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Municipal Stormwater Management Plan

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Introduction

This Municipal Stormwater Management Plan (MSWMP) documents the Township of Moorestown's strategy for addressing stormwater management and stormwater-related impacts related to land 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 impacts of land development on:

1. Groundwater recharge;
2. Stormwater quality; and
3. Stormwater quantity.

These above-referenced impacts are addressed by incorporating stormwater design and performance standards for new major development, defined as projects that disturb one or more acre of land or projects that would result in 0.25 acres or more of additional impervious coverage.

These standards are intended to minimize the adverse impact of stormwater runoff on water quality and water quantity and the loss of groundwater recharge that provides base flow in receiving water bodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities.

A "build-out" analysis has been included in this plan based upon existing zoning and land available for development. The plan also addresses the review and update of existing ordinances, the Township Master Plan, and other planning documents to allow for project designs that include low impact development (LID) techniques including an emphasis on utilizing non structural stormwater management "best management practices" (BMPs), to the maximum extent practicable, in order to accomplish this plan's goals regarding stormwater recharge, water quality, and the control of stormwater rates of flow and flow volumes.

The final component of this plan is a mitigation strategy for when a variance or exemption of the design and performance standards is sought. As part of the mitigation section of the stormwater plan, specific stormwater management measures are identified to lessen the impact of existing development.

Goals

The goals of this MSWMP are to:

a. Reduce flood damage, including damage to life and property;
b. Minimize, to the extent practical, any increase in stormwater runoff from any new development;
c. Reduce soil erosion from any development or construction project;
d. Assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
e. Maintain groundwater recharge (and improve in redevelopment areas if feasible);
f. Prevent, to the greatest extent feasible, an increase in non-point pollution;
g. Maintain the integrity of stream channels for their biological functions, as well as for drainage;
h. 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
i. Protect public safety through the proper design and operation of stormwater basins.

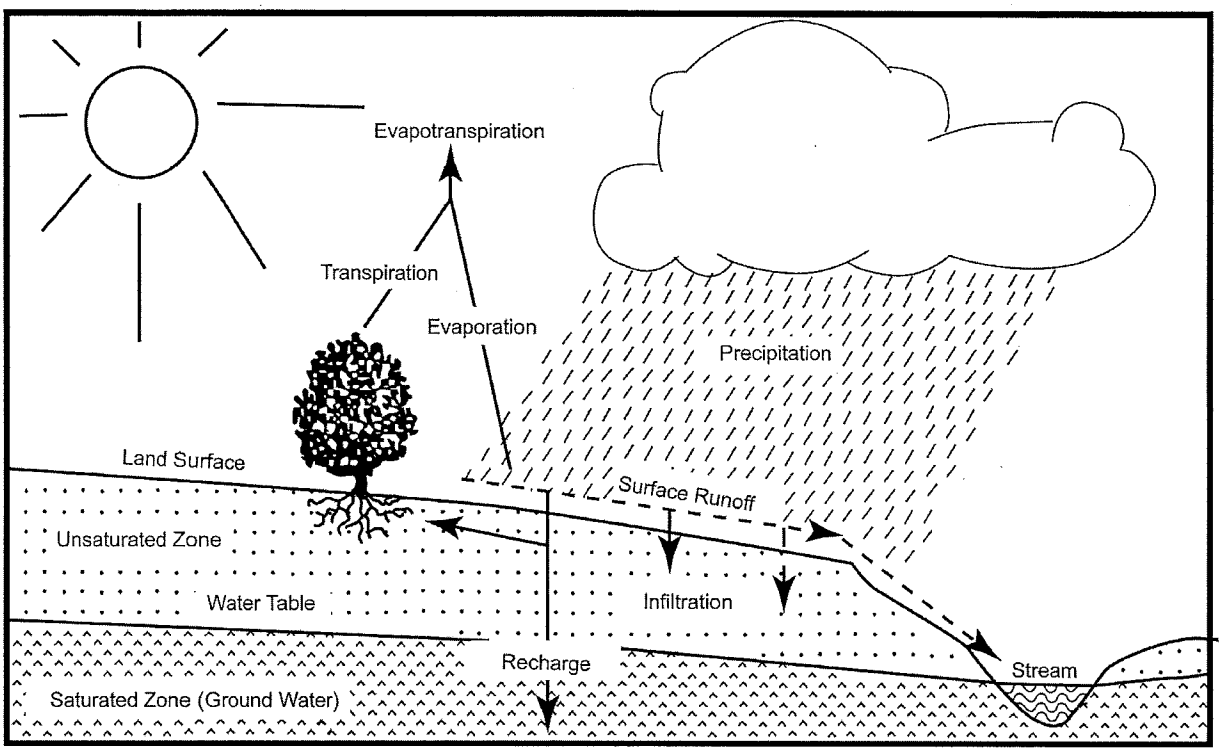
To achieve these goals, this plan outlines specific stormwater design and performance standards for new development. Additionally, the plan proposes stormwater management controls to address impacts from existing development. Preventative and corrective maintenance strategies are included in the plan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

Stormwater Discussion

The land development in Moorestown can dramatically alter the hydrologic cycle, which, ultimately, will affect entire watersheds (See Figure 1). 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. Erosion and sedimentation can destroy habitat from which some species cannot adapt

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

In addition to increased pollutant loading, land development can adversely affect water quality and stream biota in more subtle ways, such as in Strawbridge Lake or Swede Run. 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. 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.



Strategy to minimize the stormwater-related impacts of land development - The overall strategy to be employed in the Township of Moorestown to minimize stormwater-related impacts involves the following:

1. Low Impact Development Strategies - Incorporate the following nonstructural and structural low impact development (LID) stormwater management strategies to the maximum extent practicable:

   A. Nonstructural LID Strategies:

      1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and and sediment loss. Examples of areas that provide water quality benefits and/or can be susceptible to erosion and sediment loss include:

         a) Freshwater wetlands;
         b) Flood prone areas (areas within 100-year flood plains and/or within state-delineated Flood Hazard Areas);
         c) Floodway areas;
         d) Steeply sloping areas (areas with slopes of 10% or greater);
         e) Riparian corridors (in particular riparian corridors along Strawbridge Lake, North Branch Pennsauken Creek, Parkers Creek, Swede Run, Pompeston Creek, and Rancocas Creek and all other streams and tributaries shown on either the USGS quadrangle or the Burlington County Soil Survey;

f.) Forested areas;
g) Areas covered with native ground cover, native grasses, and native shrubs and trees;
h) Natural stormwater conveyance features (natural swales); and
i) Aquifer recharge areas.

2. Maximize the protection of natural drainage features and Vegetation.

Natural drainage features and vegetation include virtually the same areas as those listed immediately above in item No. 1A above.

3. Minimize land disturbance including clearing and grading.

This nonstructural stormwater management strategies calls for design engineers to "fit the development into the site" rather than changing the site's natural features to fit a pre-conceived development projects. For example:

a) Don't fill in flood plains to create dry land for building. Build on the non-flood prone lands.
b) Don't grade steeply sloping areas to create flat areas for building. Instead, locate development activities requiring flat slopes on the flat areas of the site.
c) Don't cover all of the site's best recharge areas with impervious coverage. Instead, leave much of the site's more pervious areas open to allow for the continuance of natural recharge and to provide areas suitable for manmade recharge facilities.
d) Don't relocate naturally existing drainage swales. Instead, protect those swales and utilize them in the project's design.
e) Don't develop within wetlands or wetland transition areas. Instead, preserve and realize these features as part of the project's overall stormwater management plan.
f) Don't clear existing vegetated areas to create large lawn areas. Instead utilize alternative landscaping that minimizes lawn development and maximizes the retention of natural, native grasses, shrubs, and woodlands.

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

This strategy is related to the three (3) previously listed non structural stormwater management strategies in that it incorporates strategies to preserve natural areas and drainage features important to natural stormwater management.

In addition, where manmade landscaping is needed, this nonstructural BMP calls for maximizing the planting of low maintenance, native vegetation

rather than development of large areas of high maintenance, non-native lawns and landscaping.

5. Minimize soil compaction

Soil compaction is minimized by not designing the project to require clearing and grading of large areas of the site so that the entire site becomes the "construction area." Site work should be phased and planned to minimize the extent to which the site is completely cleared and re-worked by construction equipment prior to building. Areas compacted during construction should be restored to preconstruction levels of perviousness or compaction.

This strategy is related to "minimizing land disturbance, including clearing and grading" discussed in item No. 1c, above.

6. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.

Some examples of strategies for minimizing impervious surface and disconnecting the flow of runoff over impervious surfaces include the following:

a) Utilize the minimum pavement or cartway width for roadways consistent with the traffic volumes, the need for roadside parking, and safety standards.
b) Sidewalks, when utilized, can be made of pervious materials or can be disconnected from the roadway's drainage system similarly, driveways can often be disconnected from the roadway's drainage system.
c) Rooftop runoff should be disconnected from the project's formal, engineered drainage system and directed to nearby infiltration recharge facilities such as bioretention systems.
d) Design the project's building with vegetated roofs when feasible.
e) Break-up sections of roadways and parking areas to drain, following natural drainage patterns to non-centralized stormwater storage, treatment and recharge facilities;
f.) Curbing should be constructed to permit runoff to be disconnected from the projects formal engineered drainage systems or curbs should be eliminated in favor of utilizing vegetated swales to convey the runoff.
g) Where possible, the impervious coverage from parking should be minimized by incorporating parking into, and under, the buildings proposed or by utilizing aesthetically designed parking structures.

The developer should select strategies appropriate to the proposed development, with the objective of minimizing the project's impervious coverage and maximizing the disconnection of runoff flows from that impervious coverage.

7. Minimize the decrease in the "time of concentration" from pre-construction to post-construction.

The "time of concentration" ("Tc") is defined as the time it takes for runoff to travel from the hydraulically most distant point of the drainage area to the point of interest within a watershed. Decreasing the "Tc" also decreases the peak discharge rate the velocity of flow. Thus, for purposes of stormwater management, we want the "Tc" to be maximized.

Strategies for maximizing the "Tc" for any given flow path include the following:

a) Maximize surface roughness for principal flow paths thus maximizing sheet flow and shallow concentrated flows through heavily vegetated areas and utilize vegetated conveyance channels wherever possible instead of stormwater piping systems.
b) Direct flows along slopes rather than down slopes to minimize the impact of slope on the time of concentration.
c) Utilize natural and manmade vegetated conveyance channels wherever possible instead of stormwater piping systems.
d) Don't collect and convey stormwater via traditional inlets and dipping systems only to discharge that runoff into a detention basin, the purpose of which is to slow down the rate of runoff.

8. Provide vegetated open channel conveyance systems discharging into and through stable vegetated areas.

This nonstructural strategy is directly related to "minimizing the time of concentration" discussed in item No. lg above and maximizing the protection of natural drainage features discussed in item No. lb above.

9. Provide other source controls to prevent or minimize the use or exposure of pollutants at the site in order to prevent or minimize the release of those pollutants into stormwater runoff.

a) Design and/or maintenance features that help to prevent accumulation of trash and debris in drainage systems, such as street sweeping;
b) Design features that help to prevent the discharge of trash and debris from drainage systems;
c) Maintenance features aimed a minimizing utilization of deicing salts, pesticides, and herbicides. Integrated Pest Management (IPM) techniques shall be used.

B. Structural Low Impact Development –

1. Incorporate structural low impact development (LID) strategies to the maximum extent possible, including:

   In addition to emphasizing non structural LID BMPs to the maximum extent practicable, structural low impact development strategies (structural LID BMPs) should also be incorporated into the project's stormwater management plan to the maximum extent practicable prior to consideration of larger structural measures.

   Such low impact structural measures manage stormwater by storing, infiltrating and/or treating stormwater runoff close to its source, thus more closely mimicking the site's predevelopment hydrology than larger structural stormwater BMPs. They include smaller, decentralized structural measures such as rain gardens (small biofiltration basins), infiltration areas (small at-grade infiltration basins), small, below-grade infiltration facilities, and small, naturally landscaped stormwater detention areas.

   These small, LID structural BMPs tend to be unidentifiable as stormwater BMPs, being either out of sight, in the case of below-grade facilities, or resembling natural or manmade landscaping.

2. Structural Stormwater Management BMPs - Incorporate larger, structural stormwater management strategies, if and when necessary to fully meet the design and performance standards.

   In those situations where the project's runoff requires more than non structural and structural LID BMPs to meet the performance standards, the use of larger, structural BMPs should be utilized.

3. Mitigation - When one or more of the performance standards cannot be met, provide a suitable mitigation plan, acceptable to the Planning Board.

   Sometimes, despite all efforts, it may not be possible to fully meet one of more of the stormwater management performance standards. In those cases, mitigation must be provided. The Township would provide applicant's with guidance in this regard.

Background

Moorestown Township is located in northwestern Burlington County, New Jersey, approximately 10 miles east of Philadelphia. The township contains approximately 9,555 acres and 14.93 square miles.

The population has grown 18.0% in the ten-year period of 1990 to 2000. The year 2000 population was determined to be 19,017residents. The population growth from 1930 has been 162.41%. The period of the most rapid growth within the township occurred between 1950 and 1960. Estimates for Moorestown project a population of 24,344 residents in 2030. This is an increase of 14.8%. Figure 2 provides a graphic illustration of the township on the USGS quadrangle map.

Moorestown's eastern boundary is partially defined by the Rancocas Creek. The North Branch Pennsauken Creek flows northwest and forms part of the western boundary of the township. The Pompeston Creek, Swede Run, Parkers Creek and Kendles Run also flow through the township, and Strawbridge Lake is located in the southern portion of the township. A map of the township's waterways is provided as Figure 3.

The New Jersey Department of Environmental Protection (NJDEP) has established the Ambient Biomonitoring Network (AMNET) to monitor and document the health of the state waterways. Sites are classified as non-impaired, moderately impaired, or severely impaired based on biometrics related to benthic macroinvertebrate data. The New Jersey Integrated Water Quality Monitoring and Assessment Report, 305(b) and 303(d), is required by the federal Clean Water Act to be prepared biennially and is a valuable source of water quality information. This report presents the extent to which New Jersey waters are attaining water quality standards, and identifies waters that are impaired. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants.

Some impaired waters are issued a Total Maximum Daily Load (TMDL) from NJDEP for the pollutant. 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 more of its designated uses. Implementation plans must be adopted to comply with a NJDEP TMDL.

According to these data, Pompeston Creek at New Albany Road, as well as Swede Run, have been classified as moderately impaired because of low levels of benthic macroinvertebrates. The Pennsauken Creek is classified as severely impaired due to low levels of macroinvertebrates, and high levels of phosphorus and arsenic. Strawbridge Lake has also been included on the 2004 Impaired Waterbodies List due to water quality issues related to eutrophication, specifically for sedimentation, heavy macrophyte growth and elevated phosphorus and chlordane contamination in fish.

There was a Total Maximum Daily Load (TMDL) established for the Strawbridge Lake for levels of phosphorus, as reported in the NJDEP's "Report on the Establishment of Total Maximum Daily Load (TMDL) for Phosphorous in Strawbridge Lake, Moorestown Township, Burlington County, New Jersey, September 2000". Proposed recommendations from the "Post-TMDL Implementation Plan" section of this document are incorporated into the "Design and Performance Standards" Section of this MSWMP.

In addition, TMDL's are being developed for the Rancocas and Pennsauken Creeks.

Moorestown does not experience any significant flooding problems. Principal flooding occurs in middle and late summer and in the fall. Summer floods are generally the result of thunderstorms.

As the impervious cover has increased in Moorestown, the peak and volumes of stream flows have also increased. The increased amount of water resulted in stream bank erosion along the township's waterways. The high imperviousness of the township has decreased the groundwater recharge, decreasing base flows in streams during dry weather periods. Lower base flows can have a negative impact on instream habitat during the summer months.

A map of the groundwater recharge areas is presented as Figure 4. Wellhead Protection Areas, also a required aspect of the MSWMP, are shown in Figure 5. There are no wellhead protection areas in or infringing on Moorestown Township.

Design and Performance Standards

Moorestown has adopted the design and performance standards for stormwater management measures as presented in NJ.A.C. 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies. The design and performance standards include the language for maintenance of stormwater management measures consistent with the stormwater management rules at N.J.A.C. 7:8-5.8 Maintenance Requirements, and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The Stormwater Control Ordinance was submitted to the County for review and approval, and will be revised in accordance with the County's conditional approval of plan and ordinance.

In addition, Moorestown Township is participating in the development of a Regional Stormwater Management Plan for the Pompeston Creek, spearheaded by Rutgers University and the Pompeston Creek Watershed Association. The Township's MSWMP will be revised if necessary to comply with the forthcoming Regional Plan after its adoption.

Finally, as referenced previously, a Total Maximum Daily Load (TMDL) was established for phosphorous for Strawbridge Lake. The following information and recommendations were excerpted from NJDEP's September, 2000 report under the "Post-TMDL Implementation Plan":

Post-TMDL Implementation Plan

1. Post-Dredging Water Monitoring of the Lake Basins: NJDEP will assume the water monitoring responsibility including phosphorous, starting first in the Upper and Middle Basins, using the recommendations as outlined above in the "Intended Future 303d Actions" part of the report (see pg. 6). Monitoring will be conducted in the Lower Basin when feasible, depending on the dredging schedule.

2. Retrofitting and rehabilitative Best Management Practices (BMPs): Each sub-basin has been assigned a load allocation corresponding to a 67% reduction. Modeling indicates that the Lower Basin receives the highest loadings from the North Branch of the Pennsauken Creek watershed. Therefore, new rehabilitative and other retrofitting projects will need to be concentrated in the Pennsauken Creek. It is recommended that all stormwater basins originally constructed for flood control be systematically retrofitted to nonpoint source control basins throughout the watershed. The Department will work with the municipalities affecting the Lake, Moorestown, Maple Shade, Mt. Laurel and Evesham Townships, to enlist their support and cooperation with each of the components of this implementation plan, particularly in areas of acquiring financing, grants and permits (if any).

3. Farm conservation plans: According to the previous work by F.X. Browne, it was recommended that farm conservation plans be developed in order to reduce phosphorus loadings. The extent of application of this strategy must be assessed and remaining farms targeted for development of conservation management plans. Funding for implementing such plans is available through a federal program called EQIP (Environmental Quality Incentives Program) and the State's Conservation Cost Share Program.

4. Forest preservation/mitigation: Any conversion of remaining forested areas of the watershed would negatively impact on the already very high loadings of phosphorous in this watershed. Efforts underway to acquire open space should be targeted at remaining forested tracts. Furthermore, the feasibility of actual large scale, forest mitigation (reforestation) should be investigated on suitable lands throughout the watershed, particularly in the North Branch of the Pennsauken Creek watershed. The Environmental Infrastructure Financing Program and the Garden State Trust, along with local open space programs, are sources of funds for this effort.

5. Land use in Mt. Laurel, Evesham, Maple Shade and Moorestown: As part of the watershed management process, land use projection analyses will be prepared for the sub-watersheds to provide the basis to calculate NPS pollutant loading that can be expected with future land use. This will inform municipal officials regarding possible land use changes that should be considered along with the need to adopt site development ordinances that require use of BMPs. Use of BMPs integrated into new site development can reduce NPS pollutant loadings from phosphorus by 20 to 80% (NJDEP, 2000).

6. Depending on the results of water quality monitoring and sedimentation rate estimation, additional techniques may be necessary, especially on the Lower Basin:

a) If the additional depth of the lake due to dredging increases the amount of macrophytic growth in the basins, Moorestown may consider properly timed weed harvesting of this growth in order to decrease phosphorous loading to the lake.

b) Aeration could be considered, if the basin is deep enough. This technique has been a very effective in Upper Sylvan Lake where the oxygenated water acts to oxidize any metals in the water, which then binds to phosphorous, thus tying up excess phosphorous.

c) The monitoring plan will include the collection of data necessary to estimate long-term sedimentation rates in the lake. Additional management actions may be necessary if the rates are determined to be unacceptable. For instance, it may be necessary to add structures near the basin inlets designed to settle out the bulk of the solids in a defined area that can be dredged more frequently and easily.

This MSWMP endorses and incorporates these recommendations to be implemented as determined by Moorestown Township (and others) to the extent feasible and practicable.

Finally, this MSWMP shall be revised to incorporate applicable recommendations for any future TMDL's that are established within any contributing watershed areas within the Township.

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

Plan Consistency

Moorestown Township is not within a Regional Stormwater Management Planning Area so this plan does not need to be consistent to a regional stormwater management plan (RSWMP). If a RSWMP is developed, this MSWMP will be revised to be consistent. A TMDL has been issued for the Pennsauken Creek, and this plan is consistent with the TMDL response in that it incorporates a plan for the reduction of phosphorus.

The Moorestown MSWMP is consistent with the Residential Site Improvement Standards (RSIS) as specified in N.J.A.C. 5:21. Any review of residential sites for stormwater management compliance will follow the most recent RSIS and this plan will be revised to include any RSIS updates.

Moorestown already requires all new development and redevelopment plans to comply with New Jersey's Soil Erosion and Sediment Control Standards. Township inspectors will enforce these standards at all construction sites and report any violations or inconsistencies to the local Soil Conservation District.

Nonstructural Stormwater Management Strategies

Moorestown has reviewed the Master Plan, land use and zoning ordinances, and maps to determine what adjustments are needed for the implementation of the nonstructural stormwater management techniques. The ordinances that may be revised at a future date, at the discretion of the Township are listed below. Once an ordinance is revised, it will be submitted to the County and NJ Department of Environmental Protection.

Section 158-9. Off- Tract Improvements.
This section may be amended to require that any off-site and off-tract stormwater management and drainage improvements must conform to the "Design and Performance Standards" as described in this plan.

Section 158-18. Streets.
This section may be amended to discourage on-street parking, therefore lessening road widths. Also the minimum radius of a cul-de-sac may be reduced.

Section 158-20. Curbs.
This section may be amended to allow for curb cuts or flush curbs with curb stops to allow vegetated swales to be used for stormwater conveyance and to allow the disconnection of impervious areas.

Section 158-22. Sidewalks.
This section may be amended to encourage developers to design sidewalks to drain runoff onto landscaped areas or to use permeable paving surfaces where appropriate.

Section 158-25. Storm Drainage Systems.
The section requires compliance with the Residential Site Improvement Standards promulgated at N.J.A.C 5:21-7.1 through N.J.A.C. 5:21-7.6, as amended. It may need to be amended to incorporate all requirements outlined in N.J.A.C. 7:8-5.

Section 158-26.E. Landscape buffers.
(Section 180-63.D. Landscape buffers, use of yards and pedestrian circulation.)
The sections may be amended to require the use of native vegetation, which will require less fertilization, and watering than non-native species. Also, the buffers may be used for stormwater management by disconnecting impervious surfaces and treating the runoff from surrounding impervious surfaces.

Section 158-39. Standards.
This section may be amended to prohibit materials or waste to be deposited upon a lot in such form or manner that they can be transferred off the lot, directly or indirectly, by natural forces such as precipitation, evaporation or wind. It may also be amended to require all materials and wastes that could create pollution to be enclosed in an appropriate container.

Section 158-18. Driveways.
The section on driveways may be amended to allow pervious paving materials to be used in driveway construction.

Section 158-26. Landscaping
This section may be amended to require a certain percentage preservation of forested areas.

Section 180-73. Parking Space Requirements.
This section may be amended to allow pervious paving in areas to provide overflow parking, vertical parking structures, smaller parking stalls, and shared parking. This section may also be amended to allow for flush curb with curb stop or curbing with curb cuts to encourage discharge of impervious areas into landscaped areas.

Section 180-82. Nonconforming structures, uses and lots.
This section requires a variance for structures or lots that do not conform to the standards. This section may need to be amended to reflect that the Township's Planning Board shall presume that nonstructural stormwater management BMPs have not been incorporated into the project's stormwater management plan to the maximum extent practicable, if variances or waivers are required that would result in a degree of development exceeding building coverage limits, impervious coverage limits, or lot disturbance limits.
In the event that a variance or waiver were granted by the Planning Board, the applicant would be required to fully mitigate the effect of the variance or waiver with regard to stormwater recharge, stormwater quality, and storm water runoff rates.

Building Coverage Limits.
Building coverage limits will be re-examined in each zoning district (during the next Master Plan reexamination) to determine if adjustments are necessary to better meet the stormwater management goals of this Municipal Stormwater Management Plan.

Impervious Coverage Limits.
Impervious coverage limits will be re-examined (during the next Master Plan reexamination) in each zoning district to determine if adjustments are necessary to better meet the stormwater management goals of this plan.

Maximum Site Disturbance Limits.
The Township's ordinances may be revised as necessary to specify maximum site disturbance limits for each zoning district.

Pollutant Source Control.

The Township's ordinances may be revised to require the following "source control" BMPs for all commercial, industrial and institutional uses and for all multifamily residential uses either under one management or having a homeowners association:

a. Pesticide and fertilizer use plans;
b. De-icing plans;
c. Trash receptacle and storage facilities;
d. Parking lot and internal roadway maintenance sweeping.

Land Use/ Build-Out Analysis

A detailed land use analysis for Moorestown was conducted. Figure 6 illustrates the HUC14s within the township. An existing land use plan is attached as Figure 7. The build-out calculations for impervious cover are shown in **Appendix B**, and were calculated using the Township zoning plan and zoning regulations. A zoning map appears as Figures 8. Figures 1 and 6 illustrate the HUC14 zones on the enclosed mapping. As expected, the buildout of much of the currently undeveloped land will result in a significant increase in the impervious cover within the Township.

Table 2 presents the pollutant loading coefficients by land cover. The pollutant loads at full build-out are presented in Table 3.

As per the enclosed data, the following is a summary of estimated pollutant build-outs by HUC-4 subwatershed:

Non-Point Source (NPS) Pollutant Loadings at Build-out

HUC14 Subwatershed	Total Phosphrous (lbs./yr.)	Total Nitrogen (lbs./yr.)	Total Suspended Solids (lbs./yr.)
North Branch Pennsauken Creek	2009	21,247	246,827
Pompeston Creek	1740	16,745	233,729
Strawbridge Lake	42	442	4,022
Swede Run	1790	17,205	245,249
Kendles Run	604	5,033	100,655
Rancocas Creek	775	7,390	104,322

The enclosed excerpts from the NJDEP for the Strawbridge Lake TMDL implementation provide several NPS reduction strategies that are applicable to some or all of these subwatersheds, including:

- Retrofitting & rehabilitation of existing BMP's (basins) – As feasible and practicable, existing stormwater basins originally constructed for flood control be systematically retrofitted to nonpoint source control basins throughout the watershed. Retrofits could be performed for key basins to improve Phosphorous, Nitrogen and Total Suspended Solids (TSS) removals.

- Farm Conservation Plans -- According to the previous work by F.X. Browne, it was recommended that farm conservation plans be developed in order to reduce Phosphorus loadings.

- Forest Preservation/Mitigation -- Efforts underway to acquire open space should be targeted at remaining forested tracts. Furthermore, the feasibility of actual large scale, forest mitigation (reforestation) should be investigated on suitable lands throughout the Township, particularly in the North Branch of the Pennsauken Creek watershed.

In addition to the above-referenced strategies, the following additional strategies should be considered:

- Use of BMP's for Nutrient Removal for Future Development – As a result of the NJ Stormwater Rule (N.J.A.C. 7:8), future major development projects must be designed to provide 80% Total Suspended Solids (TSS) reductions, via use of Best Management Practices (BMP's). In addition to TSS removals, certain BMP's (e.g, bioretention systems, enhanced swales, infiltration structures with filter strips) can provide significant Total Phosphorous, Nitrate and Ammonia Nitrogen removal efficiencies as well. Said BMP's should be incorporated into future stormwater designs where practicable.

- Implementation of Riparian Buffers for Future Development – Similar to forest preservation, preservation of Riparian Buffers can also provide excellent nutrient reductions. Buffers should be incorporated into future developments adjacent to waterways where practicable.

- Public Education – Use of Lawn fertilizer – As stated in the NJDEP Stormwater Best Management Practices Manual, there are basic application principles that apply to all fertilizer groups:

    - Use properly maintained and calibrated equipment.
    - Apply fertilizer evenly.
    - Keep fertilizer off of all paved and sidewalk areas.
    - Do not apply fertilizer up to a stream or pond edge. Keep a 'no apply' buffer of at least 15 feet, preferably 25 feet or more.
    - Apply nutrients in small amounts several times a year, at periods of maximum turf need.

  The Township and/or its environmental committee should participate in ongoing education efforts of homeowners' associations (HOA's) and landscape contractors as to the proper use of fertilizers.

Mitigation Plans

This mitigation plan is provided for any proposed development that is granted a variance or exemption from the stormwater management design and performance standards. Presented is a hierarchy of options.

Moorestown Township has opted to consider mitigation projects in accordance with the NJDEP's "Guidance for the Development of Municipal Mitigation Plans" document, dated February 2006.

As identified in NJDEP's Mitigation Plan Guidance Document, municipalities may:

1) Identify a pool of specific mitigation projects that could be selected by an applicant to offset the effect of a requested waiver/exemption or to address an existing stormwater problem; or

2) Choose to provide a process through which an applicant has the flexibility and responsibility to identify an appropriate mitigation project and a location to implement the mitigation project to offset the deficit that would be created by the grant of a waiver/exemption or to address a stormwater based impairment.

Moorestown has opted to provide a mitigation plan using BOTH (specific and applicant-identified mitigation project) options.

It must be stressed that requested exceptions will be granted only at the discretion of the Township. In addition, the issuance of a waiver(s) granted by NJDEP under a Land Use permit does not automatically waive the requirement for mitigation to be performed under a municipal review.

A. Specific (Township-identified) Mitigation Project Criteria

1. The mitigation project must be implemented within the same drainage area, as defined by the HUC14s, as the proposed development. The project must provide additional groundwater recharge benefits, or provide protection of previously developed property from stormwater runoff. The developer must also ensure long-term maintenance for the project, including those maintenance requirements under Chapters 8 and 9 of the NJDEP Stormwater Best Management Practices Manual.

    a. The applicant may select one project from the following list to compensate for not meeting the requirements of the performance standards. More detailed information can be obtained from the Township Engineer.

HUC 02040202100030
North Branch Pennsauken Creek

Groundwater Recharge

- Retrofit existing detention basin to provide additional annual groundwater recharge.
- Replace impervious parking lot with permeable paving to provide additional groundwater recharge.

Water Quality

- Retrofit existing stormwater management facility to provide removal of 80% of total suspending solids from the parking lot runoff.
- Retrofit existing parking area to provide removal of total suspended solids. The retrofit BMP must be installed underground and may not reduce number of parking spaces.
- Enhance vegetative buffer within the "stream corridor".
- Purchase of easements along the "stream corridor".
- Removal of invasive plant species within riparian corridors, targeted wetland areas and stream corridors and replant with native species.

Water Quantity

- If an applicant cannot meet the water quantity reductions required on-site, the additional water quantity reduction should be provided within the same watershed or sub-watershed (HUC14) to meet the required total amount of the water quantity reduction. This can be done in several ways. The flood storage area along a waterway can be increased, new best management practices can be implemented to control previously uncontrolled runoff or an existing stormwater structure can be retrofitted to decrease the volume and peak of runoff.

HUC 02040202090020
Pompeston Creek

- Combat erosion caused by the Pompeston Creek on MEND property at 39/47 Beech Street.

Groundwater Recharge

- Retrofit existing detention basin to provide additional annual groundwater recharge.
- Replace impervious parking lot with permeable paving to provide additional groundwater recharge.

Water Quality

- Retrofit existing stormwater management facility to provide removal of 80% of total suspending solids from the parking lot runoff.
- Retrofit existing parking area to provide removal of total suspended solids. The retrofit BMP must be installed underground and may not reduce number of parking spaces.
- Enhance vegetative buffer within the "stream corridor".
- Purchase of easements along the "stream corridor".
- Removal of invasive plant species within riparian corridors, targeted wetland areas and stream corridors and replant with native species.

Water Quantity

- If an applicant cannot meet the water quantity reductions required on-site, the additional water quantity reduction should be provided within the same watershed or sub-watershed (HUC14) to meet the required total amount of the water quantity reduction. This can be done in several ways. The flood storage area along a waterway can be increased, new best management practices can be implemented to control previously uncontrolled runoff or an existing stormwater structure can be retrofitted to decrease the volume and peak of runoff.

HUC 02040202090010

Swede Run

Groundwater Recharge

- Retrofit existing detention basin to provide additional annual groundwater recharge.
- Replace impervious parking lot with permeable paving to provide additional groundwater recharge.

Water Quality

- Retrofit existing stormwater management facility to provide removal of 80% of total suspending solids from the parking lot runoff.
- Retrofit existing parking area to provide removal of total suspended solids. The retrofit BMP must be installed underground and may not reduce number of parking spaces.
- Enhance vegetative buffer within the "stream corridor".
- Purchase of easements along the "stream corridor".
- Removal of invasive plant species within riparian corridors, targeted wetland areas and stream corridors and replant with native species.

Water Quantity

- If an applicant cannot meet the water quantity reductions required on-site, the additional water quantity reduction should be provided within the same watershed or sub-watershed (HUC14) to meet the required total amount of the water quantity reduction. This can be done in several ways. The flood storage area along a waterway can be increased, new best management practices can be implemented to control previously uncontrolled runoff or an existing stormwater structure can be retrofitted to decrease the volume and peak of runoff.

HUC 02040202080040
Kendles Run

Groundwater Recharge

- Retrofit existing detention basin to provide additional annual groundwater recharge.
- Replace impervious parking lot with permeable paving to provide additional groundwater recharge.

Water Quality

- Retrofit existing stormwater management facility to provide removal of 80% of total suspending solids from the parking lot runoff.
- Retrofit existing parking area to provide removal of total suspended solids. The retrofit BMP must be installed underground and may not reduce number of parking spaces.
- Enhance vegetative buffer within the "stream corridor".
- Purchase of easements along the "stream corridor".
- Removal of invasive plant species within riparian corridors, targeted wetland areas and stream corridors and replant with native species.

Water Quantity

- If an applicant cannot meet the water quantity reductions required on-site, the additional water quantity reduction should be provided within the same watershed or sub-watershed (HUC14) to meet the required total amount of the water quantity reduction. This can be done in several ways. The flood storage area along a waterway can be increased, new best management practices can be implemented to control previously uncontrolled runoff or an existing stormwater structure can be retrofitted to decrease the volume and peak of runoff.

HUC 02040202080020
Rancocas Creek

Groundwater Recharge

- Retrofit existing detention basin to provide additional annual groundwater recharge.
- Replace impervious parking lot with permeable paving to provide additional groundwater recharge.

Water Quality

- Retrofit existing stormwater management facility to provide removal of 80% of total suspending solids from the parking lot runoff.
- Retrofit existing parking area to provide removal of total suspended solids. The retrofit BMP must be installed underground and may not reduce number of parking spaces.
- Enhance vegetative buffer within the "stream corridor".
- Purchase of easements along the "stream corridor".
- Removal of invasive plant species within riparian corridors, targeted wetland areas and stream corridors and replant with native species.

Water Quantity

- If an applicant cannot meet the water quantity reductions required on-site, the additional water quantity reduction should be provided within the same watershed or sub-watershed (HUC14) to meet the required total amount of the water quantity reduction. This can be done in several ways. The flood storage area along a waterway can be increased, new best management practices can be implemented to control previously uncontrolled runoff or an existing stormwater structure can be retrofitted to decrease the volume and peak of runoff.

HUC 02040202080010
Parkers Creek

Groundwater Recharge

- Retrofit existing detention basin to provide additional annual groundwater recharge.
- Replace impervious parking lot with permeable paving to provide additional groundwater recharge.

Water Quality

- Retrofit existing stormwater management facility to provide removal of 80% of total suspending solids from the parking lot runoff.

- Retrofit existing parking area to provide removal of total suspended solids. The retrofit BMP must be installed underground and may not reduce number of parking spaces.
- Enhance vegetative buffer within the "stream corridor".
- Purchase of easements along the "stream corridor".
- Removal of invasive plant species within riparian corridors, targeted wetland areas and stream corridors and replant with native species.

Water Quantity

- If an applicant cannot meet the water quantity reductions required on-site, the additional water quantity reduction should be provided within the same watershed or sub-watershed (HUC14) to meet the required total amount of the water quantity reduction. This can be done in several ways. The flood storage area along a waterway can be increased, new best management practices can be implemented to control previously uncontrolled runoff or an existing stormwater structure can be retrofitted to decrease the volume and peak of runoff.

HUC 02040202100020
Strawbridge Lake

Groundwater Recharge

- Retrofit existing detention basin to provide additional annual groundwater recharge.
- Replace impervious parking lot with permeable paving to provide additional groundwater recharge.

Water Quality

- Retrofit existing stormwater management facility to provide removal of 80% of total suspending solids from the parking lot runoff.
- Retrofit existing parking area to provide removal of total suspended solids. The retrofit BMP must be installed underground and may not reduce number of parking spaces.
- Enhance vegetative buffer within the "stream corridor".
- Purchase of easements along the "stream corridor".

- Removal of invasive plant species within riparian corridors, targeted wetland areas and stream corridors and replant with native species.

Water Quantity

- If an applicant cannot meet the water quantity reductions required on-site, the additional water quantity reduction should be provided within the same watershed or sub-watershed (HUC14) to meet the required total amount of the water quantity reduction. This can be done in several ways. The flood storage area along a waterway can be increased, new best management practices can be implemented to control previously uncontrolled runoff or an existing stormwater structure can be retrofitted to decrease the volume and peak of runoff.

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

   Water Quality

   - Re-establish a vegetative buffer (minimum 50 foot wide) as a goose control measure and to filter stormwater runoff.
   - Provide goose management measures, including public education at a local park.

In consideration of any mitigation project identified above, the Applicant shall provide the Township all necessary environmental information and data sufficient to address sensitive receptors associated with the project, as outlined in NJDEP regulations, and as outlined in the Applicant-Identified Mitigation Project requirements addressed below.

B. General (Applicant-Identified) Mitigation Project Criteria

In order to select an appropriate mitigation project to respond to a requested waiver/exemption requires, an assessment of the impact that would result from the requested deviation from full compliance with the standard(s) in the drainage area affected by the proposed project is required. For example, a waiver for stormwater quantity requirements must focus on the impacts of increased runoff on flooding, considering both quantity and location. Stormwater quality mitigation must aim to prevent an increase in pollutant load to the waterbodies that would be affected by the waiver/exemption. Ground water recharge mitigation must seek to maintain the baseflow and aquifer recharge in the area that would be affected by the waiver/exemption. For the purpose of this discussion, the term "sensitive receptor" is used to refer to a specific area or feature that would be sensitive to the impact assessed above.

Selection of an appropriate mitigation project for a requested waiver/exemption must adhere to the following requirements:

1. The project must be within the same area that would contribute to the receptor impacted by the project. Note that depending on the specific performance standard waived, the sensitive receptor and/or the contributory area to that receptor may be different. If there are no specific sensitive receptors that would be impacted as the result of the grant of the waiver/exemption, then the location of the mitigation project can be located anywhere within the municipality, and should be selected to provide the most benefit relative to an existing stormwater problem in the same category (quality, quantity or recharge).

2. Legal authorization must be obtained to construct the project at the location selected. This includes the maintenance and any access needs for the project in the future.

3. The project should be close to the location of the original project, and if possible, be located upstream at a similar distance from the identified sensitive receptor.This distance should not be based on actual location, but on a similar hydraulic distance to the sensitive receptor. For example, if the project for which a waiver is obtained discharges to a tributary, but the closest location discharges to the main branch, it may be more beneficial to identify a location discharging to the same tributary.

4. For ease of administration, if sensitive receptors are addressed, it is preferable to have one location that addresses any and all of the performance standards waived, rather than one location for each performance standard.

5. It must be demonstrated that implementation of the mitigation project will result in no adverse impacts to other properties.

6. Mitigation projects that address stormwater runoff quantity can provide storage for proposed increases in runoff volume, as opposed to a direct peak flow reduction.

All necessary information to support a specific waiver request(s) must be provided by the Developer(s) for consideration by the Township, in accordance with applicable NJDEP and/or Township requirements, an as outlined in NJDEP's "Guidance for the Development of Municipal Mitigation Plans" document, dated February 2006.

At the Township's discretion, a developer may be permitted to fund analyses to identify potential mitigation projects that could be used to address deficits in complying with each of the performance standards. However, the funding option shall only be allowed where the project requesting the waiver will have no measurable impact with respect to flooding, erosion, water quality degradation, etc. The funding option may also be appropriate in situations where the size of an individual project requesting a waiver/exemption is small, or the degree of deficit in complying with the design and performance standard(s) is small. Or, where the project requiring mitigation is for one individual single family home, given authority constraints, a financial contribution may be a preferred option.

Finally, the following information will be obtained and provided by the Developer of an approved waiver for the Township to comply with its annual NJDEP MS4 permitting requirements (i.e., required for all Township-approved mitigation projects):

i. Impact from noncompliance. Provide a table quantifying what would be required for the project to achieve the standards, the extent to which this value will be achieved on site and the extent to which the value must be mitigated off site.

ii. Narrative and supporting information regarding the need for the waiver, including:

- The waiver cannot be due to a condition created by the applicant. If the applicant can comply with the Stormwater Management rules through a reduction in the scope of the project, the applicant has created the condition and a waiver cannot be issued. Demonstrate that the need for a waiver is not created by the applicant.

- Provide a discussion and supporting documentation of the site conditions peculiar to the subject property that prevent the construction of a stormwater management facility that would achieve full compliance with the design and performance standards. Site conditions may include soil type, the presence of karst geology, acid soils, a high groundwater table, unique conditions that would create an unsafe design, as well as conditions that may provide a detrimental impact to public health, safety and welfare..

- Demonstration that the grant of the requested waiver/exemption would not result in an adverse impact that would not be compensated for by off site mitigation.

iii. Identify the sensitive receptor(s) related to the performance standard from which a waiver is sought. Demonstrate that the mitigation site contributes to the same sensitive receptor.

iv. Provide the design details of the mitigation project. This includes, but is not limited to, drawings, calculations, and other information needed to evaluate the mitigation project.

v. List the party or parties responsible for the construction and the maintenance of the mitigation project. Documentation must be provided to demonstrate that the responsible party is aware of, has authority to, and accepts the responsibility for construction and maintenance. Under no circumstance shall the responsible party be an individual single-family homeowner. Selection of a project location that is under municipal authority avoids the need to obtain authority from a third party for the construction and future maintenance of the project.

vi. Include a maintenance plan that addresses the maintenance criteria at N.J.A.C. 7:8-5.8. In addition, if the maintenance responsibility is being transferred to the municipality or another entity, the entity responsible for the cost of the maintenance must be identified. The municipality may provide the option for the applicant to convey the mitigation project to the municipality, if the applicant provides for the cost of maintenance in perpetuity.

vii. Obtain any and all necessary local, State or other applicable permits for the mitigation measure or project. Permits must be obtained prior to the municipal approval of the project for which mitigation is being provided.

viii. Demonstrate that the construction of the mitigation project coincides with the construction of the proposed project. A Certificate of Occupancy or final approval by the municipality for the project requiring mitigation cannot be issued until the mitigation project or measure receives final approval. Any mitigation project proposed by the municipality to offset the stormwater impacts of that municipality's own project must be completed within 6 months of the completion of the municipal project, in order to remain in compliance with their NJPDES General Permit.

X. Stream Corridor Protection Plan (Optional)

It should be noted that there are no Special Water Resource Protection Areas designated Category One (NJAC 7:9B) or upstream perennial or intermittent streams of said waters within Moorestown. If such water bodies are found or designated at a later date, future major development within 300 feet of said waters will be regulated in accordance with NJAC 7:8-5.5(h) as outlined in the model stormwater ordinance.

However, it should further be noted that the Township recognizes the value of Riparian Buffers in minimizing Non Point Source (NPS) discharges into local waterways. As recommended in this MSWMP, riparian buffers of future developments may be considered by the Township on a case-by-case basis as well

Appendix A -- Mapping

Figure 1 – Hydrologic Cycle

Figure 2 – Moorestown Boundary on USGS Quadrangle

Figure 3 – Township and its Waterways

Figure 4 – Groundwater Recharge

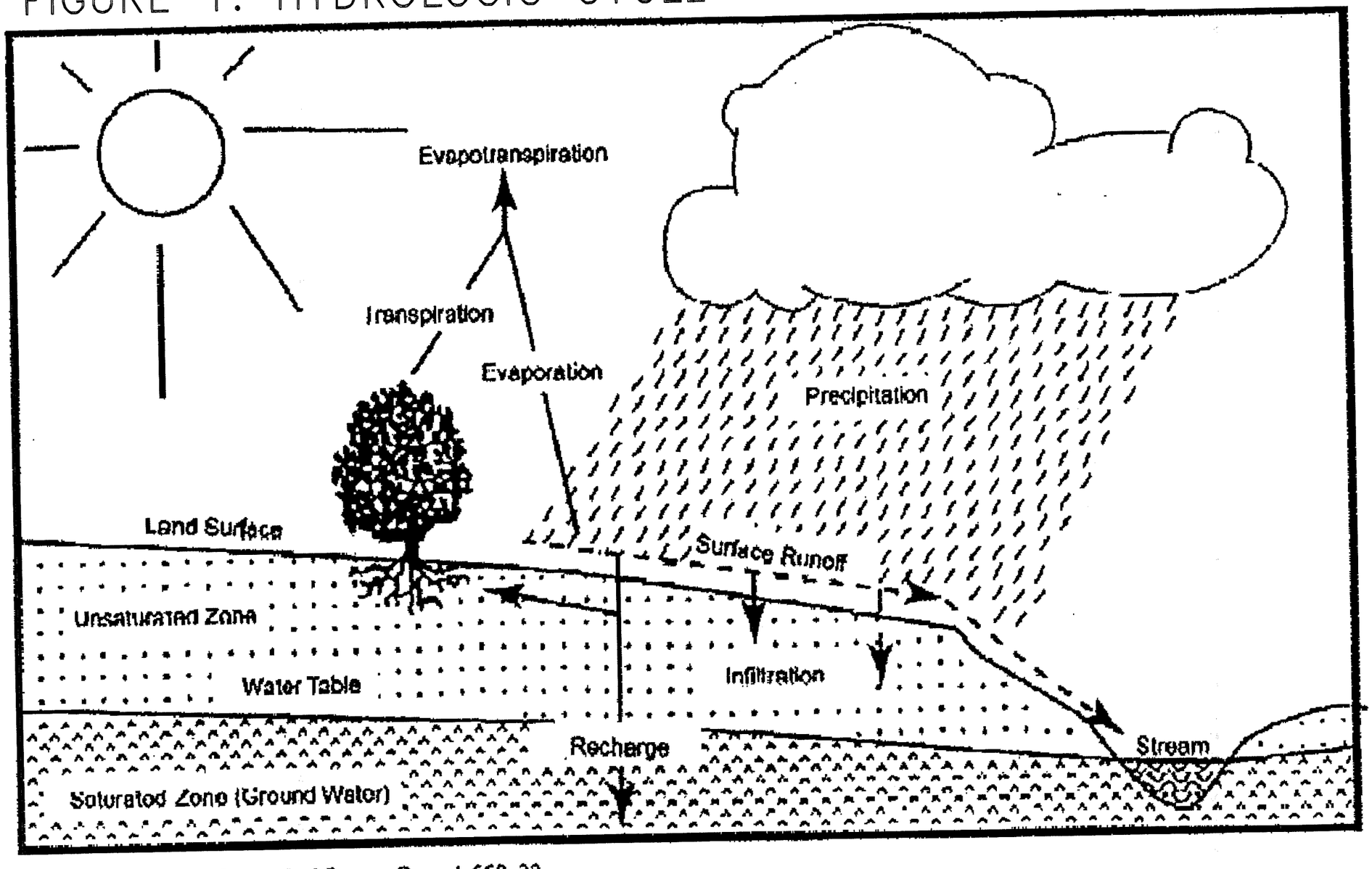
Figure 5 – Wellhead Protection Areas

Figure 6 – Wellhead Units (HUC14s) Within Township

Figure 7 – Land Use

Figure 8 – Zoning Districts

FIGURE 1: HYDROLOGIC CYCLE



Source: New Jersey Geological Survey Report GSR-32.

Moorestown Boundary on USGS Quadrangle

Legend

Municipal Boundary

N
W E
S

0 2,000 4,000 8,000 Feet

RV&A
Remington, Vernick and Arango Engineers
243 Route 130 Suite 200
Bordentown, NJ 08505
Phone: (609)-298-6017 Fax: (609)-298-8257
Web Site Address: www.rve.com

Figure 3: Township Waterways

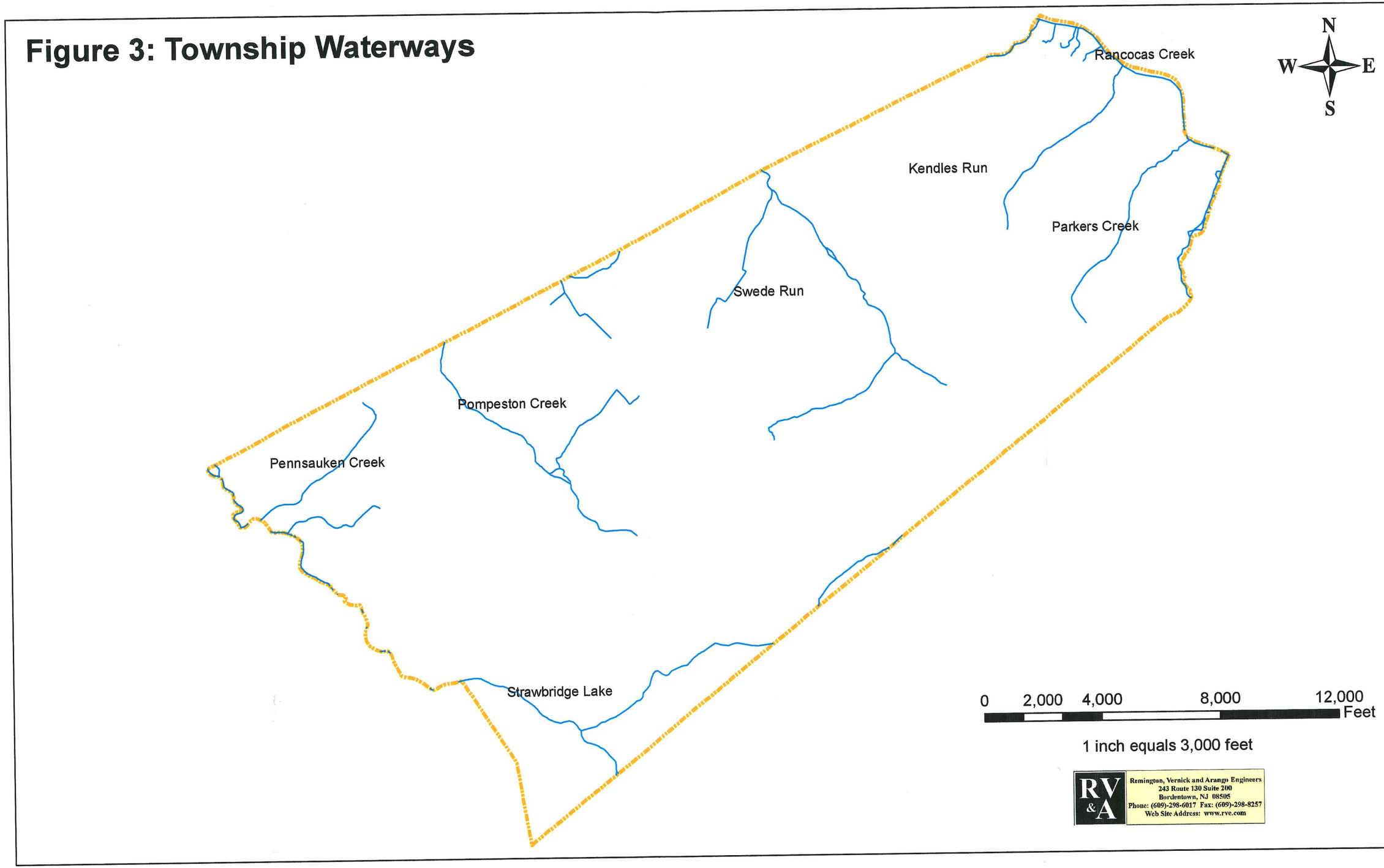


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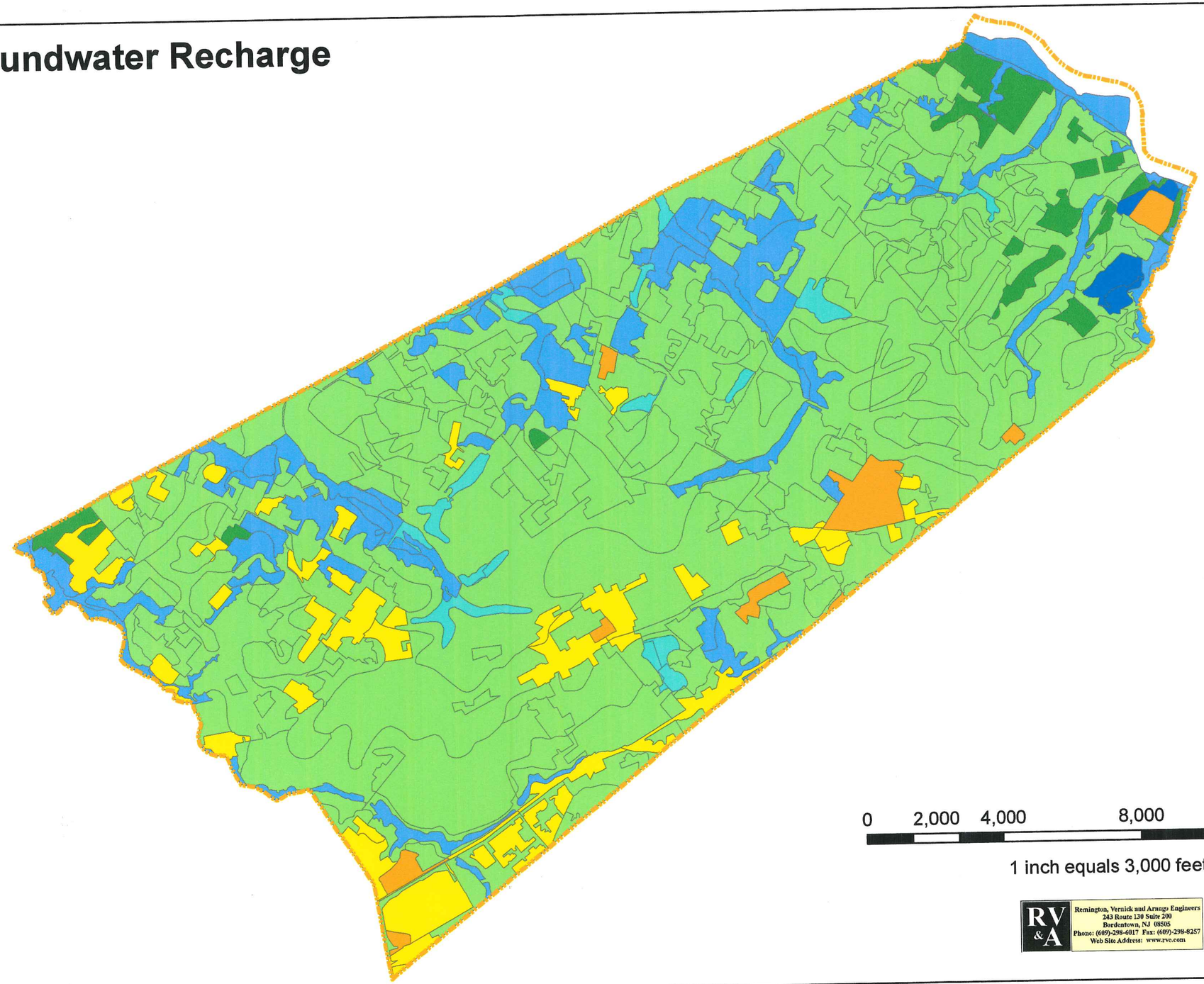
Figure 4: Groundwater Recharge



N
W E
S

Legend

Township Boundary

Groundwater Recharge

- 13 to 14 in/yr
- 11 to 12 in/yr
- 9 to 10 in/yr
- 1 to 7 in/yr
- 0 in/yr
- Hydric Soils
- Wetlands and Open Water

0 2,000 4,000 8,000 12,000 Feet

1 inch equals 3,000 feet

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Figure 5: Wellhead Protection Areas

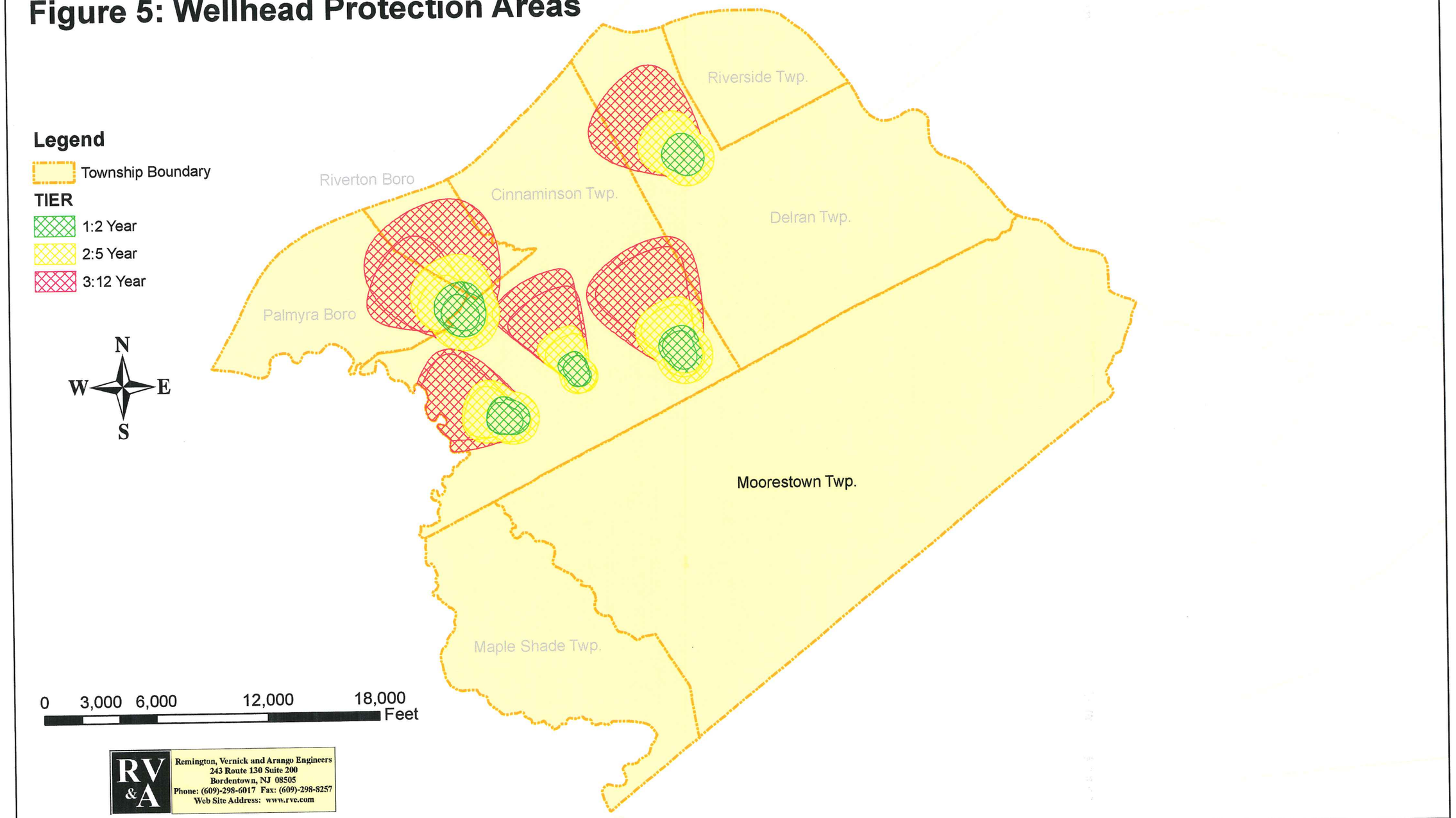

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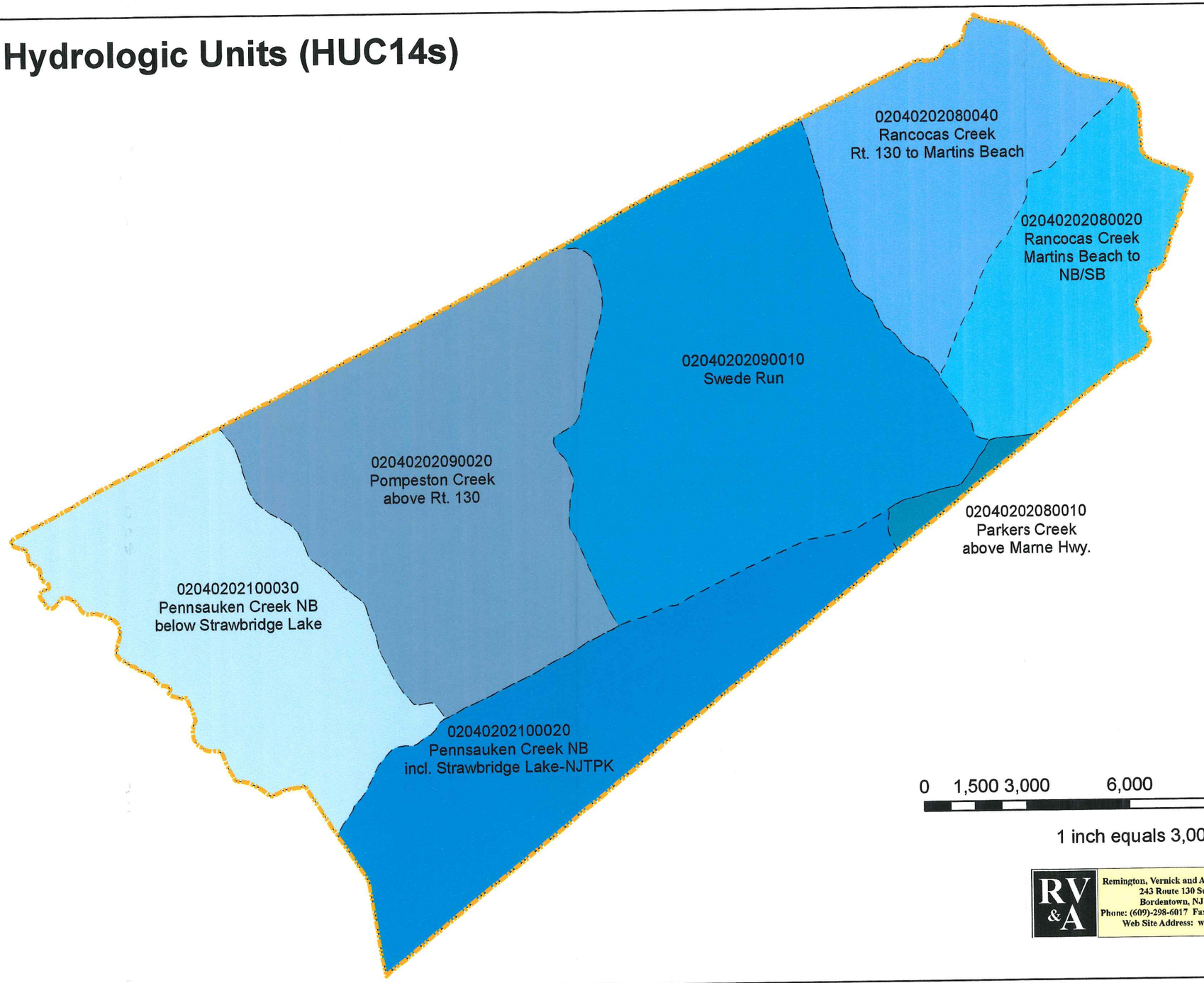
Figure 6: Hydrologic Units (HUC14s)



N
W E
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0 1,500 3,000 6,000 9,000 12,000 Feet

1 inch equals 3,000 feet

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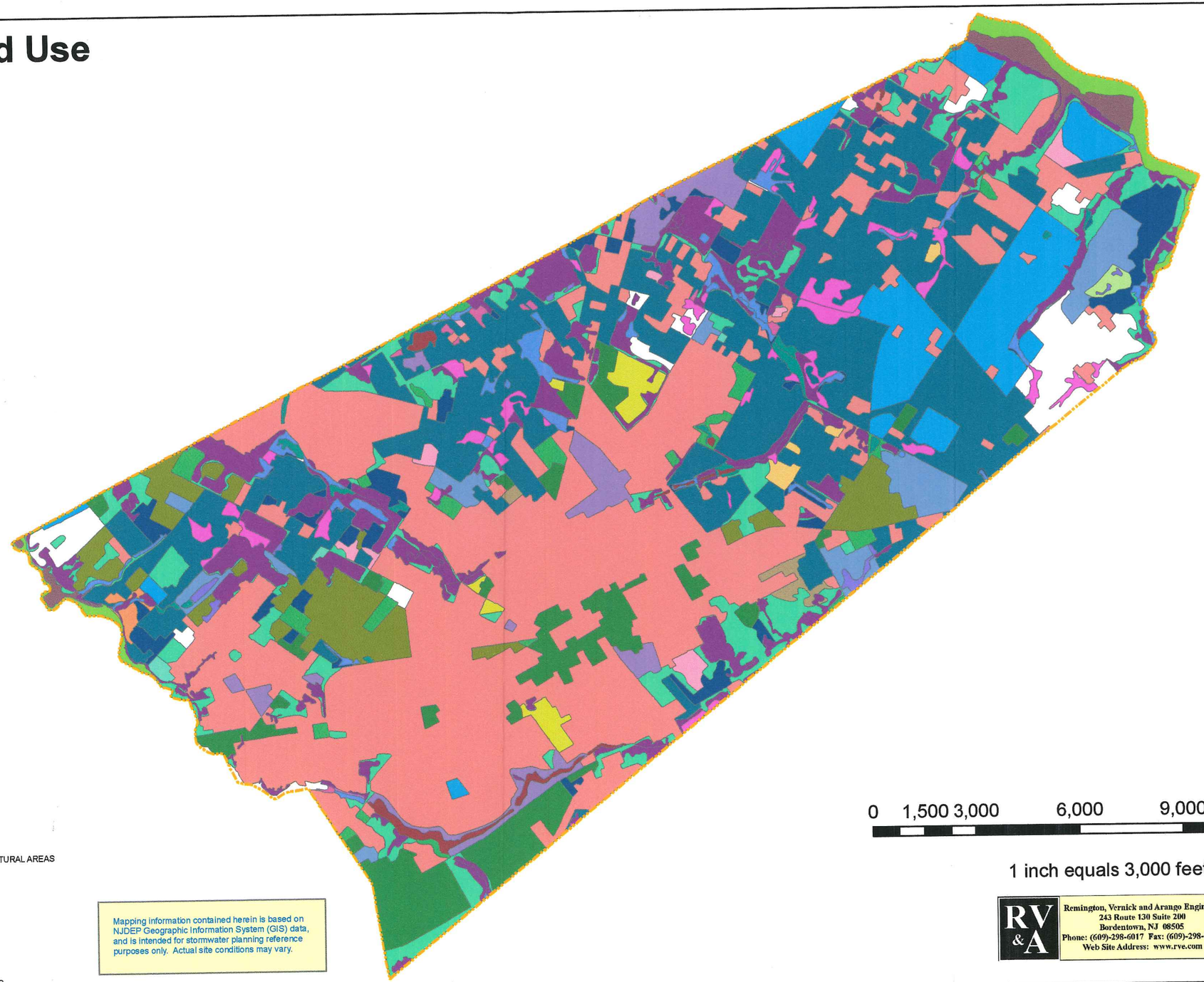
Figure 7: Land Use



N
W E
S

Legend

- Township Boundary
- AGRICULTURAL WETLANDS (MODIFIED)
- ARTIFICIAL LAKES
- ATHLETIC FIELDS (SCHOOLS)
- BRUSHLAND/SHRUBLAND
- COMMERCIAL/SERVICES
- CONIFEROUS FOREST
- CONIFEROUS WOODED WETLANDS
- CONIFEROUS/DECIDUOUS FOREST
- CROPLAND AND PASTURELAND
- DECIDUOUS FOREST
- DECIDUOUS SCRUB/SHRUB WETLANDS
- DECIDUOUS WOODED WETLANDS
- DECIDUOUS/CONIFEROUS FOREST
- DISTURBED WETLANDS (MODIFIED)
- EXTRACTIVE MINING
- FRESHWATER TIDAL MARSHES
- HERBACEOUS WETLANDS
- INDUSTRIAL
- MANAGED WETLANDS (MODIFIED)
- NATURAL LAKES
- ORCHARDS/VINEYARDS/NURSERIES/HORTICULTURAL AREAS
- OTHER AGRICULTURE
- OTHER URBAN OR BUILT-UP LAND
- RECREATIONAL LAND
- RESIDENTIAL
- STREAMS AND CANALS
- TIDAL WATERS
- TRANSITIONAL AREAS
- TRANSPORTATION/COMMUNICATIONS/UTILITIES

Mapping information contained herein is based on NJDEP Geographic Information System (GIS) data, and is intended for stormwater planning reference purposes only. Actual site conditions may vary.

0 1,500 3,000 6,000 9,000 12,000 Feet

1 inch equals 3,000 feet

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BASE MAP REVISED

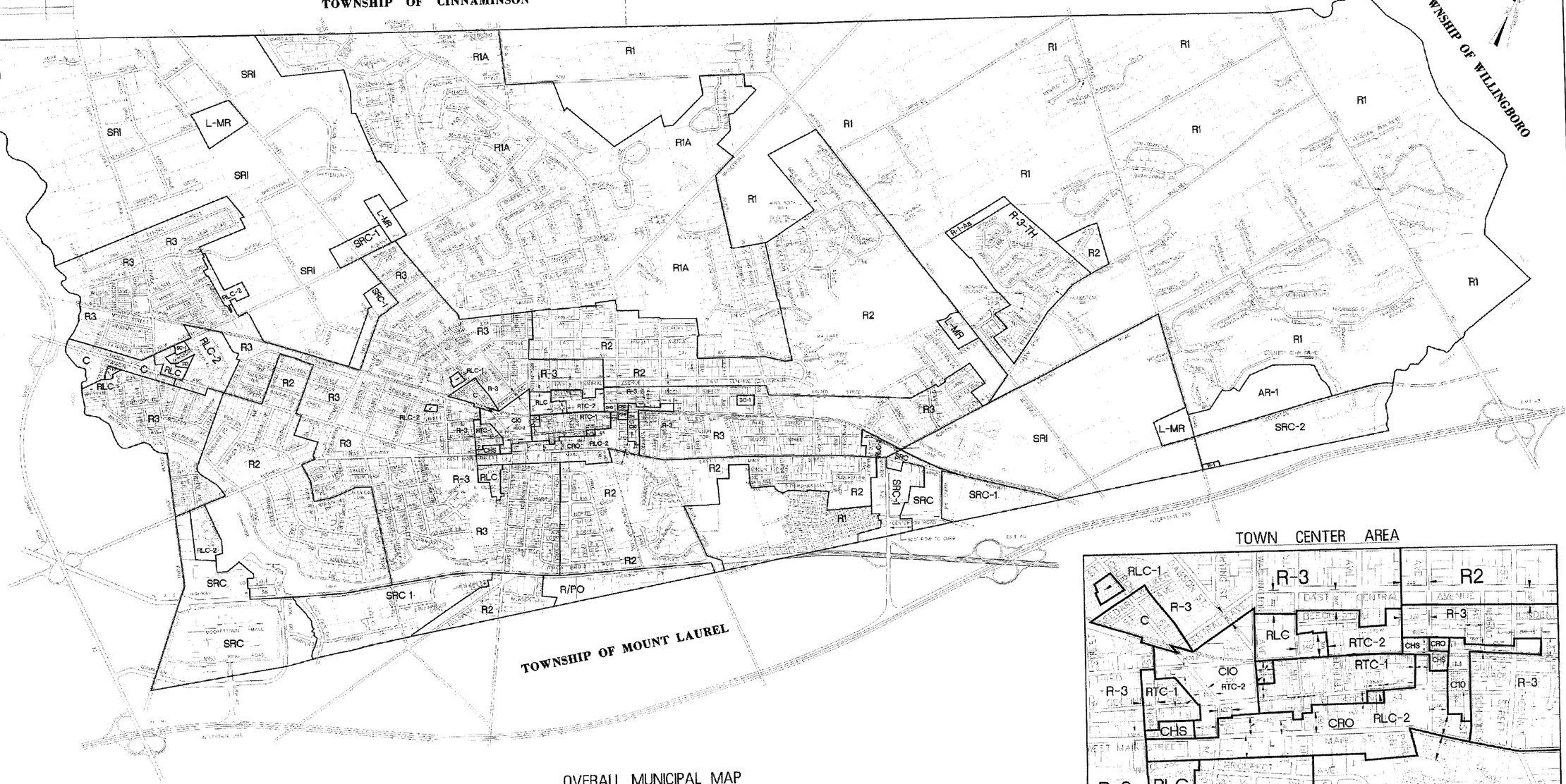
TOWNSHIP OF CINNAMINSON

TOWNSHIP OF DELRAN

TOWNSHIP OF WILLINGBORO

TOWNSHIP OF MAPLE SHADE

TOWNSHIP OF MOUNT LAUREL



OVERALL MUNICIPAL MAP

SCALE 1" = 800'

ZONING DISTRICT DESIGNATIONS

LAST REVISED MAY-29-2008 (Inc. Ord. Nos. 58-, 8- 7- 8- 9- 10- and 11-2008)

- R1 – RESIDENCE DISTRICT
- R2 – RESIDENCE DISTRICT
- R3 – RESIDENCE DISTRICT
- R1A – RESIDENCE DISTRICT
- R-1-A6 – RESIDENCE DISTRICT
- R-3-TH – RESIDENCE DISTRICT
- L-MR – LOW & MODERATE-INCOME RESIDENCE DISTRICT
- RTC-1 RESIDENCE TOWN CENTER – 1 DISTRICT
- RTC-2 RESIDENCE TOWN CENTER – 2 DISTRICT
- CIO – COMMERCIAL-INSTITUTIONAL/OFFICE DISTRICT
- CRO – COMMERCIAL-RETAIL/OFFICE DISTRICT
- CHS – COMMERCIAL HIGHWAY SERVICE DISTRICT
- C – COMMERCIAL DISTRICT
- R/PO – RESIDENTIAL/PROFESSIONAL OFFICE DISTRICT
- SRI – SPECIALLY RESTRICTED INDUSTRIAL DISTRICT
- SRC – SPECIALLY RESTRICTED COMMERCIAL DISTRICT
  - SRC-1
  - SRC-2
- RLC – RESIDENCE-LIMITED COMMERCIAL DISTRICT
  - RLC-1
  - RLC-2
- SC-1 – SENIOR CITIZEN RESIDENCE – 1 DISTRICT
- AR-1 – AGE-QUALIFIED RESIDENCE – 1 DISTRICT

TOWN CENTER AREA

ZONING MAP

Moorestown Township

BURLINGTON COUNTY NEW JERSEY

SCALE: AS NOTED DATE: 8-20-2008

CRAIG F. REMINGTON PROFESSIONAL PLANNER LIC. NO. 1877

JOSEPH M. PETRONGOLO PROFESSIONAL PLANNER LIC. NO. 5251

County of Burlington
STATE OF NEW JERSEY
CRAIG F. REMINGTON
PROFESSIONAL PLANNER LIC. NO. 1877

DISCLAIMER

THIS PLAN IS BASED ON THE ORIGINAL PREPARED BY PENNONI ASSOCIATES INC. CONSULTING ENGINEERS & PROFESSIONAL LAND SURVEYORS, ENTITLED "ZONING MAP" SITUATED IN THE TOWNSHIP OF MOORESTOWN, BURLINGTON COUNTY, NEW JERSEY, FILE NO. 30910002. LAST REVISED 12-9-2002 LAST PLOTTED 2-8-2003.

Appendix B -- Tables

Table 1: Build-Out Analysis for HUC14 Zones

Table 2: Pollutants Loads by Land Cover

Table 3: Nonpoint Source Load at Build-Out

Table 1: Build-Out Analysis for HUC14 Zones

HUC 14 and Zone	Total Area (Acres)	Existing Impervious* (%)	Existing Impervious (Acres)	Constrained Land** (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-out Impervious*** (Acres)
2040202100030 - *North Branch Pennsauken Creek*							
R2	117.61	20.00%	23.52	0.00	117.61	30%	35.28
R3	446.10	25.00%	111.52	13.31	432.78	35%	151.47
RLC	8.42	35.00%	2.95	0.00	8.42	90%	7.57
RLC-2	47.65	30.00%	14.29	0.00	47.65	50%	23.82
SC-1	1.59	35.00%	0.56	0.00	1.59	35%	0.56
C	29.20	50.00%	14.60	0.00	29.20	90%	26.28
SRI	880.51	50.00%	440.25	71.73	808.78	60%	485.27
TOTALS	**1,531.07**	**39.69%**	**607.70**	**85.04**	**1,446.03**	**50.50%**	**730.26**

* Estimate based on aerial photography, NJDEP impervious cover mapping and current land use
**Less Flood Plains, Waterways, and Green Acres areas
*** In Accordance with NJDEP (Developable Area x Allowable Impervious Percentage)

Table 1: Build-Out Analysis for HUC14 Zones

HUC 14 and Zone	Total Area (Acres)	Existing Impervious* (%)	Existing Impervious (Acres)	Constrained Land** (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-out Impervious*** (Acres)
2040202090020 - *Pompeston Creek*							
R1	319.51	5.00%	15.98	0.00	319.51	25%	79.88
RI-A	922.59	25.00%	230.65	45.28	877.30	30%	263.19
R2	73.06	25.00%	18.26	8.36	64.70	30%	19.41
R3	371.00	25.00%	92.75	27.55	343.45	35%	120.21
RLC	8.97	25.00%	2.24	0.00	8.97	90%	8.07
RLC-1	1.65	25.00%	0.41	0.00	1.65	60%	0.99
RLC-2	0.68	30.00%	0.20	0.00	0.68	50%	0.34
RTC-1	30.05	30.00%	9.01	0.00	30.05	60%	18.03
RTC-2	13.16	25.00%	3.29	0.00	13.16	40%	5.26
L-MR	10.80	0.00%	0.00	10.80	0.00	--------	--------
C	9.62	25.00%	2.40	0.00	9.62	90%	8.66
CIO	23.20	50.00%	11.60	0.00	23.20	67%	15.54
CRO	19.97	50.00%	9.99	0.00	19.97	80%	15.98
CHS	3.42	60.00%	2.05	0.00	3.42	80%	2.74
SRC-1	37.37	50.00%	18.69	3.61	33.76	65%	21.95
SRI	198.44	35.00%	69.45	25.89	172.55	60%	103.53
TOTALS	**2,043.49**	**23.83%**	**486.98**	**121.49**	**1,922.00**	**35.58%**	**683.78**

* Estimate based on aerial photography, NJDEP impervious cover mapping and current land use
**Less Flood Plains, Waterways, and Green Acres areas
*** In Accordance with NJDEP (Developable Area x Allowable Impervious Percentage)

Table 1: Build-Out Analysis for HUC14 Zones

HUC 14 and Zone	Total Area (Acres)	Existing Impervious* (%)	Existing Impervious (Acres)	Constrained Land** (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-out Impervious*** (Acres)
2040202100020 - *Strawbridge Lake*							
R1	145.38	10.00%	14.54	0.00	145.38	25%	36.34
R2	559.81	15.00%	83.97	73.23	486.58	30%	145.97
R3	298.29	15.00%	44.74	1.57	296.72	35%	103.85
RLC	7.42	30.00%	2.23	0.00	7.42	90%	6.68
RLC-2	16.33	30.00%	4.90	0.00	16.33	50%	8.16
R/PO	45.07	5.00%	2.25	0.00	45.07	40%	18.03
CRO	20.57	35.00%	7.20	0.00	20.57	80%	16.46
SRC	206.87	75.00%	155.15	0.00	206.87	65%	134.46
SRC-1	172.32	75.00%	129.24	0.00	172.32	65%	112.01
TOTALS	**1,472.04**	**30.18%**	**444.22**	**74.80**	**1,397.25**	**41.65%**	**581.97**
2040202080010 - *Parkers Creek*							
SRC-1	20.11	10.00%	2.01	0.00	20.11	65%	13.07
SRI	58.47	70.00%	40.93	0.00	0.00	60%	0.00
TOTALS	**78.58**	**54.65%**	**42.94**	**0.00**	**20.11**	**65.00%**	**13.07**

* Estimate based on aerial photography, NJDEP impervious cover mapping and current land use
**Less Flood Plains, Waterways, and Green Acres areas
*** In Accordance with NJDEP (Developable Area x Allowable Impervious Percentage)

Table 1: Build-Out Analysis for HUC14 Zones

HUC 14 and Zone	Total Area (Acres)	Existing Impervious* (%)	Existing Impervious (Acres)	Constrained Land** (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-out Impervious*** (Acres)
2040202090010 - Swede Run							
R1	970.20	5.00%	48.51	111.13	859.07	25%	214.77
R1A	214.45	25.00%	53.61	2.98	211.47	30%	63.44
R1-Aa	8.49	25.00%	2.12	0.00	8.49	30%	2.55
R2	571.61	25.00%	142.90	102.75	468.86	30%	140.66
R3	281.28	25.00%	70.32	4.69	276.59	35%	96.81
R3-TH	122.66	25.00%	30.67	0.00	122.66	35%	42.93
RLC-2	8.73	30.00%	2.62	0.00	8.73	50%	4.36
SC-1	2.20	15.00%	0.33	0.96	1.25	35%	0.44
L-MR	9.91	30.00%	2.97	9.91	0.00	--------	--------
CIO	7.98	40.00%	3.19	0.00	7.98	67%	5.35
CHS	1.23	40.00%	0.49	0.00	1.23	80%	0.98
CRO	6.53	40.00%	2.61	0.00	6.53	80%	5.22
SRC	5.09	30.00%	1.53	0.00	5.09	65%	3.31
SRI	241.38	70.00%	168.97	0.00	241.38	60%	144.83
TOTALS	**2,451.75**	**21.65%**	**530.85**	**232.41**	**2,219.34**	**32.70%**	**725.65**

* Estimate based on aerial photography, NJDEP impervious cover mapping and current land use
**Less Flood Plains, Waterways, and Green Acres areas
*** In Accordance with NJDEP (Developable Area x Allowable Impervious Percentage)

Table 1: Build-Out Analysis for HUC14 Zones

HUC 14 and Zone	Total Area (Acres)	Existing Impervious* (%)	Existing Impervious (Acres)	Constrained Land** (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-out Impervious*** (Acres)
2040202080040 - *Kendles Run*							
R1	1,127.71	5.00%	56.39	121.16	1,006.55	25%	251.64
TOTALS	**1,127.71**	**5.00%**	**56.39**	**121.16**	**1,006.55**	**25.00%**	**251.64**
2040202080020 - *Rancocas Creek*							
R1	640.85	5.00%	32.04	39.92	600.93	25%	150.23
AR-1	66.59	5.00%	3.33	18.37	48.23	35%	16.88
L-MR	12.13	10.00%	1.21	4.75	7.38	--------	--------
SRC-2	105.97	50.00%	52.98	0.00	105.97	65%	68.88
SRI	76.25	50.00%	38.13	0.00	76.25	60%	45.75
TOTALS	**901.79**	**14.16%**	**127.69**	**63.03**	**838.75**	**33.59%**	**281.74**

* Estimate based on aerial photography, NJDEP Impervious cover mapping and current land use
**Less Flood Plains, Waterways, and Green Acres areas
*** In Accordance with NJDEP (Developable Area x Allowable Impervious Percentage)

Table 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/year)
High, Medium Density Residential	1.4	15	140
Low Density, Rural Residential	0.6	5	100
Commercial	2.1	22	200
Industrial	1.5	16	200
Urban, Mixed Urban, Other Urban	1	10	120
Agricultural	1.3	10	300
Forest, Water Wetlands	0.1	3	40
Barrenland/ Transitional Area	0.5	5	60

Table 3: Nonpoint Source Loads at Build-out

HUC 14 and Zone	Land Cover	Developable Area (Acres)	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/year)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
20402021000030 - *North Branch Rennsauken Creek*								
R2	Low Density, Rural Residential	117.61	0.60	70.57	5.00	588.05	100.00	11,761.00
R3	High/ Medium Density Residential	432.78	1.40	605.89	15.00	6,491.70	140.00	60,589.20
RLC	Urban, Mixed Urban, Other	8.42	1.00	8.42	10.00	84.20	120.00	1,010.40
RLC-2	Urban, Mixed Urban, Other	47.65	1.00	47.65	10.00	476.50	120.00	5,718.00
SC-1	High/ Medium Density Residential	1.59	1.40	2.23	15.00	23.85	140.00	222.60
C	Commercial	29.20	2.10	61.32	22.00	642.40	200.00	5,840.00
SRI	Industrial	808.78	1.50	1213.17	16.00	12,940.48	200.00	161,756.00
TOTALS				**2009.24**		**21,247.18**		**246,897.20**

Table 3: Nonpoint Source Loads at Build-out

HUC 14 and Zone	Land Cover	Developable Area (Acres)	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/year)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
2040202090020 - *Pompeston Creek*								
R1	Low Density, Rural Residential	319.51	0.60	191.71	5.00	1,597.55	100.00	31,951.00
RI-A	Low Density, Rural Residential	877.30	0.60	526.38	5.00	4,386.50	100.00	87,730.00
R2	Low Density, Rural Residential	64.70	0.60	38.82	5.00	323.50	100.00	6,470.00
R3	High/ Medium Density Residential	343.45	1.40	480.83	15.00	5,151.75	140.00	48,083.00
RLC	Urban, Mixed Urban, Other	8.97	1.00	8.97	10.00	89.70	120.00	1,076.40
RLC-1	Urban, Mixed Urban, Other	1.65	1.00	1.65	10.00	16.50	120.00	198.00
RLC-2	Urban, Mixed Urban, Other	0.68	1.00	0.68	10.00	6.80	120.00	81.60
RTC-1	Urban, Mixed Urban, Other	30.05	1.00	30.05	10.00	300.50	120.00	3,606.00
RTC-2	High/ Medium Density Residential	13.16	1.00	13.16	10.00	131.60	120.00	1,579.20
L-MR	Commercial	0.00	1.40	0.00	15.00	0.00	140.00	0.00
C	Commercial	9.62	2.10	20.20	22.00	211.64	200.00	1,924.00
CIO	Commercial	23.20	2.10	48.72	22.00	510.40	200.00	4,640.00
CRO	Commercial	19.97	2.10	41.94	22.00	439.34	200.00	3,994.00
CHS	Commercial	3.42	2.10	7.18	22.00	75.24	200.00	684.00
SRC-1	Commercial	33.76	2.10	70.90	22.00	742.72	200.00	6,752.00
SRI	Industrial	172.55	1.50	258.83	16.00	2,760.80	200.00	34,510.00
TOTALS				**1740.01**		**16744.54**		**233,279.20**

Table 3: Nonpoint Source Loads at Build-out

HUC 14 and Zone	Land Cover	Developable Area (Acres)	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/year)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
2040202100020 - *Strawbridge Lake*								
R1	Low Density, Rural Residential	145.38	0.60	87.23	5.00	726.90	100.00	14,538.00
R2	Low Density, Rural Residential	486.58	0.60	291.95	5.00	2,432.90	100.00	48,658.00
R3	High/ Medium Density Residential	296.72	1.40	415.41	15.00	4,450.80	140.00	41,540.80
RLC	Urban, Mixed Urban, Other	7.42	1.00	7.42	10.00	74.20	120.00	890.40
RLC-2	Urban, Mixed Urban, Other	16.33	1.00	16.33	10.00	163.30	120.00	1,959.60
R/PO	High/ Medium Density Residential	45.07	1.40	63.10	15.00	676.05	140.00	6,309.80
CRO	Commercial	20.57	2.10	43.20	22.00	452.54	200.00	4,114.00
SRC	Commercial	206.87	2.10	434.43	22.00	4,551.14	200.00	41,374.00
SRC-1	Commercial	172.32	2.10	361.87	22.00	3,791.04	200.00	34,464.00
TOTALS				**1720.93**		**17318.87**		**193,848.60**
2040202080010 - *Parkers Creek*								
SRC-1	Commercial	20.11	2.10	42.23	22.00	442.42	200.00	4,022.00
SRI	Industrial	0.00	1.50	0.00	16.00	0.00	200.00	0.00
TOTALS				**42.23**		**442.42**		**4,022.00**

Table 3: Nonpoint Source Loads at Build-out

HUC 14 and Zone	Land Cover	Developable Area (Acres)	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/year)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
204020209010 - *Swede Run*								
R1	Low Density, Rural Residential	859.07	0.60	515.44	5.00	4,295.35	100.00	85,907.00
R1A	Low Density, Rural Residential	21.47	0.60	12.88	5.00	107.35	100.00	2,147.00
R1-Aa	Low Density, Rural Residential	8.49	0.60	5.09	5.00	42.45	100.00	849.00
R2	High/ Medium Density Residential	468.86	0.60	281.32	5.00	2,344.30	100.00	46,886.00
R3	High/ Medium Density Residential	276.59	1.40	387.23	15.00	4,148.85	140.00	38,722.60
R3-TH	Urban, Mixed Urban, Other	122.66	1.40	171.72	15.00	1,839.90	140.00	17,172.40
RLC-2	High/ Medium Density Residential	8.73	1.00	8.73	10.00	87.30	120.00	1,047.60
SC-1	High/ Medium Density Residential	1.25	1.40	1.75	15.00	18.75	140.00	175.00
L-MR	Commercial	0.00	1.40	0.00	15.00	0.00	140.00	0.00
CIO	Commercial	7.98	2.10	16.76	22.00	175.56	200.00	1,596.00
CHS	Commercial	1.23	2.10	2.58	22.00	27.06	200.00	246.00
CRO	Commercial	6.53	2.10	13.71	22.00	143.66	200.00	1,306.00
SRC	Industrial	5.09	2.10	10.69	22.00	111.98	200.00	1,018.00
SRI		241.38	1.50	362.07	16.00	3,862.08	200.00	48,276.00
TOTALS				**1789.98**		**17204.59**		**245,348.60**

Table 3: Nonpoint Source Loads at Build-out

HUC 14 and Zone	Land Cover	Developable Area (Acres)	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/year)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
2040202080040 - *Kendles Run*								
R1	Low Density, Rural Residential	1006.55	0.60	603.93	5.00	5,032.75	100.00	100,655.00
TOTALS				**603.93**		**5,032.75**		**100,655.00**
2040202080020 - *Rancocas Creek*								
R1	Low Density, Rural Residential	600.93	0.60	360.56	5.00	3,004.65	100.00	60,093.00
AR-1	High/ Medium Density Residential	48.23	1.40	67.52	15.00	723.45	140.00	6,752.20
L-MR	High/ Medium Density Residential	7.38	1.40	10.33	15.00	110.70	140.00	1,033.20
SRC-2	Commercial	105.97	2.10	222.54	22.00	2,331.34	200.00	21,194.00
SRI	Industrial	76.25	1.50	114.38	16.00	1,220.00	200.00	15,250.00
TOTALS				**775.32**		**7390.14**		**104,322.40**