STORMWATER MANAGEMENT PLAN

FOR THE

TOWNSHIP OF CLARK

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Introduction

As per the provisions of the Municipal Stormwater Permit (NJG0154971PI), the Township is required to review and update its Stormwater Management Plan periodically. Township Stormwater Management Plan dated May 2005 has been reviewed and updated as needed. This Municipal Stormwater Management Plan (MSWMP) documents the strategy for Clark Township ("the Township") to address stormwater-related impacts. The periodic review 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 acres of land. These standards are intended to minimize the adverse impact of stormwater runoff on water quality and water quantity and the loss of groundwater recharge that provides base flow in receiving water bodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities.

The plan also addresses the review and update of existing ordinances, the Township Master Plan and other planning documents to allow for project designs that include low impact development techniques. The final component of this plan is a mitigation strategy for when a variance or exemption of the design and performance standards is sought. As part of the mitigation section of the stormwater plan, specific stormwater management measures are identified to lessen the impact of existing development.

A "build-out" analysis, normally required in developing communities, has not been included in this plan. Since the combined total of vacant land and agricultural land is less than one square mile, Clark is not required to prepare a Land Use/Build Out Analysis.

Goals

The goals of this MSWMP are to:

- Reduce flood damage, including damage to life and property;
- Minimize, to the extent practical, any increase in stormwater runoff from any new development;
- Reduce soil erosion from any development or construction project;
- Assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
- Maintain groundwater recharge;
- Prevent, to the greatest extent feasible, an increase in non-point 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 to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational industrial and other uses of water, and

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

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

Stormwater Discussion

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

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

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

Background

Clark Township was a small quiet farm community, but as the years went by Clark would slowly change. In the early part of the century, large farms were slowly being sub-divided into smaller track farms. It was not until State Highway No. 4, present day Garden State Parkway, cut the town in half, that the community witnessed massive change. Many farmers facing economic changes, as well as the need for the housing shortage of post World War II, began to sell their land to housing developers. It is these land developers who in a period of 40 years, 1949 to 1989, changed the appearance of Clark, from a community of wide open land to a town with numerous housing developments and business centers.

As seen in the current land use map (Figure 1-A) and the current zoning map (Figure 2), Clark has been built out in a typical suburban fashion. The older neighborhoods have slightly smaller lots, with neighborhood commercial areas closer together. The neighborhoods that developed later show the influence of the increased availability of automobiles, with larger lots and longer distances to commercial areas.

The following table shows the amount of land devoted to each type of land use in 1978, 1990 and 1999. The most significant changes are the slight reduction in Residential land, along with the increase in land used for both Commercial uses and Open Space and Recreation. The larger amount of vacant land indicates the preparation of land for redevelopment as a result of the Township's previous built-out stage. Not much undeveloped land remains that has not already been dedicated to recreation and conservation. Therefore the slow and eventual redevelopment of the Township is the only medium through which to increase the quality of life.

Land Use by Percent of Total Land Area

Land Use Type	1978	1990	1999	2009
Single-Family Residential	41.3%	42.7%	39.8%	43.6%
Multi-Family Residential	1 9%	2.2%	1.2%	1.4%
Commercial	2.6%	3.5%	4.5%	4.8%
Industrial	8.0%	7.7%	4.0%	3.5%
Public Land and Parks	16.8%	16.7%	21.9%	25.6%
Quasi-Public	3.5%	3.5%	3.5%	2.3%
Farm	0.9%	0.7%	0.4%	0.1%
Vacant	2.4%	0.3%	7.8%	1.7%
Utilities/ Railroad	1.1%	1.1%	0.7%	0.7%
Streets (Local, County & State)	15.8%	15.9%	16.2%	16.3%

The Township of Clark has a stable, homogeneous population. Typical of many Post-War suburbs, Clark was filled with split-level Ranch and Cape Cod style housing in the two decades following WWII. The incoming residents of Clark were mostly middle-class, white and blue-collar families. The access to industry and the bustling New York Metropolitan Area made Clark an ideal town for those who desired the ease of suburban living close to the amenities of a large population base. Clark grew into a stable suburb.

The Township encompasses a total land area of 4.34 square mile area in Union County, New Jersey. In recent years, the Township's population has decreased from 16,699 in 1980 to 14,629 in 1990 to 14,597 in 2000.

The Township is near a maximum for stormwater runoff volumes and pollutant loads to the waterways of the municipality. Figure 3 illustrates the waterways in the Township.

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 following information is based on Round 3 of AMNET reports for biological and habitat ratings in the Raritan Region:

The waterways that run through Clark Township are the North Branch of the Rahway River, the Robinson's Branch of the Rahway River and Pumpkin Patch Brook.

The North Branch of the Rahway River sits between water quality stations ANO_{194} and ANO_{195} which are both classified as moderately impaired. That reach of the waterway is impaired for Total Phosphorous and Fecal Coliform.

The Robinsons branch of the Rahway River sits between water quality stations ANO_{198} and ANO_{199}, both considered moderately impaired. That reach of the waterway is impaired for Total Phosphorous and Fecal Coliform.

The Pumpkin Patch Brook runs into the Robinsons Branch of the Rahway River. Pumpkin Patch Brook is suspected of being impaired for Total phosphorous and Fecal coliform. However, there are no water quality stations along that reach of the waterway, therefore it is unclear if the waterway is considered moderately or severely impaired.

These data show that the instream total phosphorus concentrations and fecal coliform concentrations of Clarks' waterways exceed the state's criteria. This means that these waterways are impaired waterways. NJDEP will be developing a Total Maximum Daily Load (TMDL) for these pollutants for each waterway in the future.

A TMDL is the amount of a pollutant that can be accepted by a water body without causing an exceedance of water quality standards or interfering with the ability to use a water body for one or more of its designated uses. The allowable load is allocated to the various sources of the pollutant, such as stormwater and wastewater discharges, which require an NJPDES permit to discharge, and 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.

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

In addition to water quality problems, the Township has exhibited water quantity problems including flooding, stream bank erosion, and diminished base flow in its streams. Many 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 causing a backwater effect and flooding upstream.

These culverts were designed for much different hydrologic conditions (i.e., less impervious area) than presently exist in the Township. As the impervious coverage increased in the upper basin and the Township, the peak flow and volumes of stream flows has increased. The increased volume of water and associated velocities resulted in stream bank erosion, which resulted in unstable areas particularly at roadway/bridge crossings, and degraded stream habitats. The high percentage of impervious coverage in the Township has significantly decreased groundwater recharge, and 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 are shown in Figure 4, Wellhead protection areas are shown in Figure 5 and Wetlands areas, also required as part of the MSWMP, are shown in Figure 6.

Typically, the Statewide stormwater management regulations (N.J.A.C.7:8-5.4) require that new development plans should consider a groundwater re-charge component to mitigate losses in recharge due to development. The New Jersey State Plan Policy Map has delineated the Township of Clark to be within Metropolitan Planning Area (PA1). The N.J.D.E.P. has included Metropolitan Planning Areas in their definition of "Urban Redevelopment Areas". By that definition, the groundwater recharge requirement does not apply.

Design and Performance Standards

The Township has adopted the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies. Such standards will be reviewed and this document will be revised as needed for consistency. The design and performance standards include the language for maintenance of stormwater management measures consistent with the stormwater management rules at N.J.A.C. 7:8-5.8 Maintenance Requirements, and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The ordinances, revised if needed, will be submitted to Union County for review.

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

Plan Consistency

The Township of Clark is in the Robinson's Branch Regional Stormwater Management Planning Area and Clark is working with others to develop the Robinson's Branch Regional Stormwater Management Plan. Once this plan has been established and adopted, Clark Township's MSWMP will be amended as needed to be consistent with it.

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

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

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

Non-Structural Stormwater Management Strategies

The Township has reviewed the master plan and ordinances, and the following ordinances are identified for revision. Once the ordinance texts are completed, they will be submitted to the county review agency for review and approval within [24 months of the effective date of the Stormwater Management Rules]. A copy will be sent to the Department of Environmental Protection at the time of submission. Below is a copy of the proposed chapter.

Property Management

Chapter 17-4 Connection of Sump Pumps: Existing homes must connect sump pumps to the nearest existing storm sewer system if flows from same create a safety hazard, including flooding, icing, etc. as determined by the Township.

Stormwater Management

Chapter 35-4: Twenty percent (20) of all impervious surfaces or roof areas greater than 5,000 square feet will be required to be disconnected prior to resurfacing, excluding Municipal or County owned roadways, properties, etc. Runoff from the roofs should be infiltrated for the 2 year storm while disconnected pavement areas should be pretreated. A waiver may be granted subject to mitigation measures and/or contribution to a Township Stormwater Management Fund in an amount calculated by the Township Engineer.

Any disturbance or improvements to areas greater than 5,000 SF of impervious area that cannot disconnect paved or roof areas must pay $1.00/SF for the first 10,000 SF of the calculated disconnected area and $0.25/SF for the remaining area. (For example, Site A has an impervious pavement/ roof area of 60,000 SF, and cannot disconnect, then they must pay a fee based on 12,000 SF (20% of 60,000 SF) equaling $10,000 for the first 10,000 SF and $500 for the remaining 2,000 SF.

All major development will offset construction by contributing $0.10/SF of developed area to a fund that will be dedicated to reforestation, beneficial tree planting or to a Township managed tree protection and preservation.

Chapter 35-10.2: As stated in Chapter 17-4, Property Management, existing homes must connect sump pumps to the nearest storm sewer if flows create a safety hazard as determined by the Engineer.

The Township has 6 types of residential districts. Each single family district has a maximum percent building coverage allocation, ranging from 15 percent for the R-150 Zone, which has a minimum lot size of 15,000 sf for detached single-family homes, to 30 percent for the R-60 Zone, which has a minimum lot size of 6,000 square feet. The RA and RB Zone permits multi-family housing and each has a maximum percent building coverage allocation of 20% and an impervious area limitation of 45% which includes the building coverage. The minimum lot area in this zone is one acre.

The Township has 6 types of non-residential districts. Each of these districts has a maximum percent building coverage allocation, ranging from 25 percent for the CP and COH Zones to 40 percent for the CN Zone. The I Zone has a maximum percent building coverage allocation of 35% and an impervious area limitation of 85% which includes the building coverage. Although each zone has a maximum allowable percent impervious surface, the Township Code was amended to remind developers that satisfying the percent impervious requirements does not relieve them of responsibility for complying with the Design and Performance Standards for Stormwater Management Measures contained in Chapter 35 – Stormwater Management. Also, if a developer is given a variance to exceed the maximum allowable percent impervious coverage limit, the developer must mitigate the impact of the additional impervious surfaces. This mitigation effort must address water quality, flooding, and groundwater recharge as described in Chapter 35.

Land Use and Build Out Analysis

As seen in the current land use map (Figure 1-A) Clark has been built out in a typical suburban fashion. The table included in the Background section shows the amount of land devoted to each type of land use in 1978, 1990 and 1999.

If a municipality can document that it has a combined total of less than one square mile of vacant or agricultural lands, the municipality is not required to complete a build-out analysis.

In the case of Clark Township, the total amount of agricultural land and vacant land totals 1.8% of the township. With a total land area of 4.34 square miles, the total amount of agricultural land and vacant land totals 0.36 square miles; far below the threshold.

Mitigation Plans

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

Mitigation Project Criteria

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

The applicant can select one or more projects from a list of specific projects developed by the Township Engineer to compensate for the deficit from the performance standards resulting from the proposed project. Listed below are specific projects that can be used to address the mitigation requirement.

Groundwater Recharge

- Provide recharge beds at municipal building and school sites and connect roof leaders.
- Provide overflow parking at all school sites with grass-tex block pavers, a permeable pavement.
- Provide Bio-retention processes, such as rain gardens to treat flow coming off of parking lots.

Water Quality

- Construct a vehicle washing area for use by the Township organizations for fund-raising activities.
- Retrofit existing drainage inlets throughout the township with new castings to meet the NJDEP requirements.
- Reconstruct existing outfalls with new structures, rip-rap and vegetation.

Water Quantity

- Assist in the dredging and de-snagging of Clark Township's streams and rivers to increase stream capacity and to reduce flooding.

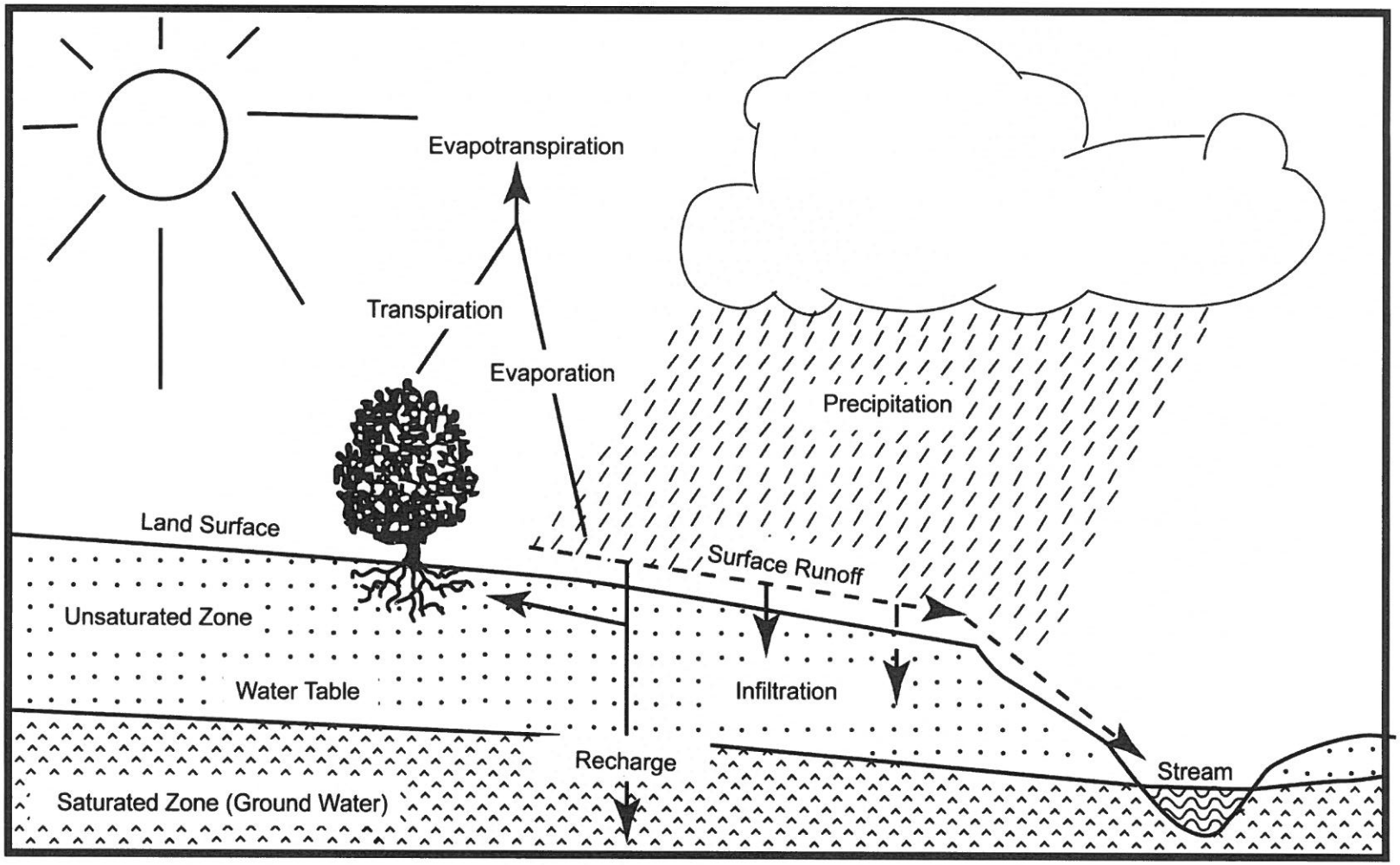
- Disconnect impervious coverage at Municipal parking lots.

The Township may allow a developer to provide funding or partial funding to the municipality for an environmental enhancement project that has been identified in a Municipal Stormwater Management Plan, or towards the development of a Regional Stormwater Management Plan. 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 Township should address stream bank erosion along the Township rivers and streams.

Figure 1: Groundwater Recharge in the Hydrologic Cycle
Source: New Jersey Geological Survey Report GSR-32.



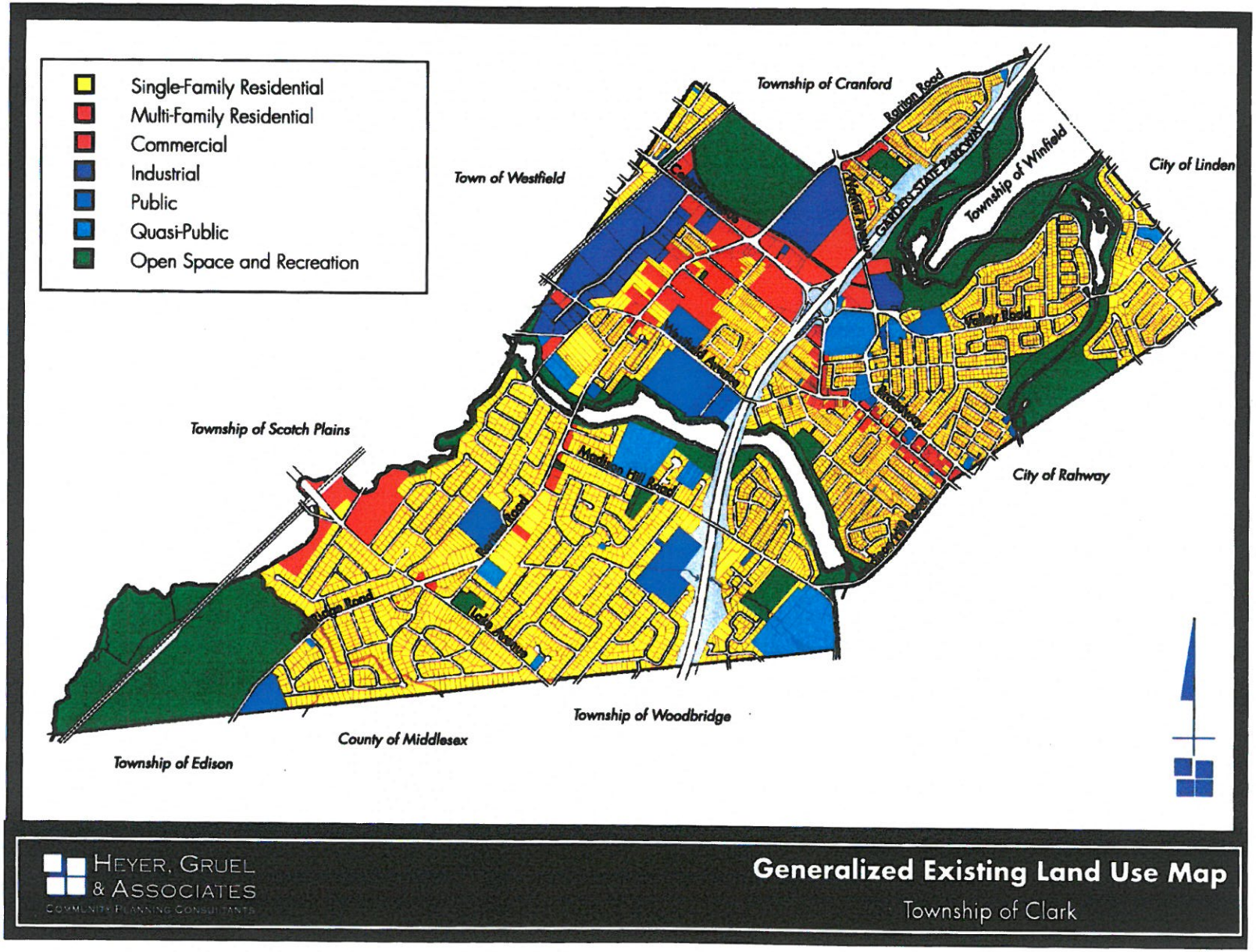


Figure 1-A: Generalized Existing Land Use Map
Source: Heyer, Gruel & Associates

Figure 2: Township and Its Waterways

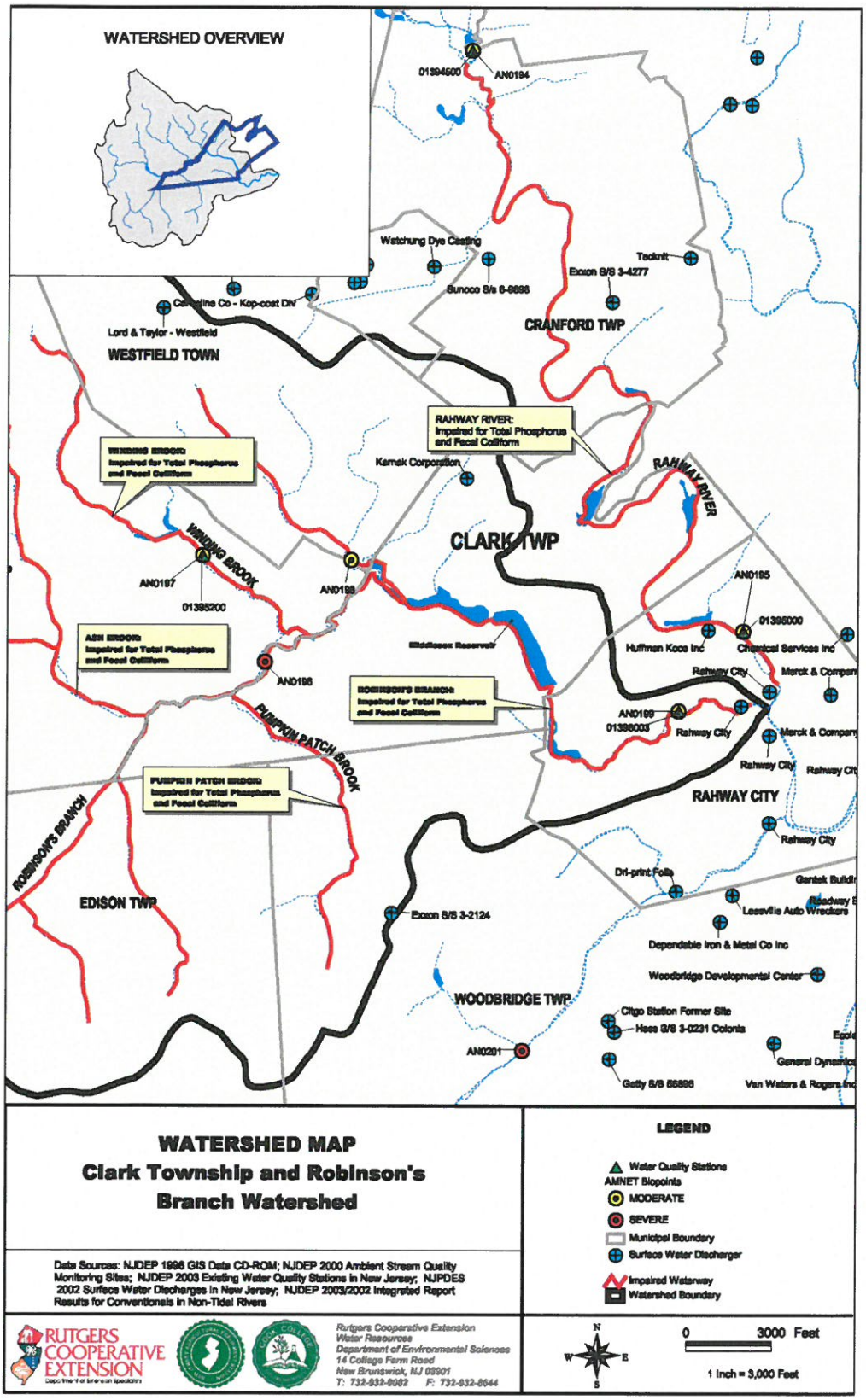


Figure 3: Township Boundary on USGS Quadrangles

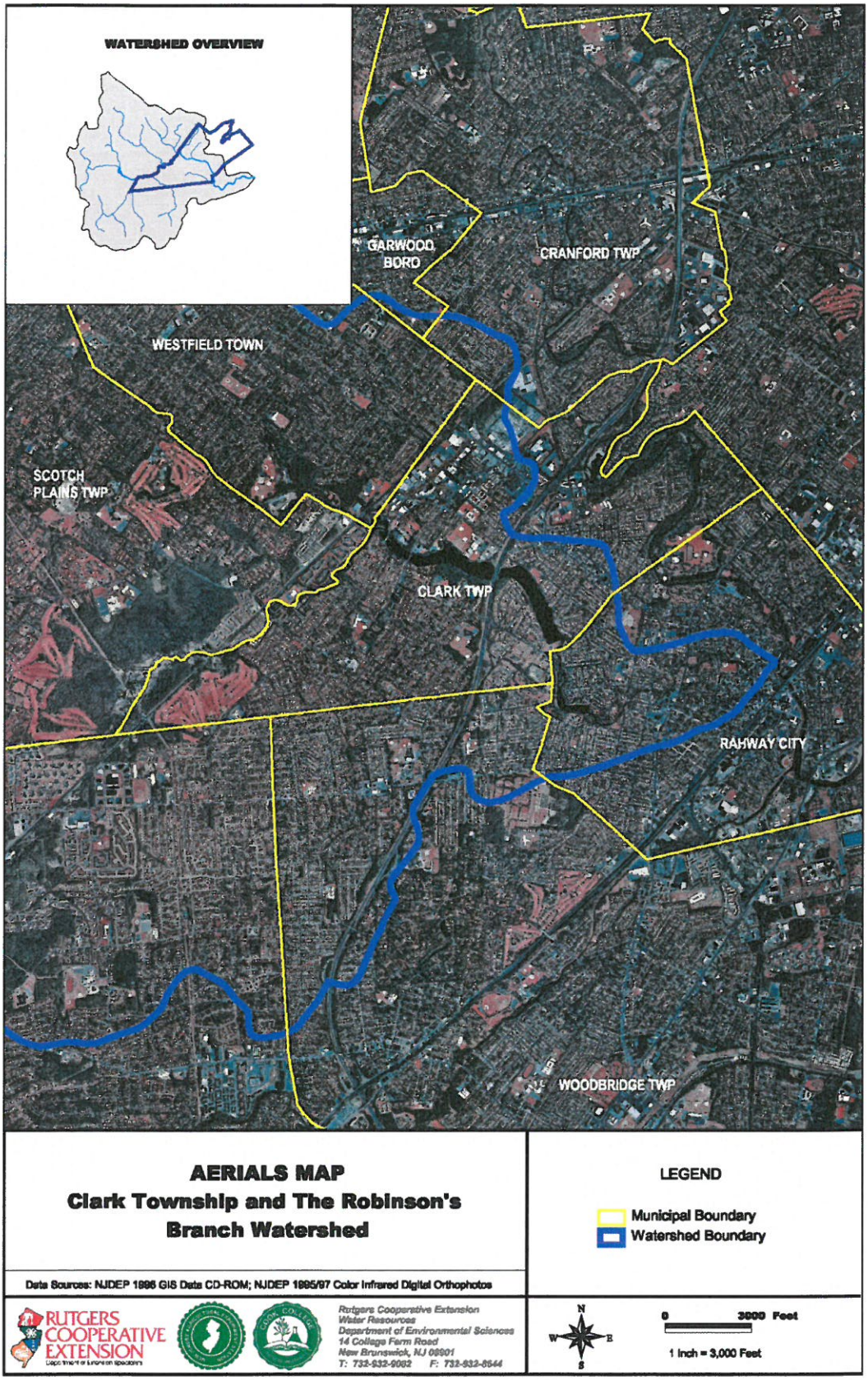


Figure 4: Groundwater Recharge Areas in the Township

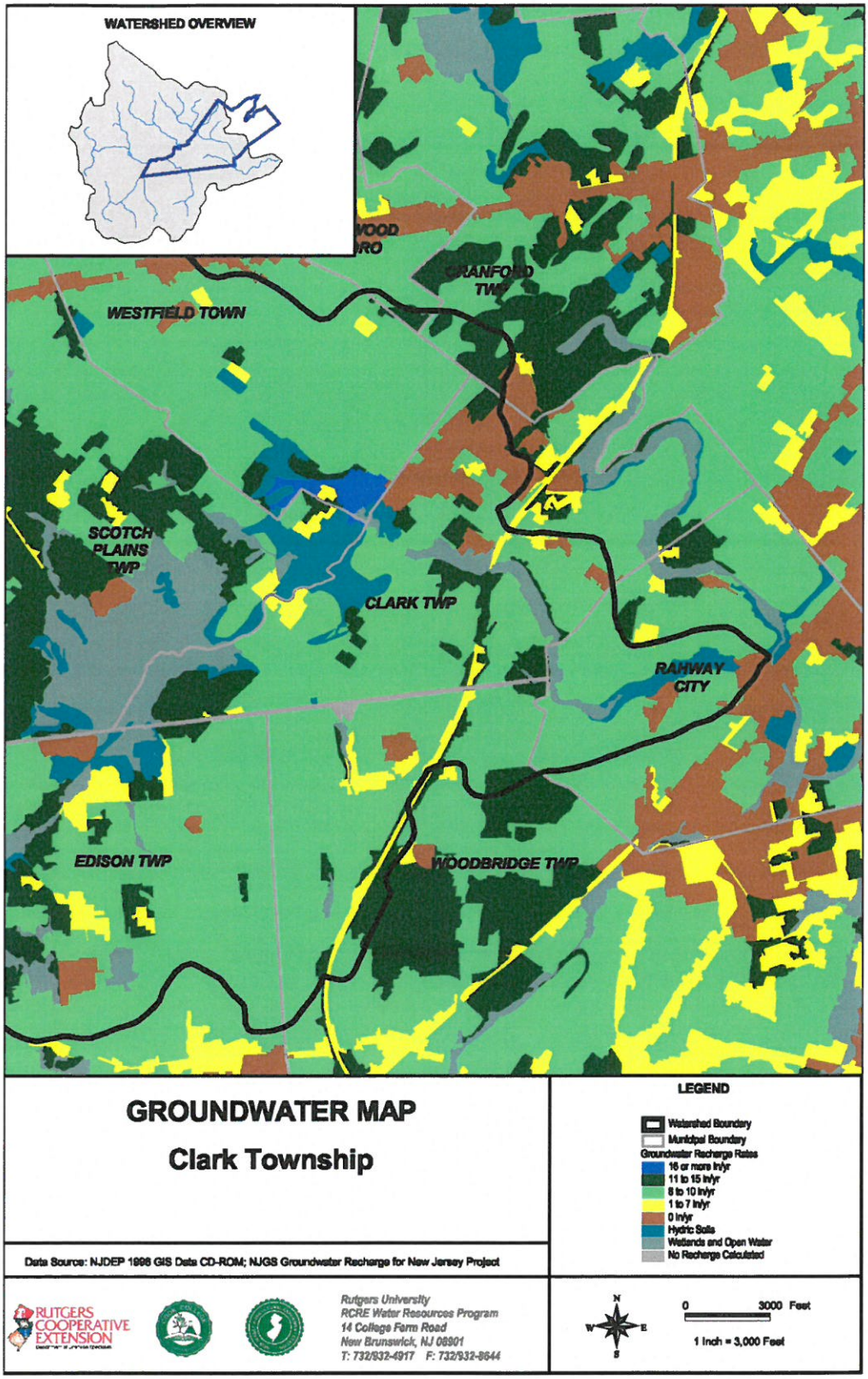


Figure 5: Wellhead Protection Areas in the Township