



Municipal Stormwater Management & Mitigation Plan

A Sub-Element of the Utility Service Plan Element

Adopted by the Holland Township Planning Board on September 14th, 2020.

Prepared For

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1. Introduction

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for the Township of Holland ("the Township") to address stormwater-related impacts caused by development. 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 create one-quarter acre or more of new impervious surface.

The Township's Stormwater Ordinance also includes standards pertaining to Minor Developments, which are defined as projects involving the construction, or installation of impervious surfaces equal to, or greater than 2,000 square feet.

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.

This plan is consistent with the state's ongoing initiative to protect waterways and reduce the impacts of increased runoff originating from development sites. The Township is constantly improving its approach to stormwater management and working with the New Jersey Highlands Council on the implementation of new initiatives intended to protect groundwater recharge and improve water quality.

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, New Jersey Highlands Council Documents and other planning efforts to encourage 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. The mitigation plan was developed in conjunction with the New Jersey Highlands Council and requires developers seeking waivers from the Township's stormwater rules to implement stormwater management measures off-site addressing the criteria from which a waiver is being sought.

2. Goals of the Stormwater Management Plan

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 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.

3. Development Impacts Upon Stormwater Runoff

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.

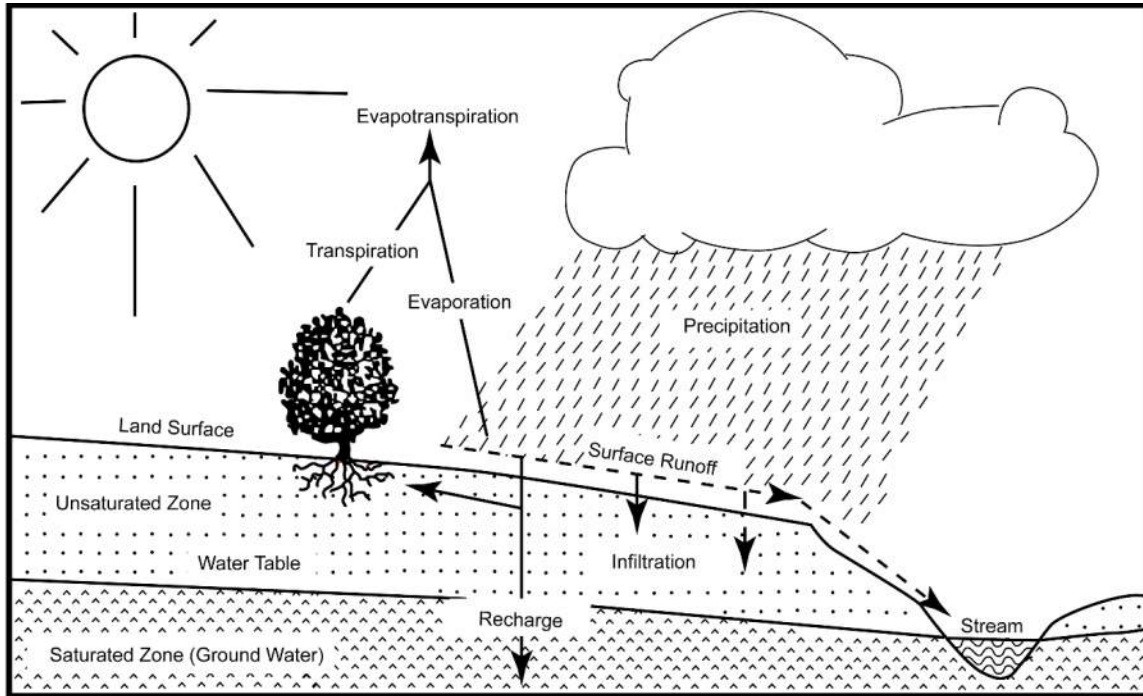


Figure C-1 – The Hydrologic Cycle

Source: New Jersey Geological Survey Report GSR-32.

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.

4. Riparian Buffers

The vegetated area along a stream functions as a buffer and filter system between upland development and the stream itself, maintaining water quality by absorbing nutrients, accumulating and stabilizing sediments, and removing heavy metals and

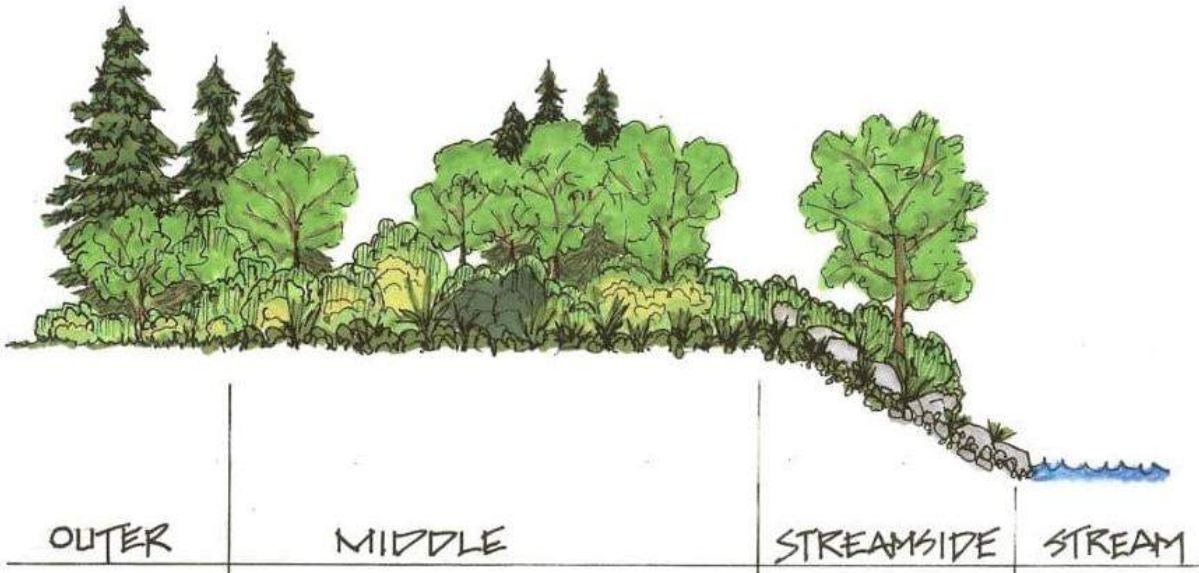


Figure C-2 - Riparian Buffer Diagram

pollutants from development that can enter the stream with surface water runoff. Near stream vegetation (trees, shrubs, grasses) stabilize the soil, help slow runoff, and serve as an effective nutrient and sediment filter. When a stream bank has been cleared of trees and shrubs, stream bank erosion and loss of valuable property occurs.



Stream with dense tree canopy



Stream with vegetated filters

Figure C-3 – Vegetated Stream Corridors



Figure C-3 – Agricultural Riparian Stream Buffer

Land disturbances within the watershed can increase pollutants. Runoff from roadways and a variety of sources may not pass through water quality basins or other treatment devices prior to entering waterways.

Pollutants such as road salts, oil, grease and other contaminants are problematic for the aquatic ecosystem. Silt is frequently a primary constituent of non-point source pollution and is a major threat to the state's water resources. Runoff from poor farming practices and land disturbances are major contributors of silt. Livestock grazing destroys near-stream vegetation, causing unstable banks that could be prevented or minimized through fencing.

5. Water Quality

Trout fisheries are widely recognized as indicators of high-water quality. The high-water quality and habitat standards necessary for the survival and successful reproduction of trout have made them a useful indicator of stream health. In 1968, New Jersey began identifying and classifying the state's waters according to their suitability to support trout under a Federal Aid Grant. During the next several years, a classification system for New Jersey waters was developed based upon sampling completed under this study. The system classifies the state's waters as trout production (natural reproduction occurring), trout maintenance (ability to support trout year-round, but no reproduction documented) and non-trout (habitat and/or water quality are not conducive to the presence of trout or trout associated species). This classification system was formally recognized in 1981 under the state's Surface Water Quality Standards and is recognized in State regulatory programs governing water quality and land development.

The Surface Water Quality Standards includes statements of policy, designated use classifications, and corresponding water quality criteria, and surface water classifications. The suitability of a waterway to support trout affects the stringency of the standards set. Trout production waters are awarded Category One status, one of the highest levels of protection which mandates an anti-degradation standard for a

number of identified water quality parameters. The New Jersey Department of Environmental Protection's Land Use Regulation Program through Stream Encroachment, Freshwater Wetlands, and the Stormwater Management Rules acknowledge the fragile nature of these ecosystems and provide additional protective measures.

The general classification applied to freshwaters of the State is FW. Waters located wholly within State or Federal land or special holdings are typically classified as FW1. These waters receive the highest protection possible and shall be maintained as to quality in their natural state. All other surface freshwaters (excluding the Delaware River and Pinelands waters) are classified FW2. Waters are then further classified according to their suitability to support trout.

TP – Trout Production – Waters designated [at N.J.A.C. 7:9B-1.15(b) through (g)] for use by trout for spawning or nursery purposes during their first summer.

TM – Trout Maintenance – Waters designated [at N.J.A.C. 7:9B-1.15(b) through (g)] for the support of trout throughout the year.

NT – Non-Trout – Waters that have not been designated [at N.J.A.C. 7:9B-1.15(b) through (h)] as trout production or trout maintenance. These waters are generally not suitable for trout because of their physical, chemical, or biological characteristics, but are suitable for a wide variety of other fish species.

Fresh waters classified as FW2 may be further designated as "Category One Waters" (C1) for the purposes of implementing anti-degradation policies (N.J.A.C. 7:9B-1.5(d)). These policies protect C1 waters from measurable changes to the existing water quality. These waters can be identified because of their clarity, color, scenic setting, and other characteristics of aesthetic value, exceptional ecological significance, exceptional water supply significance, or exceptional fisheries resource. These waters may include, but are not limited to:

- Waters originating wholly within Federal, interstate, State, county, or municipal parks, forests, fish and wildlife lands, and other special holdings that have not been designated as FW1;
- Waters that are classified as trout production and their tributaries;
- Surface waters classified as trout maintenance or non-trout that are upstream of waters classified as trout production;
- Shellfish waters of exceptional resource value;
- Other waters and their tributaries that flow through, or border, Federal, State, county, or municipal parks, forests, fish and wildlife lands, or special holding.

Comprehensive Stormwater Management Rules, adopted in January 2004, protect and enhance water quality and preserve the integrity of drinking water supplies statewide. The rules minimize the impacts on Category One streams by controlling

Major Development within a 300-foot buffer around these high-quality watersheds. These efforts enhance the protection of water quality and in-stream habit from the negative effects of widespread development.

Not only are their tangible economic benefits resulting from these rules, perhaps more importantly are the intangible benefits to all residents that appreciate the quality of life values. The state's nine million residents will all reap the benefits of these resource protection and preservation efforts.

Mapping and data presented in this report are current at the time of adoption. Any Municipal or Private development proposed which impacts waterways must reflect the most current stream classification and conform to the applicable Federal, State or Municipal restrictions and protective measures which may apply.

6. Waterway Preservation and Conservation

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. The Act is notable for safeguarding the special character of these rivers, while also recognizing the potential for their appropriate use and development. It encourages river management that crosses political boundaries and promotes public participation in developing goals for river protection.

Rivers may be designated by Congress or, if certain requirements are met, the Secretary of the Interior. Each river is administered by either a federal or state agency. Designated segments need not include the entire river and may include tributaries. For federally administered rivers, the designated boundaries generally average one-quarter mile on either bank in the lower 48 states and one-half mile on rivers outside national parks in Alaska in order to protect river-related values.

Holland Township includes two waterways which have been classified or are in the process of being designated under the National Wild and Scenic Rivers System. This includes the Lower Delaware River, and the Musconetcong River from the Hughesville Mill to the Delaware River confluence.

These waterways and their associated watersheds require additional attention in terms of development and pollutant impacts. Proposed plans must provide reductions and elimination of pollutants to these resource waterways. Also, in conjunction with relevant NJDEP permitting requirements for disturbance to surface waters and wetlands, projects within a 1/4 mile of a designated Wild and Scenic River must involve National Parks Service consultation and review.

7. Background Data

Land Area and Population

The Township encompasses a 23.9 square mile area in Hunterdon County, New Jersey. In recent years the Township has gone through varying periods of growth, and the population has steadily increased from 4,593 in 1980, to 4,892 in 1990, to 5,122 in 2000 to 5,291 in 2010. This population increase has resulted in considerable new development, and changes in the landscape that have increased stormwater runoff volumes and pollutant loads to the waterways of the municipality. Map 1 illustrates the waterways in the Township, and Map 3 indicates the topography and Township boundary on NJ Highlands Council LIDAR mapping.

Watersheds

The Township of Holland includes five (5) HUC14 watersheds, two (2) of which discharge to the Hakhokake Creek and the Musconetcong River, two (2) of which discharge directly to the Musconetcong River, and to the Upper Delaware River Watershed, and one (1) which discharge to the Central Delaware River Watershed through numerous streams and tributaries.

Specifically, these watersheds include the Harihokake Creek (1,408 acres), the Hakhokake Creek (6,996 acres), and the Musconetcong River (3,272 acres). Several other small unnamed tributaries drain directly to the Delaware River (3,806 acres).

Water Quality

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 Musconetcong River is in Watershed Management Area #1, Upper Delaware Region. The other Delaware River tributaries (Harihokake Creek and Hakhokake Creek) are in Watershed Management Area #11, Upper Delaware Region.

Currently, there are two active impairments for the Delaware River tributaries within the Township. Both pertain to elevated levels of fecal coliform in the surface waters of the Hakhokake Creek (2005) and Musconetcong River (2003).

Land use in the areas of impairment is predominantly agriculture, with suburban and urban development, including some older development on septic systems, and forest. Potential sources of fecal coliform include livestock, land application of manure and older

septic systems. Wildlife including, geese and beaver in the river can also contribute to these impairments.

In addition to the above AMNET data, the NJDEP and several other agencies collect water quality data on streams in the State. Generally, their findings indicate that the water quality is generally good in the remaining sub-watersheds in the Township.

Water quality for many of the State's larger rivers (Delaware & Musconetcong) is often below the established acceptable criteria, particularly in the downstream sections. As indicated above monitoring of the Musconetcong River at Riegelsville and Hakhokake Creek indicates that the waterways are impaired with fecal coliform. As a result, the NJDEP has developed a Total Maximum Daily Load (TMDL) for various pollutants and has adopted TMDLs for fecal coliform for the Musconetcong River and Hakhokake Creek.

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

Fecal coliform is a subset of total coliform and originates in the intestines of warm-blooded animals. It is preferred as a pathogen *indicator* since fecal coliform is not found naturally in soils. Point sources of fecal coliform are typically sewage treatment discharges. Municipal and industrial sewage treatment plant discharges are closely monitored, and routinely achieve essentially complete disinfection, and thus are not considered a significant source of this pollutant in receiving surface waters.






Non-point sources of fecal coliform pollution include storm-driven transport of pollutant loads from geese, farms and domestic pets, as well as failing or inappropriately designed or located, and poorly maintained septic systems. The sources of fecal coliform pollution for the Musconetcong River watershed as identified by the NJDEP include livestock, geese, wildlife, domestic pets, and septic systems. Management strategies for pollution reduction include implementation of agricultural BMPs, goose management programs, pet waste management through the stormwater control program, and systematic source tracking and enforcement.

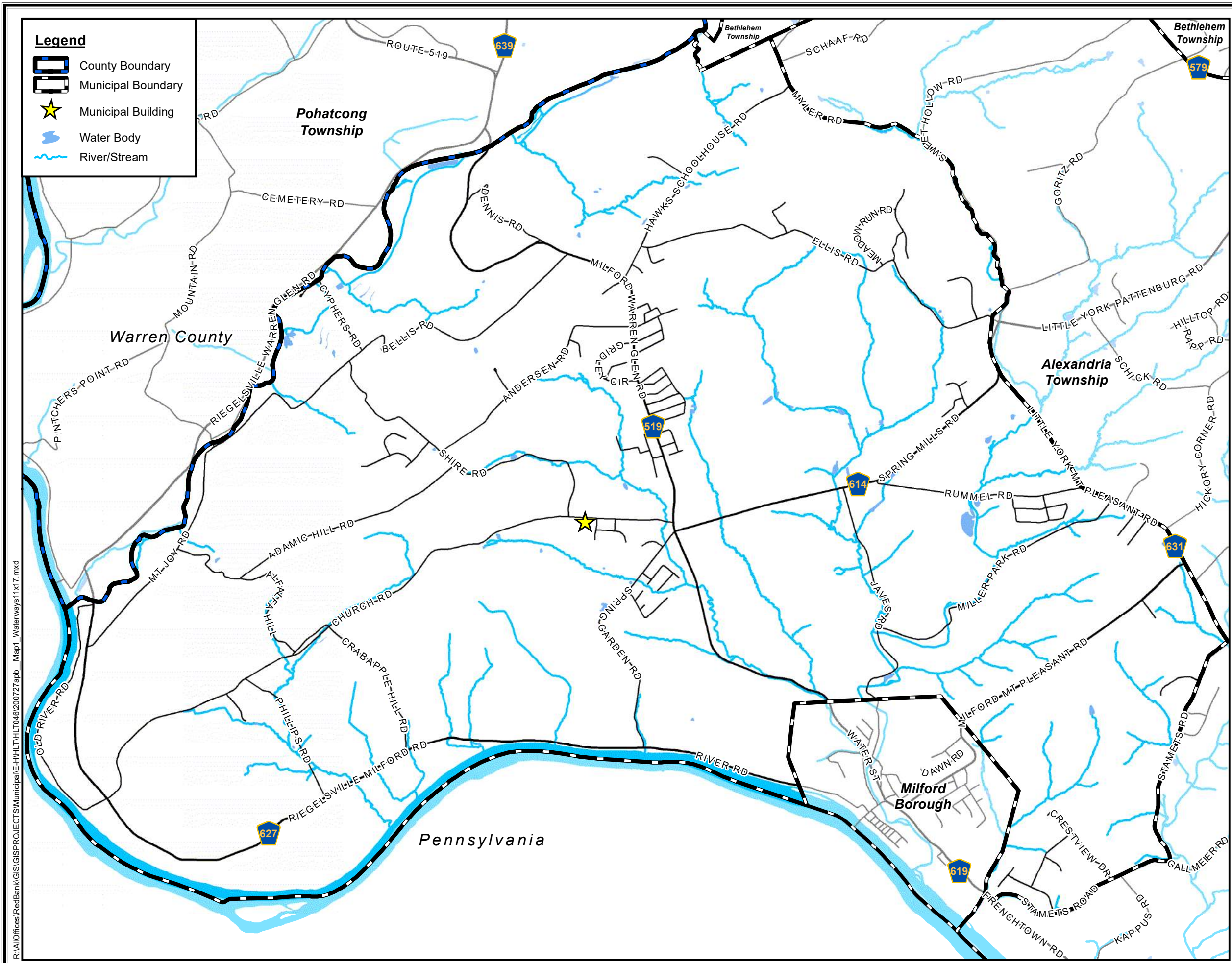
The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)) (Integrated List) is required by the federal Clean Water Act to be prepared biennially and is a valuable source of water quality information. This combined report

presents the extent to which New Jersey waters are attaining water quality standards and identifies waters that are impaired.

Map 1 - Waterways

Legend

-  County Boundary
-  Municipal Boundary
-  Municipal Building
-  Water Body
-  River/Stream




MAP 1 WATERWAYS

TOWNSHIP OF HOLLAND

HUNTERDON COUNTY
NEW JERSEY



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 Feet
 1 inch = 3,100 feet

This map was developed using NJDOT, NJDEP and Hunterdon County GIS digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.












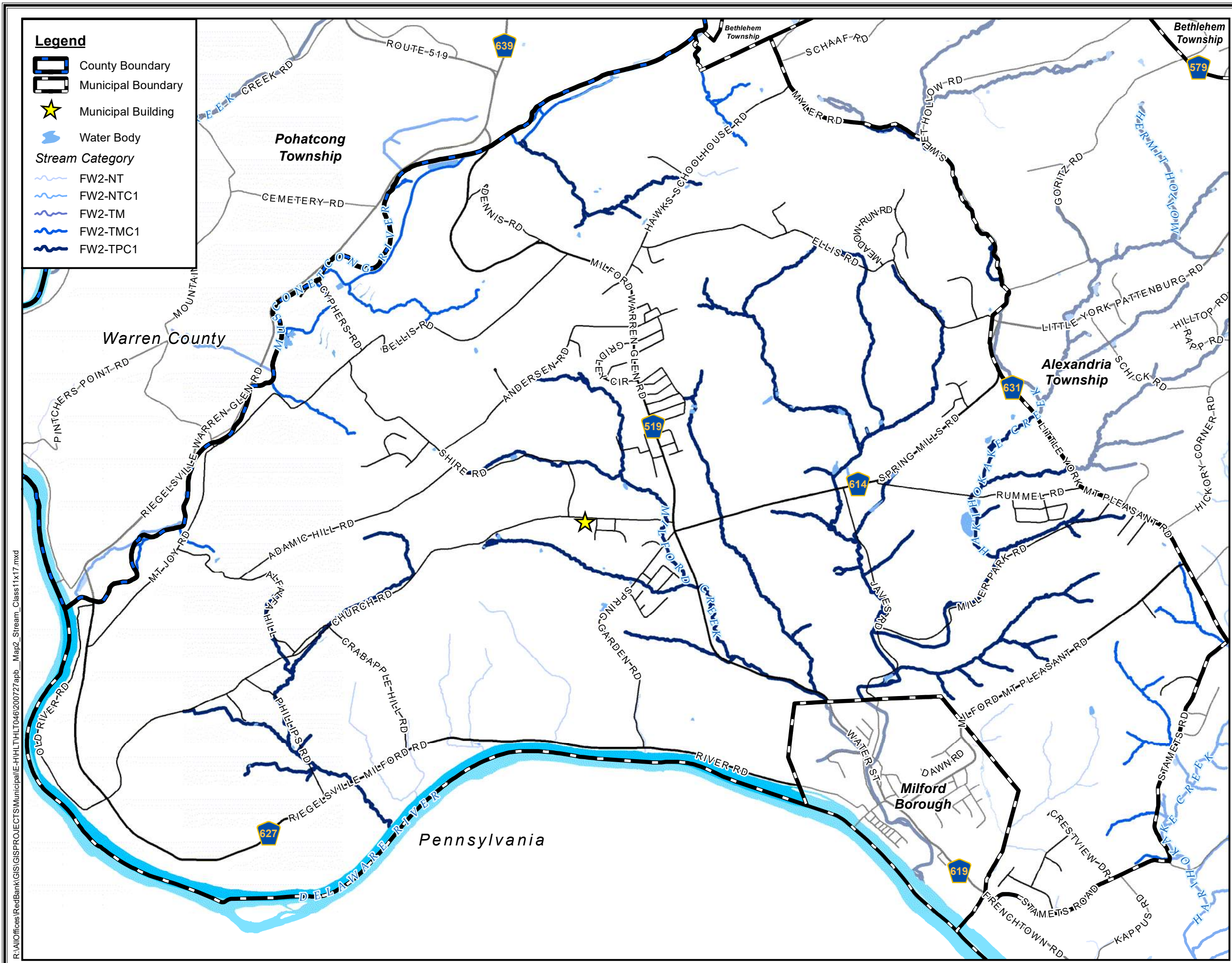
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Map 2 – Stream Classification

Legend

-  County Boundary
-  Municipal Boundary
-  Municipal Building
-  Water Body
- Stream Category**
-  FW2-NT
-  FW2-NTC1
-  FW2-TM
-  FW2-TMC1
-  FW2-TPC1



MAP 2 STREAM CLASSIFICATION

TOWNSHIP OF HOLLAND

HUNTERDON COUNTY
NEW JERSEY



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Feet
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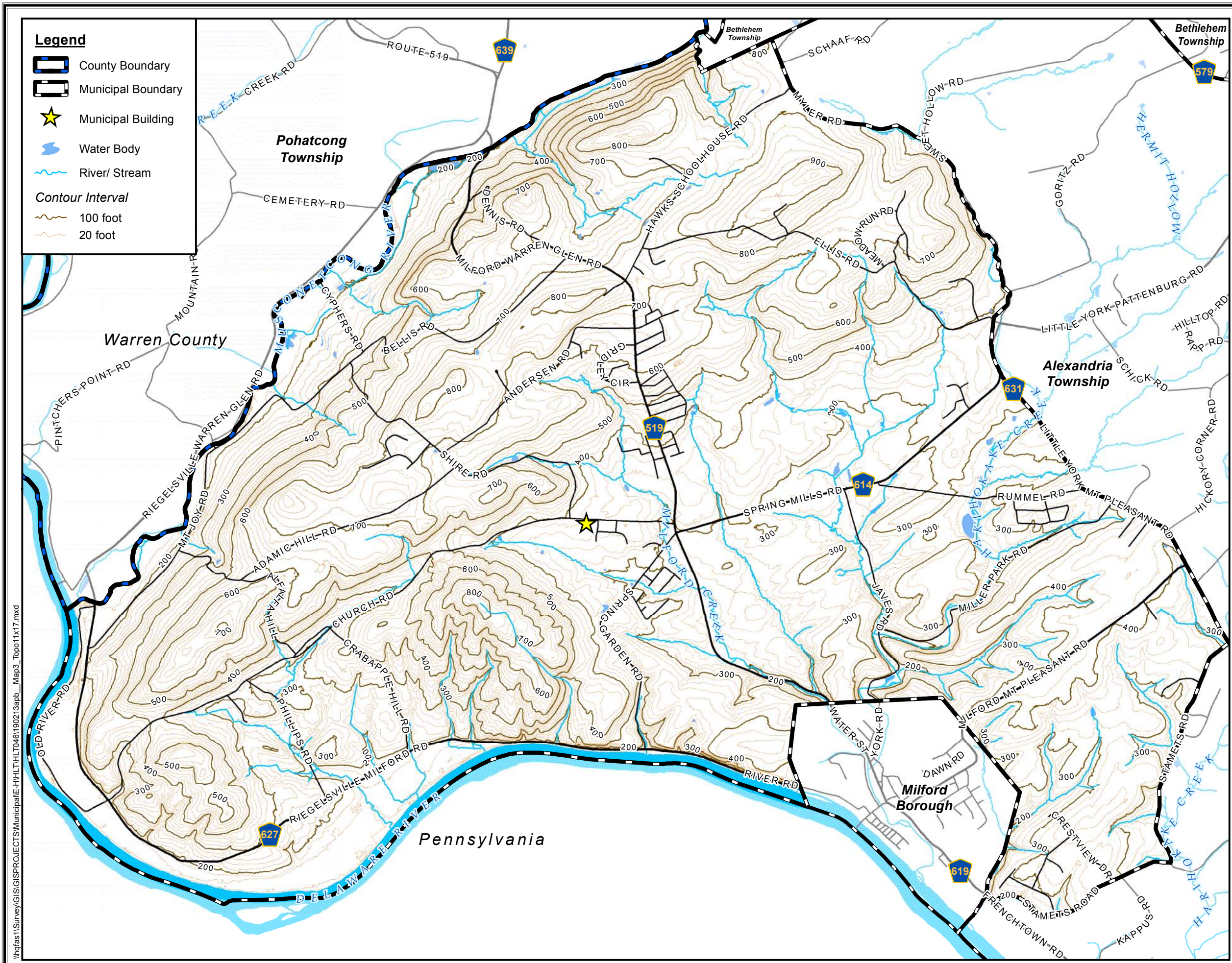
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Map 3 – Highlands LIDAR Contours

Legend

-  County Boundary
-  Municipal Boundary
-  Municipal Building
-  Water Body
-  River/ Stream
- Contour Interval**
-  100 foot
-  20 foot



MAP 3 HIGHLANDS LIDAR CONTOURS

TOWNSHIP OF HOLLAND

HUNTERDON COUNTY
NEW JERSEY



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Runoff and Recharge

The Township has experienced instances of severe stormwater runoff quantity problems including flooding, streambank erosion, and diminished base flow in its streams. Some of the culverts associated with road crossings in the Township are undersized. During severe storm events, these undersized culverts do not have adequate capacity, thereby increasing the backwater effect and upstream flooding.

Many culverts were installed under significantly different hydrologic conditions (i.e., less development and impervious area) than presently exist in the Township. As the impervious surfaces have increased in the Township, peak volumes and rates of stream flows have also increased. The increased amount of surface water runoff has resulted in stream bank erosion, which has resulted in unstable areas at roadways, bridge crossings, and degraded stream habitats.

Holland Township includes areas which are underlain by carbonate (limestone) rock is prone to the formation of karst features, including localized depressions and sinkholes. Sinkholes can provide a direct route for the transmission of contaminated stormwater runoff to flow into groundwater aquifers and surface waters. Proposals for site development and stormwater management must consider the underlying soil and rock strata and address the potential for the existence and formation of these features, and mitigation strategies to prevent the formation of sinkholes.

The increase of impervious surfaces has also reduced groundwater recharge, decreasing base flows in streams during dry weather periods. Lower base flows can have a negative impact on in-stream habitats during the summer months. A map of groundwater recharge areas in the Township are shown in Map 4. The locations of Public Water Supply Wellhead protection areas, also required as part of the MSWMP, are shown in Map 5.

Regulations relevant to Wellhead Protection Areas are contained within the Township's Highlands Land Use Ordinance – §101-29. These regulations provide protection for groundwater resources that directly provide water to potable water supply wells and are vital to the public health, safety and welfare of the community. It is also of primary importance to ensure continued availability of clean drinking water to all that rely upon it. Through regulation of land use, physical facilities and other activities within Wellhead Protection Areas (WHPAs), the potential for groundwater contamination can be reduced by preventing the introduction and migration of pollutants into groundwater sources that supply water supply wells.






These standards apply where any permitted use or structure classified as a major potential contaminant source (PCS) as defined in the Township Ordinance. Wellhead

Protection Area standards also apply to any major PCS proposed to be located or expanded in: a) any Carbonate Rock Area containing or having potential to develop karst features; b) any area discharging surface water into a Carbonate Rock Area determined to contain or have potential to develop karst features; and c) any portion of a Prime Groundwater Recharge Area. These conditions shall not be construed to waive or obviate any rules, regulations, or other requirements pertinent to such uses that may derive from outside agencies having jurisdiction, such as the NJDEP.

All major PCS facilities shall be designed in a manner that prevents the unintentional discharge of toxic or hazardous pollutants to groundwater, surface water bodies, or the land surface, from all internal and external areas, including loading, storage, and transfer areas, in accordance with the provisions of this section.

Map 4 – Highlands Prime Groundwater Recharge Areas

Legend


-  County Boundary
-  Municipal Building
-  Water Body
-  River/ Stream
-  Prime Groundwater Recharge Areas

MAP 4 HIGHLANDS PRIME GROUNDWATER RECHARGE AREAS

TOWNSHIP OF HOLLAND

HUNTERDON COUNTY
NEW JERSEY



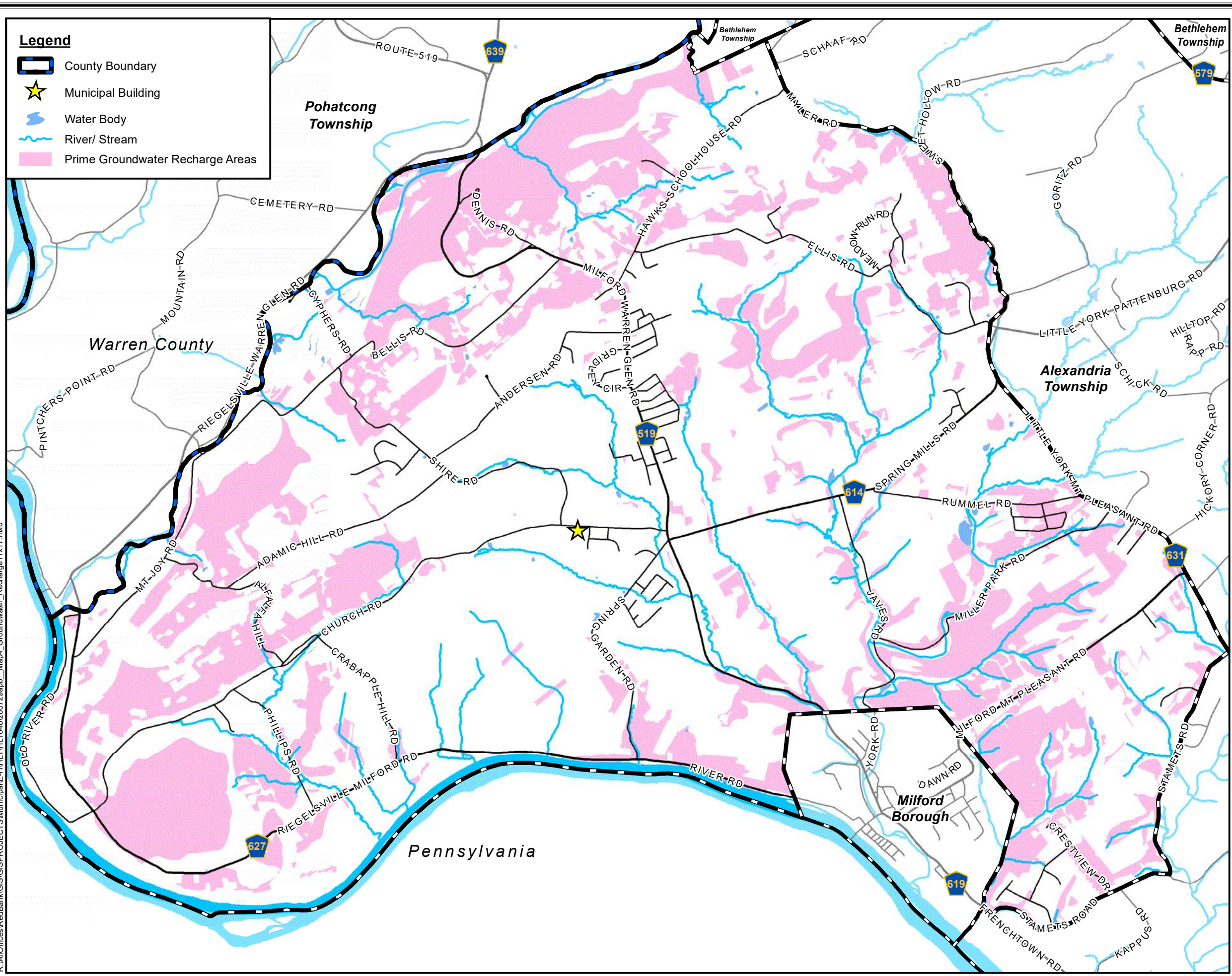
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Map 5 – NJGS Wellhead Protection Areas

Legend

- County Boundary
 - Municipal Building
 - Water Body
 - River/ Stream
 - Public Community Well Heads
- Well Head Protection Areas**
- Tier 1 (2 years)
 - Tier 2 (5 years)
 - Tier 3 (12 years)

MAP 5 NJGS WELL HEAD PROTECTION AREAS

TOWNSHIP OF HOLLAND

HUNTERDON COUNTY
NEW JERSEY



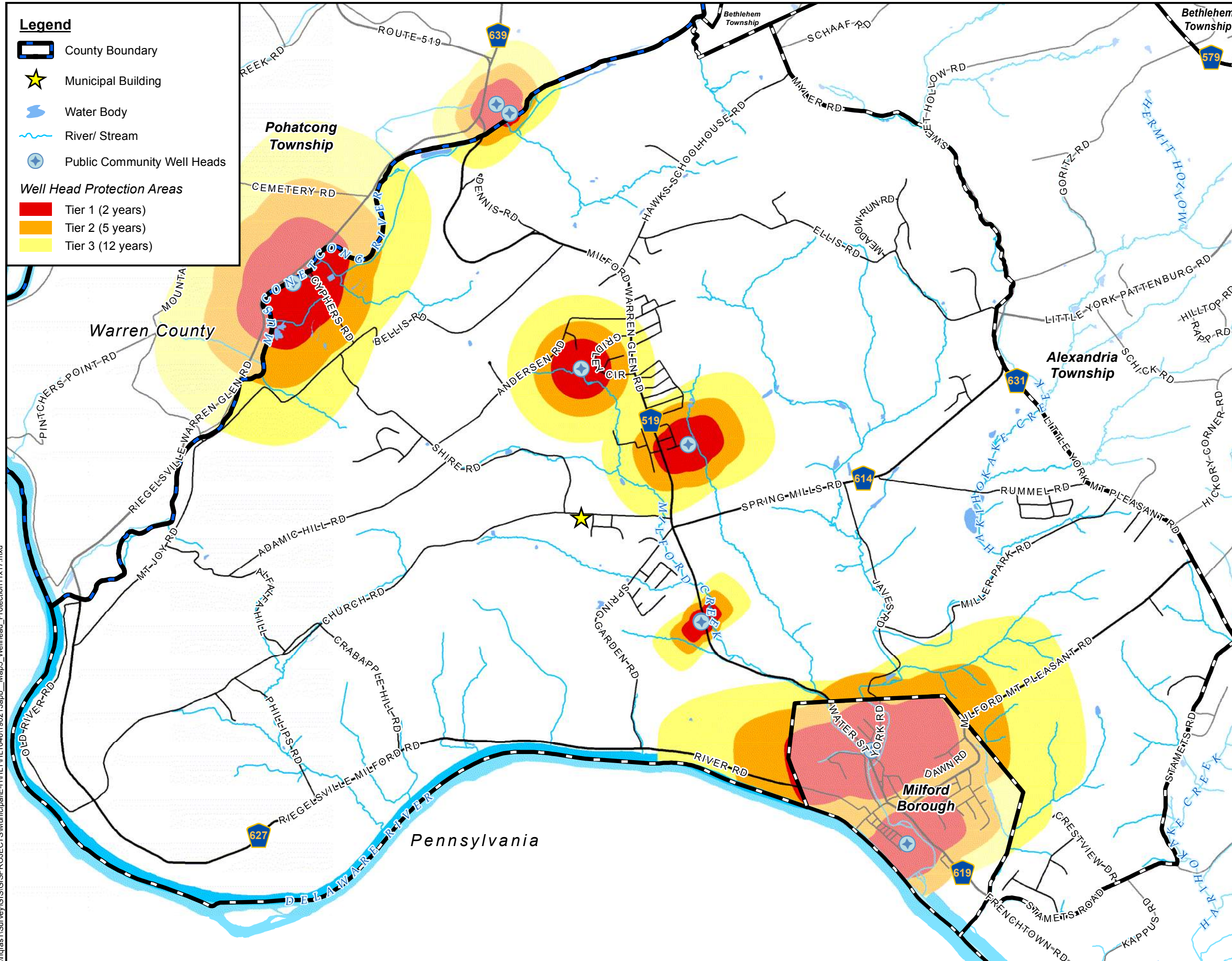
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February 2019

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8. Design and Performance Standards

The Township has adopted, as part of its Stormwater Management Ordinance (Chapter 100 – Part 3 Stormwater Management), the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to minimize the adverse impacts 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 Stormwater Management Ordinance includes provisions and measures that:

- Reduce flood damage, including damage to life and property;
- Control and minimize any increase in stormwater runoff from any new Major Development or Re-Development;
- Control and minimize any increase in stormwater runoff from any new Minor Development;
- Reduce soil erosion from development projects;
- Assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
- Maintain groundwater recharge;
- Control and prevent, to the greatest extent feasible, an increase in non-point pollution;
- Maintain the integrity of stream channels, and corridors for the biological, hydrologic, and hydraulic functions;
- Minimize pollutants in stormwater runoff from new development in order 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 ecologic values, and to enhance the domestic, municipal, recreational, industrial and other uses of the water;
- Protect public safety through the proper design and operation of stormwater management facilities.

In addition to the standards outlined above, in 2018 the Township appended the provisions of the NJ Highlands Council Model Stormwater Ordinance into their Land Use Ordinance, which specifically address the following goals of the Township and NJ Highlands Council with regards to Stormwater Management:

- To amend and add definitions pertaining to Carbonate Rock, Current Deficit Areas, Major Development, Karst, Maximum Extent Practicable, Mitigation and Redevelopment;

- To incorporate enhanced requirements for Groundwater Recharge when a project is located in a Current Deficit Area;
- To include provisions for required stormwater mitigation off-site, when groundwater recharge, or other stormwater goals (rate, volume, water quality) cannot be achieved on the project site;

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

9. Plan Consistency

The Township is within the New Jersey Highlands Region, and has areas within the Highlands Preservation and Planning areas. The NJ Highlands Council has enacted a Regional Master Plan which includes a Stormwater Management Program, which the Township has committed to.

In 2018, the Township adopted ordinance amendments, performed field inspections of stormwater outfalls and developed and adopted a Municipal Stormwater Management Mitigation Plan (See Section 11 below), in coordination with the NJ Highlands Council.

In March 2020 the NJDEP adopted an amendment to the Stormwater Management Rules (NJAC 7:8) pertaining to the implementation of Green Infrastructure on Major Development Sites. This includes the requirement that measures be constructed to address stormwater runoff pollution on development sites close to the source. This plan requires the implementation of the following:

1. Treatment of runoff by infiltration into the subsoil.
2. Treatment of runoff through filtration by vegetation or soil; or
3. Storing stormwater runoff for reuse (i.e. lawn irrigation)

The Amended Rules require that municipalities adopt the above regulations as part of their stormwater ordinance by March 2, 2021. The Township of Holland will adopt and implement the required NJDEP ordinance amendments prior to the end of the 2020 calendar year.

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.

Any future regulations enacted by the NJ Highlands Council, or NJDEP pertaining to Stormwater Management, Green Infrastructure and/or the addressing of impaired waterways (TMDLs) will be adopted as required into the relevant Township Ordinance sections. This plan will also be updated for consistency as necessary.

10. Non-Structural Stormwater Management Strategies

The Township has reviewed the master plan and ordinances with regards to the implementation of Non-Structural Stormwater Management Strategies in new Major and Minor Development as well as redevelopment.

Section 100-185.A includes the implicit Low Impact Development requirements for projects outlined in the State's Stormwater Rules (N.J.A.C. 7:8), specifically:

- (a) Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss;
- (b) Minimize the creation of new impervious surfaces and reduce, break up or otherwise disconnect the flow of runoff over impervious surfaces;
- (c) Maximize the protection of natural drainage features and vegetation, except where native or natural vegetation is considered invasive;
- (d) Minimize the decrease in the time of concentration from preconstruction to postconstruction;
- (e) Minimize land clearing and disturbance and overall site grading;
- (f) Minimize soil compaction;
- (g) Retain native, noninvasive vegetation, plant low-maintenance landscaping, plant native vegetation, and minimize the creation of lawns and the use of plantings and vegetation that require the excessive use of fertilizers, pesticides and irrigation;
- (h) Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas;
- (i) Provide other source controls to prevent or minimize the use, exposure and/or mobilization of pollutants and prevent or minimize the release and transport of those pollutants into stormwater runoff.

Section 101-36.B(8): Low Impact Development - As part of the Township's continued work with the NJ Highlands Council, in 2018 the Township adopted the Highlands Regional Land Use Ordinance () which requires the implementation of Nonstructural Stormwater Management Facilities and Best Management Practices which achieve stormwater management goals, while minimizing pollution levels without extensive

construction efforts, including a requirement to mimic the natural hydrology of a site and utilize site planning and design to achieve stormwater control.

11. Land Use/Build-Out Analysis

- A detailed land use analysis for the Township was conducted. Map 6 illustrates the existing land use in the Township based upon GIS information from the Hunterdon County Planning Board.
- Map 7 illustrates the HUC14s within the Township.
- The Township Zoning Map is shown in Map 8.
- Map 9 illustrates the areas of constrained land in the Township.
- Build out calculations for impervious cover are shown in Table C-1. As expected, when developing agricultural and forest lands, the build-out of the several HUC14s in the Township will result in a significant increase in impervious surfaces.
- Table C-2 presents the pollutant loading coefficients by land cover.
- Pollutants loads at full build out are presented in Table C-3.

Table C-1 – Build-Out Calculations for Holland Township

HUC 14 and Zone District	Total Area (acres)	Existing Impervious (%)	Existing Impervious (acres)	Undevelopable Area (acres)	Developable Area (acres)	Allowable Impervious (%)	Build-Out Impervious (acres)
02040105160060 Musconetcong River							
HPA	525	1.1%	5.8	252	273	3.0%	14.0
02040105160070 Musconetcong River							
HPA	670	2.7%	18.1	280	390	3.0%	29.8
R-1	2	25.0%	0.5	0	2	10.0%	0.7
R-5	1812	2.2%	39.9	536	1276	3.0%	78.1
IND	258	4.8%	12.4	72	186	55.0%	114.7
VR	5	16.0%	0.8	0	5	10.0%	1.3
0204105170010 Delaware River							
R-5	3498	1.7%	59.5	1076	2422	3.0%	132.1
IND	259	13.1%	33.9	112	147	55.0%	114.8
VR	49	16.7%	8.2	4	45	10.0%	12.7
02040105170020 Hahokake Creek							
HPA	760	3.6%	27.4	189	571	3.0%	44.5
R-1	452	17.7%	80.0	138	314	10.0%	111.4
R-5	5629	2.2%	123.8	2960	2669	3.0%	203.9
C	32	22.5%	7.2	25	7	30.0%	9.3
MFR	34	15.0%	5.1	18	16	35.0%	10.7
PCD/PSV	89	0.6%	0.5	39	50	50.0%	25.5
02040105170030 Hariokake Creek							
R-5	1379	2.9%	40.0	705	674	3.0%	60.2
VR	29	11.0%	3.2	24	5	10.0%	3.7

Notes:

1. An estimate has been made for the "Build-Out Impervious" area based upon the limitations imposed by the Highlands Preservation Area Designation.
2. The Holland Township Code does not specify allowable impervious coverages for the R-1, R-5, VR and PCD/PSV Districts. For the purposes of this analysis, an allowable impervious coverage was assumed as follows: R-1=10%; R-5=3%; VR=10%; PCD/PSV=50%
3. The above analysis estimates the Build-Out based upon current Township Zoning.
4. Areas within the Highlands Preservation Areas will have additional limitations affecting their ultimate buildout. Please see Appendix B for the Highlands Council Municipal Buildout Report Adopted in July 2009.

Table C-2 – Pollutant Loads by Land Cover

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


















Source: NJDEP Stormwater BMP Manual 2004.

Table C-3 – Non-Point Source Loads at Build-Out for Holland Township

HUC 14 and Zone District	Build-Out Zoning	Developable Area (acres)	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/yr)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
02040105160060 Musconetcong River								
HPA	LD Res.	273	0.6	163.8	5	1365	100	27300
02040105160070 Musconetcong River								
HPA	LD Res.	390	0.6	234.0	5	1950	100	39000
R-1	MD Res.	2	1.4	2.8	15	30	140	280
R-5	LD Res.	1276	0.6	765.6	5	6380	100	127600
IND	Industrial	5	1.5	7.5	16	80	200	1000
VR	MD Res.	0	1.4	0.0	15	0	140	0
0204105170010 Delaware River								
R-5	LD Res.	147	0.6	88.2	5	735	100	14700
IND	Industrial	45	1.5	67.5	16	720	200	9000
VR	MD Res.	0	1.4	0.0	15	0	140	0
02040105170020 Hakhokake Creek								
HPA	LD Res.	314	0.6	188.4	5	1570	100	31400
R-1	MD Res.	2669	1.4	3736.6	15	40035	140	373660
R-5	LD Res.	7	0.6	4.2	5	35	100	700
C	Commercial	571	2.1	1199.1	22	12562	200	114200
MFR	MD Res.	314	1.4	439.6	15	4710	140	43960
PCD/PSV	MD Res.	2669	1.4	3736.6	22	58718	200	533800
02040105170030 Harihokake Creek								
R-5	LD Res.	5	0.6	3.0	5	25	100	500
VR	MD Res.	0	1.4	0.0	15	0	140	0

Map 6 – 2016 Updated Land Use/ Land Cover

Legend

-  County Boundary
 -  Municipal Boundary
 -  Municipal Building
- 2012 Land Use/ Land Cover (2016 Update)**
-  Residential (High Density)
 -  Residential (Medium Density)
 -  Residential (Low Density)
 -  Residential (Rural)
 -  Commercial & Services
 -  Industrial
 -  Transportation, Communication & Utilities
 -  Other Urban Land
 -  Recreational Land
 -  Agricultural Land
 -  Forest and Brush/Shrub Land
 -  Water
 -  Wetlands
 -  Transitional Areas

MAP 6
2016 UPDATED
LAND USE/
LAND COVER

TOWNSHIP
OF
HOLLAND

HUNTERDON COUNTY
 NEW JERSEY



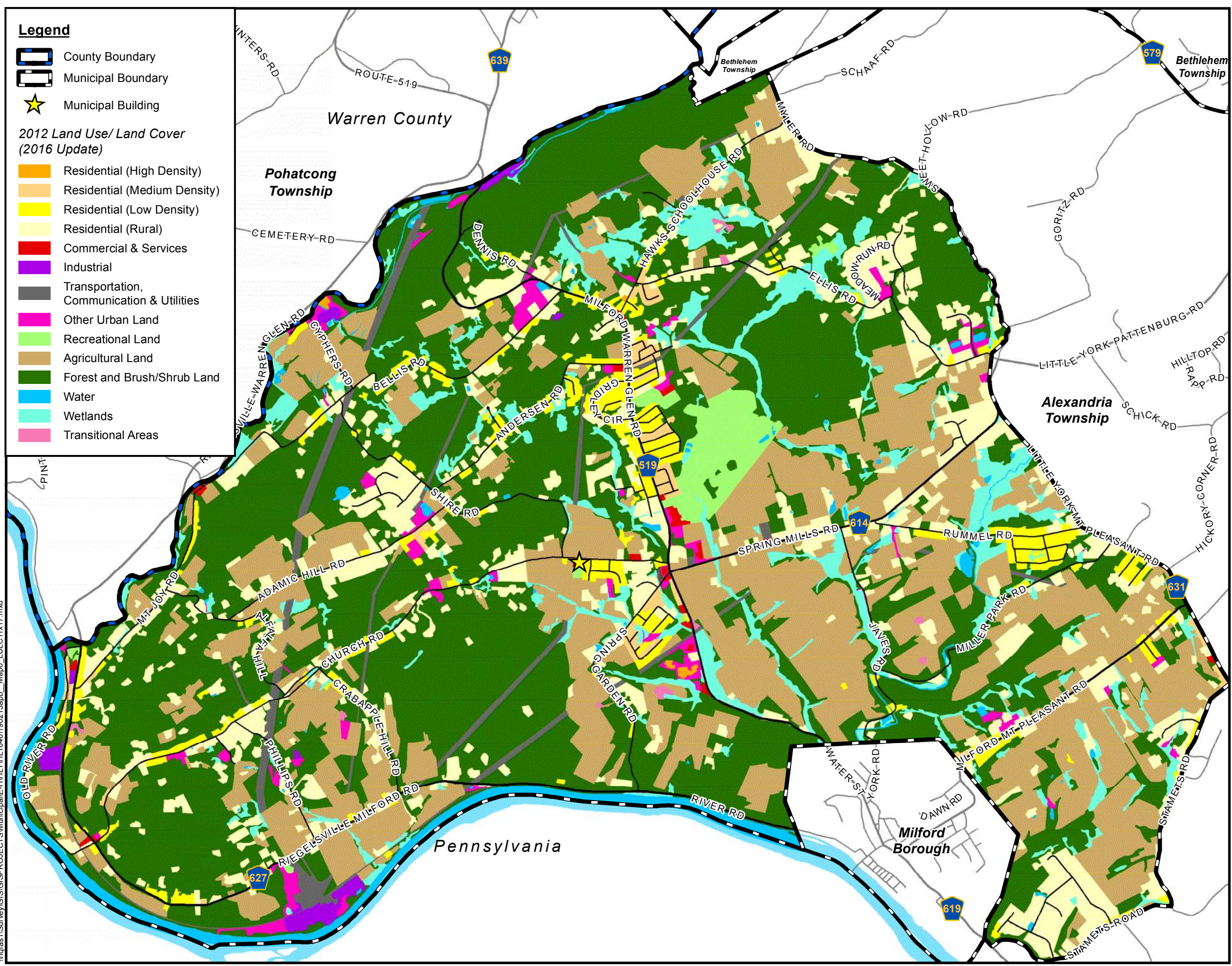
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This map was developed using NJDOT, NJDEP and Hunterdon County GIS digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.









February 2019

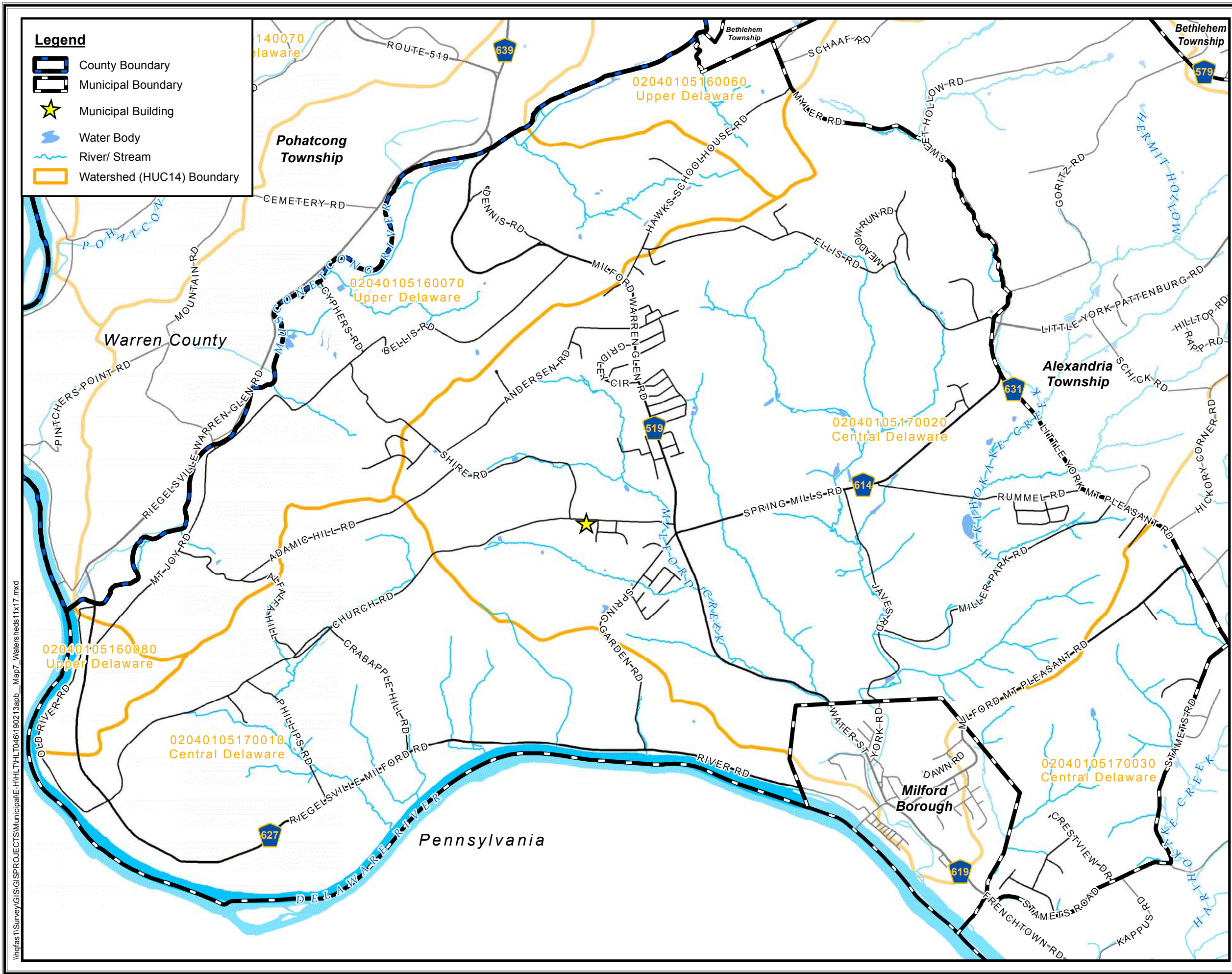
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Map 7 – Watersheds by HUC14

Legend

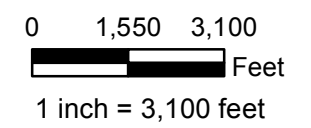
-  County Boundary
-  Municipal Boundary
-  Municipal Building
-  Water Body
-  River/ Stream
-  Watershed (HUC14) Boundary



**MAP 7
WATERSHEDS
BY HUC14**

**TOWNSHIP
OF
HOLLAND**

HUNTERDON COUNTY
NEW JERSEY



This map was developed using NJDOT, NJDEP and Hunterdon County GIS digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.



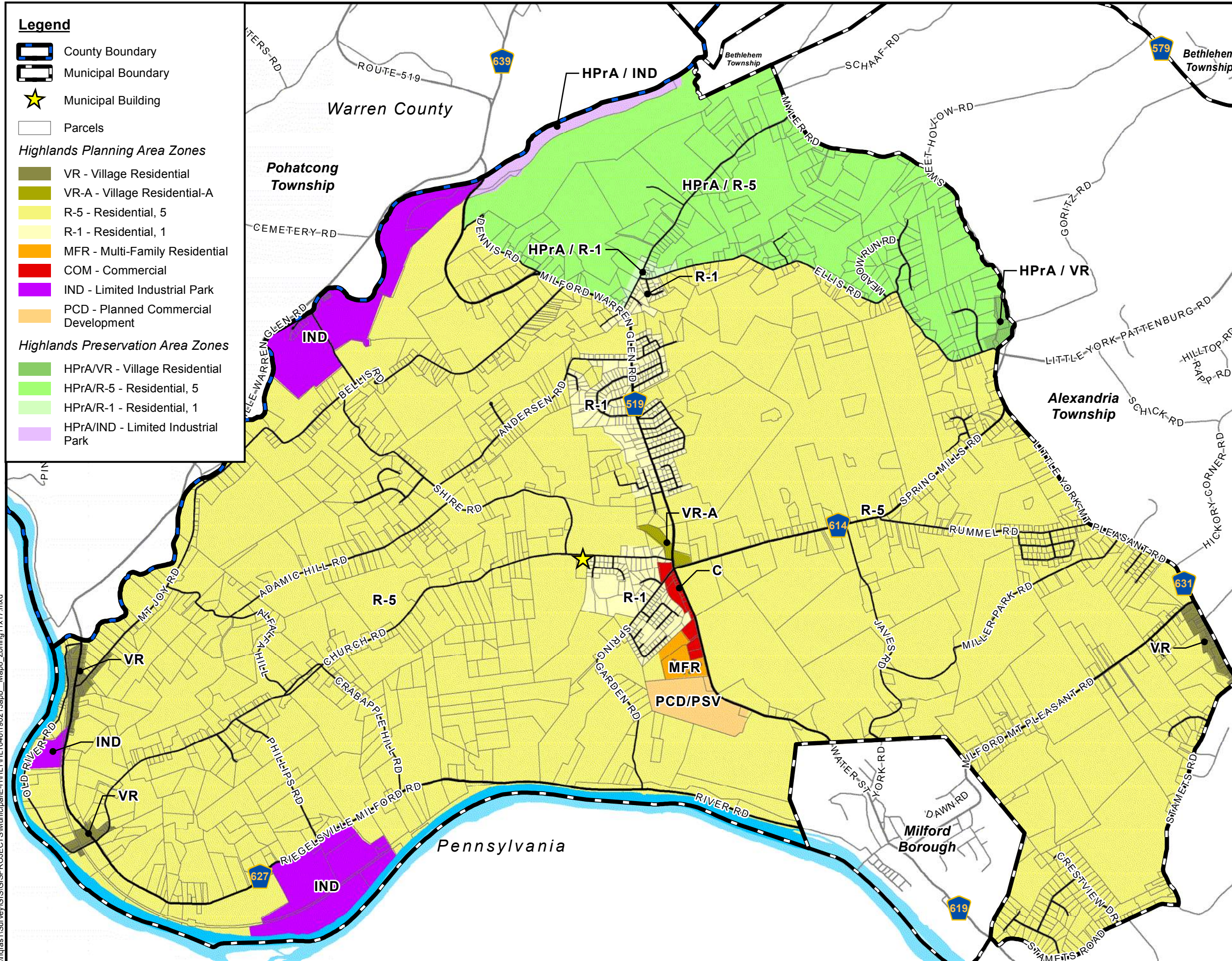
February 2019

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Map 8 – Zoning

Legend

-  County Boundary
 -  Municipal Boundary
 -  Municipal Building
 -  Parcels
- Highlands Planning Area Zones**
-  VR - Village Residential
 -  VR-A - Village Residential-A
 -  R-5 - Residential, 5
 -  R-1 - Residential, 1
 -  MFR - Multi-Family Residential
 -  COM - Commercial
 -  IND - Limited Industrial Park
 -  PCD - Planned Commercial Development
- Highlands Preservation Area Zones**
-  HPra/VR - Village Residential
 -  HPra/R-5 - Residential, 5
 -  HPra/R-1 - Residential, 1
 -  HPra/IND - Limited Industrial Park



**MAP 8
ZONING**

**TOWNSHIP
OF
HOLLAND**

HUNTERDON COUNTY
NEW JERSEY



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Feet
1 inch = 3,100 feet

This map was developed using NJDOT, NJDEP and Hunterdon County GIS digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.













February 2019

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Map 9 – Constrained Land

Legend

-  County Boundary
-  Municipal Boundary
-  Municipal Building
-  Water Body
-  Highlands Open Water Protection Area
-  Highlands Riparian Area
-  Wetlands
-  Wetlands Buffer (50')
-  Wetlands Buffer (150')
-  Highlands Steep Slope Protection Areas

**MAP 9
CONSTRAINED
LAND**

**TOWNSHIP
OF
HOLLAND**

HUNTERDON COUNTY
NEW JERSEY



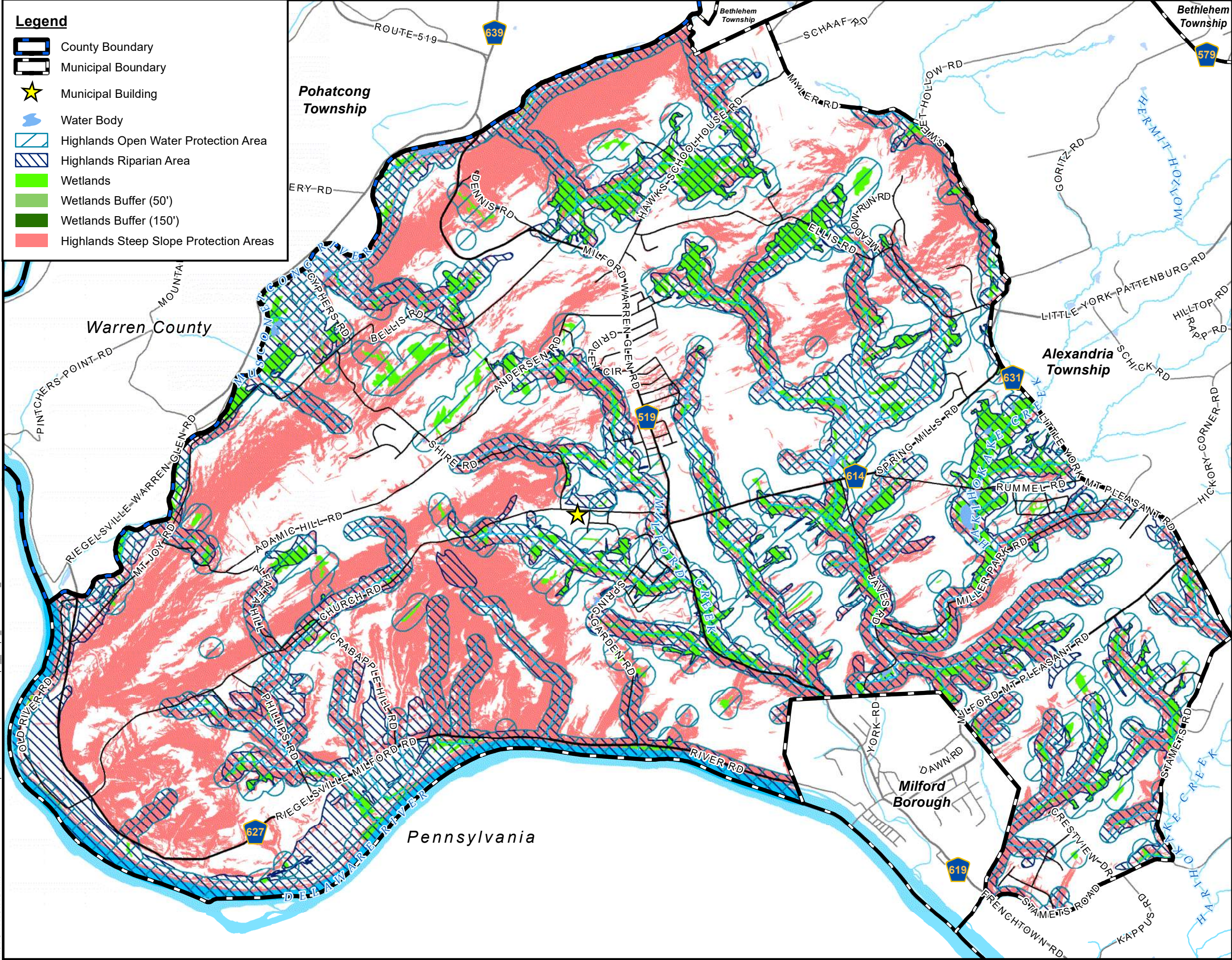
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1 inch = 3,100 feet

This map was developed using NJDOT, NJDEP, Highlands Council and Hunterdon County GIS digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.



July 2020

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12. Stormwater Management Mitigation Plan

This Mitigation Plan is intended to be implemented when a proposed development seeks a variance or exemption from the Township's Stormwater Management Design and Performance Standards as defined in the Land Use Ordinance, Chapter 100 - Article XXIV – Stormwater Management Regulations.

This plan has been prepared in accordance with the New Jersey Stormwater Management Rules (NJAC 7:8), the New Jersey Department of Environmental Protection, Bureau of Nonpoint Pollution Control Municipal Stormwater Regulation Program (NJAC 7:14A), and the New Jersey Highlands Water Protection and Planning Council – Regional Stormwater Management Plan Guidance for Mitigation Plan Preparation.

Mitigation Project Criteria

The mitigation project should, wherever possible, be implemented in the same HUC14 subwatershed as the proposed development or an inter-connected subwatershed and must address the same performance standard for which the variance or exemption was granted.

The Township of Holland includes five (5) HUC14 watersheds, two (2) of which discharge to the Hakhokake Creek and the Musconetcong River, two (2) of which discharge directly to the Musconetcong River, and to the Upper Delaware River Watershed, and one (1) which discharge to the Central Delaware River Watershed through numerous streams and tributaries.

The project must provide groundwater recharge benefits, or address stormwater runoff quality and quantity requirements on a previously developed property that does not currently meet the design and performance standards outlined in the Township's Stormwater Management Regulations. The developer must also ensure the long-term maintenance of the mitigation project in accordance with the maintenance requirements defined in Chapters 8 and 9 of the NJDEP Stormwater BMP Manual, as amended.

The applicant can select one of the following strategies in order to mitigate their development project and its impacts on a 1:1 basis:

- Identify, design and implement a compensating measure to mitigate those impacts from which an exemption is being sought.
- Complete a project identified by the Township as equivalent to the environmental impact created by the exemption or variance.
- Provide funding for Township projects that would equivalently address the requested stormwater impact mitigation.

Holland Township is located within the Highlands Region, which provides drinking water to approximately half the State's residents, as such, the Highlands Region Stormwater Management Program prioritizes the need for groundwater recharge on existing and proposed development sites, and requires an enhanced, 125% post-development groundwater recharge criteria over and above the NJDEP 100% post-development recharge volume. Any project proposing mitigation through infiltration and groundwater recharge measures must be designed to this standard.

Mitigation Project Selection

When seeking relief from the Township's Stormwater Management Regulations, the applicant must first coordinate directly with the Township Engineer to identify the specific performance criteria for which mitigation is required. Once the required performance standard is established, the discussion can proceed towards the selection and implementation of a mitigation project.

Mitigation Sites

These municipal properties present ample opportunities for mitigation:

- Holland Township Municipal Building – 61 Church Road (Block 22, Lot 22.01)

The municipal building houses the Township offices and Township Police Department. At present, the site is fully developed, and includes buildings, parking areas, driveways and athletic fields. The parking area and roof leader drainage is directed to pipes and catch basins. The collected runoff discharges into a ditch along the eastern property line which outfalls directly to a stream bed to the south.

- Riegel Ridge Community Center – 910 Milford-Warren Glen Road (CR519)
(Block 6, Lot 2)

The Community Center is a large complex which serves the residents of the Township and surrounding areas. The site includes the main community center building, accessory structures, athletic fields and courts, an outdoor swimming pool and multiple parking areas. At present, the parking areas drain to the south, flowing into lawn areas. Driveway and roof leader discharges are collected in pipes and discharged downslope through an outfall to a grassed swale and ultimately to a wooded area on site.

Both sites feature Hydrologic Group 'B' soils, indicating their ability to accept moderate infiltration when thoroughly wet, and have a moderate rate of water transmission. These conditions are ideal for enhancing the groundwater recharge capacity of these Township properties.

Mitigation Projects

The applicant seeking relief will select, size and design their mitigation project based upon the below list. If necessary, multiple measures can be combined to achieve the required

compensation for the deficit from the performance standards resulting from their proposed project. The measures shall be designed as outlined in the NJDEP Stormwater Management BMP manual. Some of the following Best Management Practices are able to address multiple measures. When constructed, the mitigation projects must not interfere with the normal operations of the site and must not adversely impact any of the existing improvements on-site, or on neighboring properties.

Groundwater Recharge:

Retrofit the Township Municipal Building, or Riegel Ridge Community Center to provide subsurface wells to capture and infiltrate the roof leader runoff from the existing structures on-site. The required volume of annual groundwater recharge will be determined through the use of the NJDEP Groundwater Recharge spreadsheet on the development site. The equivalent amount of groundwater recharge volume must then be provided on the selected municipal site to achieve the desired mitigation.

Water Quality:

Retrofit the Township Municipal Building, or Riegel Ridge Community Center to provide bioretention measures on-site to capture and treat runoff from existing impervious areas equivalent to the area for which a variance from the performance standard is being sought.

These raingardens can be installed along, and within existing pavement areas on-site to treat stormwater at its source prior to being discharged downstream. They will be designed and constructed per the NJDEP BMP Manual with the appropriate site preparation, planting bed depths, vegetation selection and storage volumes to achieve the required TSS removal rates.

Water Quantity:

Retrofit the Township Municipal Building, or Riegel Ridge Community Center site to achieve the peak flow reduction rates (50%, 75% and 80% of the 2, 10 and 100-year storm events) required by the developer's project seeking mitigation.

Following implementation of the proposed mitigation, the peak flow reductions provided at the Municipal property must be equivalent to the net reductions required on the developer's project seeking relief. (i.e. if peak flows must be reduced by 20, 35 and 50 cfs for each of the 2, 10 and 100-year storms on the developer's site, then, the same peak flow reductions must be provided in the construction of the mitigation project on the municipal property).

Additionally, in order to further the goals of the Highlands Regional Master Plan, the preferred method of achieving these net peak flow reductions would be through the use of infiltration or bioretention features and subsurface detention/infiltration measures that capture and infiltrate the increased volumes of runoff leaving the proposed development site. Traditional detention basins are typically less effective for recharge as they release a

significant volume of water before it can infiltrate into the subsurface soils.

Priority Mitigation Projects and Concept Mitigation Plans

As required by the New Jersey Highlands Region Stormwater Plan, and as outlined above, the Holland Township Municipal Building and the Riegel Ridge Community Center sites are the priority mitigation sites for the Township.

Though they are constructed to convey stormwater away as efficiently as possible they are not providing for on-site groundwater recharge beyond what is absorbed by the lawn areas, and ultimately most of the runoff from both sites is conveyed over paved and lawn areas to ditches and streams which discharge to the Delaware and Musconetcong Rivers.

Please see the aerial maps in Appendix A for concept mitigation plans, depicting improvements to be installed on both aforementioned sites in order to achieve the goals of the Highlands Regional Master Plan. When constructed these will improve runoff water quality and significantly increase groundwater recharge.

Financial Contribution in Lieu of Constructed Improvements:

In accordance with NJAC 7:8, The Township may also allow a developer to provide funding or partial funding to the Township for an environmental enhancement project that has been identified in this Municipal Stormwater Mitigation Plan, or to address stormwater related goals identified by the Holland Township Environmental Commission – Stormwater Committee. The funding must be equal to or greater than the cost to implement the mitigation outlined above, including costs associated with purchasing the property or easement for mitigation, and the cost associated with the long-term maintenance requirements of the mitigation measure.

The amount of these financial contributions shall be established by the Township Engineer in coordination with the developer at the time of their application to the Township for Land Development approvals and shall be agreed upon prior to the project receiving approvals for construction. These contributions will need to be made to the Township prior to the site receiving a certificate of occupancy for the site.

The contribution will be deposited in a Stormwater Fund at the Township and shall be used in the implementation of the mitigation projects depicted in the concept mitigation plans presented in Appendix A.

Appendix A – Concept Mitigation Plans

Holland Township Municipal Building

Stormwater Management Mitigation Plan Projects

Legend:



- Proposed Stormwater Mitigation Project

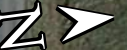
Construct Pocket Raingarden (regrade adjacent pavement areas as necessary to direct runoff to raingarden)

Bioretention/
Infiltration Basin

Roof Leader Dry Well.
(Direct overflow to existing
inlet along driveway)

Stabilize Swale w/ Vegetation.
Provide subsurface infiltration
storage volume.

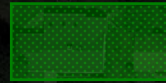
Church Rd



Riegel Ridge Community Center

Stormwater Management Mitigation Plan Projects

Legend:



- Proposed Stormwater Mitigation Project



Clarkson St

Green St

Construct Pocket Raingardens along Driveway Lawns (direct overflows to stormwater inlets)

Roof Leader Dry Well

Construct Pocket Raingardens in Gore Areas (regrade adjacent pavement areas as necessary to capture runoff)

Stabilize Existing Parking Area Runoff Discharge Points (each side)

Bioretention Area with subsurface infiltration storage bed

Bioretention/ Infiltration Basin

519

Upper Oak Ln
Oak Ln
Google earth

© 2018 Google

500 ft



Appendix B – Highlands Council – Holland Township Municipal Buildout Report



Holland Township **Municipal Build-Out Report**

Prepared by the State of New Jersey Highlands Water Protection and Planning Council in Support of the Highlands Regional Master Plan: Report on the Results of Modules 1 and 2 of the 2009 Plan Conformance Process

July 2009

HOLLAND TOWNSHIP MUNICIPAL BUILD-OUT REPORT

for
HIGHLANDS REGIONAL MASTER PLAN CONFORMANCE

Purpose and Scope

The Highlands Regional Master Plan (RMP) requires that conforming municipalities develop a local build-out analysis that incorporates the policies and objectives of the RMP. Specifically, conforming municipalities are required to “use the Highlands Build-Out Model to develop a local build-out analysis that incorporates RMP policies and objectives to evaluate land use capability and capacity planning” (Objective 6G4c). The RMP build-out process requires a Limiting Factor Analysis to examine three categories of constraints:

1. Land Based Capacity (potential developable lands);
2. Resource Based Capacity (Septic System Yield and Net Water Availability); and
3. Utility Based Capacity (public water and wastewater).

This Municipal Build-Out Report provides the results of the local build-out analysis based on potential developable lands and existing municipal conditions, including sewer and water supply capacity and Net Water Availability where relevant. It incorporates the results of the first two modules of the 2009 Plan Conformance Grants Program: Module 1 “Current Municipal Conditions and Build-Out Analysis,” and Module 2 “Land Use and Resource Capacity Analysis.” Both modules were completed through a detailed process involving a cooperative effort of the municipality and the Highlands Council. This process was designed to ensure use of the most current municipal information available and proper application of RMP requirements in the conduct of all analyses. The results for Holland Township are presented in the section “**Full Build-Out and Constraints Summary**” and tabulated in Table 4 below.

The results of the local build-out analysis are for use by conforming municipalities for other planning activities required for Plan Conformance, such as development of Fair Share Plans addressing affordable housing obligations (Module 3). They also will be useful in complying with the New Jersey Department of Environmental Protection (NJDEP) wastewater management planning requirements under the Water Quality Management Planning rules at N.J.A.C. 7:15-5. The results are intended to assess current municipal conditions as they relate to specific RMP policies and objectives. It is important to note that the build-out analysis incorporates many but not every constraint to development included in the RMP, State regulations or local zoning. Future activities under Plan Conformance will address issues such as more refined or current analyses of land availability, resource capacity, resource protection and utility capacity that may modify these results to either increase or decrease the projected build out of the municipality (e.g., reducing build-out

Municipal Build-Out Report for Holland Township

projections through land preservation, increasing build-out projections by increasing Net Water Availability or designation of Highlands Redevelopment Areas).

The results of the municipal build-out analysis are designed to be utilized at a municipal scale and are not appropriate for determining if a particular parcel or development project is consistent with the RMP. Therefore, the Highlands Build-Out Model is not intended to be applied at a parcel level to determine the development potential of that parcel, as the municipality must apply additional planning and zoning analyses to determine appropriate future sustainable development.

All of the data and figures regarding specific parcels, including, but not limited to, preserved lands and water and sewer service, are based on a review of currently available information; however, unintentional inaccuracies may occur and may be formally addressed as RMP Updates. Any request for a formal determination to address updated information may be submitted to the Highlands Council in accordance with the RMP policies and procedures for RMP Updates. In addition, this report does not address any Map Adjustments that a municipality may seek to revise the Land Use Capability Zone Map; these will be addressed at a later date.

It is critical to note that this build-out analysis was conducted based on the requirements of Plan Conformance with the RMP, as applied to parcels deemed potentially developable (vacant, oversized and redevelopable) as of early 2009. These results do not include:

- development that has been approved but not completed as of early 2009, which may yield more or less growth than the build-out results calculated for the affected parcels;
- the potential impact of some future development that may be deemed exempt from the Highlands Act, which may yield more or less growth than the build-out results calculated for those lands;¹
- the potential impact of future redevelopment that may be approved through designation of Highlands Redevelopment Areas or other approvals granted with waivers as authorized by the Highlands Act, which may yield more growth than the build-out results calculated for those lands;
- the potential impact of certain land use restrictions based on State regulations and local ordinances that could not be assessed through a municipal level of analysis; and

¹ Where such development is located in an approved wastewater service area in the RMP Existing Community Zone (not including the Environmentally-Constrained Sub-Zone) or the Lake Community Sub-Zone, the results should be similar because the build-out analysis used local zoning. Future developments that may be authorized within the Environmentally-Constrained Sub-Zones, Protection Zone or Conservation Zone that use public or community on-site wastewater systems will have significantly different yields than calculated through the RMP build-out process. Likewise, the Septic System Yields for lands that will rely on septic systems may be significantly different from what those allowed by current municipal zoning.

Municipal Build-Out Report for Holland Township

- any reductions in build-out projections due to land preservation for open space or farmland beyond those preserved lands identified by the municipality through Module 1.

Therefore, the Highlands Municipal Build-Out Report for a municipality is a result of current conditions and application of RMP requirements. It provides a critical planning tool but cannot be used as a definitive prediction of the future or as a basis for parcel-based development potential.

This is a final Municipal Build-Out Report, which supersedes the Module 1 Summary Report. The results may be used in Module 3 by the municipality in support of its Housing Element and Fair Share Plan and other relevant purposes.

Report Structure

This Highlands Council report is based on the municipal build-out results from Modules 1 and 2 performed by Holland Township and the Highlands Council, in conformance with the Highlands Regional Master Plan (RMP). These results include consideration of potential land availability, utility capacity, municipal zoning in wastewater utility service areas, Septic System Yield and Net Water Availability in accordance with the RMP. The RMP build-out analysis estimates the potential for new development in Holland Township, for the entire municipality (see **Full Build-Out and Constraints Summary**, below).

First, the analysis addressed the build-out potential of the available lands, assuming application of RMP requirements for septic system yields and utility service areas without constraints related to the available capacity of public water supply and wastewater utilities or Net Water Availability. Essentially, the land-based build out represents the maximum potential for development in conformance with the RMP if no other constraints exist. Where sewer development is in conformance with the RMP, municipal zoning is used to determine build-out potential. Where septic systems will be used, the RMP requirements apply and the resulting septic system yield is assumed to be entirely residential in nature. To the extent that septic system capacity is used for non-residential development based on a proportional reallocation from residential development, the projected growth will be different than those reported above. Any reallocations of septic system yield will be addressed in Module 3 – Housing Element and Fair Share Plan.

Second, the public water supply and wastewater demands of development projected for the utility service area are compared to the utility capacity available to the municipality, regarding both public water supply and wastewater utilities. Where capacity is insufficient to support the build-out demand, the build-out estimates are reduced.

Third, the resulting water supply demands from build out in both public water supply utility service areas and domestic well service areas are compared to the Net Water Availability for the HUC14 subwatershed. In many cases, this step required information regarding water supply demands from other municipalities, so that the full demands against each HUC14 subwatershed could be assessed. Again, where Net Water Availability is insufficient to support the build-out demand, the build-out estimates are reduced.

Finally, where a wastewater utility had available capacity for a municipality after meeting all build-out demands, the Highlands Council investigated whether sufficient Net Water Availability exists to support the use of all or part of that wastewater utility capacity for such purposes as affordable housing, TDR Receiving Zones and other purposes supported by the RMP.

This report also includes a discussion of technical methods used in the build-out process, including quality control assessments and build-out impact factors.

Full Build-Out and Constraints Summary for Holland Township

Overview

The Holland Township is located within both the Preservation Area and Planning Area. The RMP build-out analysis for Holland Township estimates the following new development results for potential developable lands for the entire municipality, which are discussed in detail in the following section and summarized in Table 4:

1. Development in Wastewater Utility Service Areas: 0 residential dwelling units and 0 square feet of non-residential development, resulting in a wastewater demand of 0 gallons per day (gpd), or 0 million gallons per day (MGD), and estimated public water supply demands of 0 gpd, or 0 MGD.
2. Development in Septic System Areas: 258 septic systems in the Planning Area for all RMP Land Use Capability Zones and HUC14 subwatersheds, and 4 septic systems in the Preservation Area.

The build-out results based on potential developable lands are not constrained by water supply utility capacity and wastewater utility capacity. The water supply demands from the build-out are not constrained by water availability. The remaining wastewater utility capacity, after all RMP build-out demands are met, may be constrained by water availability depending on the source of water supply to support such growth.

Municipal Capacity Conditions and Analysis

A summary of findings on municipal build-out capacity conditions appears in Table 1. It includes the following: potential developable vacant, over-sized and redevelopable lands in the RMP wastewater utility area; potential developable vacant, over-sized and redevelopable parcels in the septic system areas; RMP Septic System Yield; RMP Build-Out Environmentally Constrained lands; available wastewater utility capacity; and available Public Community Water Supply utility capacity.

All figures are the results of an RMP consistency analysis applied to the information supplied by the Highlands Council, as supplemented and verified by Holland Township. Each Figure shows all of the parcels that were used in the build-out process, whether for Septic System Yield or for build out of RMP wastewater utility areas.

- **Figure 1** presents the parcel-based potential developable lands and their association with HUC14 subwatersheds and Land Use Capability Zones, which relate to the RMP Septic System Yield values where the parcels will be served by septic systems.
- **Figure 2** presents the parcel-based potential developable lands and the RMP Build-Out Environmentally Constrained lands (i.e., steep slopes, flood prone areas and Highlands Open Water buffers). Some of these areas are within the RMP Environmentally-

Municipal Build-Out Report for Holland Township

Constrained Sub-Zones while others are smaller-scale environmental features outside those sub-zones.

- **Figure 3** presents the parcel-based potential developable lands and their association with the RMP utility area² for RMP HDSF³ wastewater utilities.
- **Figure 4** presents the parcel-based potential developable lands associated with the RMP utility area⁴ for RMP Public Community Water System utilities.

RMP Build-Out Developable Land, Over-Sized Lot Analysis and Redevelopable Land

Holland Township identified 1,673 acres of potential developable vacant lots and 2,581 acres of potential developable lands on over-sized lots within areas that will be served by septic systems, for a total of 4,254 acres of potential developable Septic System Yield lands. These lands were used as the basis for Septic System Yield, regardless of the extent to which any of the lands were steep slopes, flood prone areas or Highlands Open Water buffers.

In addition, there are no (0) acres of potential developable vacant lands and no (0) acres of identified potential redevelopable land (either over-sized lots or specifically identified by the municipality as being a redevelopment target) within the Existing Area Served by utilities. The municipal information for potential developable lands, over-sized lots and redevelopable land was evaluated by the Highlands Council in accordance with the RMP for the build-out analysis. The results for all report figures are summarized in Table 1.

RMP Septic System Yield Analysis

There are four (4) HUC14 subwatersheds located entirely or partially within the Planning Area of Holland Township. The RMP Septic System Yield analysis for the Planning Area determined a yield of 235 units for the Conservation Zone, 1 unit for the Existing Community Zone and 22 units for the Protection Zone. The RMP Septic System Yield analysis determined a yield of 4 units for the

² The RMP utility area for wastewater includes the Existing Areas Served based on the RMP, plus any NJDEP-approved Sewer Service Area that is within the Existing Community Zone (not including the Environmentally-Constrained Sub-Zone) or the Lake Community Sub-Zone.

³ HDSF - Highlands Domestic Sewerage Facility. These are wastewater treatment works that provide wastewater treatment primarily of sanitary sewage rather than industrial wastewater as a public utility, and may include service areas and treatment capacities sufficient to support redevelopment and regional growth opportunities. As such, they provide service to multiple parcels under different ownership, rather than to specific developments (e.g., schools, shopping centers, public institutions).

⁴ The RMP utility area for public water supply includes the Existing Areas Served based on the RMP, plus any additional properties identified by the municipality that are within the Existing Community Zone (not including the Environmentally-Constrained Sub-Zone) or the Lake Community Sub-Zone.

Municipal Build-Out Report for Holland Township

Preservation Area. The total RMP Septic System Yield for Holland Township is 262 units. Refer to Table 1 and Figure 1 for additional details.

The build out for septic systems in the Preservation Area identifies the number of septic systems that would be considered permissible under the NJDEP Preservation Area Rules at N.J.A.C. 7:38-3.4. Each vacant or over-sized lot identified through Module 1 and 2 was assessed to determine whether it was of sufficient size to accommodate one or more septic systems, based on NJDEP requirements for 1 unit per 25 acres of non-forested lands, 1 unit per 88 acres of forested lands, or some proportional combination thereof. The yield is assigned by parcel, not by aggregate acreage across multiple parcels, and is compiled for the entire Preservation Area of the municipality as shown in Table 1. Parcels that were too small to accommodate a new septic system under these provisions received no Septic System Yield.

In the Planning Area, the build out for septic systems is based on a yield evaluation for the aggregate of two areas: the acreage of vacant parcels and the net acreage of over-sized parcels. These areas are divided into HUC14 subwatershed/RMP Land Use Capability Zone combinations. Each combination of HUC14 subwatershed and Land Use Capability Zone within the municipality receives its own Septic System Yield, which is not transferable. The yield is based on RMP Policy 2L2, which establishes nitrate targets for each Land Use Capability Zone and incorporates the relevant drought recharge values for each HUC14 subwatershed.

The RMP Septic System Yield is calculated for all potential developable lands reliant on septic systems, which may include lands zoned for both residential and non-residential development. Any yields are provided in “equivalent residential units” which may later be allocated among residential and non-residential development using flow translation factors provided in the *Highlands Regional Build-Out Technical Report* (see Appendix B of this report). Therefore, Septic System Yield calculated for Holland Township would equate to 262 residential units only if no yield is allocated to non-residential development. Septic System Yield may be allocated to non-residential development by reducing the number of residential units and increasing the amount of non-residential development proportionally based on relative flows. This allocation process and the implications for affordable housing requirements will be addressed in Module 3 - Housing Element and Fair Share Plan; this analysis is not part of this report. Therefore, no estimate is made here of non-residential development. All development on septic systems is assumed to rely on domestic wells for the purposes of this analysis.

RMP Build-Out Environmentally Constrained Lands

The RMP Build-Out analysis identified portions of the potential developable lands that are environmentally constrained based on the RMP (i.e., steep slopes, flood prone areas and Highlands Open Water buffers). These constraints were used in the build-out analysis to determine, where wastewater utility service was anticipated based on conformance with the RMP and approved sewer service areas, whether specific parcels had at least 1,400 square feet of unconstrained area. In addition, the nature and extent of these lands may influence the future development of lands in the

Municipal Build-Out Report for Holland Township

septic system areas regarding the allocation of Septic System Yield to them and utility lands that are suitable for development. Out of the 4,254 gross developable acres in Holland Township, for vacant parcels there is a potential net developable area of 528 acres in the Planning Area and 20 acres in the Preservation Area; for over-sized parcels there is a potential net developable area of 822 acres in the Planning Area and 36 acres in the Preservation Area. These values are a summation of the parcel-specific analyses. Refer to Table 1 and Figure 2 for additional details. This analysis should be viewed as an indicator of the level of environmental constraints in potentially developable lands, not as a parcel-based measure of development capacity.

In certain instances, the municipal potential net developable acres may be under-reported relative to actual buildable area conditions, and may even show a zero or negative value. A zero or negative value indicates that a very high degree of environmental constraints exists on the potential developable parcels of the municipality as a whole and especially on the over-sized lots; however, some potential developable lands may still exist. This result reflects the evaluation of over-sized lots and of vacant lots that are partly included in the sewer service build-out analysis. The potential developable acres for over-sized parcels are calculated by subtracting the equivalent of a buildable area for a single unit of development (e.g., one house) under the RMP from the total parcel size. Likewise, some parcels are only partially eligible for sewer development. In both cases the environmental constrained acres for these parcels are calculated based on the entire parcel area due to GIS processing issues. This section of the Municipal Build-Out Report uses a municipal aggregate land area analysis. This information will be used in later aspects of Plan Conformance at a parcel level and not as a municipal land aggregate value. Evaluation of the relationship of septic system yield and buildable lands will be based on the build-out parcel data information and not the Table 1 municipal summary reported values.

As part of that analysis, the municipality will be able to use the database to analyze vacant parcels in septic system areas, to help identify parcels that could be considered to have some reasonable potential for development based on the amount of unconstrained land within them. Further analysis in later phases of Plan Conformance would then identify additional constraints to the realistic development potential of these parcels based on one or more of the following factors:

1. lack of a minimum one-acre contiguous, unconstrained building site;
2. the potential building site is not accessible or access will result in damage to environmentally constrained lands;
3. application of municipal zoning constraints such as those prohibiting creation of flag lots, landlocked parcels, etc.; or
4. parcel configuration or other parcel-specific issues.

This information on vacant lands with a reasonable potential for development can be used to support the evaluation of Septic System Yield assignment in later phases of Plan Conformance.

Municipal Build-Out Report for Holland Township

Available HDSF Wastewater Utility Capacity

The HDSF facility serving Holland Township is Milford STP. The current available Highlands Region capacity for the utility is 0.099 million gallons per day (MGD) (2003 data) for all municipalities served by the system. Milford STP is a utility with contracts in Holland Township and other municipalities. The current capacity available to Holland Township is approximately 0.03 MGD, based upon information developed for the build-out process. The total estimated wastewater generation from the build out for the Milford STP facility is 0 MGD for the Planning Area and Preservation Area and does not exceed the utility capacity conditions. Refer to Table 1 and Figure 3 for additional details.

Based on the current municipal available capacity minus the build-out demands for this wastewater utility, there may be capacity available for future allocation. Priority shall be given to addressing additional needs based on Objective 2K3e, such as imminent threats to public health from areas of failing septic systems, designated TDR Receiving Zones, and to infill or redevelopment projects in the Existing Community Zone (not including the Environmentally-Constrained Sub-Zone) and the Lake Community Sub-Zone that are consistent with the RMP and either address affordable housing obligations or have final municipal approval. Additional priorities include Highlands Redevelopment Areas or cluster development consistent with the RMP. Capacity may also be allocated to the Existing Area Served for redevelopment purposes.

Available Public Community Water System Utility Capacity

The public water supply utility serving Holland Township is Aqua NJ, which is shown on Table 1 and Figure 4 as Milford Water Department. The current available Highlands Region capacity for the utility is 4.11 million gallons per month (MGM). The current capacity available to Holland Township is approximately 0.11 MGM. The total estimated public water demand from the build out is 0 MGD for the Planning Area and Preservation Area and does not exceed the utility capacity conditions. Refer to Table 1 and Figure 4 for additional details.

Based on the current municipal available capacity minus the build out for this water supply utility, there may be capacity available for future allocation. Priorities are similar to those for wastewater capacity (see RMP Objective 2J4c).

Water Availability Constraints

The build-out results for Holland Township, based on developable land and utility capacity, were compared to Net Water Availability by the Highlands Council to determine if Net Water Availability posed an additional constraint on development capacity. This analysis determined the potential for Net Water Availability constraints by HUC14 subwatershed, including water demands from both Holland Township and other municipalities and water users that withdraw water from the same HUC14 subwatershed. The Highlands Council determined whether each demand was consumptive or depletive. For the purpose of this analysis, all septic system units were considered to represent a

Municipal Build-Out Report for Holland Township

residential land use in accordance with the Highlands Module 2 Build-out Impact Factors presented in Appendix B, and were addressed as consumptive water uses.

The results were compared to Net Water Availability, whether for non-deficit (surplus) subwatersheds, or deficit (Conditional Water Availability) subwatersheds. These values, whether from a deficit or surplus subwatershed, are collectively referred to as Net Water Availability. In HUC14 subwatersheds dominated by Conservation Zone lands, the water availability dedicated for agricultural purposes is not used for this analysis.

Based on this analysis, the Highlands Council determined that the following HUC14 subwatersheds, both within the municipality and in other municipalities but relied upon for municipal water supply, have insufficient Net Water Availability to support the build out demand:

Table 2 – Net Water Availability Constraints Analysis – Deficits			
HUC14 Subwatershed	Build-Out Demand (MGD)*	Net Water Availability (MGD)	Shortfall (MGD)
NA			

*Subsequent to any reductions due to utility constraints.

For the remaining HUC14 subwatersheds partially or entirely in the municipality, the Highlands Council also assessed the amount of Net Water Availability remaining after build out. The results are in Table 3, which indicates the remaining Net Water Availability for each HUC14 subwatershed (where positive) and the associated public water supply systems that rely upon the HUC14 subwatershed for supply. This information can be used by the municipality to determine whether there is water available to the public water supply system that could support development within any associated wastewater utility service area, whether within the same HUC14 subwatershed or another, for purposes consistent with the RMP as describe above. The wastewater utility must also have remaining capacity available to the municipality. (Note: this available water cannot be used to increase the Septic System Yield beyond the amount calculated by the Highlands Council, nor can it be used to justify creation or expansion of utilities in violation of RMP requirements.) A decision as to the allocation of this capacity may occur in Module 3 regarding affordable housing needs identified in the Fair Share Plan, or later in the Plan Conformance process regarding other uses. Where a HUC14 subwatershed is relied upon by more than one municipality for water supply, whether on-site or a public water supply system, coordination will be needed among the municipalities to ensure that proposals for additional use do not exceed the remaining Net Water Availability. Also, there may be additional HUC14 subwatersheds not within the municipality that supply water to the municipality, which are not assessed here.

Municipal Build-Out Report for Holland Township

Table 3 – Net Water Availability – Remaining Capacity		
HUC14 Subwatershed	Remaining Net Water Availability (MGD)	Public Water Supply System(s) Reliant Upon the HUC14 Subwatershed (w/ PWSID)
02040105160070 Musconetcong R (below Warren Glen)	0.007973	
02040105170010 Holland Twp (Hakihokake to Musconetcong)	0.005776	
02040105170020 Hakihokake Creek	0.017671	1020001 Aqua NJ (Milford Water Dept) 2119001 Aqua NJ-Phillipsburg (Consumers NJ Water Co)
02040105170030 Harihokake Creek (and to Hakihokake Ck)	0.000537	1020001 Aqua NJ (Milford Water Dept)
02040105160060 Musconetcong R (Warren Glen to I-78)	0.006046	1003001 Bloomsbury Water Dept

Final Build-Out Results

The build-out results for Holland Township are summarized in Table 4, based on land based capacity (potential developable land in both wastewater and septic system service areas), utility capacity and resource based capacity (Net Water Availability). These results are to be applied in Module 3 - Housing Element and Fair Share Plan toward the determination of affordable housing obligations. To assist in the evaluation of this information, an Excel file of the Module 2 database has been prepared by the Highlands Council for use in Module 3, where applicable. The Excel file is included on the Module 2 CD.

Table 4 – Municipal Build-Out Results With Resource and Utility Constraints			
	Preservation Area	Planning Area	Totals
Residential units – Sewered	0	0	0
Septic System Yield	4	258	262
Total Residential Units	4	258	262
Non-Residential Jobs – Sewered	0	0	0

Highlands Module 2 Municipal Summary Report

Table 1: RMP Municipal Capacity Conditions based on Module 2 Potential Developable Lands- HOLLAND TOWNSHIP

RMP Build-Out WASTE WATER UTILITY Existing Areas Served (EAS) Analysis						
MUNICIPALITY	WASTEWATER UTILITY	Total Wastewater Generation (MGD) - Planning Area	Total Wastewater Generation (MGD) - Preservation Area	Municipal Assigned Percentage	Current Available Highlands Capacity (MGD)	Municipal Available Wastewater Capacity (MGD)
HOLLAND TOWNSHIP	NJ0021890 / Milford STP / HDSF	0	0	31%	0.099	0.03

RMP Build-Out POTABLE WATER UTILITY Existing Areas Served (EAS) Analysis						
MUNICIPALITY	WATER UTILITY	Total Water Demand (MGD) - Planning Area	Total Water Demand (MGD) - Preservation Area	Municipal Assigned Percentage	Water Utility Available Capacity (MGM)	Municipal Available Water Utility Capacity (MGM)
HOLLAND TOWNSHIP	1020001 / MILFORD WATER DEPARTMENT / Facility #7	0	0	3%	4.11	0.11

RMP Build-Out WASTEWATER UTILITY Existing Areas Served (EAS) Analysis Build-out Impact Results					
MUNICIPALITY	WASTEWATER UTILITY	Residential Units	Nonresidential Square Feet	People	Jobs
HOLLAND TOWNSHIP	NJ0021890 / Milford STP / HDSF	0	0	0	0

RMP Build-Out WATER UTILITY Existing Areas Served (EAS) Analysis Build-out Impact Results					
MUNICIPALITY	WATER UTILITY	Residential Units	Nonresidential Square Feet	People	Jobs
HOLLAND TOWNSHIP	1020001 / MILFORD WATER DEPARTMENT / Facility #7	0	0	0	0

RMP Build-Out Septic System Yield Analysis					
Planning Area					
MUNICIPALITY	HUC14	SUBWATERSHED NAME	PLAN CZ YIELD	PLAN ECZ YIELD	PLAN PZ YIELD
HOLLAND TOWNSHIP	02040105160070	Musconetcong R (below Warren Glen)	34	0	0
HOLLAND TOWNSHIP	02040105170010	Holland Twp (Hakihokake to Musconetcong)	29	0	11
HOLLAND TOWNSHIP	02040105170020	Hakihokake Creek	138	1	11
HOLLAND TOWNSHIP	02040105170030	Harihokake Creek (and to Hakihokake Ck)	34	0	0
totals			235	1	22

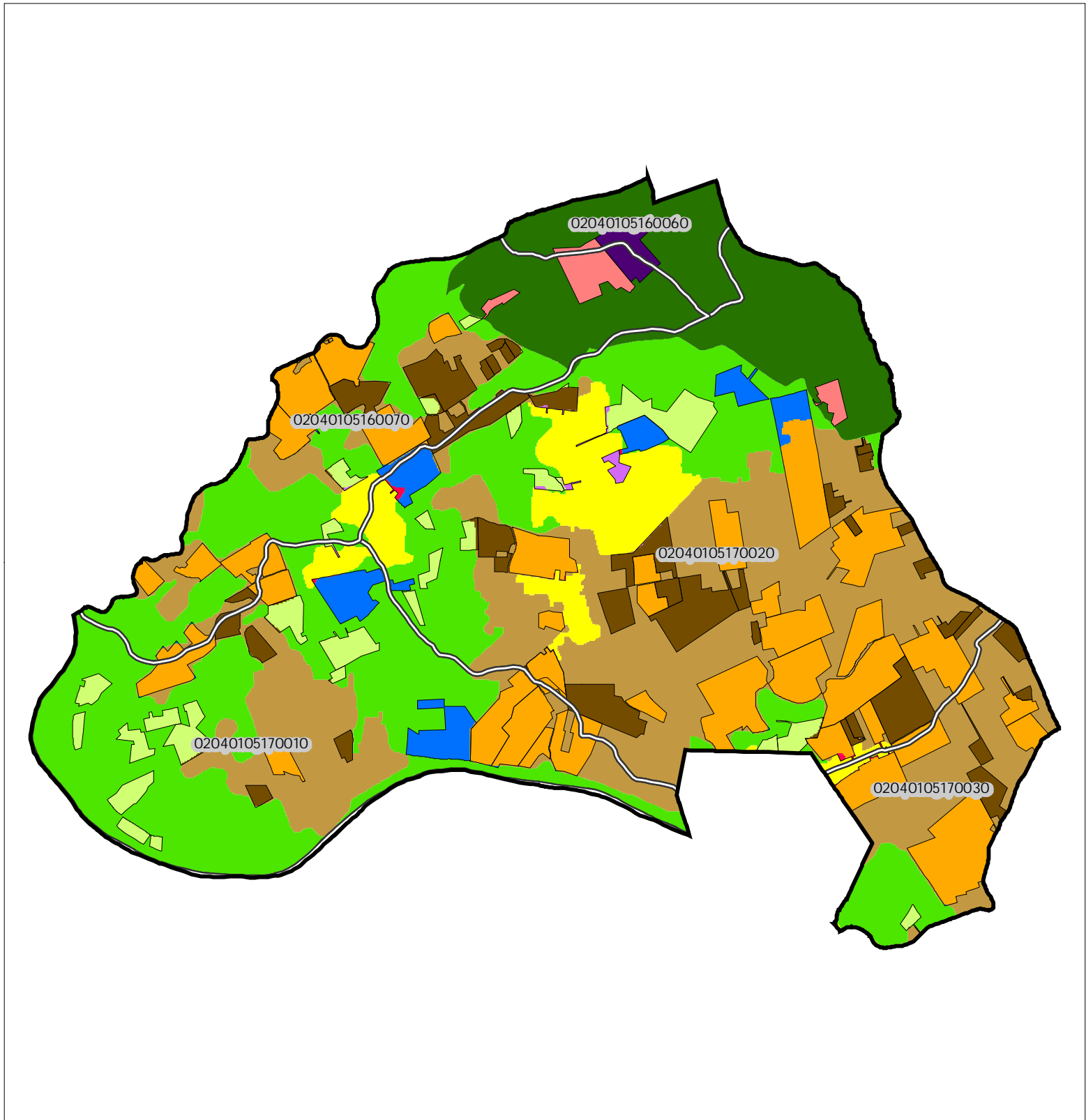
Preservation Area	
MUNICIPALITY	PRES YIELD
HOLLAND TOWNSHIP	4

Table 1: RMP Municipal Capacity Conditions based on Module 2 Potential Developable Lands- HOLLAND TOWNSHIP

RMP Build-Out Potential Developable Lands Analysis				
POTENTIAL DEVELOPABLE VACANT LOT SEPTIC SYSTEM ACRES				
MUNICIPALITY	CZ ACRES - PLANNING	ECZ ACRES - PLANNING	PZ ACRES - PLANNING	PRESERVATION ACRES
HOLLAND TOWNSHIP	1020	25	540	88
POTENTIAL DEVELOPABLE OVERSIZED LOT SEPTIC SYSTEM ACRES				
MUNICIPALITY	CZ ACRES - PLANNING	ECZ ACRES - PLANNING	PZ ACRES - PLANNING	PRESERVATION ACRES
HOLLAND TOWNSHIP	2197	0	308	76
POTENTIAL DEVELOPABLE WASTEWATER UTILITY ACRES				
MUNICIPALITY	PLANNING ACRES	PRESERVATION ACRES		
HOLLAND TOWNSHIP	0	0		
POTENTIAL DEVELOPABLE OVERSIZED LOT WASTEWATER UTILITY ACRES				
MUNICIPALITY	PLANNING ACRES	PRESERVATION ACRES		
HOLLAND TOWNSHIP	0	0		

RMP Build -Out Environmentally Constrained Lands Analysis						
Potential Developable Lot Acres						
MUNICIPALITY	POTENTIAL FULL DEVELOPABLE ACRES - Planning Area	ENVIRONMENTAL CONSTRAINED ACRES - Planning Area	NET DEVELOPABLE ACRES - Planning Area	POTENTIAL FULL DEVELOPABLE ACRES - Preservation Area	ENVIRONMENTAL CONSTRAINED ACRES - Preservation Area	NET DEVELOPABLE ACRES - Preservation Area
HOLLAND TOWNSHIP	1585	1056	528	88	69	20
Potential Oversized Lot Acres						
MUNICIPALITY	POTENTIAL FULL DEVELOPABLE ACRES - Planning Area	ENVIRONMENTAL CONSTRAINED ACRES - Planning Area	NET DEVELOPABLE ACRES - Planning Area	POTENTIAL FULL DEVELOPABLE ACRES - Preservation Area	ENVIRONMENTAL CONSTRAINED ACRES - Preservation Area	NET DEVELOPABLE ACRES - Preservation Area
HOLLAND TOWNSHIP	2505	1683	822	76	40	36

Figure 1: Municipal Build-out Report Septic System Yield by HUC14 and LUCM Zone *
 HOLLAND TOWNSHIP



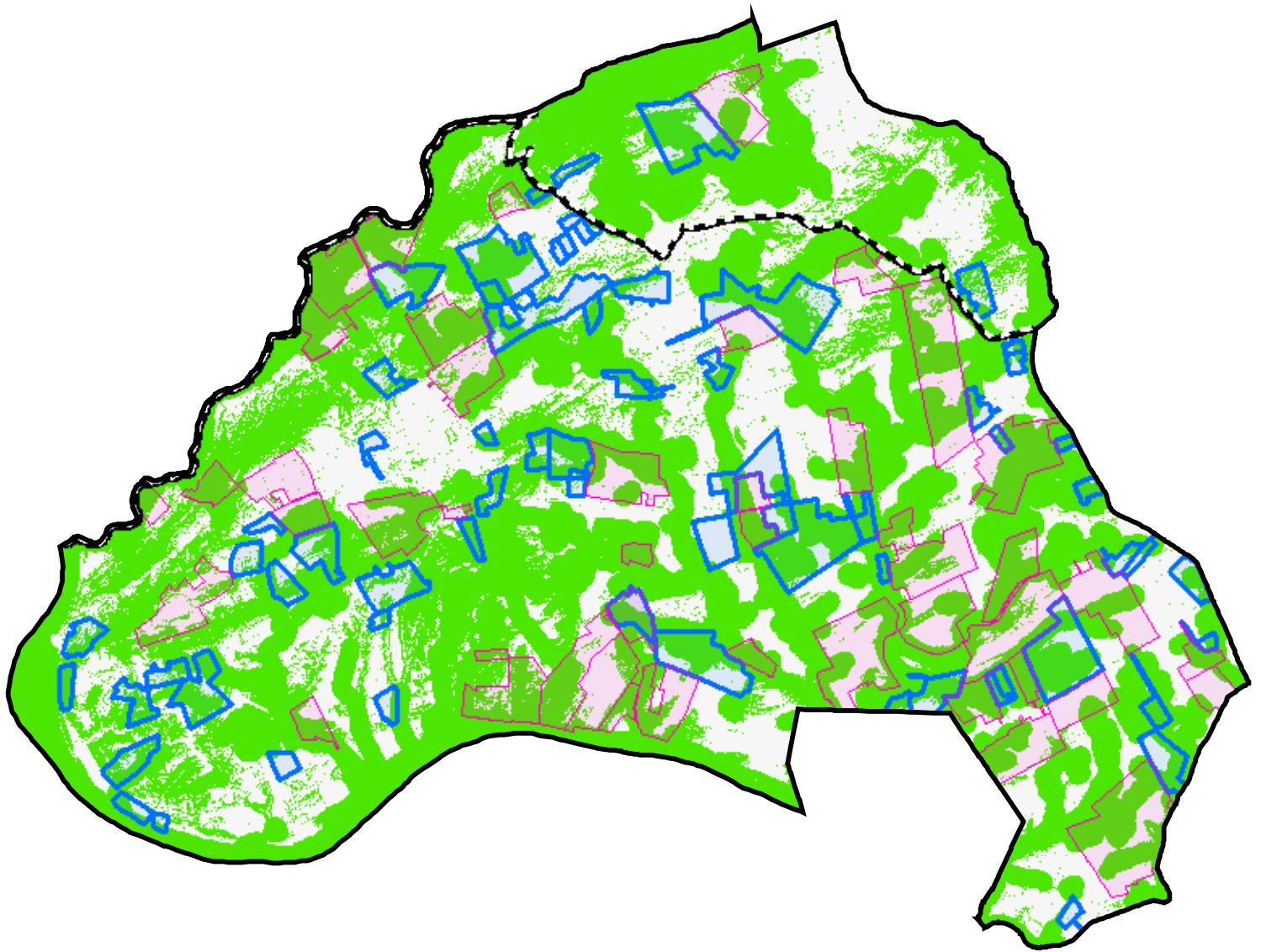
Potential Undevelopable Lands	Potential Oversized Lots	Potential Developable Lands	Potential Redevelopable Lands
Conservation Zone	in Conservation Zone	in Conservation Zone	in Conservation Zone
Existing Community Zone	in Existing Community Zone	in Existing Community Zone	in Existing Community Zone
Protection Zone	in Protection Zone	in Protection Zone	in Protection Zone
Preservation Area	in Preservation Area	in Preservation Area	in Preservation Area


HUC14 Subwatersheds
 HUC14 ID Number



Miles

* Refer to Table 1 for Septic System Yield values, indexed by HUC14 ID

Figure 2: Municipal Build-out Report Environmental Constrained Lands



 Highlands Build-out Environmental Constrained Lands
Constraints:
Highlands Open Water Buffers (300ft)
Flood Prone Areas
Steep Slopes (Moderate and Severe)

 Potential Oversized Lots
 Potential Developable Lots

 Preservation Area

HOLLAND TOWNSHIP

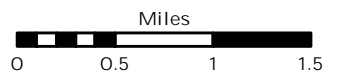
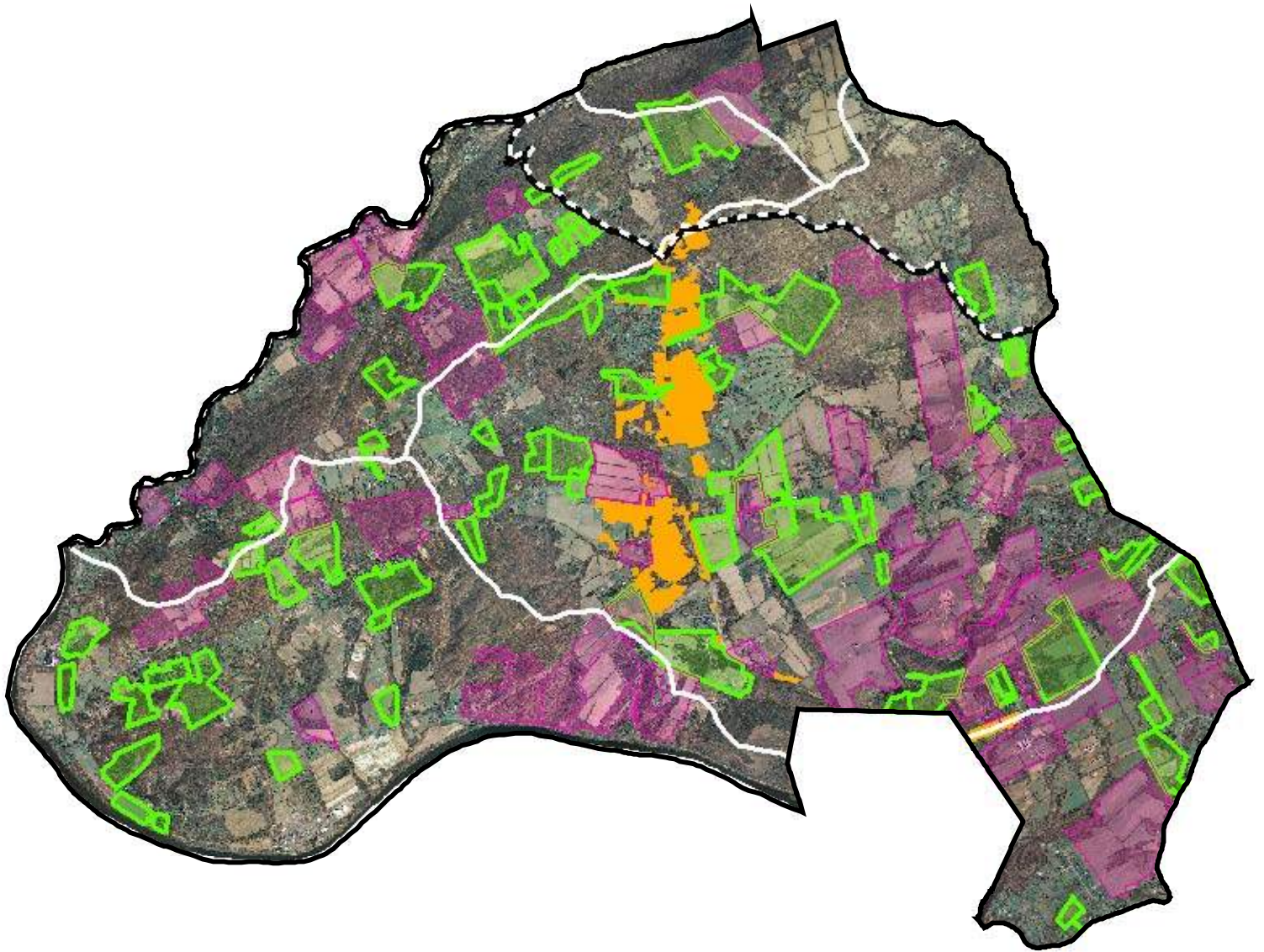




Figure 3: Municipal Build-out Report RMP HDSF Wastewater Utilities



Highlands Domestic Sewerage Facilities "2008 RMP Existing Area Served"

 *Milford STP*

 HUC14 Subwatersheds

 Potential Oversized Lots

 Potential Developable Lots

 Preservation Area

HOLLAND TOWNSHIP

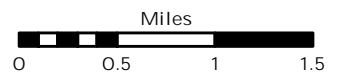
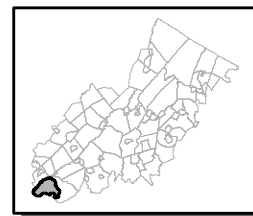
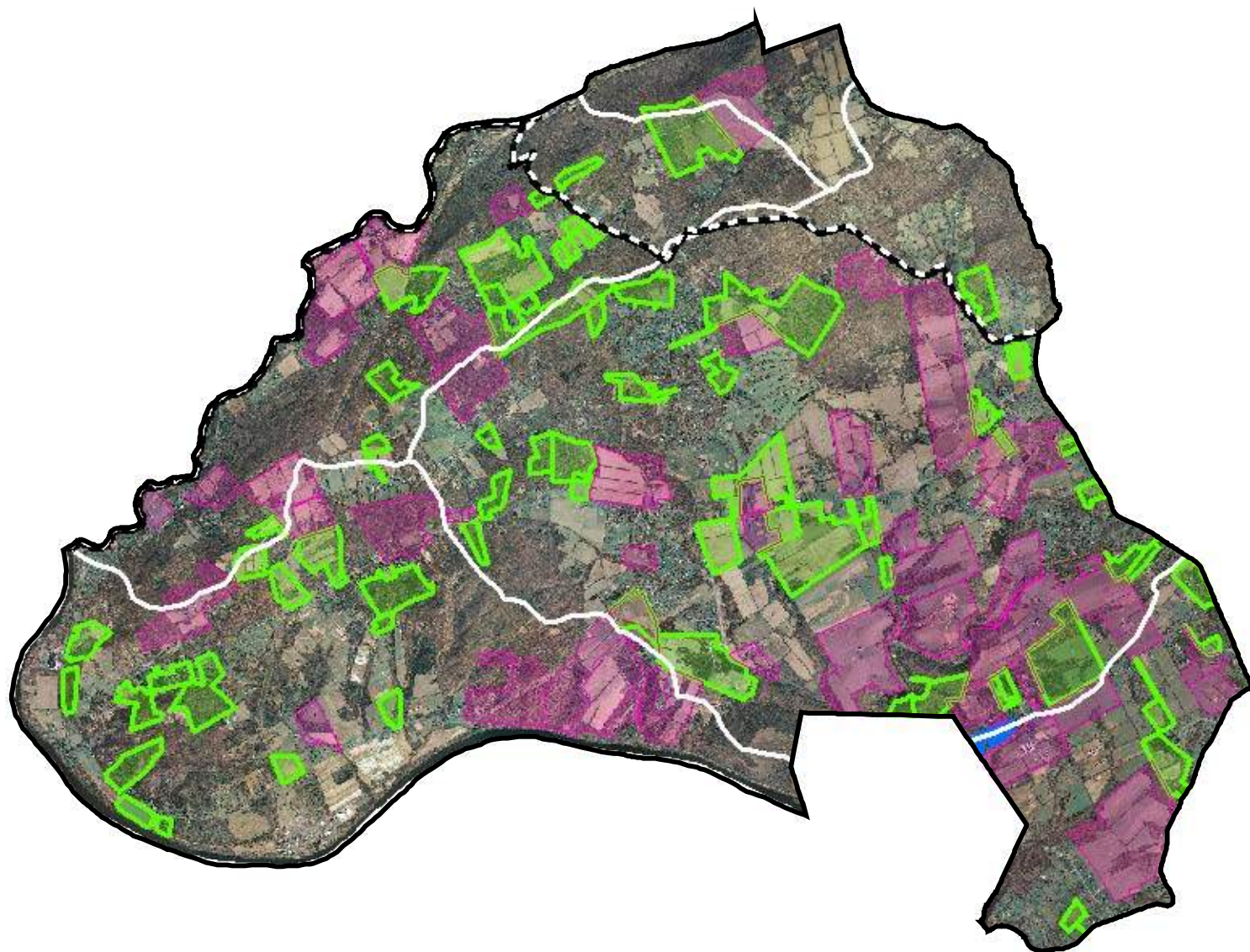




Figure 4: Municipal Build-out Report RMP Public Community Water System Utilities




Public Community Water Systems "2008 RMP Existing Area Served"

 MILFORD WATER DEPARTMENT

 HUC14 Subwatersheds

 Potential Oversized Lots

 Potential Developable Lots

 Preservation Area

HOLLAND TOWNSHIP

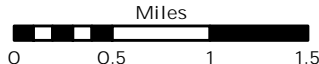
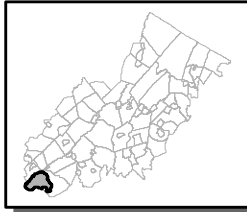


Figure 5: Municipal Build-out Report Final Build-out Results



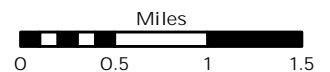
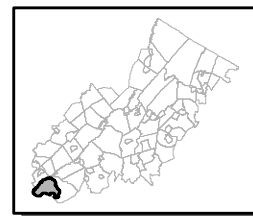
Table 4 - Municipal Build-out Results With Resource and Utility Constraints

	Preservation Area	Planning Area	Totals
Residential Units - Sewered	0	0	0
Septic System Yield	4	258	262
Total Residential Units	4	258	262
Non-Residential Jobs - Sewered	0	0	0



Preservation Area Boundary

HOLLAND TOWNSHIP



Highlands Module 2 Municipal Summary Report

Table 1: RMP Municipal Capacity Conditions based on Module 2 Potential Developable Lands- HOLLAND TOWNSHIP

RMP Build-Out WASTE WATER UTILITY Existing Areas Served (EAS) Analysis						
MUNICIPALITY	WASTEWATER UTILITY	Total Wastewater Generation (MGD) - Planning Area	Total Wastewater Generation (MGD) - Preservation Area	Municipal Assigned Percentage	Current Available Highlands Capacity (MGD)	Municipal Available Wastewater Capacity (MGD)
HOLLAND TOWNSHIP	NJ0021890 / Milford STP / HDSF	0	0	31%	0.099	0.03

RMP Build-Out POTABLE WATER UTILITY Existing Areas Served (EAS) Analysis						
MUNICIPALITY	WATER UTILITY	Total Water Demand (MGD) - Planning Area	Total Water Demand (MGD) - Preservation Area	Municipal Assigned Percentage	Water Utility Available Capacity (MGM)	Municipal Available Water Utility Capacity (MGM)
HOLLAND TOWNSHIP	1020001 / MILFORD WATER DEPARTMENT / Facility #7	0	0	3%	4.11	0.11

RMP Build-Out WASTEWATER UTILITY Existing Areas Served (EAS) Analysis Build-out Impact Results						
MUNICIPALITY	WASTEWATER UTILITY	Residential Units	Nonresidential Square Feet	People	Jobs	
HOLLAND TOWNSHIP	NJ0021890 / Milford STP / HDSF	0	0	0	0	

RMP Build-Out WATER UTILITY Existing Areas Served (EAS) Analysis Build-out Impact Results						
MUNICIPALITY	WATER UTILITY	Residential Units	Nonresidential Square Feet	People	Jobs	
HOLLAND TOWNSHIP	1020001 / MILFORD WATER DEPARTMENT / Facility #7	0	0	0	0	

RMP Build-Out Septic System Yield Analysis						
Planning Area						
MUNICIPALITY	HUC14	SUBWATERSHED NAME	PLAN CZ YIELD	PLAN ECZ YIELD	PLAN PZ YIELD	
HOLLAND TOWNSHIP	02040105160070	Musconetcong R (below Warren Glen)	34	0	0	
HOLLAND TOWNSHIP	02040105170010	Holland Twp (Hakihokake to Musconetcong)	29	0	11	
HOLLAND TOWNSHIP	02040105170020	Hakihokake Creek	138	1	11	
HOLLAND TOWNSHIP	02040105170030	Hakihokake Creek (and to Hakihokake Ck)	34	0	0	
<i>totals</i>			235	1	22	
Preservation Area						
MUNICIPALITY	PRES YIELD					
HOLLAND TOWNSHIP	4					

Highlands Module 2 Municipal Summary Report

Table 1: RMP Municipal Capacity Conditions based on Module 2 Potential Developable Lands- HOLLAND TOWNSHIP

RMP Build-Out Potential Developable Lands Analysis				
POTENTIAL DEVELOPABLE VACANT LOT SEPTIC SYSTEM ACRES				
MUNICIPALITY	CZ ACRES - PLANNING	ECZ ACRES - PLANNING	PZ ACRES - PLANNING	PRESERVATION ACRES
HOLLAND TOWNSHIP	1020	25	540	88
POTENTIAL DEVELOPABLE OVERSIZED LOT SEPTIC SYSTEM ACRES				
MUNICIPALITY	CZ ACRES - PLANNING	ECZ ACRES - PLANNING	PZ ACRES - PLANNING	PRESERVATION ACRES
HOLLAND TOWNSHIP	2197	0	308	76
POTENTIAL DEVELOPABLE WASTEWATER UTILITY ACRES				
MUNICIPALITY	PLANNING ACRES	PRESERVATION ACRES		
HOLLAND TOWNSHIP	0	0		
POTENTIAL DEVELOPABLE OVERSIZED LOT WASTEWATER UTILITY ACRES				
MUNICIPALITY	PLANNING ACRES	PRESERVATION ACRES		
HOLLAND TOWNSHIP	0	0		

RMP Build -Out Environmentally Constrained Lands Analysis						
Potential Developable Lot Acres						
MUNICIPALITY	POTENTIAL FULL DEVELOPABLE ACRES - Planning Area	ENVIRONMENTAL CONSTRAINED ACRES - Planning Area	NET DEVELOPABLE ACRES - Planning Area	POTENTIAL FULL DEVELOPABLE ACRES - Preservation Area	ENVIRONMENTAL CONSTRAINED ACRES - Preservation Area	NET DEVELOPABLE ACRES - Preservation Area
HOLLAND TOWNSHIP	1585	1056	528	88	69	20
Potential Oversized Lot Acres						
MUNICIPALITY	POTENTIAL FULL DEVELOPABLE ACRES - Planning Area	ENVIRONMENTAL CONSTRAINED ACRES - Planning Area	NET DEVELOPABLE ACRES - Planning Area	POTENTIAL FULL DEVELOPABLE ACRES - Preservation Area	ENVIRONMENTAL CONSTRAINED ACRES - Preservation Area	NET DEVELOPABLE ACRES - Preservation Area
HOLLAND TOWNSHIP	2505	1683	822	76	40	36

Overview of Technical Method for Build-Out Analysis

Module 1 “Current Municipal Conditions and Build-Out Analysis” (results of which are incorporated into or modified as appropriate for this report) was based on municipal information regarding potential developable lands (including identification of preserved lands and fully developed lands) and areas currently served with public water supply and wastewater utilities. It also included the current capacity conditions of public water supply and wastewater utilities, and was evaluated for municipal Land Use Capability in accordance with the RMP. The information was initially prepared by the Highlands Council and has been edited and verified by the municipality as representing the best available information on existing potential developable lands, which include vacant, non-preserved lands, as well as partially-developed lands having potential for further development (i.e., over-sized parcels) or redevelopment. The Highlands Council performed a quality control assessment to ensure that the database was technically sufficient for the build-out process (see Appendix A – Module 1). The build-out capacity conditions represent the complete build out of potential developable lands in accordance with the RMP, assuming no constraints other than location within areas served by water supply or wastewater utilities or, for those lands not within a wastewater utility service area, the Septic System Yield based upon RMP Land Use Capability Zone Map policies (which incorporate the NJDEP Rules for the Preservation Area at N.J.A.C. 7:38-3.4). The Module 1 Summary Report was prepared by the Highlands Council and provided to the municipality, which further verified or corrected land availability and municipal zoning information in the report as the first step in Module 2.

The build-out capacity conditions in Module 1 identified the available utility capacity (in units of flow) allocated to the municipality for associated Highlands Domestic Sewerage Facilities (HDSF), on-site wastewater facilities, and Public Community Water Supply Systems. The Highlands Council initially used available capacity information from the *Utility Capacity Technical Report (2008)*, which used 2003 data for wastewater utilities (comparing permitted flows to the rolling maximum three month daily average in million gallons per day, or MGD) and 2004 data for public water supply utilities (comparing permitted flows to the maximum monthly demand, in million gallons per month, or MGM). The available capacity estimates initially assumed that the capacity for regional utilities (i.e., serving more than one municipality) would be allocated on a first-come, first-served basis; available capacity was apportioned among the municipalities based on relative land availability in the service area municipalities. In the Module 1 process, municipalities and regional utilities were requested to provide both updated flow data and any available information on contracted flows for a municipality. Where such information was provided and verified, it was used to update both utility-wide and municipal available capacity estimates.

The build-out impacts analysis within RMP utility areas was performed by the Highlands Council using build-out environmental constraints, municipal zoning and various impact factors (e.g., water demand, sewerage demand, population, jobs) as identified in the *Highlands Regional Build-Out Technical Report (2008)* and listed in Appendix B of this report. This analysis was applied only within the RMP utility service areas, defined as the lands within a NJDEP approved utility service area that are also

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located within the Existing Community Zone or Lake Community Sub-Zone (not including the Existing Community-Environmentally-Constrained Sub-Zone). Of these lands, only parcels with at least 1,400 square feet of land that is not environmentally constrained based on the RMP (i.e., steep slopes, flood prone areas and Highlands Open Water buffers) were evaluated for build out in RMP utility service areas. Potential developable lands that did not meet the criteria of the build-out RMP utility areas were evaluated as lands contributing to Septic System Yield.

In addition, the RMP Septic System Yield was calculated for the municipality. The build out for septic system areas in the Planning Area is based on the RMP Septic System Yield Analysis and does not incorporate or evaluate the effects of environmental constraints or municipal zoning. The build-out of septic system areas in the Preservation Area is based on the NJDEP Preservation Area Rules at N.J.A.C. 7:38-3.4, as required by the RMP. The total acreage of all vacant lands, the net acreage of over-sized parcels (i.e., the total lot size minus the acreage needed for one lot under the RMP) and redevelopable lands were used in the Septic System Yield analysis. In the Planning Area, the analysis used the nitrate target for the appropriate Land Use Capability Zone and the drought recharge value for the appropriate HUC14 subwatershed. In the Preservation Area, the analysis used the forested and non-forested lands at a parcel level. In keeping with RMP policies, preserved lands (including SADC, Green Acres, federal, State, county and local lands, and land trust properties and conservation easements where known) were excluded from this analysis. Environmentally constrained lands (i.e., steep slopes, flood prone areas and Highlands Open Water buffers) were included in the septic system yield analysis because the methodology assumes a mixture of constrained and unconstrained lands, but will affect how Septic System Yield is allocated in later stages of the Plan Conformance Process.

The information from Module 1 directly supported the Module 2 Land Use and Resource Capacity Analysis, results of which are incorporated into this report. In Module 2, the Highlands Council and the municipality evaluated the build-out impacts and the associated wastewater and water supply demands within the RMP utility areas as identified in Module 1.

In Module 2, municipalities reviewed the RMP build-out impacts for RMP utility areas and verified that they reflect densities allowed by existing municipal zoning. Areas included in the build-out process for sewer service included those lands within the wastewater Existing Area Served, as defined by the RMP, and also those lands within an NJDEP-approved Sewer Service Area that is also within the Lake Community Sub-Zone or the Existing Community Zone (excluding the Existing Community-Environmentally Constrained Sub-Zone). If the existing municipal zoning conditions have changed from the 2005 data used by the Highlands Council, then the municipality provided the current zoning and the Highlands Council revised the build-out impacts accordingly. The Highlands Council performed a quality control assessment to ensure that the database was technically sufficient for the build-out process (see Appendix A – Module 2).

When the land based build out of potential developable lands in Module 1 exceeded the available utility capacity conditions, further analysis by the Highlands Council was required in Module 2 to

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determine the extent to which the build out was constrained by the lack of utility capacity. In such cases, the land-based build-out potential is lowered proportionately for residential and non-residential development within the service area. It is important to note that no change is made to the Existing Area Served for the utility; only the build-out potential is reduced.

Where utility capacity exceeded the land-based build out of potential developable lands in Module 1, the utility capacity is potentially available for future demands. The municipality will evaluate utility capacity assignment in Module 3 where appropriate to support affordable housing, and in support of later phases of Plan Conformance.

For some HUC14 subwatersheds in the municipality, the projected consumptive or depletive water demand based on both domestic well sources (either as derived from Septic System Yield, which is assumed to be supplied by domestic wells, or within a RMP wastewater utility area served by domestic wells) and water supply utility service indicate that the complete municipal build out of potential developable lands might exceed the Net Water Availability. In such cases, the Highlands Council then calculated Net Water Availability values in Module 2 for use as a further constraint on growth, and determined the extent to which the Net Water Availability would reduce the build out. The Highlands Council also assessed the extent to which the use of remaining wastewater utility capacity (i.e., beyond full build-out), if any, would be constrained by Net Water Availability. This information can be used by the municipality to determine whether the wastewater utility capacity can reasonably be used for purposes consistent with the RMP (e.g., affordable housing projects, TDR receiving zones, Highlands Redevelopment Areas, redevelopment within the Existing Area Served) as provided for by Objective 2K3e. A decision as to the allocation of this capacity will occur in Module 3 regarding affordable housing needs identified in the Fair Share Plan, or later in the Plan Conformance process regarding other uses.

Appendix A: Technical Sufficiency Review

MODULE 1

The Module 1 Geodatabase (GDB) and utility capacity spreadsheet information submitted by the municipality were evaluated for technical sufficiency and quality assurance and quality control purposes by the Highlands Council staff. The Highlands Council reviewed the GDB (GDB#1 and GDB#2, with GDB#3, where relevant) to determine that all the changes that the municipality made to the GDB are technically sufficient in order to process for RMP Build-out. All revisions made to a GDB by the Highland Council are reflected in the NJHC_QA_QC_COMMENTS field of the GDB. The same Build-out QA/QC Review method is conducted for both GDB#1 and GDB#2. These results were reviewed by the municipality in Module 2 (see below). Any database issues that were not specifically responsive to the technical sufficiency review and not specific to the Module 1 Build-Out Analysis were flagged in the GDB by the Highlands Council for future reference.

When a municipality received GDB#3 (the updated public water utility database), the Council joined and updated the PWSID data from GDB#3 into GDB#1 so all the Module 1 information was in GDB#1 for build-out processing.

Before a GDB is processed for Build-out, the Highlands Council reviewed the material submitted by the municipality including cover letters and any email correspondence for additional information relevant to the build-out analysis. The Highlands Council utilizes Microsoft Access to process the GDB through the NJHC QA/QC review method to create a Technical Protocol Status (TPS) report that flags all parcels that have contradictory data, as well as a SDE check which identifies inserted, deleted and updated information in the GDB. The Highlands Council utilized the TPS Report and the GDB along with the supporting documentation to evaluate any contradictory data reported as Error Codes on the TPS Report.

The TPS report created by the Highlands Council identifies parcels that may contain contradictory data in the GDB and therefore not process correctly in the build-out. There are 11 Error Codes and 5 Data Conditions that may potentially be flagged by the Highlands Council within a GDB. The identification of an Error Code may or may not result in an edit by the Council. If an edit was required in order to technically correct the GDB for build-out processing, the edit was conducted by the Highlands Council and recorded in the GDB. The following is a list of the TPS Error Codes and Data Conditions that may be applicable to the municipality:

- **Error Code 01: Municipal Verification Field Missing** - every verifiable field and row should include the Module 1 verifier's name. If a row was blank, the NJHC QA/QC reviewer would populate the field with the verifier's name or consult with the municipality as required, and enter a comment in the NJHC_QA_QC_COMMENTS field in the GDB.

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- **Error Code 02: Parcels identified as both a Condo and Open Space** - the Highlands Council evaluated the parcel's development and land preservation status to determine if the necessary data fields were populated correctly by the municipality.
- **Error Code 03: Parcels identified as both Developable and Open Space** - the Highlands Council evaluated the parcel's development status and land preservation status and determined if the necessary data fields were populated correctly by the municipality.
- **Error Code 04: Parcels identified as Oversized or Redevelopable and missing the oversized or redevelopable acreage value** - the Highlands Council would either consult with the municipality in order to edit the data field or utilized the GDB information to determine the missing value.
- **Error Code 05: Parcels identified as Oversized or Redevelopable that were also listed as Not Developable** - the Highlands Council evaluated the parcel and edited the PARC_STAT_DEV_STATUS data field accordingly.
- **Error Code 06: Parcels identified as connected to a wastewater utility however no System Provider was identified** - the Highlands Council would consult with the municipality and/or review the GDB and supporting documentation in order to edit the missing entry.
- **Error Code 07: Parcels identified as a "Yes" indicating they are currently both connected and not connected to a wastewater utility** - the Highlands Council edited Not Developable, oversized or redevelopable parcels in the wastewater no connect field to a "No." and if the parcel is vacant and developable then the Highlands Council edited the wastewater existing served field to a "No."
- **Error Code 08: Parcels identified as being connected to a wastewater utility and also identified as vacant or developable** - the Highlands Council evaluated these parcels to see if they are developable, redevelopable or oversized and edited and documented accordingly in the GDB.
- **Error Code 09: Parcels identified as connected to a public water utility however no System Provider was identified** - the Highlands Council would consult with the municipality and/or review the GDB and supporting documentation in order to edit the missing entry.
- **Error Code 10: Parcels identified as a "Yes" indicating they are currently both connected and not connected to a public water utility** - the Highlands Council edited Not Developable, oversized or redevelopable parcels in the public water no connect field to a "No." and if the parcel is vacant and developable then the Highlands Council edited the public water existing served field to a "No."
- **Error Code 11: Parcels identified as being connected to a public water utility and also identified as vacant or developable** - the Highlands Council evaluated these parcels to see if they are developable, redevelopable or oversized and edited and documented accordingly in the GDB.

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- **Data Condition 1: Parcels identified as Not Developable due to Environmental Constraints or Inadequate Lot Geometry** - these parcels were evaluated in septic served areas to ensure that the environmentally constrained parcels in the GDB were not a water body and therefore not appropriate for inclusion in the RMP Septic System Area analysis. Otherwise, vacant parcels indicated to be “Not Developable” due to environmentally constrained lands were included in the Septic System Yield analysis. Parcels that were identified as an inadequate lot geometry but developable with an adjacent parcel may require further review by the municipality to ensure that the build-out process was applied correctly because the Highlands Council is not able to discern the adjacent parcel record that is in common ownership and referenced by the municipality.
- **Data Condition 2: Parcels identified as having a WW Utility with a Contractual Allocation** were flagged in the TPS Report.
- **Data Condition 3: Parcels identified for PW Utility with a Contractual Allocation** were flagged in the TPS Report.
- **Data Condition 4: Parcels containing entries as “OTHER” with associated comments** were reviewed to see if the proper data field associated with the comment had been completed correctly and to assist in the review of the GDB information.
- **Data Condition 5: Parcels with entries in any of the “Comment” data fields-** the Council reviewed this information as a means to assist in GDB technical evaluation and QA/QC review.

In addition to going through the TPS Report as described above, the Council evaluated all open space parcels to ensure they are technically correct in the GDB. The Council also reviewed parcels that have no provider listed for public water or wastewater to ensure that there are no “Yes” data fields in the utility connection status data field, as these parcels are on septic/domestic wells and not relevant regarding a utility connection status in the GDB. Lastly, the Council QA/QC reviewer initialed and dated the GDB to complete the TPS Report and QA/QC Review process.

The municipality then received a modified GDB that:

1. incorporated the results of all edits by the Highlands Council;
2. merged the final results of GDB’s #1 and, where applicable, #2 and #3 into a single GDB;
3. identified the parcels that were processed for build out as potential developable vacant, redevelopable and over-sized lots in both septic system and sewer areas; and
4. incorporated additional fields used by the Highlands Council in running the build-out process, including municipal zoning for potential developable vacant and redevelopable parcels associated with sewer service conforming with RMP requirements, and having at least 1,400 square feet of land that is not environmentally constrained. Where such parcels were associated with public water supply service, they were also evaluated for water demands.

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The Municipal Conditions Geodatabase may include in some cases duplicate parcel records within the municipality. These duplicates derive from the process of creating a spatial representation of parcels in GIS. The Highlands Council has taken the necessary steps to avoid double counting of developable duplicate parcels, in the summary reports and in the geodatabase and any derivatives thereof.

MODULE 2

In Module 2, the municipality completed a final check on parcel information and verified the municipal zoning applicable to parcels that were processed for build out in RMP utility areas. Where edits were made and returned to the Highlands Council, the Council incorporated the edits and, where necessary, performed a revised build-out analysis, the results of which are reflected in this report.

Please note that the Type A and Type B edits conducted by the municipality were reviewed by the Highlands Council and only when an edit was relevant to the RMP Build-out analysis was it incorporated and re-processed for build-out analysis as required.

Type A Edits – Tabular

- The information will be updated in the GDB as indicated.
- The nature and extent of the information may or may not affect the build-out results.
- Type A tabular edits that require a revised build-out will be processed and reported as a Module 2 Municipal Build-out Summary Report.

Type A Edits – Spatial

- The revised spatial information will be reviewed in accordance with the Module 1 Technical Review Protocols.
- Type A spatial edits that require a revised build-out will be processed and reported as a Module 2 Municipal Build-out Summary Report.

Type B Edits – Municipal Zoning

- The information will be updated in the GDB as indicated.
- Updated zoning changes only affect parcels in RMP utility areas.
- Type B edits that require a revised build-out will be processed and reported as a Module 2 Municipal Build-out Summary Report.

Appendix B – Highlands Module 2 Build-Out Model Impact Factors

Highlands Zone Type	Comparison Zone/Unit Type	Source	Region	Density Dwelling unit (du)/acre *	Efficiency Factor % (1)	Average Household Size (2)	Average School Children in Household (2)	Percent Impervious (3)	Consumptive/Depletive Water Use includes Indoor demand (gpd per person) plus outdoor demand as (gpd per unit) multiplied by Consumptive/Depletive Use Coefficient (4)	Public Water System Demand (5)	Public Wastewater System Generation (6)
SF Estate Residential or (PA-5)				0.05 to 0.20 (0.17 maximum)	95			0.075* acres	(75 gpd/person + 50 gpd/unit) * Consumptive/Depletive Coefficient	100 gallons per person per day	75 gallons per person per day
	Single-family Detached 4-5 BR	Statewide NJ Demographic Multipliers (2)	Northern ¹			3.809	1.072				
Single-family Detached 4-5 BR	Central ²					3.780	1.094				
SF Rural Residential, Resource Residential, or (PA-4B)				0.21 to 0.5 du/acre (0.17 maximum)	95			0.075* acres	(75 gpd/person + 50 gpd/unit) * Consumptive/Depletive Coefficient	100 gallons per person per day	75 gallons per person per day
	Single-family Detached 4-5 BR	Statewide NJ Demographic Multipliers (2)	Northern ¹			3.809	1.072				
Single-family Detached 4-5 BR	Central ²					3.780	1.094				
SF Low Density or (PA-4)				0.51 to 1.0 du/acre (1.16 maximum)	80			0.075* acres	(75 gpd/person + 50 gpd/unit) * Consumptive/Depletive Coefficient	100 gallons per person per day	75 gallons per person per day
	Single-family Detached 4-5 BR	Statewide NJ Demographic Multipliers (2)	Northern ¹			3.809	1.072				
Single-family Detached 4-5 BR	Central ²					3.780	1.094				
SF Medium Density, Suburban Residential, or (PA-3)				1.01 to 3.0 du/acre (3.81 minimum)	75			26.7	(75 gpd/person + 30 gpd/unit) * Consumptive/Depletive Coefficient	100 gallons per person per day	75 gallons per person per day
	Single-Family Detached, 2-3 BR	Statewide NJ Demographic Multipliers (2)	Northern ¹			3.137	0.607				
Single-Family Detached, 2-3 BR	Central ²					2.578	0.367				
SF High Density or (PA-2)				3.01 to 8.0 du/acre (7.04 minimum)	75			33.7	(75 gpd/person + 5 gpd/unit) * Consumptive/Depletive Coefficient	75 gallons per person per day	75 gallons per person per day
	Single-Family Attached, 2-3 BR	Statewide NJ Demographic Multipliers (2)	Northern ¹			2.477	0.296				
Single-Family Attached, 2-3 BR	Central ²					2.296	0.292				
Attached/Townhouse or (PA-1)				8.01 to 16.0 du/acre (9.78 minimum)	75			45.7	(75 gpd/person + 5 gpd/unit) * Consumptive/Depletive Coefficient	75 gallons per person per day	75 gallons per person per day

Appendix B – Highlands Module 2 Build-Out Model Impact Factors

Highlands Zone Type	Comparison Zone/Unit Type	Source	Region	Density Dwelling unit (du)/acre *	Efficiency Factor % (1)	Average Household Size (2)	Average School Children in Household (2)	Percent Impervious (3)	Consumptive/Depletive Water Use includes Indoor demand (gpd per person) plus outdoor demand as (gpd per unit) multiplied by Consumptive/Depletive Use Coefficient (4)	Public Water System Demand (5)	Public Wastewater System Generation (6)
	Single-Family Attached, 2-3 BR	Statewide NJ Demographic Multipliers (2)	Northern ¹			2.477	0.296				
	Single-Family Attached, 2-3 BR		Central ²				2.296	0.292			
Garden Apartment or (PA-1)				16.01+ du/acre (9.78 minimum)	70			57.1	(75 gpd/person + 5 gpd/unit) * Consumptive/Depletive Coefficient	75 gallons per person per day	75 gallons per person per day
	5+ Units (Own/Rent), 2-3 BR	Statewide NJ Demographic Multipliers (2)	Northern ¹			2.262	0.308				
	5+ Units (Own/Rent), 2-3 BR		Central ²				2.342	0.373			
Mixed use/Age Restricted Housing (percent mix based on 40% residential and 60% non-residential as Office/Commercial)		Municipal Zoning		Apply zone density and FAR value Note: Use Retail/Commercial Impact factors for non-res %	70	Varies Based on zoning Du/Acre description	0.00	68.8	(75 gpd/person + 5 gpd/unit) * Consumptive/Depletive Coefficient	75 gallons per person per day	75 gallons per person per day
Mixed use (percent mix based on 40% residential and 60% non-residential as Office/Commercial)		Municipal Zoning		Apply zone density and FAR value Note: Use Retail/Commercial Impact factors for non-res %	70	Varies Based on zoning Du/Acre description	Varies Based on zoning Du/Acre description	42.0	(75 gpd/person + 5 gpd/unit) * Consumptive/Depletive Coefficient	75 gallons per person per day	75 gallons per person per day
Senior or Age restricted Housing		Municipal Zoning		Varies Based on zoning Du/Acre description	70	Varies Based on zoning Du/Acre description	0.00	60.3	(75 gpd/person + 5 gpd/unit) * Consumptive/Depletive Coefficient	75 gallons per person per day	75 gallons per person per day

Highlands Build-Out Residential Impact Factors – Sources

* Residential dwelling units generated by the build-out model include both market rate and affordable units.

(1) Source: Efficiencies are given as a percentage, between 0 and 100, where a 100 value means complete efficiency (no land lost to development), and a 0 value means no buildings will be estimated for that land use. For example an efficiency of 70% may be representative of developable land that has a 10% set aside for parks and 20% for roads (100% - 10% - 20% = 70%). Project determined values.

(2) Source: Who Lives in New Jersey Housing? New Jersey Demographic Multipliers, The Profile of Occupants of Residential and nonresidential Development. Listokin, D., Voicu, I., Dolphin, W., Camp, M. Center for Urban Policy Research. Rutgers University. November 2006. Northern NJ values were applied to Bergen, Morris, Passaic, Sussex and Warren County municipalities. Central NJ values were applied to Hunterdon and Somerset County municipalities.

1 Table II-C-1 North Region of New Jersey Total Persons and Persons by Age (2000) (p. 85)

2 Table II-D-1 Central Region of New Jersey Total Persons and Persons by Age (2000) (p. 99)

(3) Source: NCNBR, Rutgers University, April 27, 2006. The impervious surface area for new dwelling units large lot zoned areas (*) is based on an average 15% impervious surface value (per NJDEP LU/LC) and a project determined average homestead area of 0.50 acres. No impact value is attached to the remaining undeveloped area. The impact percentage factors for the other residential composite zones represent weighted averages of NJ Highlands Percent Impervious Surface for all residentially developed lands in that composite zone. The raw data was obtained by overlaying NJ Highlands Zoning and DEP 2002 LU/LC spatial data files, and extracting the calculated percent impervious surface area attached to each LU/LC residential developed land polygon and the acres of associated developed land in each intersecting municipal zone polygon. The impervious surface areas in each municipal zone within the composite zone were aggregated and then divided by the total developed residential land area, to produce a weighted IS average for each composite zone.

(4) Source: Center for Urban Policy Research (CUPR), September 2000. NJGS Consumptive Use Coefficients. For consumptive uses, a factor of 29% is utilized. For depletive uses, a factor of 100% is used

(5) Source: NJDEP N.J.A.C. 7:10 Safe Drinking Water Act Regulations Adopted November 4, 2004, 7:10-12.6 Water Volume Requirements and State Plan Impact Assessment

(6) Source: NJDEP N.J.A.C. 7:14A-23.3 Pollutant Discharge Elimination System: Technical Requirements For TWA Applications; Projected flow criteria

Appendix B – Highlands Module 2 Build-Out Model Impact Factors

Highlands Composite Zone Type	Floor Area Ratio	Efficiency Factor % (1)	Region	Jobs per 1,000 sf (2)	Percent Impervious (3)	Consumptive/Depletive Water Use multiplied by Consumptive/Depletive Use Coefficient (4)	Public Water System Demand (5)	Public Wastewater System Generation (6)
Office/Commercial	Based on zoning	80	Northeast US	2.99	78.3	0.125 gpd/sf * Consumptive/Depletive Coefficient	0.125 gallons/day/sf	0.10 gallons/day/sf
Retail	Based on zoning	80	Northeast US	1.63	72.5	0.125 gpd/sf * Consumptive/Depletive Coefficient	0.125 gallons/day/sf	0.10 gallons/day/sf
Industrial	Based on zoning	80	Northeast US	1.11	53.4	25 gpd/person * Consumptive/Depletive Coefficient	25 gallons per person per day	25 gallons per person per day

Highlands Build-Out Non-Residential Impact Factors – Sources

(1) Source: Efficiencies are given as a percentage, between 0 and 100, where a 100 value means complete efficiency (no land lost to development), and a 0 value means no buildings will be estimated for that land use. For example an efficiency of 70% may be representative of developable land that has a 10% set aside for parks and 20% for roads (100% - 10% - 20% = 70%). Project determined values.

(2) Source: Who Lives in New Jersey Housing? New Jersey Demographic Multipliers, The Profile of Occupants of Residential and nonresidential Development. Listokin, D., Voicu, I., Dolphin, W., Camp, M. Center for Urban Policy Research. Rutgers University. November 2006.

a Table II-I-3 Commercial - Office Employees per 1,000 Square Feet of Gross Floor Area (GFA) (p. 136) (Reported Northeast mean value).

b Table II-I-4 Commercial – Retail Employees per 1,000 Square Feet of Gross Floor Area (GFA) (p. 139)

(Value derived by averaging the mean number of employees per 1,000 sq. ft. of GFA for retail (excluding mall), retail (enclosed mall), and retail (strip shopping mall) space in the Northeast).

c Table II-I-6 Industrial – Warehouses Employees per 1,000 Square Feet of Gross Floor Area (GFA) (p. 143)

(Value derived by averaging the mean number of employees per 1,000 sq. ft. of GFA for Non-Refrigerated and Refrigerated space in the Northeast).

(3) Source: NCNBR, Rutgers University, April 27, 2006. The impervious surface area for new dwelling units large lot zoned areas (*) is based on an average 15% impervious surface value (per NJDEP LU/LC) and a project determined average homestead area of 0.50 acres. No impact value is attached to the remaining undeveloped area. The impact percentage factors for the other residential composite zones represent weighted averages of NJ Highlands Percent Impervious Surface for all residentially developed lands in that composite zone. The raw data was obtained by overlaying NJ Highlands Zoning and DEP 2002 LU/LC spatial data files, and extracting the calculated percent impervious surface area attached to each LU/LC residential developed land polygon and the acres of associated developed land in each intersecting municipal zone polygon. The impervious surface areas in each municipal zone within the composite zone were aggregated and then divided by the total developed residential land area, to produce a weighted IS average for each composite zone.

(4) Source: Center for Urban Policy Research (CUPR), September 2000. NJGS Consumptive Use Coefficients. For consumptive uses, a factor of 29% is utilized. For depletive uses, a factor of 100% is used

(5) Source: NJDEP N.J.A.C. 7:10 Safe Drinking Water Act Regulations Adopted November 4, 2004, 7:10-12.6 Water Volume Requirements and State Plan Impact Assessment

(6) Source: NJDEP N.J.A.C. 7:14A-23.3 Pollutant Discharge Elimination System: Technical Requirements For TWA Applications; Projected flow criteria