The parcel information contained on this map is used to locate, identify and inventory parcels of land in Morris County for deliberative, advisory, and consultative purposes ONLY, and is NOT to be construed or used as a legal description. Map information is believed to be accurate, but accuracy is not guaranteed. Any errors or omissions should be reported to the Morris County Department of Planning, Development & Technology, GIS Division. In no event will Morris County be liable for any damages, including loss of data, lost profits, business interruption, loss of business information or other pecuniary loss that might arise from the use of this map or the information it contains.
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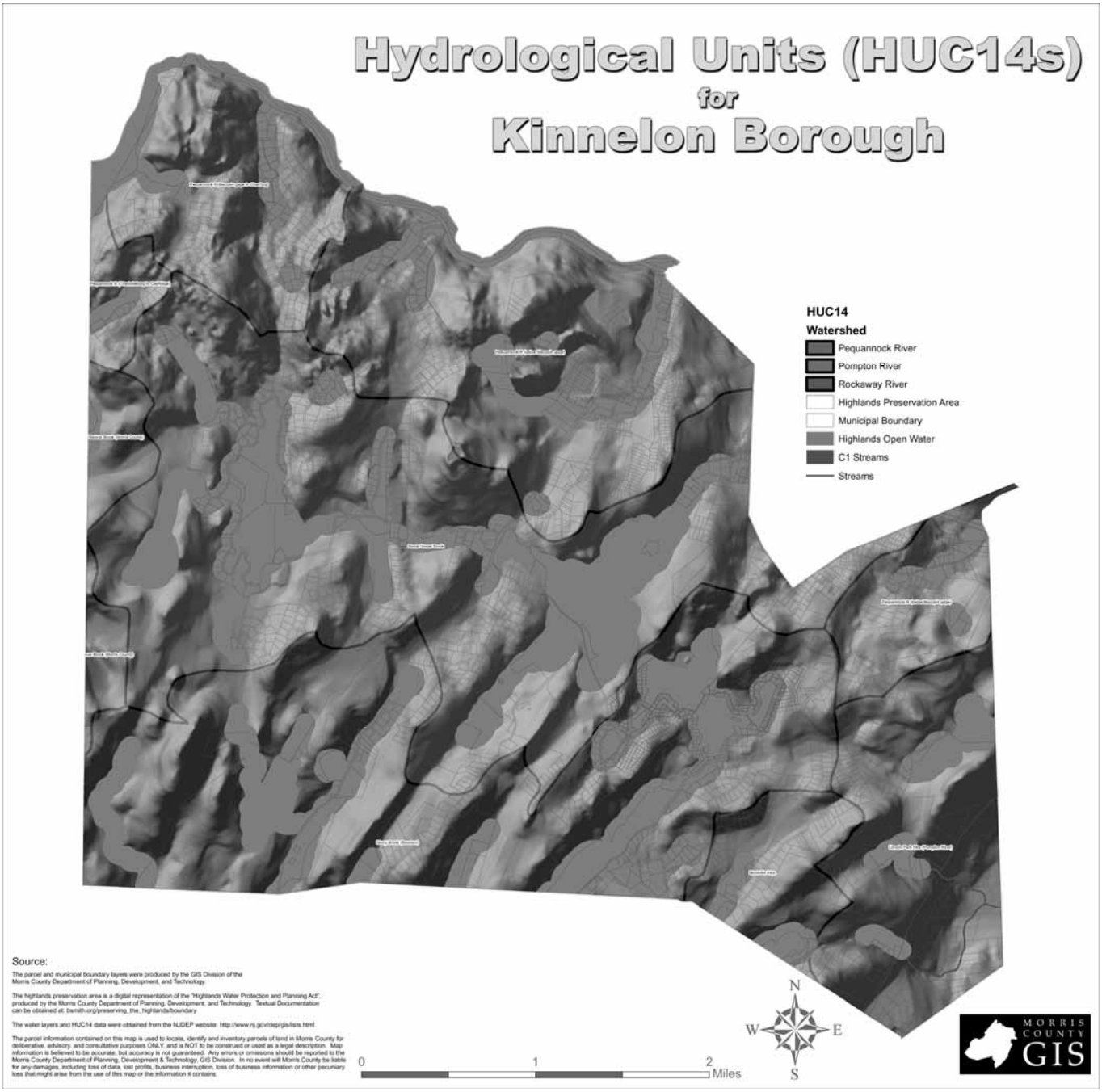
Miles
MORRIS COUNTY GIS

FIGURE 6


Hydrological Units (HUC14s)
for
Kinnelon Borough
HUC14
Watershed
Pequannock River
Pompton River
Rockaway River
Highlands Preservation Area
Municipal Boundary
Highlands Open Water
C1 Streams
Streams
Source:
The parcel and municipal boundary layers were produced by the GIS Division of the Morris County Department of Planning, Development, and Technology.
The highlands preservation area is a digital representation of the "Highlands Water Protection and Planning Act", produced by the Morris County Department of Planning, Development, and Technology. Textual Documentation can be obtained at: bsmith.org/preserving_the_highlands/boundary
The water layers and HUC14 data were obtained from the NJDEP website: http://www.nj.gov/dep/gis/lists.html
The parcel information contained on this map is used to locate, identify and inventory parcels of land in Morris County for deliberative, advisory, and consultative purposes ONLY, and is NOT to be construed or used as a legal description. Map information is believed to be accurate, but accuracy is not guaranteed. Any errors or omissions should be reported to the Morris County Department of Planning, Development & Technology, GIS Division. In no event will Morris County be liable for any damages, including loss of data, lost profits, business interruption, loss of business information or other pecuniary loss that might arise from the use of this map or the information it contains.
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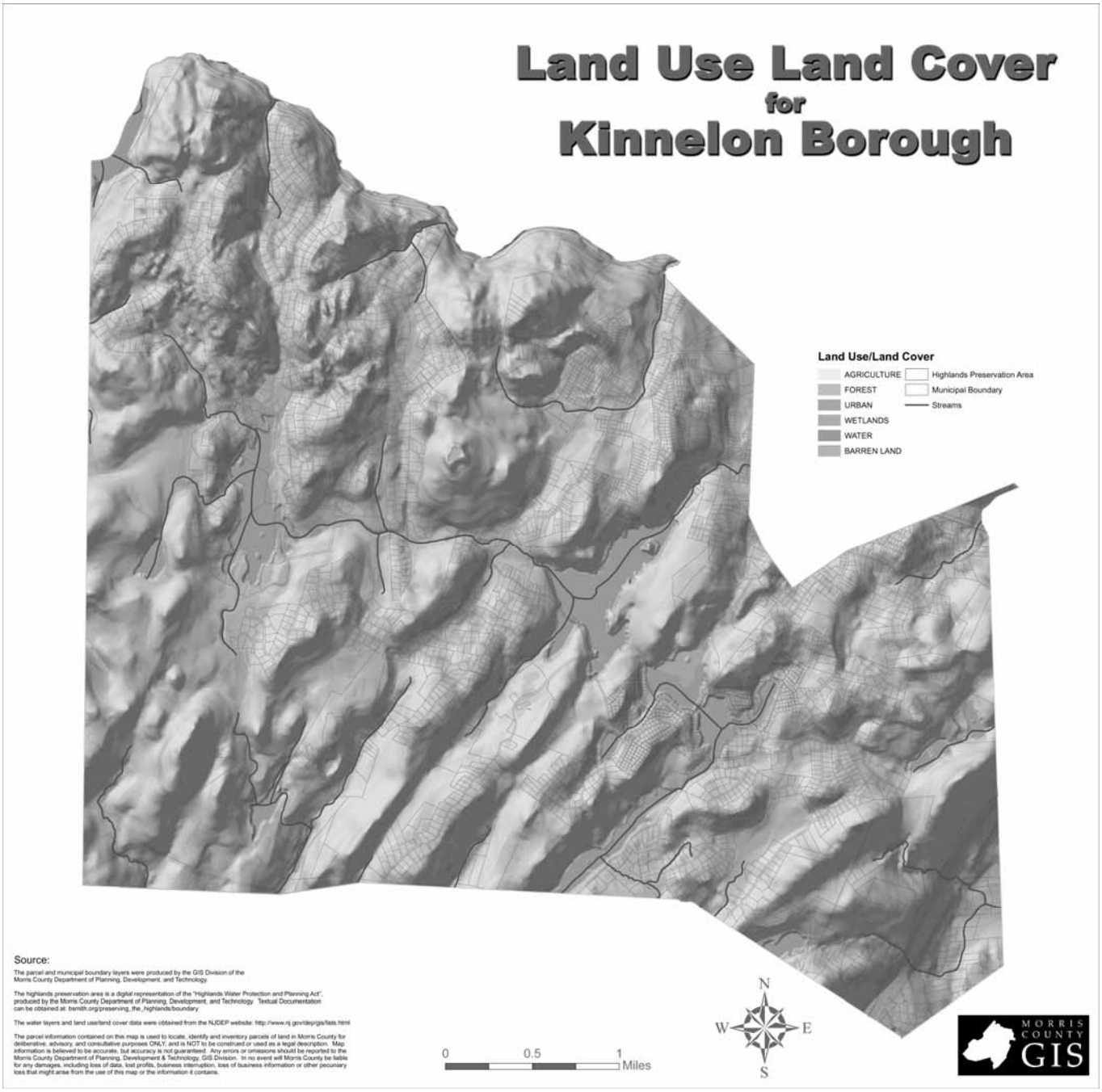
MORRIS COUNTY GIS

FIGURE 7


Land Use Land Cover
for
Kinnelon Borough
Land Use/Land Cover
AGRICULTURE
FOREST
URBAN
WETLANDS
WATER
BARREN LAND
Highlands Preservation Area
Municipal Boundary
Streams
Source:
The parcel and municipal boundary layers were produced by the GIS Division of the Morris County Department of Planning, Development, and Technology.
The highlands preservation area is a digital representation of the "Highlands Water Protection and Planning Act", produced by the Morris County Department of Planning, Development, and Technology. Textual Documentation can be obtained at: bemlh.org/preserving_the_highlands/boundary
The water layers and land use/land cover data were obtained from the NJDEP website: http://www.nj.gov/dep/gis/lists.html
The parcel information contained on this map is used to locate, identify and inventory parcels of land in Morris County for deliberative, advisory, and consultative purposes ONLY, and is NOT to be construed or used as a legal description. Map information is believed to be accurate, but accuracy is not guaranteed. Any errors or omissions should be reported to the Morris County Department of Planning, Development & Technology, GIS Division. In no event will Morris County be liable for any damages, including loss of data, lost profits, business interruption, loss of business information or other pecuniary loss that might arise from the use of this map or the information it contains.
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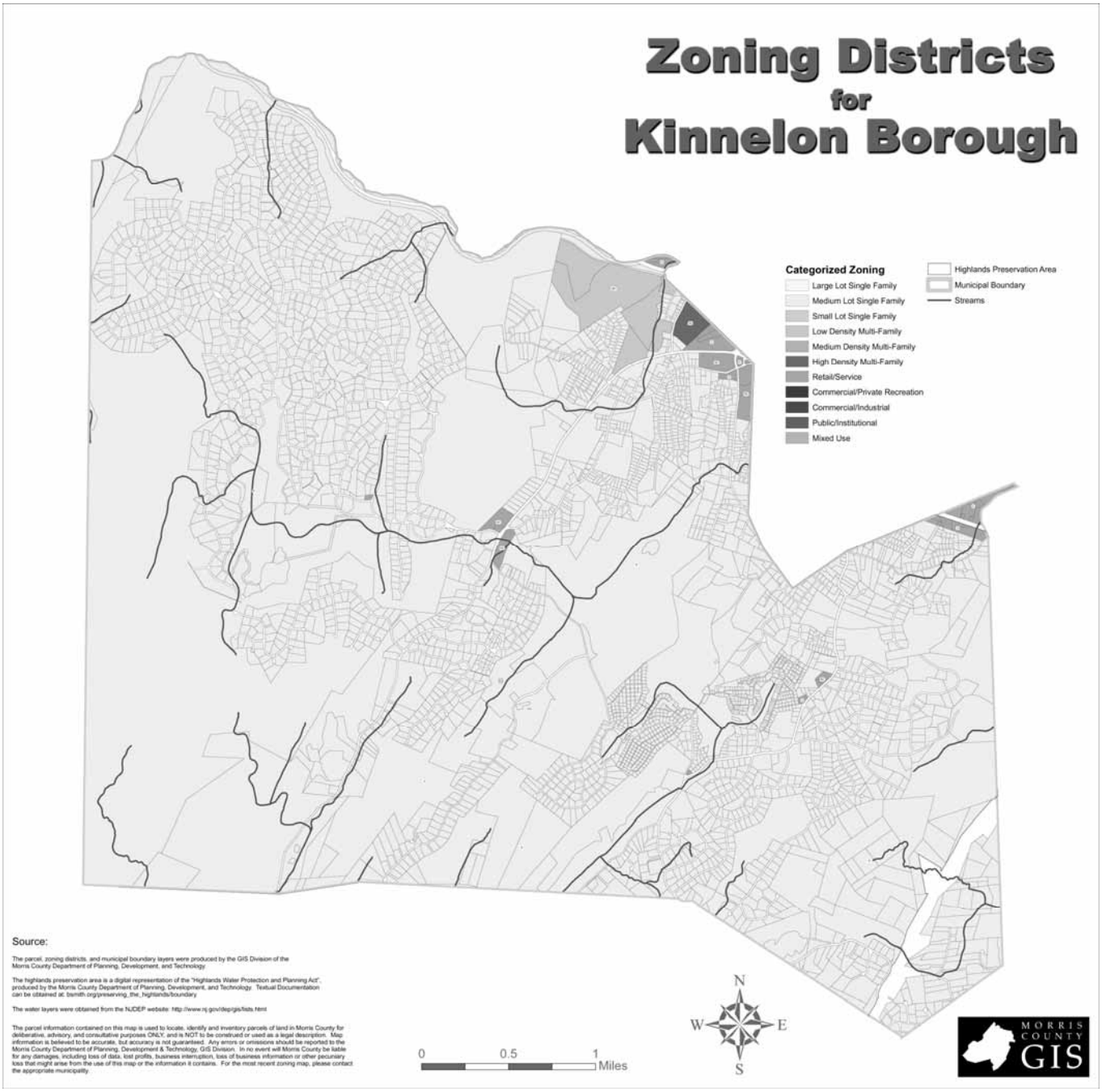
MORRIS COUNTY GIS

FIGURE 8


Zoning Districts
for
Kinnelon Borough
Categorized Zoning
Large Lot Single Family
Medium Lot Single Family
Small Lot Single Family
Low Density Multi-Family
Medium Density Multi-Family
High Density Multi-Family
Retail/Service
Commercial/Private Recreation
Commercial/Industrial
Public/Institutional
Mixed Use
Highlands Preservation Area
Municipal Boundary
Streams
Source:
The parcel, zoning districts, and municipal boundary layers were produced by the GIS Division of the Morris County Department of Planning, Development, and Technology
The highlands preservation area is a digital representation of the "Highlands Water Protection and Planning Act", produced by the Morris County Department of Planning, Development, and Technology. Textual Documentation can be obtained at: bsmith.org/preserving_the_highlands/boundary
The water layers were obtained from the NJDEP website: http://www.nj.gov/dep/gis/lists.html
The parcel information contained on this map is used to locate, identify and inventory parcels of land in Morris County for deliberative, advisory, and consultative purposes ONLY, and is NOT to be construed or used as a legal description. Map information is believed to be accurate, but accuracy is not guaranteed. Any errors or omissions should be reported to the Morris County Department of Planning, Development & Technology, GIS Division. In no event will Morris County be liable for any damages, including loss of data, lost profits, business interruption, loss of business information or other pecuniary loss that might arise from the use of this map or the information it contains. For the most recent zoning map, please contact the appropriate municipality.
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MORRIS COUNTY GIS

TABLE 1
SUMMARY OF HUC 14 SUB-WATERSHEDS IN THE BOROUGH OF KINNELON

Sub-Watershed Name	Sub-Watershed ID	HUC14 Code	Watershed Name	Watershed ID	Watershed Management Area	WMA ID
Pequannock River (Charlotteburg to OakRidge) Timber Brook (Springwood Terrace in Smoke Rise)	**03AA05**	**2030103050050**	**Pequannock River**	**03AA**	**Pompton, Pequannock, Wanaque, Ramapo**	**3**
Pequannock River (Macopin gage to Charlotteburg) Unnamed Tributary (Black Oak Lane in Smoke Rise flows to Charlotteburg Reservoir) Unnamed Tributary (Pepperidge Tree Lane flows north to Pequannock River)	**03AA06**	**2030103050060**	**Pequannock River**	**03AA**	**Pompton, Pequannock, Wanaque, Ramapo**	**3**
Stone House Brook New Pond / Lake Kinnelon / Stone House Brook / Forge Pond / Decker Pond / Butler Reservoir	**03AA07**	**2030103050070**	**Pequannock River**	**03AA**	**Pompton, Pequannock, Wanaque, Ramapo**	**3**
Pequannock River (below Macopin gage) Unnamed Tributaries along Cutlass Road flowing northeast across Rt. 23 to Riverdale (former Suntan Lake) Silas Condict Pond / Maple Lake Unnamed Tributarties from Echo Valley Rd and Cherry Tree Lane (Smoke Rise North Gate)	**03AA08**	**2030103050080**	**Pequannock River**	**03AA**	**Pompton, Pequannock, Wanaque, Ramapo**	**3**
Lincoln Park Tributaries (Pompton River) East Ditch (Untermeyer Lake / Sawmill Pond) West Ditch (Jacksonville / Voorhis)	**03DA01**	**2030103110010**	**Pompton River**	**03DA**	**Pompton, Pequannock, Wanaque, Ramapo**	**3**
Beaver Brook (Morris County) Drains to Split Rock Reservoir	**06CA11**	**2030103030110**	**Rockaway River**	**06CA**	**Upper Passaic, Whippany, and Rockaway**	**6**
Stony Brook (Boonton) Unnamed Tributary flows to Koehler Pond in Boonton Twp Beaver Brook (Carters Pond, Stony Brook, Jay's Pond, Lake Juliet, Rickabear Lake, Unnamed Tributary (Miller Road) Stony Brook (Lake Reality, Fayson Lakes, Unnamed Tributary, Taylortown Reservoir, Boonton Reservoir)	**06CA13**	**2030103030130**	**Rockaway River**	**06CA**	**Upper Passaic, Whippany, and Rockaway**	**6**
Montville Tributaries Crooked Brook (Brook Valley Section of Kinnelon flowing south to Lake Valhalla in Montville Twp)	**06CA16**	**2030103030160**	**Rockaway River**	**06CA**	**Upper Passaic, Whippany, and Rockaway**	**6**

TABLE 2
SUMMARY OF HUC 11 WATERSHEDS IN THE BOROUGH OF KINNELON

Watershed Name	Watershed ID	HUC 11 Code	Watershed Management Area	Management Area ID	Water Region	Water Region ID
Rockaway River	06CA	2030103030	Upper Passaic, Whippany, and Rockaway	6	Northeast	1
Pequannock River	03AA	2030103050	Pompton, Pequannock, Wanaque, Ramapo	3	Northeast	1
Pompton River	03DA	2030103110	Pompton, Pequannock, Wanaque, Ramapo	3	Northeast	1

TABLE 3

The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)) (Integrated List)

The assessment units were placed on one of five sublists according to the following: (See Section 7 of the Integrated List Methods Document for more detail on the Sublists)

Sublist 1: There is sufficient data to assess all applicable designated uses for the waterbody and the assessment indicates full attainment for all designated uses.

Sublist 2: Waterbodies are placed on this sublist when an assessment for an individual designated use is complete and results for that assessment indicates full attainment but other designated uses are unassessed, assessed as non attain or have an approved TMDL. When all designated uses are assessed as full attain, these waterbodies will be moved to Sublist 1.

Sublist 3: Waterbodies are placed on this sublist when the designated use assessment indicated insufficient or no data to assess the designated use.

Sublist 4: Waterbodies are placed on this sublist when the designated use is non attain due to pollutants and a TMDL has been adopted in New Jersey Register and approved by the USEPA.

Sublist 5: Designated use assessment is complete and results for the assessment indicate non-attain.

Note: The pollutant will be listed if known or "pollutant unknown" will be used when the pollutant is not known.
(i.e. Biological shows impairment but there are no water quality violations, the parameter on sublist 4 or 5 will be "pollutant unknown")

WMA	Assessment Unit ID	Assessment Unit Name	Aquatic Life (general)	Aquatic Life (trout)	Drinking Water	Primary Contact Recreation	Secondary Contact Recreation	Agricultural Water Supply	Industrial Water Supply
06	02030103030110-01	Beaver Brook (Morris County)	Sublist 5	Sublist 2	Sublist 2	Sublist 4	Sublist 2	Sublist 2	Sublist 2
06	02030103030130-01	Stony Brook (Boonton)	Sublist 5	N/A	Sublist 2	Sublist 4	Sublist 2	Sublist 2	Sublist 2
06	02030103030160-01	Montville tribs.	Sublist 1	Sublist 1	Sublist 1	Sublist 1	Sublist 1	Sublist 1	Sublist 1
03	02030103050050-01	Pequannock R (Charlotteburg to OakRidge)	Sublist 4	Sublist 4	Sublist 3	Sublist 3	Sublist 3	Sublist 3	Sublist 3
03	02030103050060-01	Pequannock R(Macopin gage to Charl'brg)	Sublist 4	Sublist 4	Sublist 2	Sublist 4	Sublist 2	Sublist 2	Sublist 2
03	02030103050070-01	Stone House Brook	Sublist 2	N/A	Sublist 3	Sublist 3	Sublist 3	Sublist 3	Sublist 3
03	02030103050080-01	Pequannock R (below Macopin gage)	Sublist 4	Sublist 4	Sublist 2	Sublist 2	Sublist 2	Sublist 2	Sublist 2
03	02030103100070-01	Lincoln Park tribs (Pompton River)	Sublist 5	N/A	Sublist 2	Sublist 4	Sublist 4	Sublist 2	Sublist 2

TABLE 4

SUMMARY OF SUBLIST 4 AND SUBLIST 5 POLLUTANTS

BOROUGH OF KINNELON

Assessment Unit ID	Assessment Unit Name	Total Phosphorus	pH	Temperature	Fecal Coliform	E-Coli	Pollutant Unknown	Mercury (tissue)	PCBs (tissue)	DDX (tissue)	Chlordane (tissue)
02030103030110-01	Beaver Brook (Morris County)		Sublist 5		Sublist 4			Sublist 5			
02030103030130-01	Stony Brook (Boonton)				Sublist 4		Sublist 5				
02030103050050-01	Pequannock R (Charlotteburg to OakRidge)			Sublist 4							
02030103050060-01	Pequannock R(Macopin gage to Charl'brg)			Sublist 4	Sublist 4						
02030103050080-01	Pequannock R (below Macopin gage)			Sublist 4				Sublist 5	Sublist 5	Sublist 5	Sublist 5
02030103110010-01	Lincoln Park tribs (Pompton River)	Sublist 5	Sublist 5		Sublist 4	Sublist 4					
	West Lake (Sabeys Beach, West Fayson Lake, Main Beach)				Sublist 5						