

Municipal Stormwater Management Plan

for the

Township of North Bergen Hudson County, New Jersey



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I. INTRODUCTION

This Municipal Stormwater Management Plan (hereinafter the MSWMP or the Plan) documents the strategy for the Township of North Bergen (the Township) to address stormwater-related impacts. The creation of this Plan is required by N.J.A.C. 7:14A-25 Municipal Stormwater Regulations.

This Plan contains 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 developments, defined as projects that disturb one or more acres of land or increasing impervious surface by one-quarter acre. These standards are intended to minimize the adverse impact of stormwater runoff on water quality, water quantity and the loss of groundwater recharge that provides baseflow in receiving water bodies.

The Plan describes long-term operation and maintenance measures for existing and future stormwater facilities. A build-out analysis is not required in this Plan based upon existing zoning and land available for development. The Plan also addresses the review and update of existing ordinances, the Township Master Plan and other planning documents to allow for project designs that include low-impact development techniques. The Township Master Plan was last reviewed in 2003. 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 Plan, specific stormwater management measures are identified to lessen the impact of existing development.

II. GOALS

The goals of this MSWMP are to:

- ***Reduce flood damage, including damage to life and property.***

The Township is currently incorporating several non-structural stormwater strategies into their Zoning and Site Plan ordinances. The purpose of some of these non-structural strategies is to reduce flooding and therefore reduce damage to life and property.

- ***Minimize, to the extent practical, any increase in stormwater runoff from any new development.***

Current Residential Site Improvement Standards (RSIS) require a reduction in runoff during all rain events for residential developments. Commercial developments will be required to follow all regulations in N.J.A.C. 7:8 and 7:15 to minimize any increase in stormwater runoff.

- ***Reduce soil erosion from any development or construction project.***

Currently, all development projects are required to obtain approval from the Bergen County Soil Conservation District if their area of disturbance is above 5,000 square feet. The BCSCD will only approve the application if the proper soil erosion measures have been proposed.

- ***Assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures.***

The Township is working to eliminate pollution and minimize soil erosion by adopting various ordinances. Also, as part of their Stormwater Pollution Prevention Plan (SP3), the

Township is required to retro-fit all existing inlets with new NJDEP approved curb pieces. This will also help limit litter in the Township's stormwater systems and prevent any blockages.

- ***Maintain groundwater recharge.***

The Township currently enforces existing ordinances limiting the amount of development that can occur on any particular site. This can maintain or increase the groundwater recharge by simply limiting the amount of maximum impervious coverage allowed. The Township is also working to reinforce its current ordinance with new non-structural stormwater strategies such as driveway swales or porous pavement which will allow for increased groundwater recharge.

- ***Prevent, to the greatest extent feasible, an increase in non-point pollution.***

The Township has recently adopted several ordinances with applicable fines to help prevent non-point source pollution. These ordinances include litter, wildlife feeding, pet waste, and yard waste management.

- ***Maintain the integrity of stream channels for their biological functions, as well as for drainage.***

As stated above, the Township has adopted wildlife feeding and pet waste ordinances. These ordinances will decrease the amount of biological pollutants allowed to reach the Township's waterways and assist in reducing or preventing TMDL's.

- ***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.

As part of the SP3, the Township began a public education program. The Township is required to inform its residents concerning the consequences of pollution and instruct them in its prevention.

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

The Township will require that future development must meet the Safety Standards for Stormwater Management Basins as outlined in N.J.A.C. 7:8-6.

To achieve these goals, this Plan outlines specific stormwater design and performance standards for new development. Additionally, 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.

III. STORMWATER DISCUSSION

Land development can dramatically alter the hydrologic cycle (Image 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.

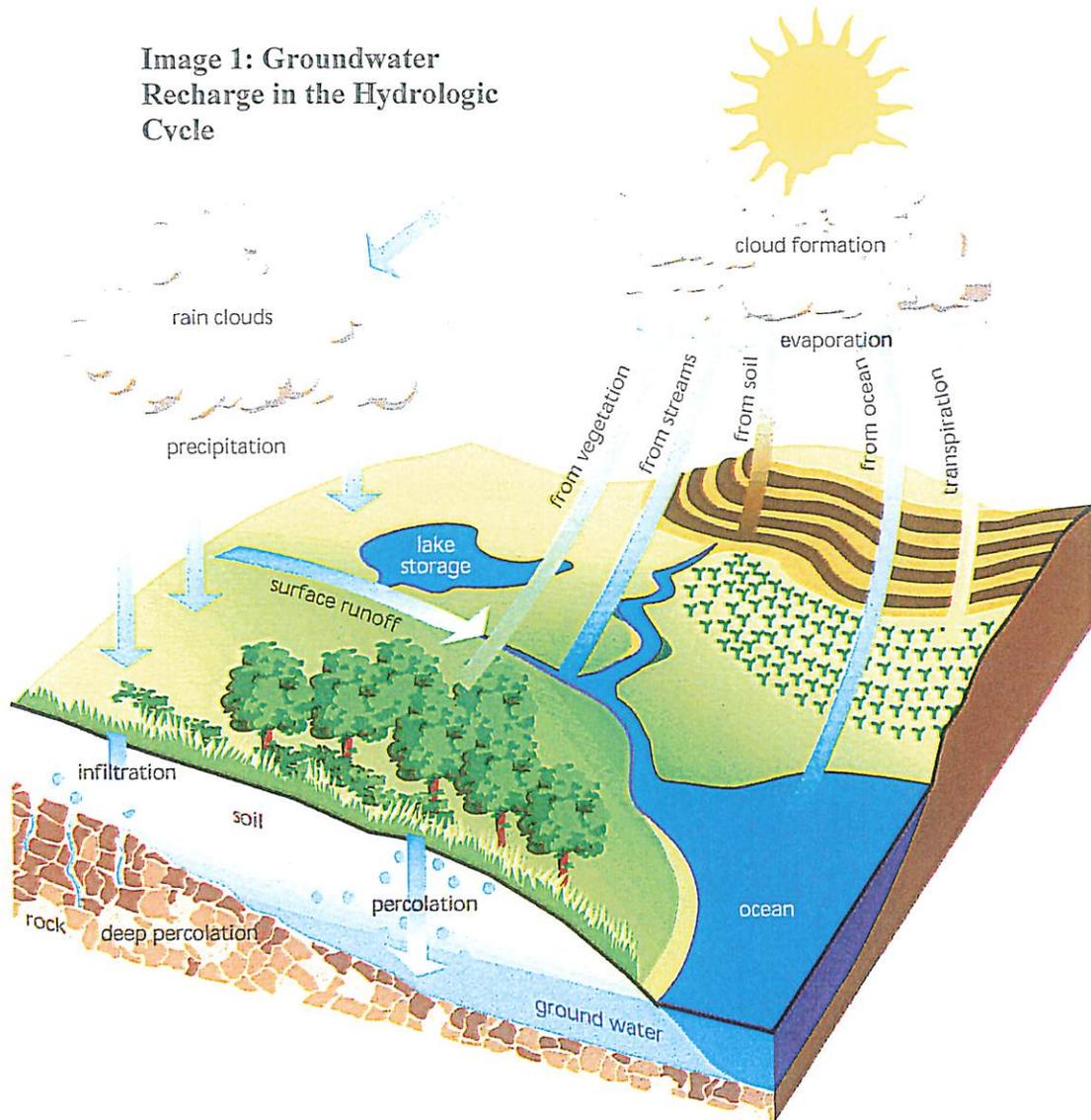
Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration 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.

Image 1: Groundwater Recharge in the Hydrologic Cycle



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.

IV. BACKGROUND

North Bergen encompasses 5.19-square miles in northeastern Hudson County, New Jersey. The Township is largely built-out with 449-acres of remaining developable open space, equating to approximately 13.5% of New North Bergen's total area. The Township depends entirely on sanitary sewers with few septic systems. Additionally, United Water supplies almost 100% of the Township's potable water. **Figure 1** illustrates North Bergen's waterways while **Figure 2** depicts the Township boundary on the United States Geological Survey (USGS) Quadrangle Maps. Since there are no potable public supply wells in the Township, a wellhead protection map is not provided.

The Township's population increased from 47,019 in 1980 to 48,414 in 1990 and increased again to 58,092 in 2000. This population increase has likely resulted in a demand for new development. Since North Bergen is an older primarily developed community, increased stormwater runoff volumes and pollutant loadings have likely impacted the Township's waterways. Dwelling units constructed since the 1980s may implement some of the new performance standards and best management practices (BMP) to alleviate increased stormwater runoff and pollutant loadings. Hudson County does not have any soil maps for North Bergen, however, due to the Township's topographic and geologic characteristics, groundwater recharge is most likely minimal.

The Township's major watercourses are as follows:

- Hudson River (SE2)

The Hudson River flows north to south along the Township's eastern border. The Surface Water Quality Standard (SWQS) assigned the Hudson River a SE2. The river is classified as a saline estuary (SE2).

- Hackensack River (SE2)

The Hackensack River flows north to south along the Township's western border with Carlstadt and has been assigned a SE2 SWQS. The SE2 designation is a classification applied to saline estuaries.

- Bellman's Creek (FW2-NT/SE2)

Bellman's Creek flows east to west along the northwestern border of the Township before emptying into the Hackensack River. The creek is assigned a FW2-NT/SE2 classification indicating a general surface water (FW2) and saline estuary (SE2), incapable of supporting trout production or maintenance (NT).

- Cromakill Creek (FW2-NT/SE2)

The Cromakill Creek flows south to north in the west-central portion of the Township and is also a tributary to the Hackensack River. The creek is also assigned a FW2-NT/SE2 classification.

-
- Penhorn Creek (FW2-NT/SE2)

Penhorn Creek is located in the Township's southwestern corner and also flows west into the Hackensack River. The creek is assigned the creek a FW2-NT/SE2 classification.

A Map depicting the Township's major waterways is included as **Figure 1**.

North Bergen is located in Watershed Management Area 5 (WMA-5), Hackensack, Pascack. The WMA-5 is divided into smaller sub-watersheds, assigned Hydrologic Unit Codes (HUC-14). The Townships four (4) separate HUC-14s are shown in **Figure 3**. A map of the groundwater recharge areas is not available at this time due to insufficient or outdated soil data. A wellhead protection area map is not provided because there are no known municipal potable wells located in the Township.

The NJDEP is designating an increasing number of streams in the State as Category-1 (C1) waterways, especially those that provide drinking water and important habitat for threatened and endangered species as well as popular recreation fish such as trout. Streams can be designated as C1 based on their ecological significance, recreational or aesthetic significance, water supply significance, fisheries resources, shellfisheries or their location within publicly preserved open space. The C1 designation prevents further degradation in existing water quality. Moreover a 300' buffer is established around the C1 waterways and is referred to as a Special Water Resource Protection Area (SWRPA). The Township contains no C1 designated waterways.

The 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 5-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 NJDEP and other regulatory agencies collect water quality chemical data on the streams in the state. These data show that there are no impaired waterways in the Township. Although there are no reported TMDLs, it is well known that both Bellman's and Cormackill Creeks have been subject to years of industrial discharge and may have contaminants in the sediments. Therefore, the NJDEP is not required to develop a Total Maximum Daily Load (TMDL) for these pollutants of each waterway. A TMDL is the amount of a pollutant that can be accepted by a waterbody without causing an exceedance of water quality standards or interfering with the ability to use a waterbody for one or more of its designated uses. The allowable load is allocated to the various sources of the pollutant, such as stormwater and wastewater discharges, which require an NJPDES permit to discharge, and nonpoint source, which includes stormwater runoff from agricultural areas and residential areas, along with a margin of safety. Provisions may also be made for future sources in the form of reserve capacity. An implementation plan is developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include improved stormwater treatment plants, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems, and other BMPs.

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.

The Township has water quantity problems including flooding and stream bank erosion. For example, due to an undersized stormwater drainage system Dell Avenue experiences flooding during heavy storm events particularly between 40th and 49th Streets. Additionally, 83rd Street floods between Tonnelle and West Side Avenues since the area formerly drained to an open channel creek. The Township is currently designing a pump station to help alleviate some of the area's flooding. Also, 91st Street (West of Tonnelle Avenue) has a combined sewer line that surcharges during heavy rainfalls. Railroad Avenue along the border between North Bergen and Fairview lies near Bellman's Creek. Bellman's Creek is tidal and has a tendency to flood the area. Fairview and North Bergen are investigating possible options to alleviate the flooding that may include raising the road's elevation. Lastly, a Roc Harbor condominium at 8000 River Road is a condominium has experienced flooding along the east side of their property during heaving rainfalls.

V. DESIGN AND PERFORMANCE STANDARDS

The Township has reviewed its existing ordinances and 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. The design and performance standards include 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 the safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The ordinances have been submitted to Hudson County for review.

In addition to the adoption of the above performance standards during construction projects, Township inspectors will observe projects to ensure that the stormwater management measures are constructed and function as designed. The Township will also assume responsibility for the operation and maintenance of the stormwater management facilities on residential properties if a homeowner's association is not present.

VI. PLAN CONSISTENCY

The Township is not within a Regional Stormwater Management Planning Area; therefore this Plan does not need to be consistent with any regional stormwater management plans (RSWMP). If any RSWMPs are developed in the future, this MSWMP will be updated as necessary. Hudson County is creating a County Stormwater Management Plan and this MSWMP will be updated as necessary to be consistent with the County Stormwater Management Plan.

The MSWMP is consistent with the Residential Site Improvement Standards (RSIS) detailed in N.J.A.C. 5:21. The Township will utilize the most current RSIS during the stormwater management review of residential development. This MSWMP will be updated to be consistent with any future changes to the RSIS.

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

VII. NONSTRUCTURAL STORMWATER MANAGEMENT STRATEGIES

The Township has reviewed its Master Plan, and has adopted a Stormwater Control Ordinance that has been submitted to the County Division of Planning for review. The Stormwater Control Ordinance incorporates nonstructural stormwater management strategies.

VIII. LAND USE/BUILD-OUT ANALYSIS

As previously mentioned, a detailed land use analysis is not required since North Bergen does not contain more than 640-acres of vacant developable land. In support of the aforementioned we have included **Figure 4** illustrating the existing land use in the Township based on NJDEP's 1995/97 GIS information. Moreover, **Figure 3** illustrates the HUC-14s within the Township; **Figure 5** presents the Township's zoning; **Figure 6** illustrates the Township's constrained lands; and **Figure 7** depicts floodplains located within the Township. By overlaying the figures referenced above it was determined that a build-out analysis is not required.

IX. 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 mitigation options.

Mitigation Project Criteria

- A. The mitigation project must be implemented in the same drainage area (HUC-14) 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 MSWMP. 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 (1) of the following projects listed to compensate for the deficit from the performance standards resulting from the proposed project. More detailed information or a list of additional projects can be obtained from the Township Engineer. Listed below are general projects that can be used to address the mitigation requirement.

1. Water Quality

- a) Retrofit an existing stormwater management facility on a Township-owned property to provide the removal of 80 percent of total suspended solids (TSS) from the parking lot runoff.
- b) Retrofit the existing parking area on a Township-owned property to provide the removal of 80 percent of TSS.

2. Water Quantity

- a) Install stormwater management measures in an open space to reduce the peak flow from an upstream development on the receiving stream by 20 cubic feet per second (cfs), 35 cfs, and 100 cfs for the 2, 10, and 100-year storms respectively.

3. Groundwater Recharge

- a) Retrofit an existing Township-owned property to provide an additional 300,000 cubic feet of average annual groundwater recharge.
- b) Replace an existing deteriorated impervious parking lot on a Township-owned property.

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

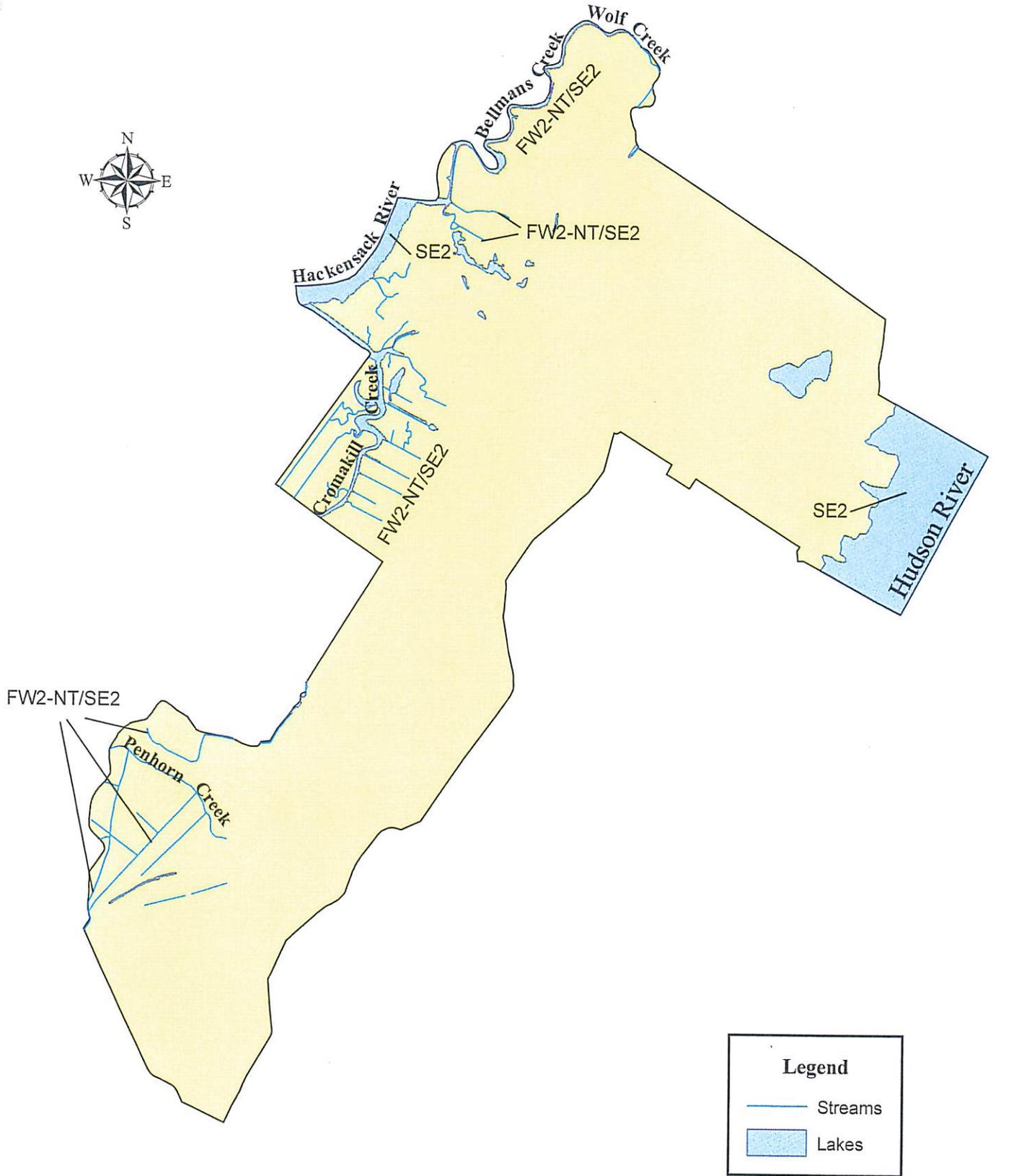
1. Water Quality

- a) Re-establish a vegetative buffer (minimum 50 foot wide) along 1,500 linear feet of the shoreline at one of the Township's lakes or ponds as a goose control measure and to filter stormwater runoff from the high goose traffic areas.
- b) Provide goose management measures, including public education at the Township's parks.

The municipality may allow a developer to provide funding or partial funding to the municipality for a project that has been identified by the Township Engineer or towards the development of a RSMP. 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.

FIGURES

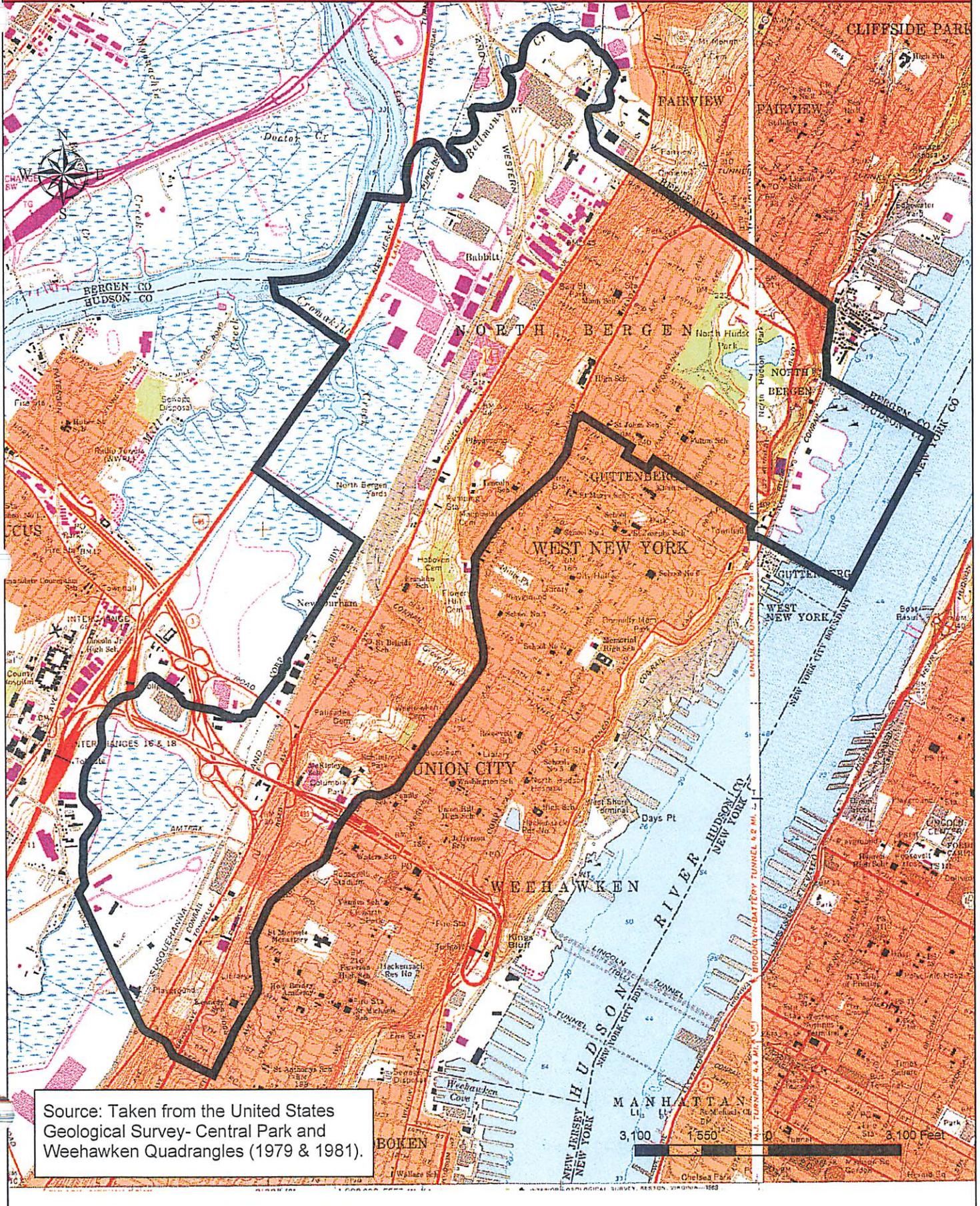
Figure 1: Township of North Bergen Waterways



Source: Waterways layer taken from the New Jersey Department of Environmental Protection, Streams and Lakes shapefile (1998).

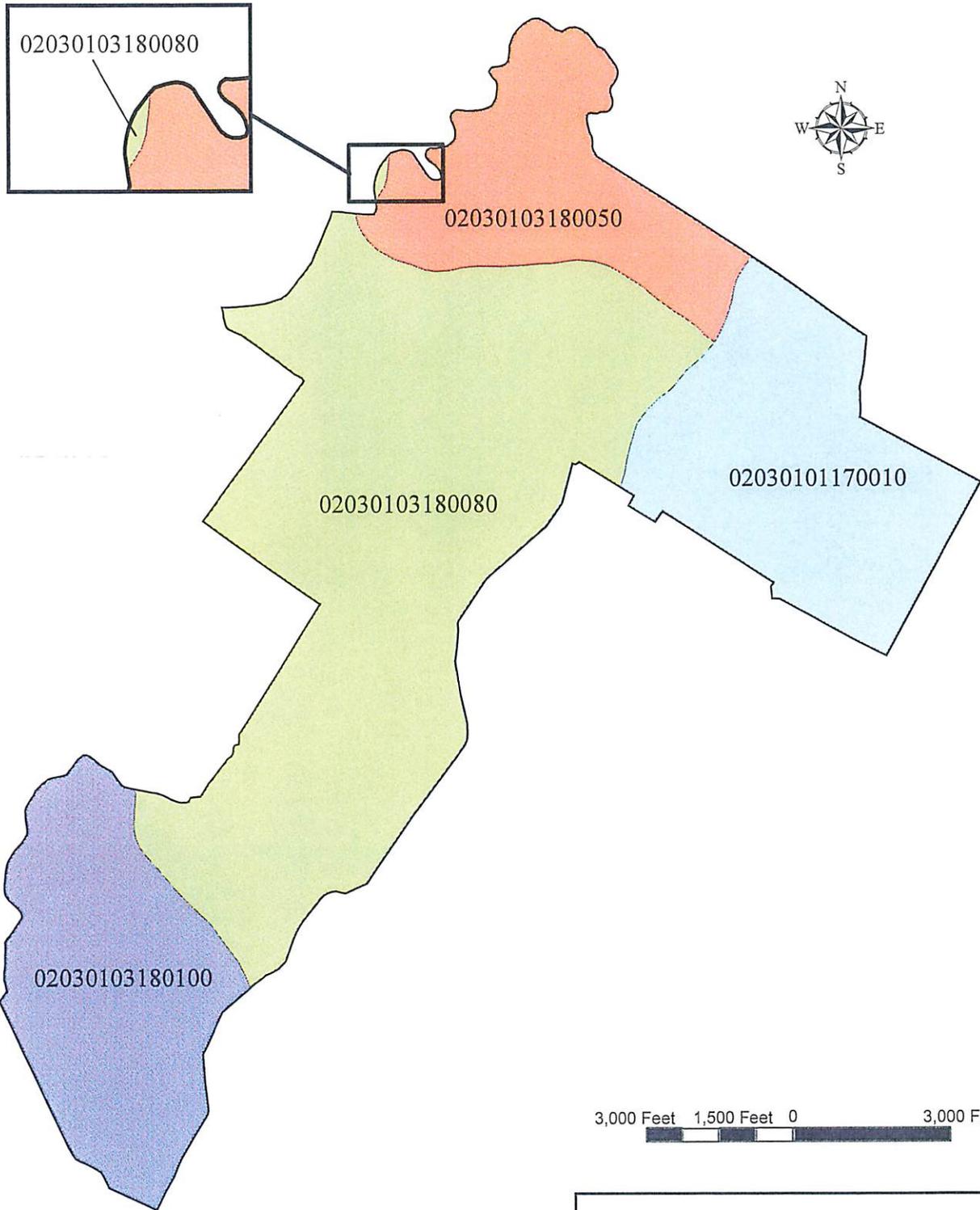
3,000 Feet 1,500 Feet 0 3,000 Feet

Figure 2: Township of North Bergen Boundary on USGS Quadrangle Map



Source: Taken from the United States Geological Survey- Central Park and Weehawken Quadrangles (1979 & 1981).

Figure 3: Hydrologic Units (HUC-14) in the Township of North Bergen



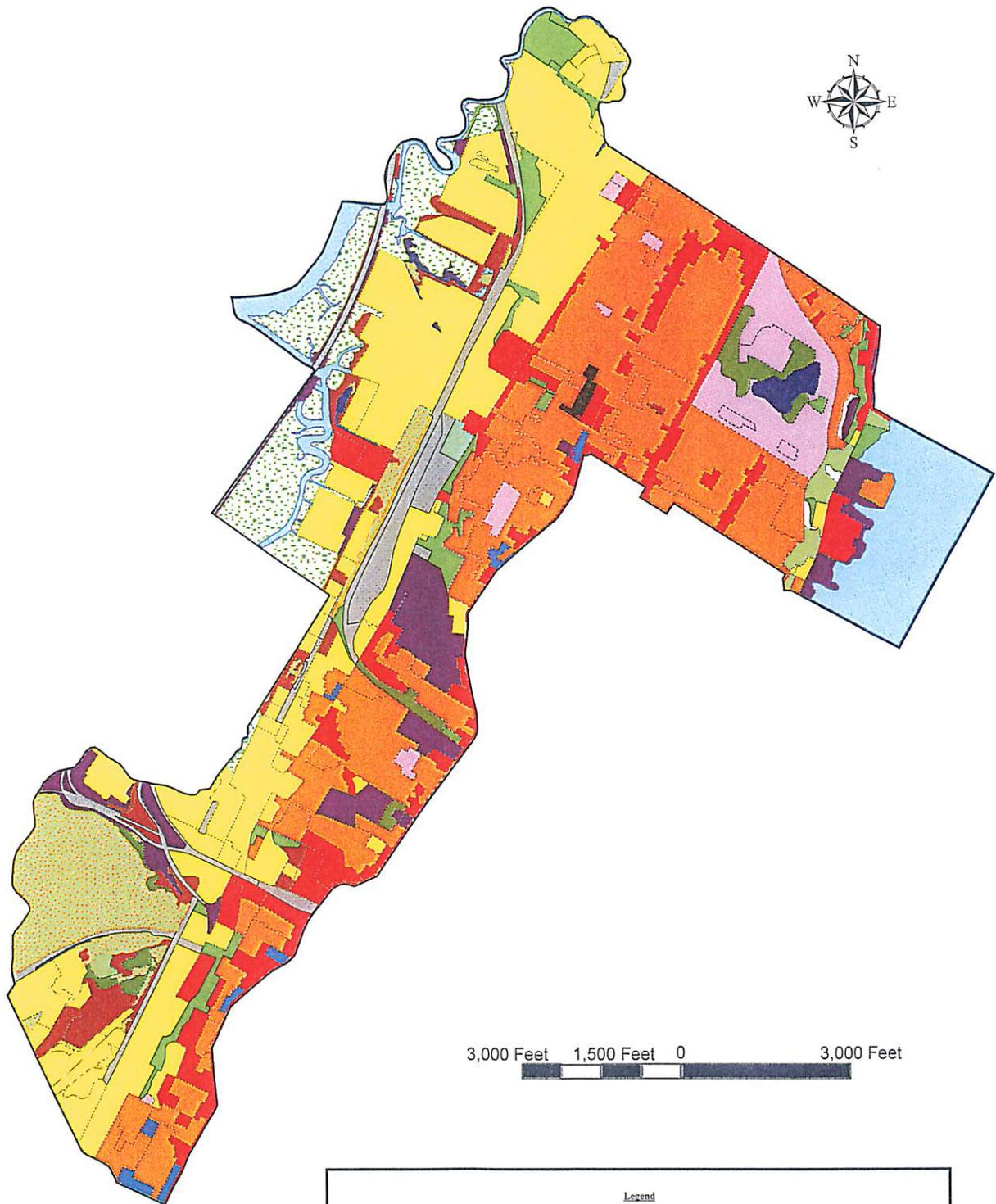
Source: Watershed information taken from the New Jersey Department of Environmental Protection HUC-14 shapefile (2000).

Legend

Sub-Watershed Name

-  Hackensack R (Bellmans Ck to Ft Lee Rd)
-  Hackensack R (Rt 3 to Bellmans Ck)
-  Hackensack R (below Amtrak bridge)
-  Hudson River

Figure 4: Existing Land Use in the Township of North Bergen

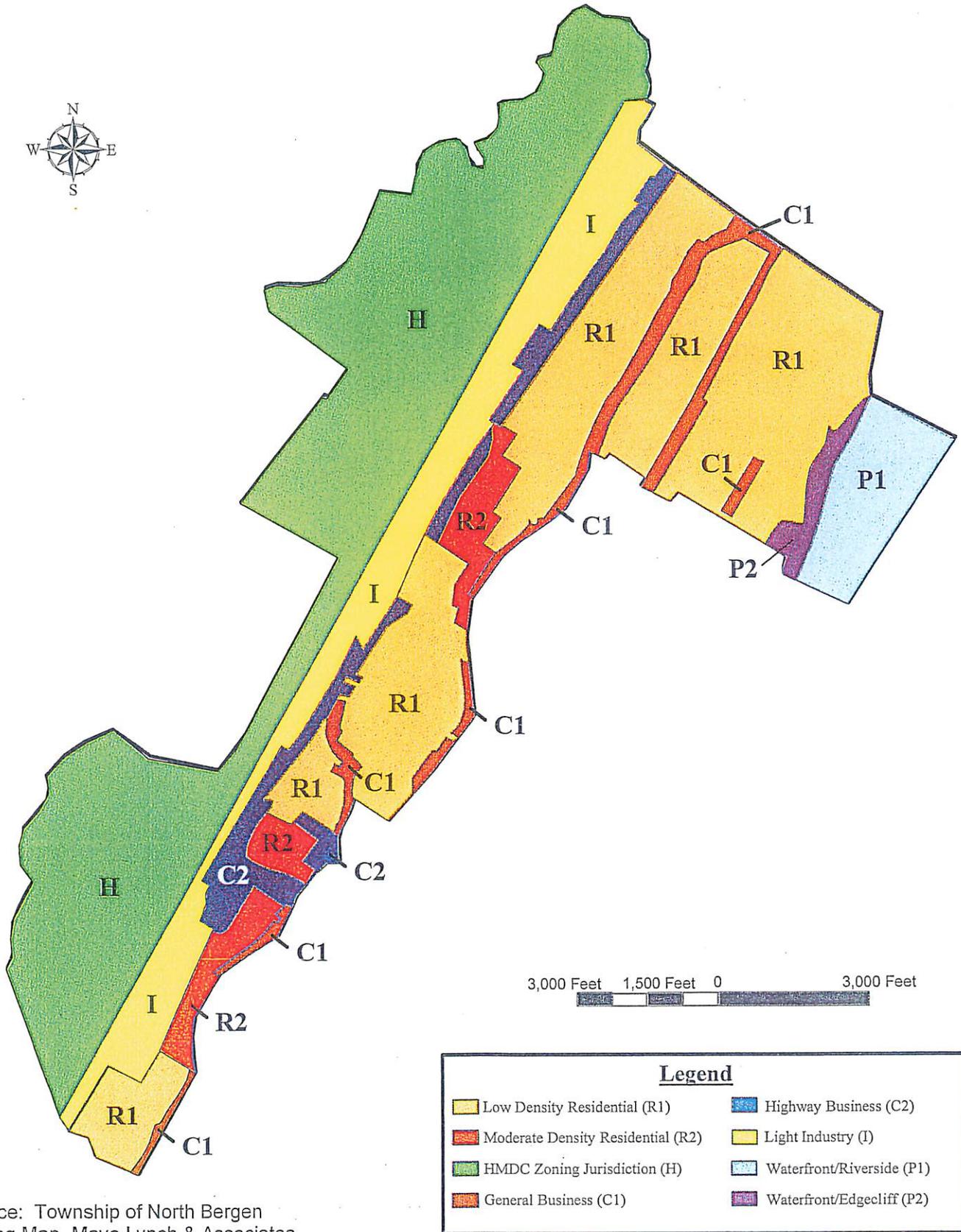


3,000 Feet 1,500 Feet 0 3,000 Feet

1995/97 Land Use/Land Cover		Legend	
	ARTIFICIAL LAKES		MIXED URBAN OR BUILT-UP LAND
	ATHLETIC FIELDS (SCHOOLS)		NATURAL LAKES
	BARE EXPOSED ROCK, ROCK SLIDES, ETC.		OLD FIELD (< 25% BRUSH COVERED)
	COMMERCIAL/SERVICES		OTHER URBAN OR BUILT-UP LAND
	DECIDUOUS BRUSH/SHRUBLAND		RECREATIONAL LAND
	DECIDUOUS FOREST (10-50% CROWN CLOSURE)		RESIDENTIAL, HIGH DENSITY, MULTIPLE DWELLING
	DECIDUOUS FOREST (>50% CROWN CLOSURE)		SALINE MARSHES
	DISTURBED WETLANDS (MODIFIED)		STREAMS AND CANALS
	HERBACEOUS WETLANDS		TIDAL RIVERS, INLAND BAYS, AND OTHER TIDAL WATERS
	INDUSTRIAL		TRANSITIONAL AREAS
	MANAGED WETLAND IN MAINTAINED LAWN GREENSPACE		TRANSPORTATION/COMMUNICATIONS/UTILITIES

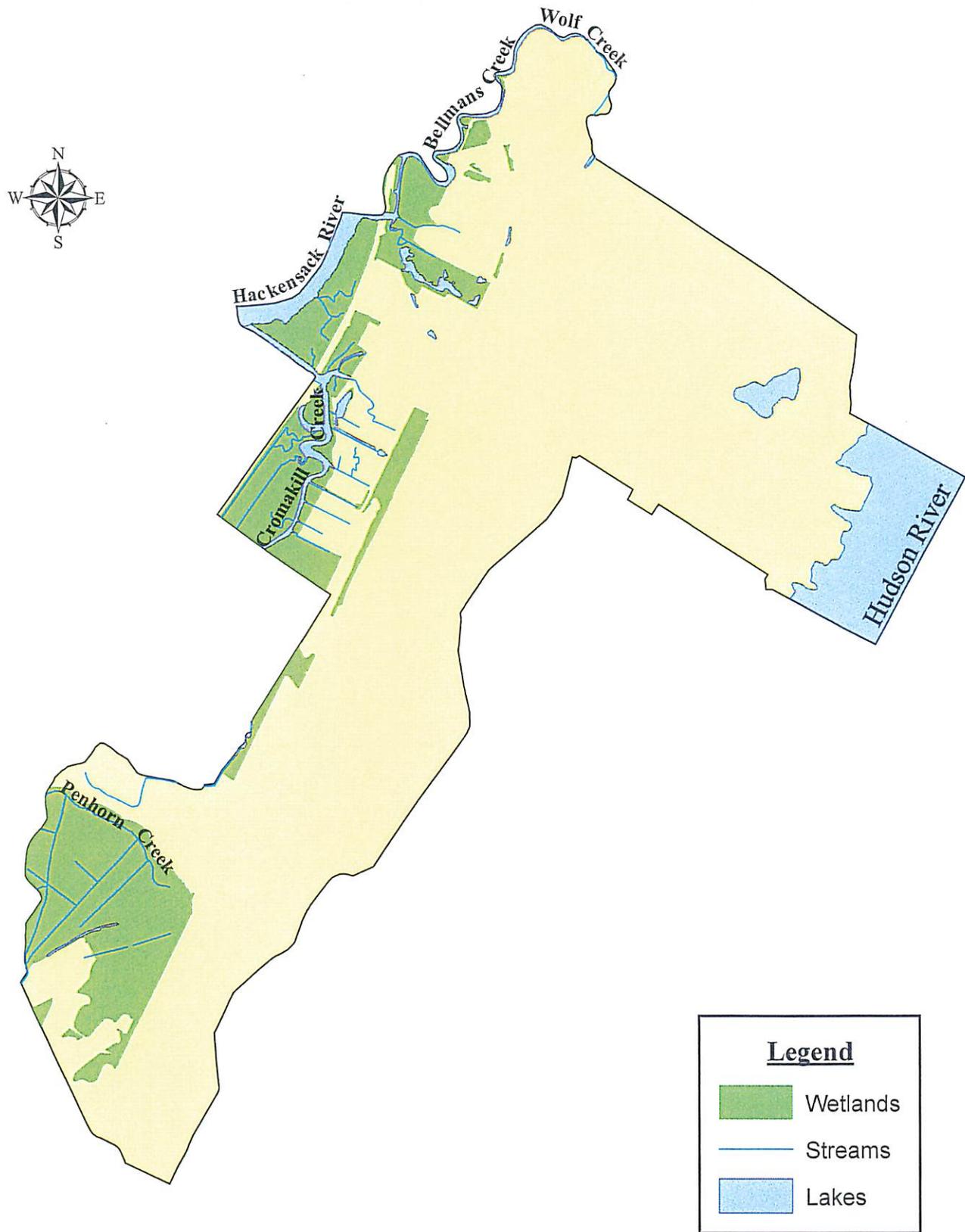
Source: Land Use information taken from the New Jersey Department of Environmental Protection, 1995/97 Land Use/Land Cover shapefile (2000).

Figure 5: Zoning Districts in the Township of North Bergen



Source: Township of North Bergen Zoning Map, Mayo Lynch & Associates, Inc., 1987.

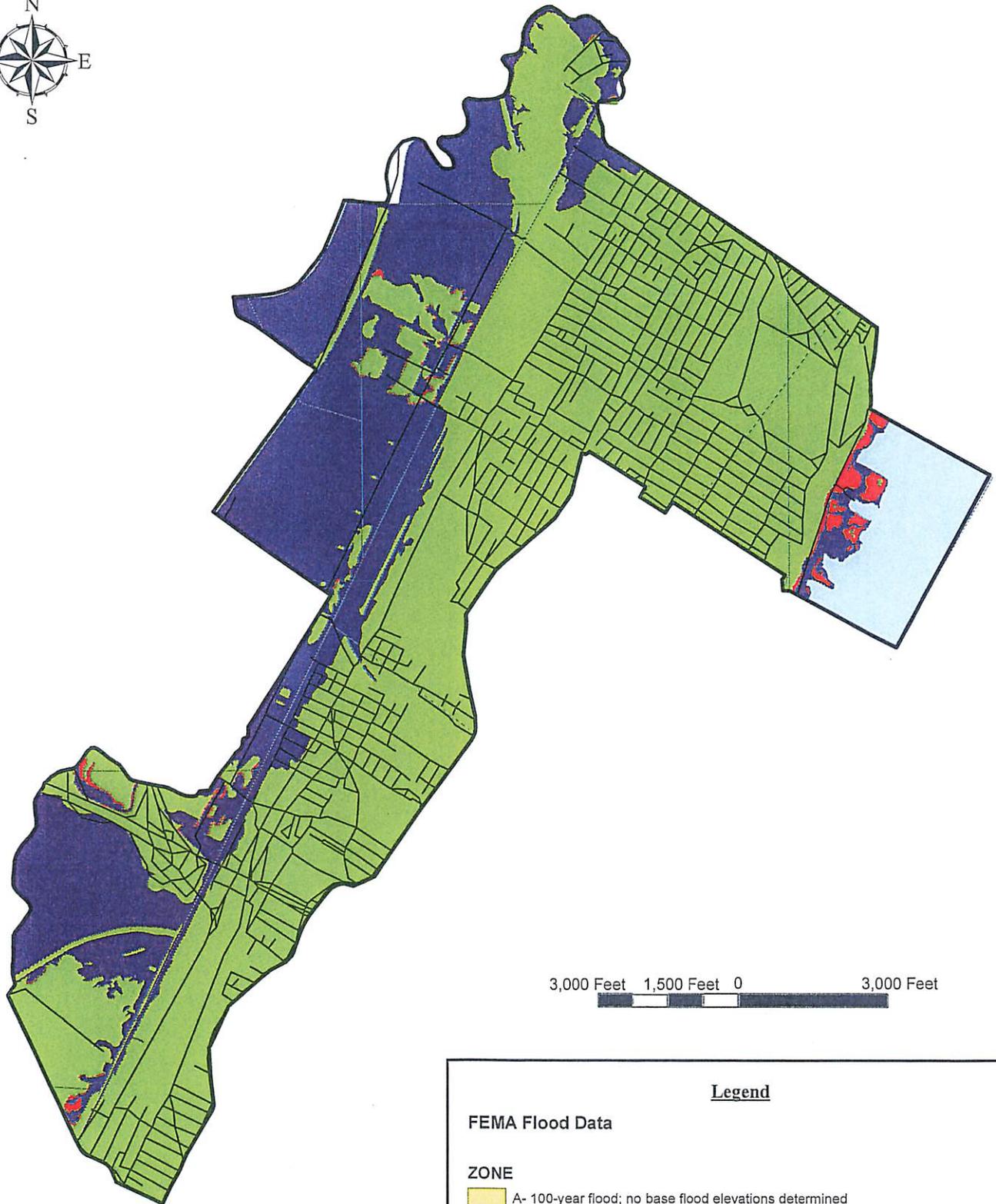
Figure 6: Freshwater Wetlands and Water Land Uses within the Township of North Bergen (Constrained Land)



Source: Waterways layer taken from the New Jersey Department of Environmental Protection, Streams and Lakes shapefile (1998).

3,000 Feet 1,500 Feet 0 3,000 Feet

Figure 7: Township of North Bergen Floodplain Map



3,000 Feet 1,500 Feet 0 3,000 Feet

Legend

FEMA Flood Data

ZONE

-  A- 100-year flood; no base flood elevations determined
-  AE- 100-year flood; no base flood elevations determined
-  AH- Flood depth of 1-3 feet (usually areas of ponding); average depth determined
-  ANI- Undetermined
-  VE- 100-year coastal flood limit
-  X- Areas outside 500-year floodplain
-  X500- Areas of 500-year floodplain

Source: Federal Emergency Management Agency (FEMA)
Q3 Flood Data, Hudson County, 1996.