Municipal Stormwater Management Plan

For the

Borough of Oakland
Bergen County, New Jersey

Prepared by:

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I. INTRODUCTION

This Municipal Stormwater Management Plan (hereinafter the MSWMP or the Plan) documents the strategy for the Borough of Oakland (the Borough) 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. 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.

A build-out analysis has been prepared and in included in this Plan. The Plan also addresses the review and update of existing ordinances, the Borough Master Plan and other planning documents to allow for project designs that include low-impact development techniques. The Borough Master Plan was last reviewed in 2000. The Borough of Oakland is currently reexamining their Master Plan and Official Map with the help of the Borough Planner. This will coincide with the Borough reviewing their existing ordinance and updating any development regulations and long-term operation and maintenance procedures.

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. Currently, the Borough of Oakland does not have a groundwater assessment.

II. GOALS

The goals of this MSWMP as well as a brief description of the Borough's strategies to implement the goals are as follows:

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

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

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

- ***Maintain groundwater recharge.***

  The Borough 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 Borough 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 Borough 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 Borough has adopted wildlife feeding and pet waste ordinances. These ordinances will decrease the amount of biological pollutants allowed to reach the Borough'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 Borough began a public education program. The Borough 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 Borough 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. 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.

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.

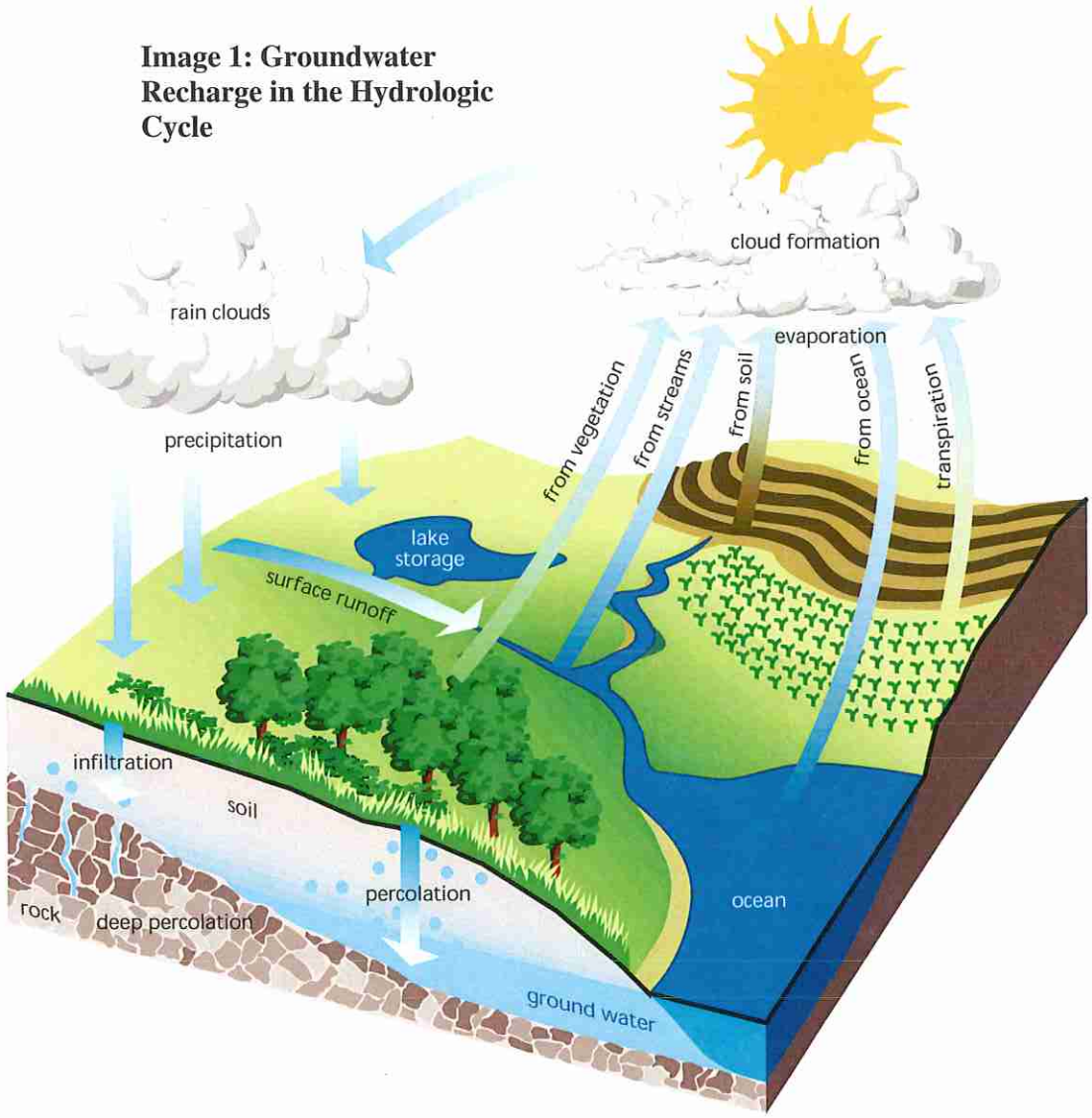
Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration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

Oakland encompasses 8.75-square miles in northwest Bergen County, New Jersey. The Borough is partially built-out with 2,637-acres of remaining developable open space, equating to approximately 47% of Oakland's total area. **Figure 1** illustrates the Oakland's waterways while **Figure 2** depicts the Borough boundary on the United States Geological Survey (USGS) Quadrangle Maps.

Approximately 95% of the Borough is serviced by private septic systems while the remaining 5% discharge to sanitary sewers. The sanitary sewerage is treated by a number of small privately/municipality owned package treatment plants. The sanitary sewers are separated from all stormwater systems. A map depicting the areas serviced by sanitary sewers is included as **Figure 4**. Additionally, Oakland's Water Department supplies potable water to approximately 95% of the municipality while the remainder of the Borough utilizes private wells.

The Borough's population decreased from 13,433 in 1980 to 11,997 in 1990. The population then increased to 12,466 in 2000. This recent population increase has most likely resulted in demand for new development. In addition to the population, the number of dwelling units has increased steadily over time. In 1980, there were 3,979 dwelling units located in the Borough. The number of dwelling units grew to 4,019 in 1990 and again to 4,345 in 2000. Long Hill Estates, a recent project that was approved by the Borough, consists of a 5-lot subdivision with the construction of 4 new houses. Recently, Phase 5 of the Ramapo River Reserve began construction. The Ramapo River Reserve contains over 400 new single-family homes. A new affordable housing complex called Pinnacle is seeking Planning Board approval and includes 209 units, both townhouses and single-family homes. In addition to residential development,

there has been or will be some commercial and industrial development. FileBank, a 47,778 sq-ft office/warehouse building, was completed in 2004. DT Allen Industrial Warehousing, a 33,600 sq-ft warehouse was also completed recently.

The majority of the Borough lies within the Metropolitan Planning Area (PA-1). This planning area designated to areas that are considered Urban Redevelopment Area and are not subject to groundwater recharge requirements. Additionally, the portion of the Borough west of the Ramapo River has some areas that are considered PA-5 (Environmentally Sensitive) and PA-8 (State Park). Lastly, a small area in the northeast portion of the Borough is designated PA-6 (Park 1st Plan) while another small area to the southeast is considered PA-5. **Figure 3** indicates the planning areas in the Borough of Oakland.

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 Pond Brook, Ramapo Lake, Ramapo Brook and unnamed tributaries to the Ramapo River in northwest Oakland are designated C1 waters.

The major water bodies located in the Borough are:

- Ramapo River (FW2-NT) – [HUC-14s - 02030103100050 and 02030103100070]

  The Ramapo River flows south and generally bisects the Borough. The river is assigned a Surface Water Quality Standard (SWQS) of FW2-NT. The classification indicates that Ramapo River is considered a general surface water (FW2) that is incapable of supporting trout production or maintenance (NT). The Ramapo River near Mahwah appears on Sublist 4 of the New Jersey Water Quality Monitoring and Assessment Report for high concentrations of fecal coliform. It also appears on Sublist 5 for high concentrations of phosphorous.

- Allerman Brook (FW2-NT) – [HUC-14 - 02030103100060]

  The Allerman Brook flows west through the center portion of the Borough before outletting into Crystal Lake. The river is also classified FW2-NT.

- Crystal Lake (FW2-NT) – [HUC-14 - 02030103100060]

  Crystal Lake is onstream with Allerman Brook before outletting into the Ramapo River. The lake is also classified FW2-NT. Crystal Lake appears on Sublist 5 for high concentrations of fecal coliform.

- Potash Lake (FW2-NT) – [HUC-14 - 02030103100070]

  Potash Lake is onstream with the Ramapo River near the southwestern portion of the Borough. The lake is also classified FW2-NT.

- Ramapo Lake (FW2-NT(C1)) – [HUC-14 – 02030103100070]

  Ramapo Lake lay along the Borough's western border with Wanaque and outlets to the Ramapo Brook. The lake is classified FW2-NT(C1). The classification indicates that Ramapo Lake is considered a general surface water (FW2) that is incapable of supporting trout production or maintenance. However the C1 designation indicates that the brook must be protected from measurable changes in water quality characteristics. Additional discussion of C1 waters is presented later in this section.

- Ramapo Brook (FW2-NT(C1)) – [HUC-14 – 02030103100070]

  Ramapo Brook is fed by Ramapo Lake referenced above and flows to the east into the Ramapo River. The brook is also classified FW2-NT(C1).

- Pond Brook (FW2-NT(C1)) – [HUC-14s – 02030103100060 and 02030103100070]

  The Pond Brook flows into the Ramapo River south of Potash Lake. The brook is also classified FW2-NT(C1).

- Unnamed Tributary to Ramapo Brook (FW2-TP(C1)) – [HUC-14 – 02030103100070]

  An unnamed tributary flows southeast into the Ramapo Brook. The brook is classified FW2-TP(C1) with the TP designation indicating that the watercourse supports trout production.

- Unnamed Tributaries to Ramapo River – Northwest Oakland ((FW2-TP(C1)) – [HUC-14 – 020301031000501

  Several unnamed tributaries located in the northwest portion of the Borough flow into the Ramapo River. The tributaries are classified FW2-TP(C1).

- Unnamed Tributary to Potash Lake ((FW2-NT) – [HUC-14 – 020301031000701

  An unnamed tributary flows east into Potash Lake. The tributary is classified FW2-NT.

- Unnamed Tributaries to Ramapo River – Northeast Oakland ((FW2-NT) – [HUC-14 – 020301031000501

  Several unnamed tributaries located in the northeast portion of the Borough flow into the Ramapo River. The tributaries are classified FW2-NT.

- Unnamed Tributary to Allerman Brook ((FW2-NT) – [HUC-14 – 020301031000601

  Two (2) unnamed tributary flow southwest into Allerman Brook. The tributaries are also classified FW2-NT.

A Map depicting the Borough's major waterways is included as **Figure 1**. The Borough contains no tidal waterways.

The Borough of Oakland is located in Watershed Management Area 3 (WMA-3) Hackensack, Pascack. The WMA-5 is divided into four (4) smaller sub-watersheds, assigned a 14-digit Hydrologic Unit Code (HUC-14). The four (4) HUC-14s are shown in **Figure 5**.

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 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. Currently, the Ramapo River at Lenape Lane in the Borough of Oakland is classified as impaired and appears on Sublist 1 of the New Jersey 2004 Integrated Water Quality Monitoring and Assessment Report. Also, Crystal Lake appears on Sublist 5 for fecal coliform and mercury impairments.

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 Total Maximum Daily Loads (TMDLs) are needed. Currently, none of the waterways located within the Borough of Oakland appear on the Sublist 5 except for Crystal Lake. The Ramapo River near Mahwah appears on Sublist 5 due to high concentrations of phosphorous and fecal coliform. When the NJDEP adds the TMDL to their priority list, the Borough will comply with any and all recommendations stated in the TMDL.

The NJDEP and other regulatory agencies collect water quality chemical data on the streams in the state. These data show that the instream fecal coliform concentrations of the Ramapo River

within nearby municipalities exceed the State's criteria. This means that these rivers are impaired waterways and the NJDEP is required to develop a 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 TMDL documentation for the Ramapo River lists potential sources for the fecal coliform impairment as: Failing septic systems in Oakland, Canada Geese at Ramapo College athletic fields and other recreational fields, and horse farms located across from Ramapo College. Several long-term strategies are offered in this documentation. The include implementing a Canada Geese management plan, repairing faulty septic systems, implementing better stormwater management BMP's, and adoption of Pet Waste management ordinances. The Borough currently has ordinances adopted to regulate Pet Waste and Wildlife Feeding. By adoption of this document and the Stormwater Control Ordinance, the Borough has implemented a stronger stormwater management policy to begin the pollution elimination process.

In addition to water quality problems, the Borough has exhibited water quantity problems including flooding, stream bank erosion. In 2002, the U.S. Army Corps of Engineers (ACOE) completed a flood control project on a portion of the Ramapo River. Recently, many property owners near the Crystal Lake tributaries have experienced erosion problems as a result of Hurricane Floyd in 1999. A proposed plan that will include repairing gabion walls along the bank of the tributary is being developed. In addition to this erosion problem, there is a flooding problem on Grove Street. The existing 36-inch corrugated metal pipe receiving flow from the nearby stream is obstructed by silt. At Grove Street, the 36-inch pipe reduces to a 24-inch pipe downstream. During heavy rainstorms, the system backs up and floods Grove Street. The Borough is currently beginning the system's repair.

Lastly, the Borough contains, or lies within a number of wellhead protection areas. A wellhead protection area is divided into three (3) tiers. The 2-year (Tier 1), 5-year (Tier 2) and 12-year (Tier 3) are intended to represent the time of travel (TOT) a groundwater contaminant in the zones could be expected to reach a municipal potable supply well. The NJDEP then prioritizes the investigation and remediation of contaminated sites within the 2 and 5-year tiers. Wellhead protection areas are shown in **Figure 7**. The Borough may also wish to adopt specific ordinances to further protect wellhead protection areas and minimize the infiltration of pollutants into aquifers.

V. *DESIGN AND PERFORMANCE STANDARDS*

The Borough has reviewed its existing ordinances and 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 Bergen County for review and have received a conditional approval.

In addition to the adoption of the above performance standards during construction projects, Borough inspectors will observe projects to ensure that the stormwater management measures are constructed and function as designed. The Borough will also assume responsibility for the operation and maintenance of the stormwater management facilities.

VI. PLAN CONSISTENCY

The Borough is not within a Regional Stormwater Management Planning Area within the Borough, 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 to be consistent. Bergen County is currently creating a County Stormwater Management Plan that should be complete in 2005. 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 Borough 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 MSWMP is also consistent with the New Jersey Highlands Water Protection and Planning Act. The Borough will update the MSWMP if there are any future changes to the regulations introduced by the NJ Highlands Water Protection and Planning Act.

The Borough's existing ordinances also require new development and redevelopment plans to comply with New Jersey's Soil Erosion and Sediment Control Standards. Any project with over 5,000 square feet of disturbance will require approval from Bergen County Soil Conservation District. Additionally, if a project disturbs over 1-acre, a Request for Authorization (RFA) must be submitted to the NJDEP Bureau of Non-Point Pollution Control. Construction shall not begin until all required approvals are received. During construction, Borough inspectors will observe

on-site soil erosion and sediment control measures and report any inconsistencies to the local Soil Conservation District.

As mentioned previously, a fecal coliform TMDL has been established for the Ramapo River. The Borough will investigate the source of these pollutants that may include horse stables or areas with high goose populations.

A detailed land use analysis for the Borough was conducted and is attached to this Plan as **Attachment A**. **Figure 6** presents groundwater recharge areas while **Figure 8** illustrates the existing land use in the Borough based on 1995/97 GIS information from NJDEP. **Figure 5** illustrates the HUC-14s within the Borough. The Borough zoning map is shown in **Figure 9**. **Figure 10** illustrates the constrained lands within the Borough. **Figure 11** illustrates the NJ Highlands Planning and Preservation Areas within the Borough while **Figure 12** depicts floodplains.

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 Borough 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 Borough-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 Borough-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 Borough-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 Borough-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.

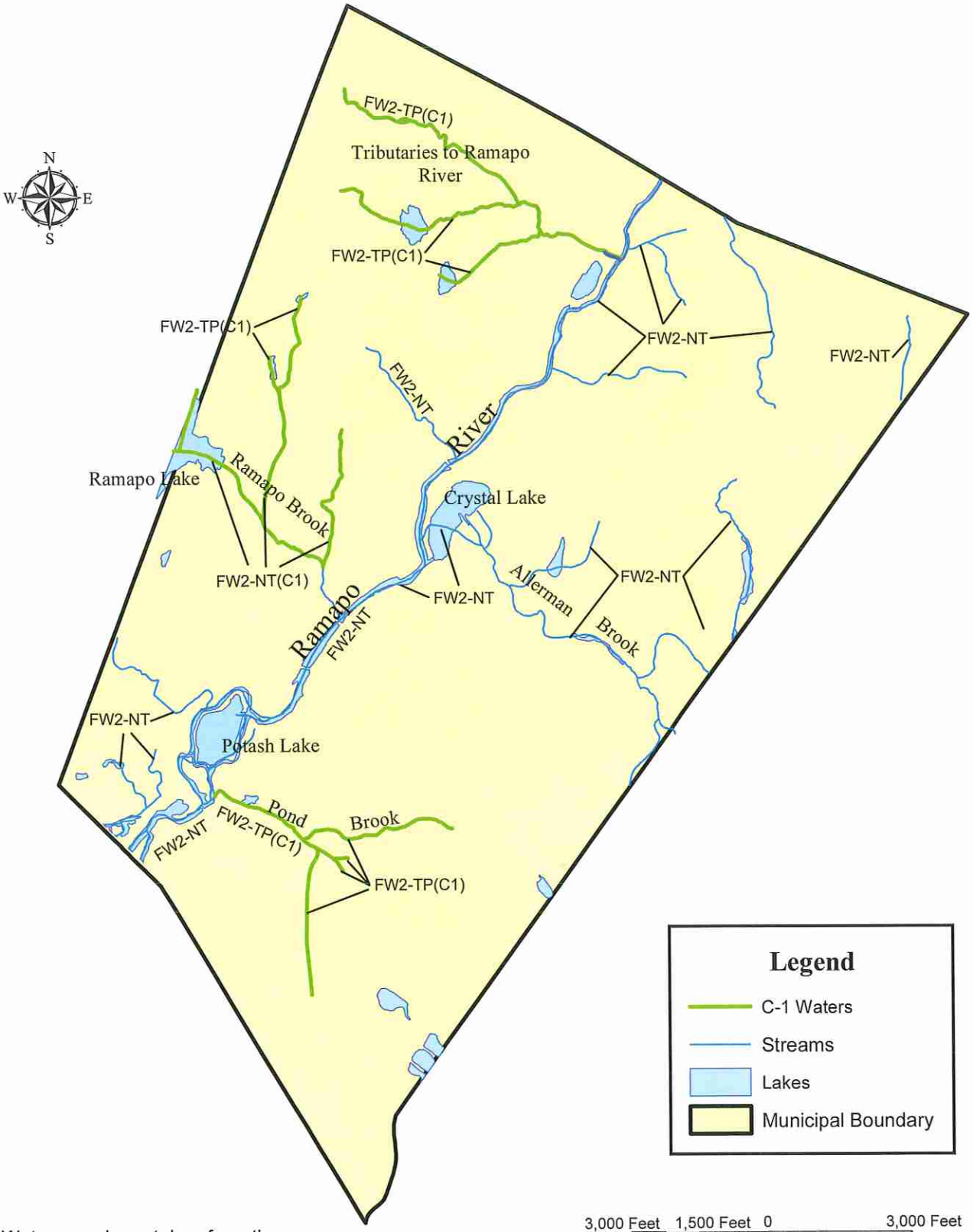
1. **Water Quality**

   a) Re-establish a vegetative buffer (minimum 50 foot wide) along 1,500 linear feet of the shoreline at one of the Borough'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 Borough's parks.

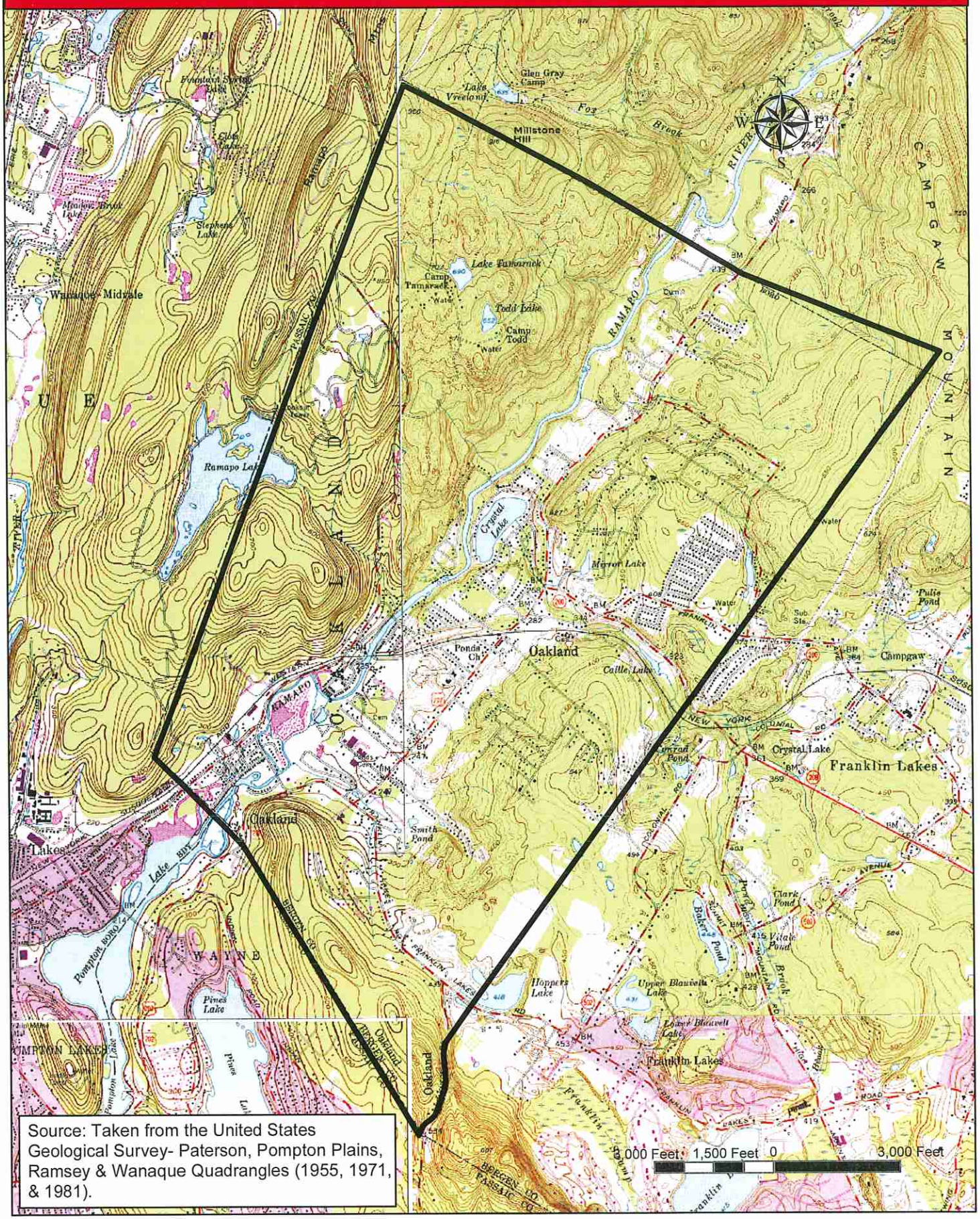
The municipality may allow a developer to provide funding or partial funding to the municipality for a project that has been identified by the Borough Engineer or towards the development of a RSMP. The funding must be equal to or greater than the cost to implement the mitigation outlined above, including costs associated with purchasing the property or easement for mitigation, and the cost associated with the long-term maintenance requirements of the mitigation measure.

Figure 1: Borough of Oakland Waterways



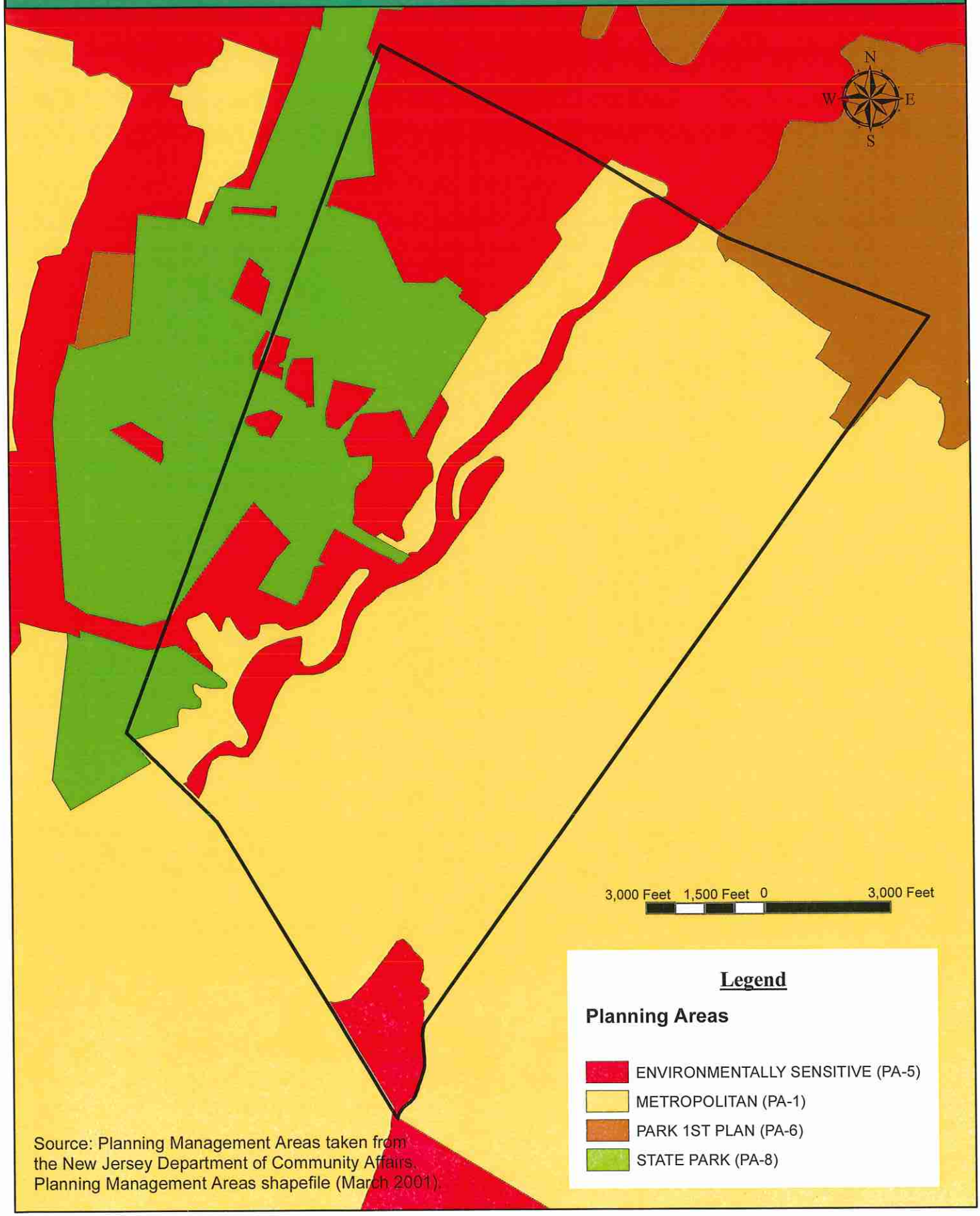
Source: Waterways layer taken from the New Jersey Department of Environmental Protection, Streams and Lakes shapefile (11/1998) & Surface Water Quality Standards shapefile (11/2003).

Figure 2: Borough of Oakland Boundary on USGS Quadrangle Maps



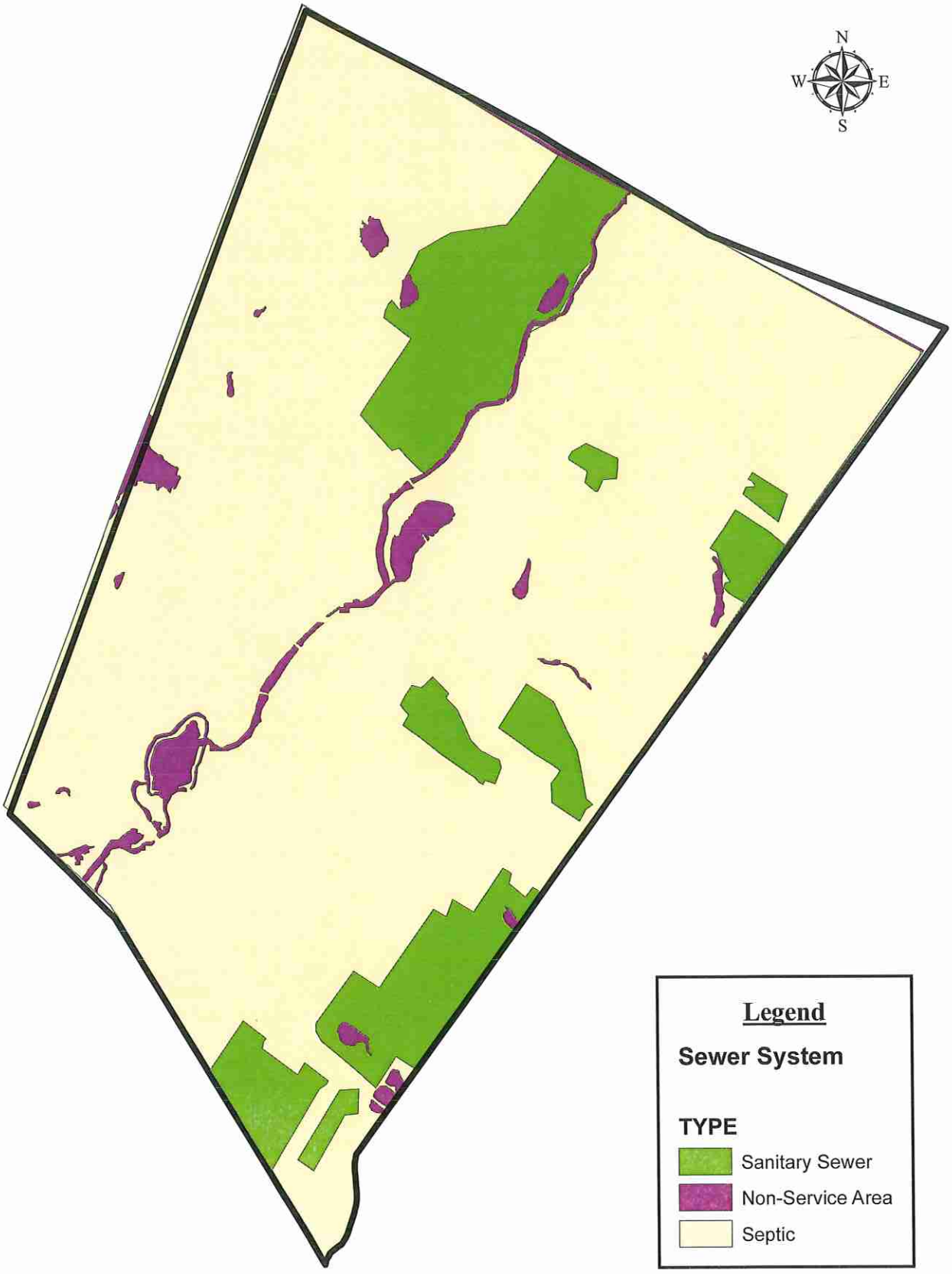
Source: Taken from the United States Geological Survey- Paterson, Pompton Plains, Ramsey & Wanaque Quadrangles (1955, 1971, & 1981).

Figure 3: Planning Management Areas within the Borough of Oakland



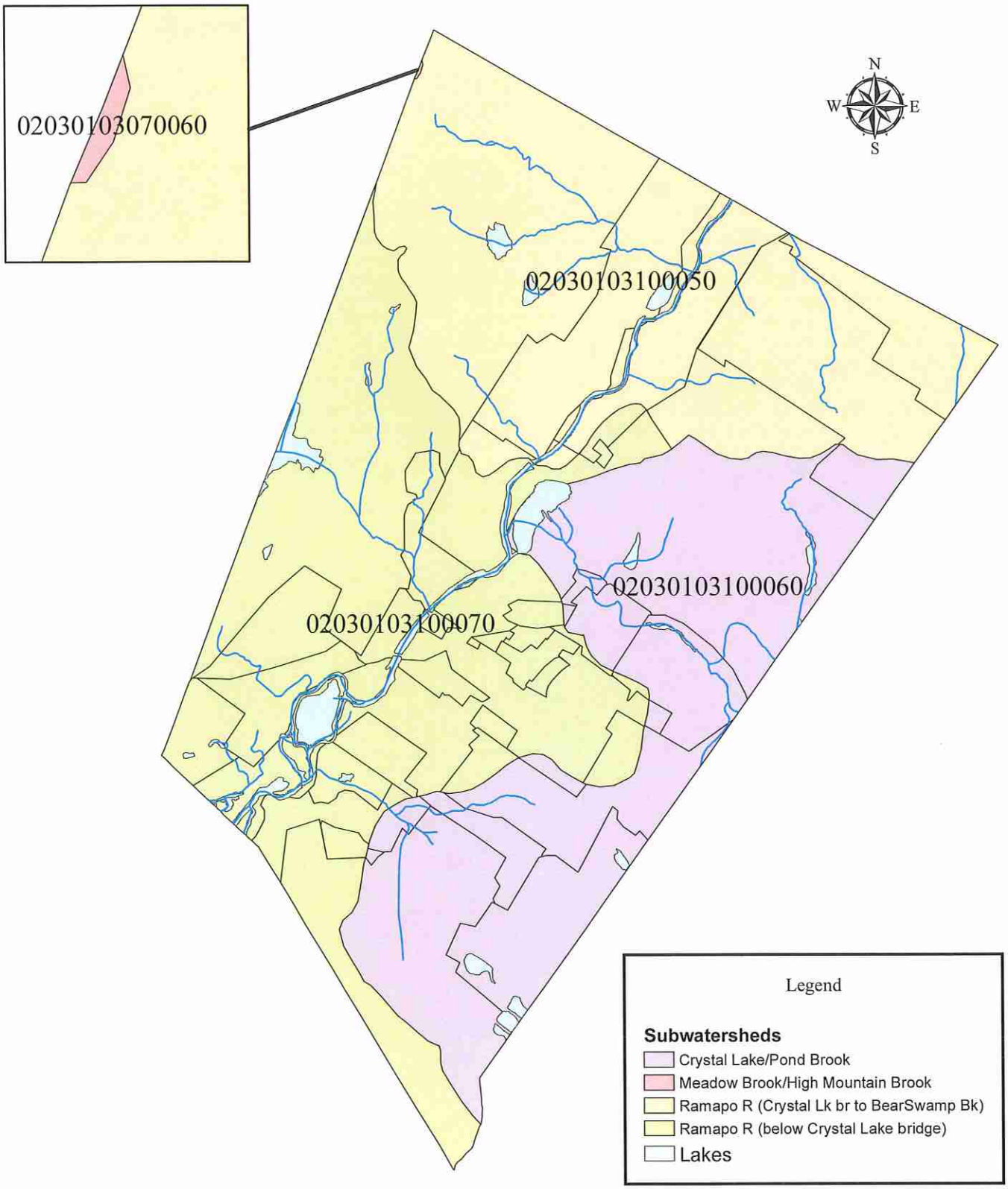
Source: Planning Management Areas taken from the New Jersey Department of Community Affairs, Planning Management Areas shapefile (March 2001).

Figure 4: Borough of Oakland Sanitary Sewer Map



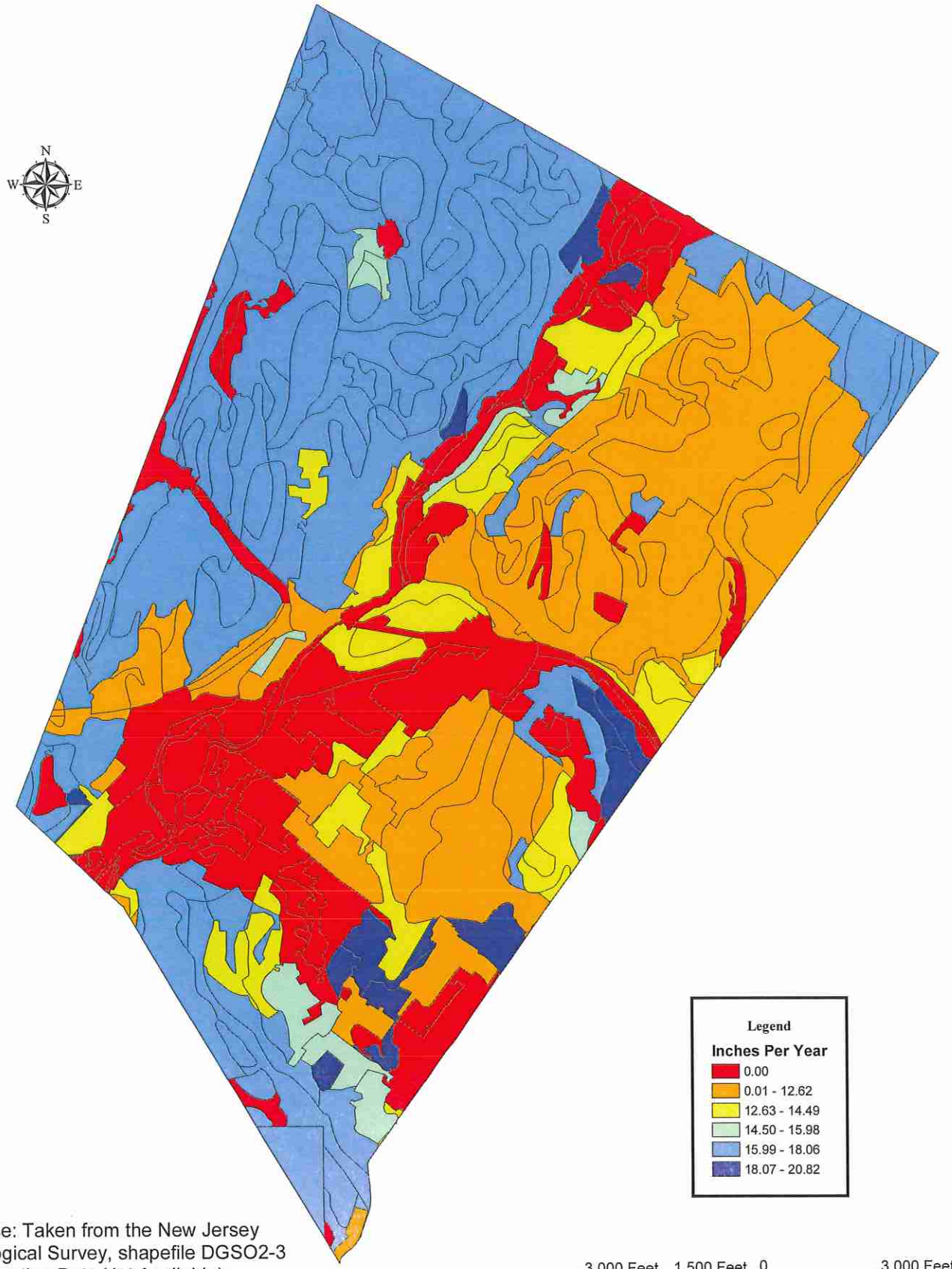
Source: Sewer Service Status layer taken from the New Jersey Department of Environmental Protection, Sewer Service Status, Cross Acceptance shapefile (2004).

Figure 5: Hydrologic Units (HUC-14's) in the Borough of Oakland



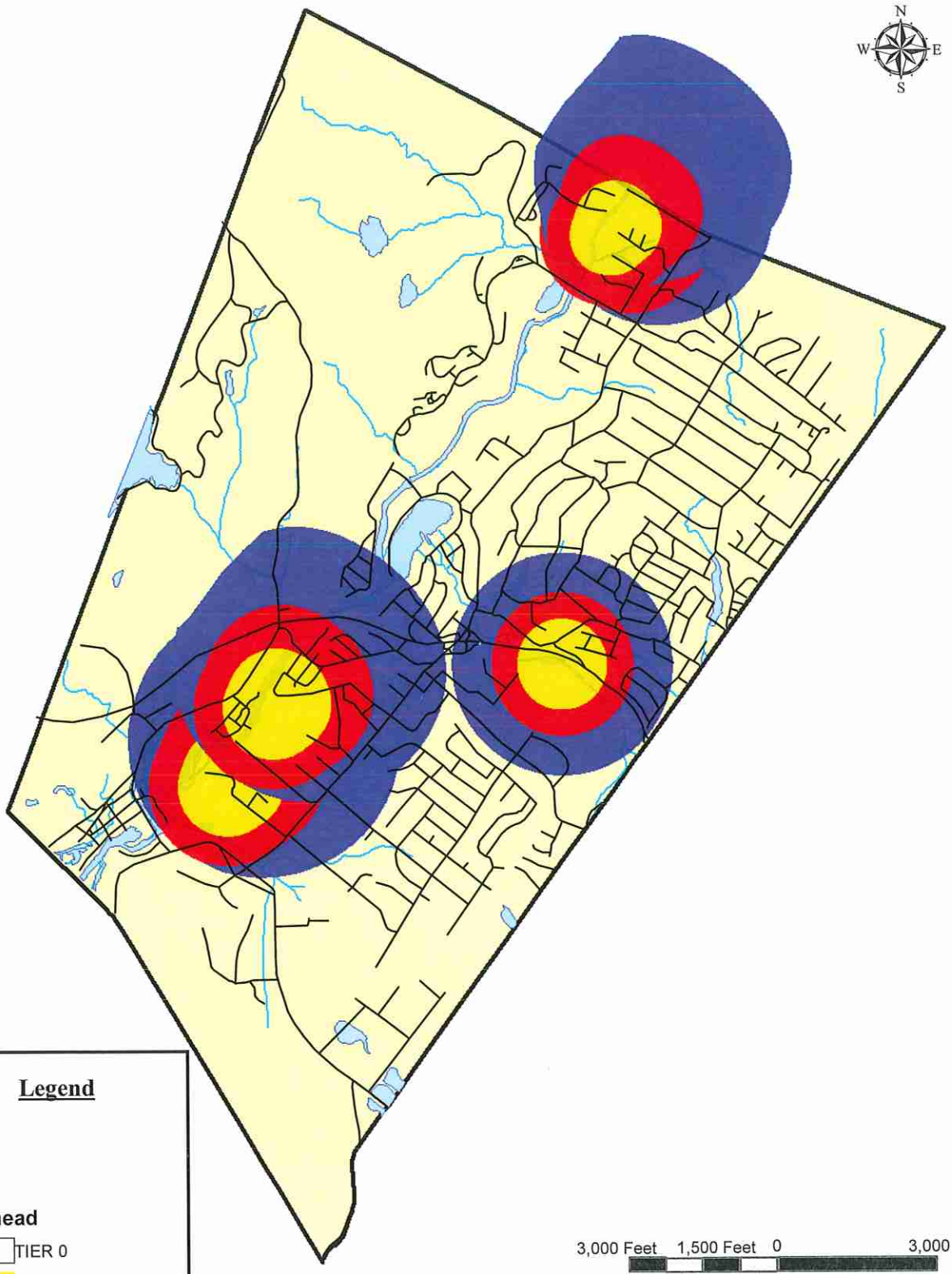
Source: Watershed information taken from the New Jersey Department of Environmental Protection HUC-14 shapefile (12/2000).

Figure 6: Groundwater Recharge Areas in the Borough of Oakland



Source: Taken from the New Jersey Geological Survey, shapefile DGSO2-3 (Publication Date Not Available).

Figure 7: Wellhead Protection Areas in the Borough of Oakland



Legend

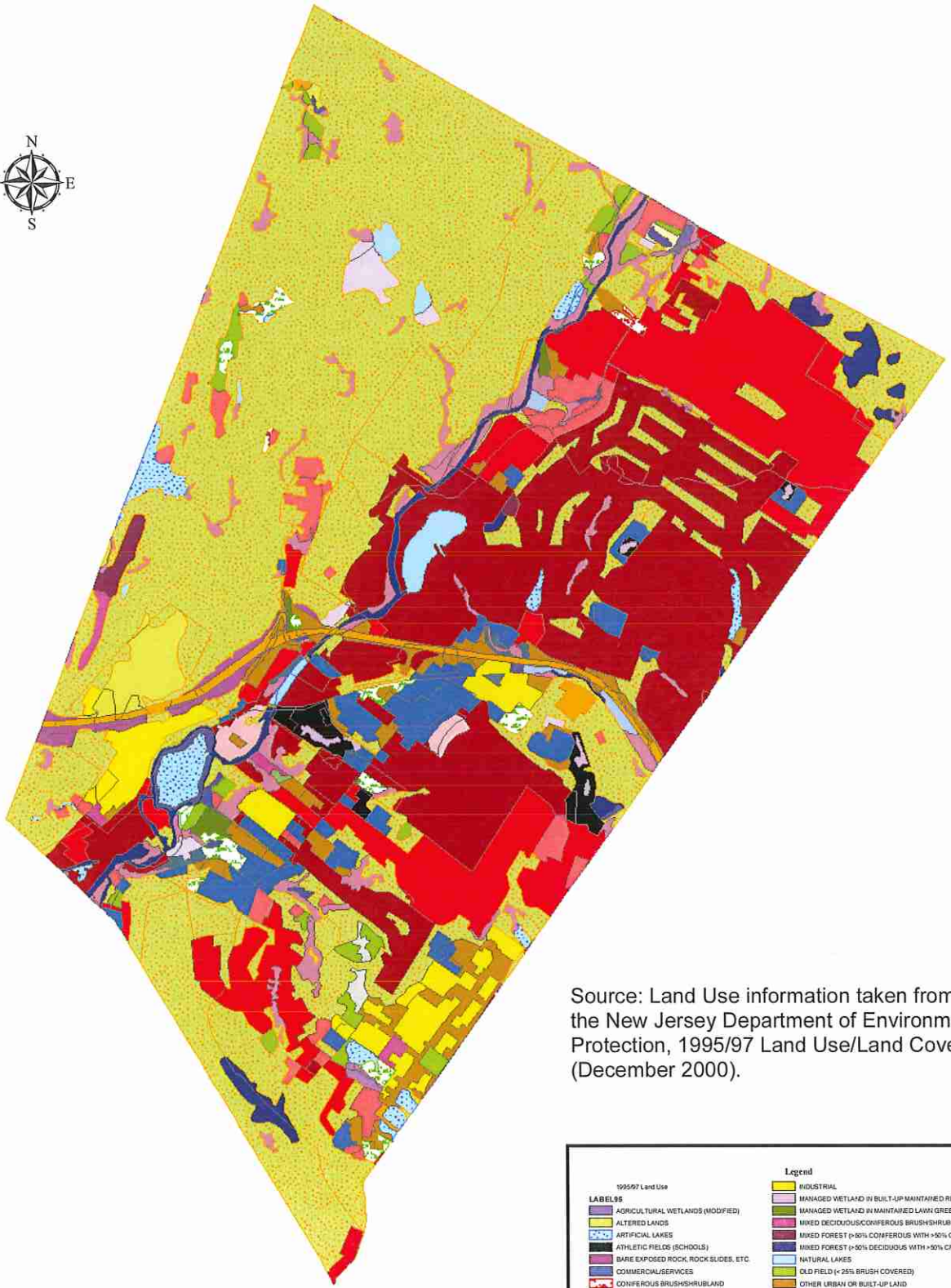
Wellhead

- TIER 0
- TIER 1
- TIER 2
- TIER 3
- Municipal Boundary

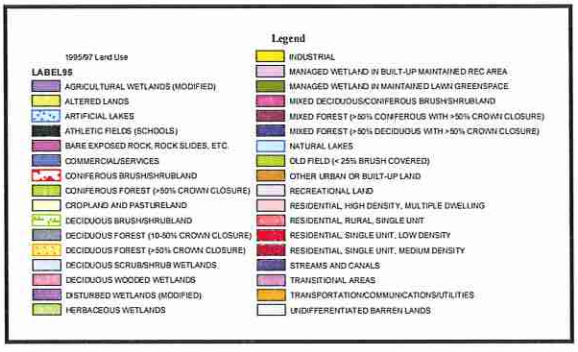
3,000 Feet 1,500 Feet 0 3,000 Feet

Source: Wellhead locations taken from the New Jersey Geological Survey, shapefile DGSO4-5 (Bergen County Updated: February 2004).

Figure 8: Existing Land Use in the Borough of Oakland



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



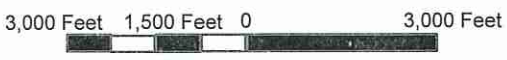
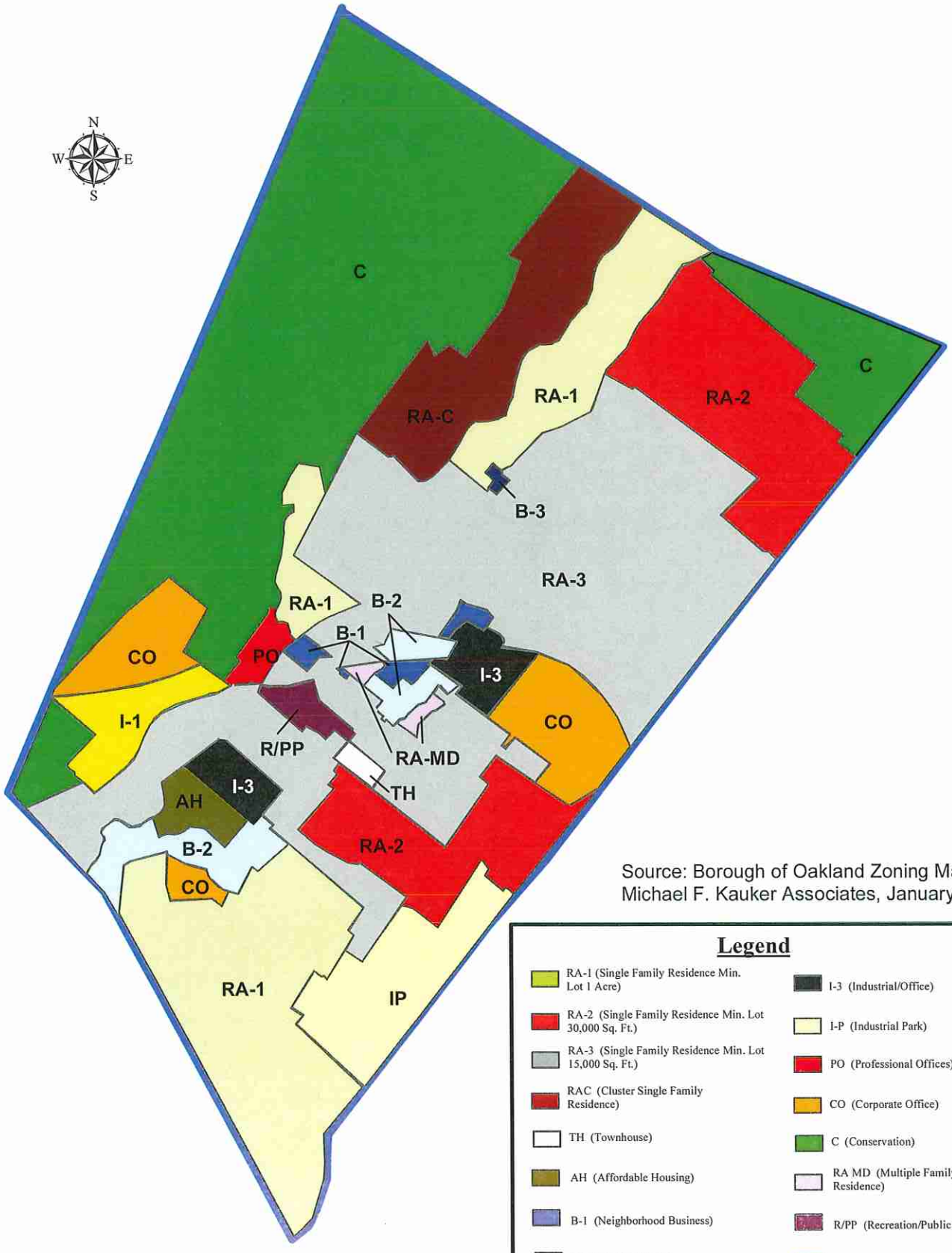


Figure 9: Zoning Districts in the Borough of Oakland

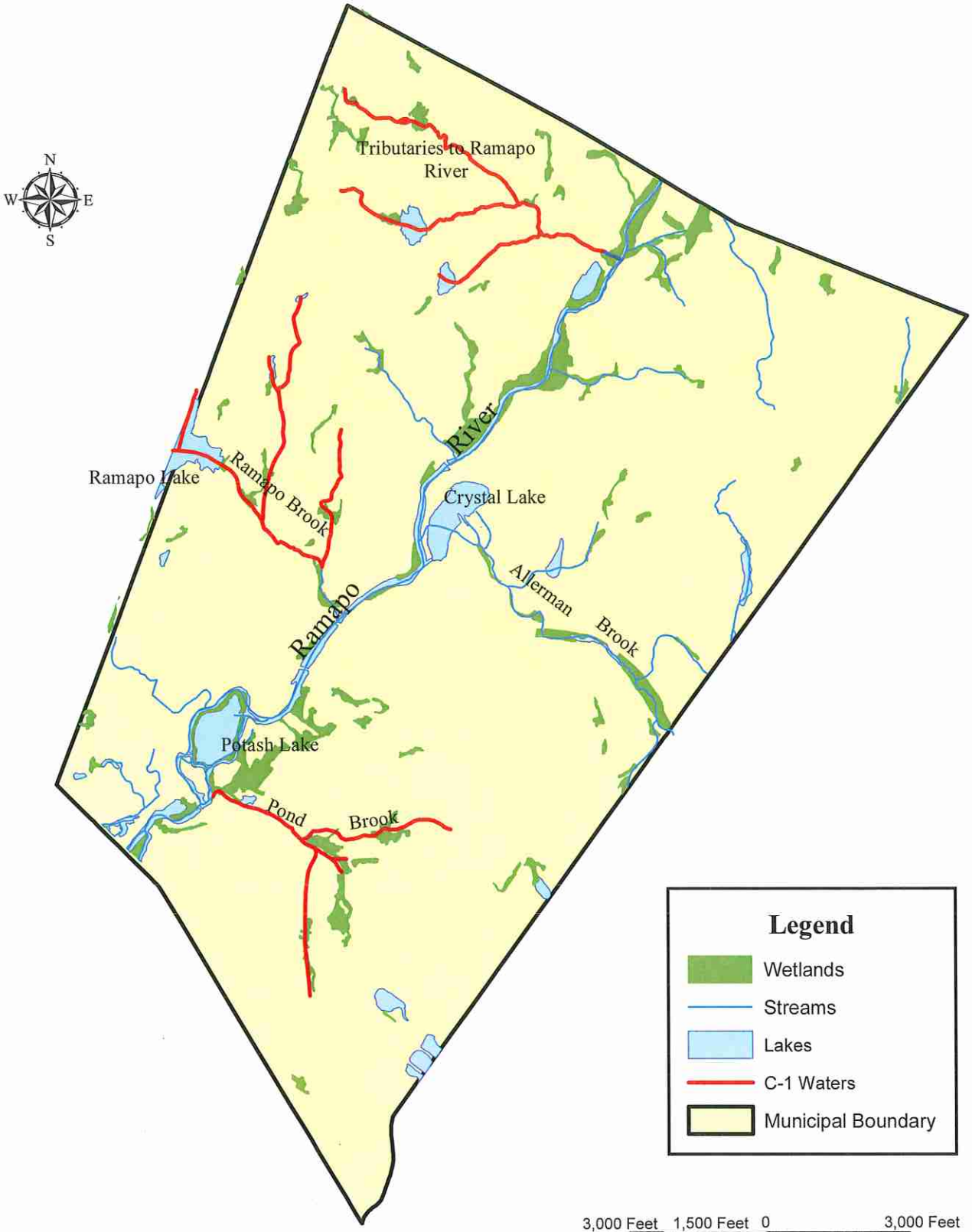


Source: Borough of Oakland Zoning Map, Michael F. Kauker Associates, January 1979.

Legend

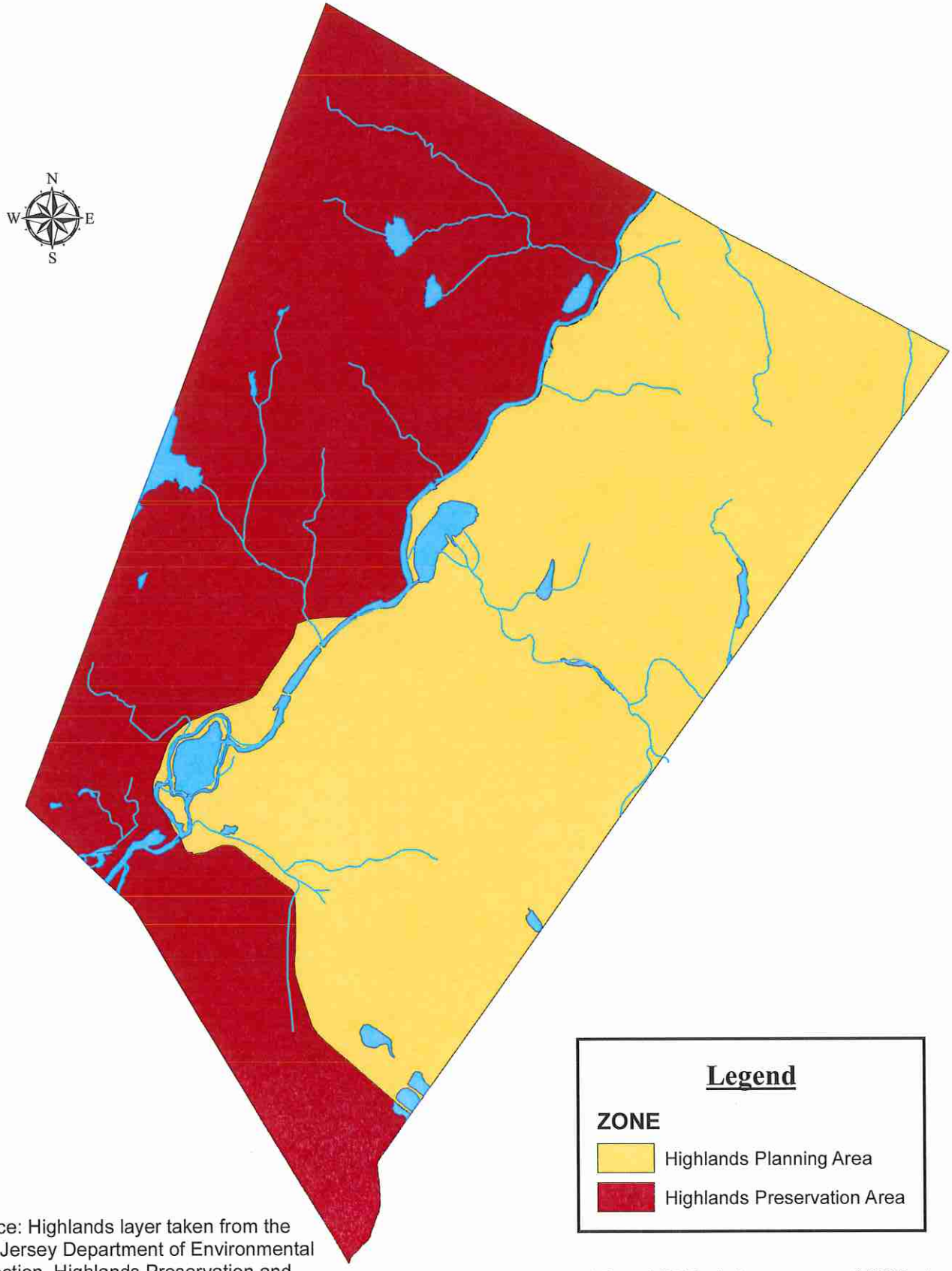
- RA-1 (Single Family Residence Min. Lot 1 Acre)
- RA-2 (Single Family Residence Min. Lot 30,000 Sq. Ft.)
- RA-3 (Single Family Residence Min. Lot 15,000 Sq. Ft.)
- RAC (Cluster Single Family Residence)
- TH (Townhouse)
- AH (Affordable Housing)
- B-1 (Neighborhood Business)
- B-2 (Local Business)
- B3 (Neighborhood Business)
- I-3 (Industrial/Office)
- I-P (Industrial Park)
- PO (Professional Offices)
- CO (Corporate Office)
- C (Conservation)
- RA MD (Multiple Family Residence)
- R/PP (Recreation/Public Purpose)
- I-1 (Industrial)

Figure 10: Freshwater Wetlands and Water Land Uses within the Borough of Oakland (Constrained Land)



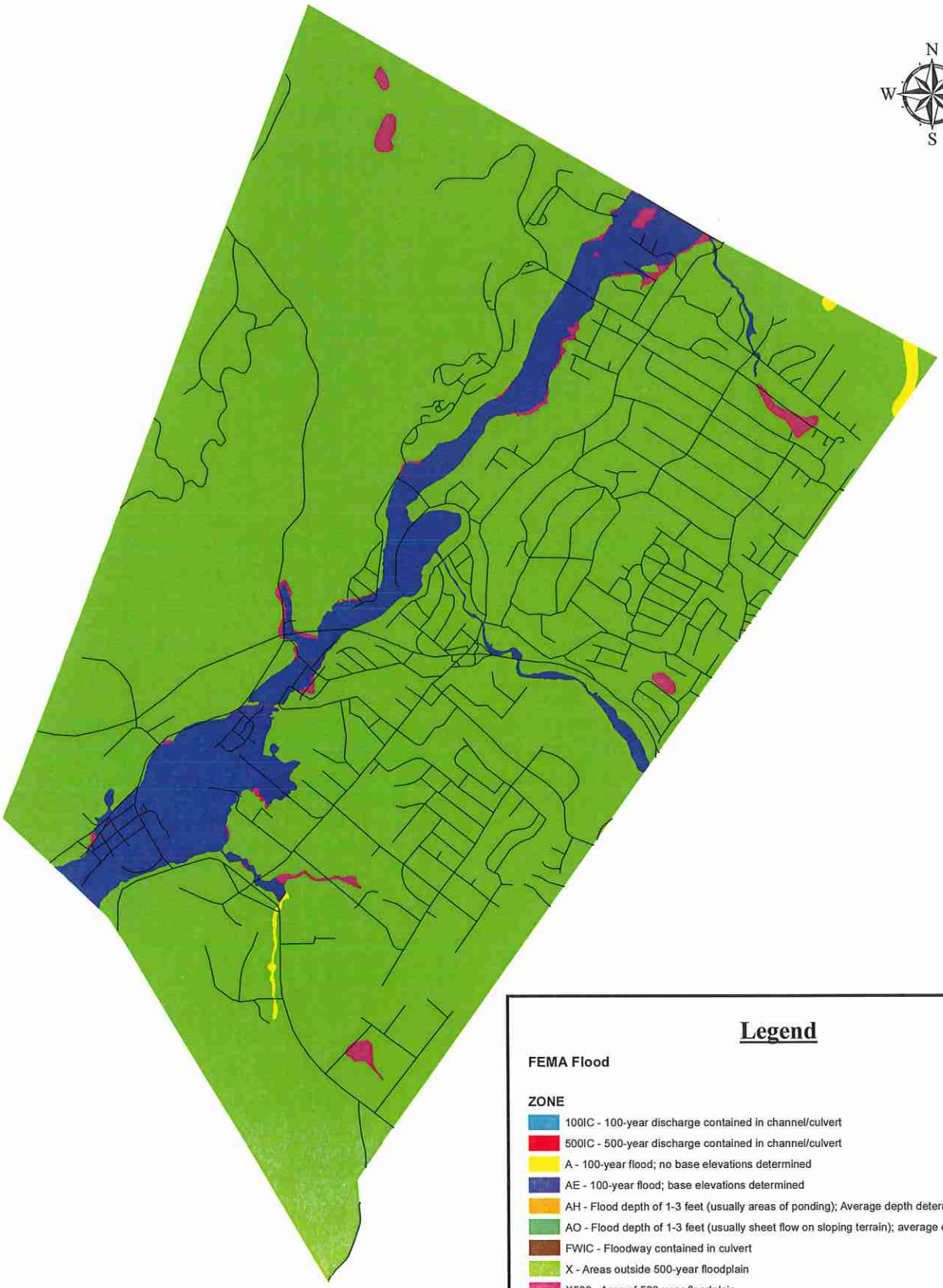
Source: Wetlands layer taken from the New Jersey Department of Environmental Protection, Wetlands shapefile (11/1999).

Figure 11: N.J. Highlands Planning and Preservation Areas within the Borough of Oakland



Source: Highlands layer taken from the New Jersey Department of Environmental Protection, Highlands Preservation and Planning Area shapefile (July 2004).

Figure 12: Borough of Oakland Floodplains Map



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

TABLE 1

Each HUC-14 was then broken into the Zoning Districts that were present within that HUC-14, and each Zoning District was further broken down to the types of Land Use that were present. From here, the GIS could calculate the area of each type of Land Use within each Zoning District, within each HUC-14. We then summed these areas to get the Total Area (acres). Furthermore, the percentages of impervious surfaces for each type of Land Use were present in the GIS, and these were used in a weighted average to determine the total Existing Impervious (%) coverage in each Zoning District. The Developable Area (acres) was calculated by subtracting the Wetlands/Water Area (acres) from the Total Area (acres), since Water and Wetlands are excluded from developable lands.

HUC14 and Zone	Total Area (acres)	Existing Impervious (%)	Existing Impervious (acres)	Wetlands/ Water Area (acres)	Developable Area (acres)	Allowable Impervious (%)	Build-Out Impervious (acres)
02030103100050 ID#1 PRESERVATION AREA							
Conservation (C)	782.30	0.24%	1.86	42.87	739.43	3.14%	23.22
Cluster Single Family Residence (RA-C)	292.58	0.09%	0.26	54.88	237.70	3.07%	3.26
Single Family Residence (RA-3)	29.26	9.38%	2.74	0.99	28.27	11.55%	3.26
TOTALS	**106.24**	**9.01%**	**9.57**	**2.53**	**103.71**	**25.00%**	**25.93**

*picture is part of TABLE 1 from Build-out Analysis.

The western and southern portions of the Borough are part of the Highlands Preservation Area, while the eastern half is part of the Highlands Planning Area. For zoning districts within the Planning Area, the Allowable Impervious (%) is determined by the Borough.

To determine the Allowable Impervious (%) in the Preservation Area, we examined each Zoning District in a given HUC-14, and added the areas for all Land Use types that had an IS (impervious surface) of 0% (excluding Water and Wetlands). We then used the following formula to calculate the Allowable Impervious:

$$\frac{[(A_{TOT}\ IS=0\%)*(0.03)] + [(A_{TOT}\ DA) * (EI\%)]}{(A_{TOT}\ DA)}$$

Where DA = Developable Area (acres) &
EI% = Existing Impervious (%)

Three percent (3%, or 0.03) is used in the equation for areas where there is currently no impervious coverage. This number is taken from the Highlands Act which states that a

proposed development or activity cannot result in impervious surface of greater than three percent of the land area of the lot (*see Highlands Act N.J.A.C. 7:38).*

TABLE 2

Table 2 is taken from the NJDEP Stormwater Best Management Practices Manual, and these numbers were used for the calculations in TABLE 3.

TABLE 3

In Table 3, each Zoning District was assigned to one of the Land Cover categories that are listed in Table 2 in order to calculate the pollutant loads. In cases where the name of a particular Zoning District did not match one of these categories, we examined that particular district with recent (2002) aerial photography. If there was little urban development observed, the district was assigned lower pollutant loads. If greater urban development was shown, the district was assigned higher pollutant loads.

Borough of Oakland Build-out Analysis

HUC14 and Zone	Total Area (acres)	Existing Impervious (%)	Existing Impervious (acres)	Wetlands/ Water Area (acres)	Developable Area (acres)	Allowable Impervious (%)	Build-Out Impervious (acres)
02030103100050 ID#1	PRESERVATION AREA						
Conservation (C)	782.30	0.24%	1.86	42.87	739.43	3.14%	23.22
Cluster Single Family Residence (RA-C)	292.58	0.09%	0.26	54.88	237.70	3.07%	7.30
Single Family Residence (RA-3)	29.26	9.38%	2.74	0.99	28.27	11.55%	3.26
TOTALS	**1,104.14**	**0.44%**	**4.86**	**98.74**	**1,005.40**	**3.36%**	**33.78**
02030103100050 ID#1	PLANNING AREA						
Conservation (C)	109.77	0.01%	0.01	5.22	104.55	5.00%	5.23
Single Family Residence (RA-1)	197.50	11.08%	21.88	44.37	153.13	20.00%	30.63
Single Family Residence (RA-2)	317.09	21.64%	68.61	0.84	316.25	20.00%	63.25
Single Family Residence (RA-3)	133.90	27.55%	36.90	1.03	132.87	20.00%	26.57
TOTALS	**758.25**	**16.80%**	**127.39**	**51.46**	**706.79**	**17.04%**	**120.45**
02030103170050 ID#2	PRESERVATION AREA						
Business (B2)	54.12	32.12%	17.38	8.90	45.22	32.87%	14.86
Conservation (C)	620.89	0.60%	3.70	39.75	581.14	3.48%	20.22
Corporate Office (CO)	124.29	6.87%	8.53	0.00	124.29	6.90%	8.58
Industrial (I1)	86.84	46.33%	40.23	0.00	86.84	47.20%	40.99
Professional Office (PO)	14.21	29.31%	4.17	0.00	14.21	29.68%	4.22
Single Family Residence (RA1)	272.85	4.24%	11.56	7.88	264.97	6.59%	17.46
Single Family Residence (RA3)	149.51	16.20%	24.21	21.78	127.73	17.47%	22.31
TOTALS	**1,322.70**	**8.30%**	**109.78**	**78.31**	**1,244.39**	**10.34%**	**128.64**
02030103170050 ID#2	PLANNING AREA						
Affordable Housing - (AH)	30.98	12.28%	3.80	3.18	27.80	45.00%	12.51
Business - (B1)	23.50	60.79%	14.29	0.75	22.75	30.00%	6.83
Business - (B2)	55.59	61.10%	33.97	0.00	55.59	30.00%	16.68
Corporate Office - (CO)	7.68	46.96%	3.61	0.00	7.68	50.00%	3.84
Industrial/Office - (I3)	45.88	46.86%	21.50	8.22	37.66	50.00%	18.83
Professional Office - (PO)	17.49	18.83%	3.29	3.29	14.20	50.00%	7.10
Recreation/Public Purpose - (R/PP)	28.68	22.84%	6.55	4.13	24.55	50.00%	12.27
Single Family Residence - (RA1)	28.89	27.88%	8.05	1.73	27.16	20.00%	5.43
Single Family Residence - (RA2)	50.12	24.79%	12.42	0.16	49.96	20.00%	9.99
Single Family Residence - (RA3)	447.99	27.71%	124.14	60.57	387.42	20.00%	77.48
Multiple Family Residence - (RA-MD)	13.36	40.27%	5.38	0.00	13.36	20.00%	2.67
Townhouse - (TH)	10.57	15.38%	1.63	1.01	9.56	40.00%	3.82
TOTALS	**760.71**	**31.37%**	**238.62**	**83.04**	**677.67**	**12.39%**	**83.98**

TABLE 1

Borough of Oakland Build-out Analysis

HUC14 and Zone	Total Area (acres)	Existing Impervious (%)	Existing Impervious (acres)	Wetlands/ Water Area (acres)	Developable Area (acres)	Allowable Impervious (%)	Build-Out Impervious (acres)
2030103100060 ID#3	PRESERVATION AREA						
Local Business - (B2)	4.48	54.33%	2.44	0.00	4.48	54.53%	2.44
Corporate Office - (CO)	1.04	0.00%	0.00	0.00	1.04	3.00%	0.03
Single Family Residence - (RA1)	196.78	8.49%	16.71	5.55	191.23	10.17%	19.45
TOTALS	**202.30**	**9.46%**	**19.15**	**5.55**	**196.75**	**11.14%**	**21.92**
2030103100060 ID#3	PLANNING AREA						
Neighborhood Business - (B1)	8.05	46.07%	3.71	0.21	7.84	30.00%	2.35
Local Business - (B2)	13.41	51.70%	6.93	1.69	11.72	30.00%	3.51
Corporate Office - (CO)	118.76	15.50%	18.41	15.61	103.15	50.00%	51.58
Industrial Office - (I3)	52.10	47.05%	24.52	6.48	45.62	50.00%	22.81
Industrial Park - (IP)	197.89	39.28%	77.73	14.41	183.48	50.00%	91.74
Single Family Residence - (RA1)	136.15	5.87%	7.99	17.39	118.76	20.00%	23.75
Single Family Residence - (RA2)	200.41	19.64%	39.36	6.81	193.60	20.00%	38.72
Single Family Residence - (RA3)	706.76	29.68%	209.77	41.53	665.23	20.00%	133.05
TOTALS	**1,433.53**	**27.09%**	**388.41**	**104.13**	**1,329.40**	**27.64%**	**367.51**

TABLE 1

Pollutant Loads by Land Cover

Land Cover	Total Phosphorus Load (lbs/acres/year)	Total Nitrogen Load (lbs/acres/year)	Total Suspended Solids Load (lbs/acres/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

Source: NJDEP Stormwater Best Management Practices Manual 2004.

Non-Point Source Loads at Build-out

HUC14 and Zone	Developable Area (acres)	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/yr)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
02030103100050 ID#1	PRESERVATION AREA						
Conservation (C)	739.43	0.1	73.94	3	2218.30	40	29,577.34
Cluster Single Family Residence (RA-C)	237.70	1.4	332.78	15	3565.48	140	33,277.84
Single Family Residence (RA-3)	28.27	0.6	16.96	5	141.33	100	2,826.67
TOTALS	**1,005.40**		**423.68**		**5,925.12**		**65,681.86**
02030103100050 ID#1	PLANNING AREA						
Conservation (C)	104.55	0.1	10.45	3	313.64	40	4,181.82
Single Family Residence (RA-1)	153.13	0.6	91.88	5	765.64	100	15,312.74
Single Family Residence (RA-2)	316.25	0.6	189.75	5	1581.23	100	31,624.60
Single Family Residence (RA-3)	132.87	1.4	186.02	15	1993.08	140	18,602.11
TOTALS	**706.79**		**478.10**		**4,653.59**		**69,721.27**
02030103170050 ID#2	PRESERVATION AREA						
Business (B2)	45.22	2.1	94.96	22	994.78	200	9,043.48
Conservation (C)	581.14	0.1	58.11	3	1743.42	40	23,245.58
Corporate Office (CO)	124.29	1.0	124.29	10	1242.86	120	14,914.29
Industrial (I1)	86.84	1.5	130.26	16	1389.40	200	17,367.50
Professional Office (PO)	14.21	1.5	21.32	16	227.40	200	2,842.44
Single Family Residence (RA1)	264.97	0.6	158.98	5	1324.84	100	26,496.81
Single Family Residence (RA3)	127.73	1.4	178.82	15	1915.88	140	17,881.58
TOTALS	**1,244.39**		**766.73**		**8,838.58**		**111,791.68**
02030103170050 ID#2	PLANNING AREA						
Affordable Housing - (AH)	27.80	1.4	38.91	15	416.93	140	3,891.34
Business - (B1)	22.75	2.1	47.78	22	500.58	200	4,550.68
Business - (B2)	55.59	2.1	116.74	22	1223.03	200	11,118.41
Corporate Office - (CO)	7.68	1.0	7.68	10	76.77	120	921.24
Industrial/Office - (I3)	37.66	1.5	56.49	16	602.55	200	7,531.91
Professional Office - (PO)	14.20	1.5	21.30	16	227.25	200	2,840.62
Recreation/Public Purpose - (PP)	24.55	1.0	24.55	10	245.46	120	2,945.49
Single Family Residence - (RA1)	27.16	0.6	16.29	5	135.78	100	2,715.58
Single Family Residence - (RA2)	49.96	0.6	29.97	5	249.79	100	4,995.74

TABLE 3

Non-Point Source Loads at Build-out

HUC14 and Zone	Developable Area (acres)	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/yr)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
02030103170050 ID#2	**PLANNING AREA (con't)**						
Single Family Residence - (RA3)	387.42	1.4	542.38	15	5811.26	140	54,238.39
Multiple Family Residence - (RA-MD)	13.36	1.4	18.70	15	200.41	140	1,870.48
Townhouse - (TH)	9.56	1.4	13.38	15	143.37	140	1,338.08
TOTALS	**677.67**		**934.19**		**9,833.16**		**98,957.99**
2030103100060 ID#3	**PRESERVATION AREA**						
Local Business - (B2)	4.48	2.1	9.41	22	98.62	200	896.58
Corporate Office - (CO)	1.04	1.0	1.04	10	10.40	120	124.80
Single Family Residence - (RA1)	191.23	0.6	114.74	5	956.15	100	19,123.09
TOTALS	**196.75**		**125.19**		**1,065.18**		**20,144.46**
2030103100060 ID#3	**PLANNING AREA**						
Neighborhood Business - (B1)	7.84	2.1	16.47	22	172.55	200	1,568.65
Local Business - (B2)	11.72	2.1	24.60	22	257.74	200	2,343.11
Corporate Office - (CO)	103.15	1.0	103.15	10	1031.50	120	12,378.03
Industrial Office - (I3)	45.62	1.5	68.44	16	729.98	200	9,124.78
Industrial Park - (IP)	183.48	1.5	275.22	16	2935.69	200	36,696.13
Single Family Residence - (RA1)	118.76	0.6	71.26	5	593.80	100	11,876.00
Single Family Residence - (RA2)	193.60	0.6	116.16	5	967.98	100	19,359.62
Single Family Residence - (RA3)	665.23	1.4	931.33	15	9978.49	140	93,132.59
TOTALS	**1,329.40**		**1,606.62**		**16,667.74**		**186,478.91**

TABLE 3

Huc #1 - Preservation Area

ZONING DISTRICT	LAND USE	IS	Area	Acres	Existing Impervious
Conservation - (C)	Barren Land	0%	95,358	2.19	0.00
	Forest	0%	30,999,400	711.65	0.00
		5%	23,343	0.54	0.03
	Water	0%	502,675	11.54	0.00
	Wetlands	0%	1,364,826	31.33	0.00
	URBAN				
	Recreational Land	5%	1,028,528	23.61	1.18
	Transportation/Communications/Utilities	45%	63,015	1.45	0.65
			TOTALS	782.30	1.86
Cluster Sing. Family Residence - (RA-C)	Forest	0%	10,205,654	234.29	0.00
	Water	0%	696,506	15.99	0.00
	Wetlands	0%	1,694,018	38.89	0.00
	URBAN				
	Other Urban or Built-Up Land	0%	88,173	2.02	0.00
	Residential, Rural, Single Unit	15%	49,124	1.13	0.17
	Residential, Single Unit, Medium Density	35%	11,261	0.26	0.09
			TOTALS	292.58	0.26
Single Family Residence - (RA-3)	Forest	0%	890,003	20.43	0.00
	Water	0%	43,026	0.99	0.00
	URBAN				
	Residential, Single Unit, Medium Density	35%	341,395	7.84	2.74
			TOTALS	29.26	2.74

Huc#1 - Planning Area

ZONING DISTRICTS	LAND USE	IS	Area (ft²)	Acres	Existing Impervious
Conservation - (C)	Forest	0%	4,539,730	104.22	0.00
	Wetlands	0%	240,653	5.52	0.00
	URBAN				
	Residential, Single Unit, Low Density	25%	1,000	0.02	0.01
			TOTALS	109.77	0.01
Single Family Residence - (RA-1)	Agriculture	0%	133,326	3.06	0.00
	Forest	0%	1,628,067	37.38	0.00
		5%	54,100	1.24	0.06
	Water	0%	257,622	5.91	0.00
	Wetlands	0%	1,675,386	38.46	0.00
	URBAN				
	Recreational Land/Other Urban Land	0%	442,099	10.15	0.00
	Residential, Rural, Single Unit	15%	1,558,302	35.77	5.37
	Residential, Single Unit, Low Density	25%	2,819,909	64.74	16.18
	Residential, Single Unit, Medium Density	30%	8,107	0.19	0.06
		35%	26,067	0.60	0.21
			TOTALS	197.50	21.88
Single Family Residence - (RA-2)	Forest	0%	1,933,436	44.39	0.00
	Wetlands	0%	36,482	0.84	0.00
	URBAN				
	Residential, Rural, Single Unit	15%	103,440	2.37	0.36
	Residential, Single Unit, Low Density	25%	11,130,181	255.51	63.88
	Residential, Single Unit, Medium Density	30%	448,222	10.29	3.09
		35%	160,506	3.68	1.29
			TOTALS	317.09	68.61
Single Family Residence - (RA-3)	Forest	0%	1,195,763	27.45	0.00
	Wetlands	0%	45,002	1.03	0.00
	URBAN				
	Residential, Single Unit, Medium Density	35%	4,592,016	105.42	36.90
			TOTALS	133.90	36.90

Huc#2 - Preservation Area

ZONING DISTRICTS	LAND USE	IS	Area (ft²)	Acres	Existing Impervious (acres)
Business - (B2)	Forest	0%	492,035	11.30	0.00
		5%	165,968	3.81	0.19
	Water	0%	170,462	3.91	0.00
	Wetlands	0%	217,449	4.99	0.00
	URBAN				
	Other Urban or Built-up Land	5%	168,453	3.87	0.19
	Residential, Rural, Single Unit	15%	61,097	1.40	0.21
	Residential, Single Unit, Low Density	25%	167,996	3.86	0.96
	Residential, Single Unit, Medium Density	30%	128,522	2.95	0.89
	Commercial/Services	70%	74,143	1.70	1.19
		75%	57,909	1.33	1.00
		85%	653,319	15.00	12.75
			TOTALS	54.12	17.38
Conservation - (C)	Barren Land	0%	400,527	9.19	0.00
		5%	170,976	3.93	0.20
	Forest	0%	23,850,421	547.53	0.00
		5%	23,144	0.53	0.03
	Water	0%	998,161	22.91	0.00
	Wetlands	0%	733,578	16.84	0.00
	URBAN				
	Other Urban or Built-up Land	0%	58,299	1.34	0.00
	Residential, Rural, Single Unit	15%	755,356	17.34	2.60
	Commercial/Services	45%	31,620	0.73	0.33
	Transportation/Communication/Utilities	100%	23,865	0.55	0.55
			TOTALS	620.89	3.70
Corporate Office - (CO)	Barren Land	0%	2,403,090	55.17	0.00
	Forest	0%	2,624,264	60.24	0.00
	URBAN				
	Industrial	90%	148,148	3.40	3.06
	Transportation/Communication/Utilities	100%	238,386	5.47	5.47
			TOTALS	124.29	8.53

Huc#2 - Preservation Area

Industrial - (I1)	Barren Land	0%	413,867	9.50	0.00
	Forest	0%	687,158	15.77	0.00
		5%	366,316	8.41	0.42
	URBAN				
	Other Urban or Built-up Land	5%	54,262	1.25	0.06
	Residential, Rural, Single Unit	15%	55,387	1.27	0.19
	Industrial	75%	1,917,086	44.01	33.01
	Commercial/Services	90%	30,915	0.71	0.64
	Transportation/Communication/Utilities	100%	257,650	5.91	5.91
			TOTALS	86.84	40.23
Professional Office - (PO)	Barren Land	0%	10,685	0.25	0.00
		5%	37,911	0.87	0.04
	Forest	5%	40,770	0.94	0.05
	URBAN				
	Other Urban or Built-up Land	0%	65,124	1.50	0.00
		5%	239,452	5.50	0.27
	Residential, Single Unit, Low Density	25%	77,543	1.78	0.45
	Commercial/Services	90%	14,188	0.33	0.29
	Transportation/Communication/Utilities	100%	133,410	3.06	3.06
			TOTALS	14.21	4.17

Huc#2 - Preservation Area

Single Family Residence - (RA1)	Barren Land	0%	73,408	1.69	0.00
	Forest	0%	8,979,686	206.15	0.00
		10%	47,650	1.09	0.11
	Water	0%	58,697	1.35	0.00
	Wetlands	0%	201,588	4.63	0.00
		10%	82,862	1.90	0.19
	URBAN				
	Recreational Land	5%	159,549	3.66	0.18
	Other Urban or Built-up Land	10%	153,275	3.52	0.35
	Residential, Rural, Single Unit	15%	810,618	18.61	2.79
	Residential, Single Unit, Low Density	20%	869,037	19.95	3.99
		25%	298,123	6.84	1.71
	Residential, Single Unit, Medium Density	35%	71,999	1.65	0.58
	Commercial/Services	45%	12,554	0.29	0.13
	Transportation/Communication/Utilites	100%	66,219	1.52	1.52
			TOTALS	272.85	11.56
Single Family Residence - (RA3)	Forest	0%	2,353,080	54.02	0.00
		5%	75,789	1.74	0.09
	Water	0%	666,204	15.29	0.00
	Wetlands	0%	282,611	6.49	0.00
	URBAN				
	Residential, Rural, Single Unit	15%	66,536	1.53	0.23
	Residential, Single Unit, Low Density	25%	333,982	7.67	1.92
	Residential, Single Unit, Medium Density	35%	2,732,960	62.74	21.96
	Industrial	75%	1,300	0.03	0.02
			TOTALS	149.51	24.21

Huc #2 - Planning Area

ZONING DISTRICTS	LAND USE	IS	Area (ft²)	Acres	Existing Impervious
Affordable Housing - (AH)	Forest	0%	224,556	5.16	0.00
		5%	481,759	11.06	0.55
	Water	0%	135,277	3.11	0.00
	Wetlands	0%	3,060	0.07	0.00
	URBAN				
	Other Urban or Built-up Land	10%	240,994	5.53	0.55
	Recreational Land	30%	193,867	4.45	1.34
	Commercial/Services	85%	69,771	1.60	1.36
			TOTALS	30.98	3.80
Business - (B1)	Forest	0%	70,980	1.63	0.00
	Water	0%	32,575	0.75	0.00
	URBAN				
	Other Urban or Built-up Land	0%	15,444	0.35	0.00
	Residential, Single Unit, Low Density	25%	11,395	0.26	0.07
	Residential, Single Unit, Medium Density	35%	176,092	4.04	1.41
	Commercial/Services	45%	16,668	0.38	0.17
		60%	156,254	3.59	2.15
		80%	123,028	2.82	2.26
		85%	421,373	9.67	8.22
			TOTALS	23.50	14.29
Business - (B2)	Forest	0%	33,544	0.77	0.00
		5%	24,910	0.57	0.03
	URBAN				
	Other Urban or Built-up Land	5%	278,706	6.40	0.32
		10%	124,292	2.85	0.29
	Residential, Single Unit, Medium Density	30%	134,781	3.09	0.93
		35%	51,263	1.18	0.41
	Commercial/Services	40%	108,921	2.50	1.00
	Residential, Single Unit, Medium Density	45%	212,098	4.87	2.19
		85%	1,323,248	30.38	25.82
	Transportation/Communication/Utilities	100%	129,827	2.98	2.98
			TOTALS	55.59	33.97

Huc #2 - Planning Area

Corporate Office - (CO)	Forest	0%	119,487	2.74	0.00
	URBAN				
	Other Urban or Built-up Land	5%	19,868	0.46	0.02
	Commercial/Services	80%	195,056	4.48	3.58
			TOTALS	7.68	3.61
Industrial/Office - (I3)	Forest	0%	523,151	12.01	0.00
	Water	0%	30,535	0.70	0.00
	Wetlands	0%	327,702	7.52	0.00
	URBAN				
	Residential, Rural, Single Unit	15%	49,238	1.13	0.17
	Residential, Single Unit, Medium Density	30%	41,057	0.94	0.28
		35%	35,819	0.82	0.29
	Commercial/Services	45%	49,793	1.14	0.51
	Industrial	85%	94,830	2.18	1.85
	Commercial/Services	90%	56,764	1.30	1.17
	Industrial	95%	648,703	14.89	14.15
	Commercial/Services	95%	140,922	3.24	3.07
			TOTALS	45.88	21.50
Professional Office - (PO)	Forest	0%	82,430	1.89	0.00
	Water	0%	65,036	1.49	0.00
	Wetlands	0%	78,196	1.80	0.00
	URBAN				
	Other Urban or Built-up Land	5%	100,660	2.31	0.12
	Residential, Single Unit, Low Density	25%	331,283	7.61	1.90
	Residential, Single Unit, Medium Density	35%	75,015	1.72	0.60
	Transportation/Communication/Utilities	100%	29,380	0.67	0.67
			TOTALS	17.49	3.29
Recreation/Public Purpose - (PP)	Forest	0%	30,450	0.70	0.00
		5%	15,763	0.36	0.02
	Water	0%	21,006	0.48	0.00
	Wetlands	0%	158,964	3.65	0.00
	URBAN				
	Athletic Fields	5%	631,690	14.50	0.73
	Other Urban or Built-up Land	10%	53,666	1.23	0.12

Huc #2 - Planning Area

	Residential, Single Unit, Medium Density	35%	11,057	0.25	0.09
	Commercial/Services	60%	82,470	1.89	1.14
	Athletic Fields	75%	155,396	3.57	2.68
	Commercial/Services	85%	41,341	0.95	0.81
	Athletic Fields	90%	47,312	1.09	0.98
			TOTALS	28.68	6.55
Single Family Residence - (RA1)	Forest	0%	2,000	0.05	0.00
	Water	0%	46,514	1.07	0.00
	Wetlands	0%	12,643	0.29	0.00
		5%	15,930	0.37	0.02
	URBAN				
	Other Urban or Built-up Land	0%	92,049	2.11	0.00
		5%	49,002	1.12	0.06
		10%	6,626	0.15	0.02
	Residential, Rural, Single Unit	15%	107,662	2.47	0.37
	Residential, Single Unit, Low Density	25%	784,128	18.00	4.50
	Residential, Single Unit, Medium Density	35%	7,859	0.18	0.06
	Commercial/Services	80%	9,250	0.21	0.17
	Transportation/Communication/Utilities	100%	124,603	2.86	2.86
			TOTALS	28.89	8.05
Single Family Residence - (RA2)	Forest	0%	327,448	7.52	0.00
	Wetlands	0%	7,000	0.16	0.00
	URBAN				
	Athletic Fields/Other Urban Land	5%	190,016	4.36	0.22
	Residential, Single Unit, Low Density	25%	1,165,770	26.76	6.69
	Residential, Single Unit, Medium Density	35%	129,356	2.97	1.04
	Commercial/Services	40%	165,654	3.80	1.52
		65%	197,871	4.54	2.95
			TOTALS	50.12	12.42
Single Family Residence - (RA3)	Forest	0%	1,141,496	26.21	0.00
		5%	589,552	13.53	0.68
	Water	0%	1,811,235	41.58	0.00
	Wetlands	0%	827,364	18.99	0.00
	URBAN				

Huc #2 - Planning Area

	Other Urban or Built-up Land	0%	174,062	4.00	0.00
	Athletic Fields/Other Urban Land	5%	551,460	12.66	0.63
	Other Urban or Built-up Land	10%	93,175	2.14	0.21
	Residential, Rural, Single Unit	15%	57,813	1.33	0.20
	Residential, Single Unit, Low Density & Transportation/Communication/Utilities	20%	314,349	7.22	1.44
	Residential, Single Unit, Low Density	25%	761,617	17.48	4.37
	Residential, Single Unit, Medium Density	30%	1,035,176	23.76	7.13
		35%	10,194,793	234.04	81.91
	Residential, High Density, Multiple Dwelling & Commercial/Services	40%	620,793	14.25	5.70
	Commercial/Services	45%	187,294	4.30	1.93
		60%	114,603	2.63	1.58
	Residential, High Density, Multiple Dwelling & Commercial/Services	65%	559,190	12.84	8.34
	Athletic Fields/Industrial	75%	28,116	0.65	0.48
	Commercial/Services	80%	55,408	1.27	1.02
		85%	158,122	3.63	3.09
		90%	27,577	0.63	0.57
	Industrial	95%	6,300	0.14	0.14
	Transportation/Communication/Utilities	100%	204,823	4.70	4.70
			TOTALS	447.99	124.14
Multiple Family Residence - (RA-MD)	Forest	0%	143,344	3.29	0.00
	URBAN				
	Other Urban or Built-up Land	0%	76,221	1.75	0.00
	Residential, Single Unit, Medium Density	35%	1,600	0.04	0.01
	Commercial/Services	60%	14,257	0.33	0.20
	Residential, High Density, Multiple Dwelling	65%	346,566	7.96	5.17
			TOTALS	13.36	5.38
Townhouse - (TH)	Forest	0%	96,500	2.22	0.00
		5%	137,162	3.15	0.16
	Wetlands	0%	43,949	1.01	0.00
	URBAN				
	Residential, Single Unit, Medium Density	35%	182,720	4.19	1.47
			TOTALS	10.57	1.63

Huc #2 - Planning Area

Huc #3 - Preservation Area

ZONING DISTRICTS	LAND USE	IS	Area (ft²)	Acres	Existing Impervious
Local Business - (B2)	Forest	0%	12,900	0.30	0.00
	URBAN				
	Residential, Rural, Single Unit	35%	97,870	2.25	0.79
	Commercial/Services	85%	84,505	1.94	1.65
			TOTALS	4.48	2.44
Corporate Office - (CO)	Forest	0%	45,450	1.04	0.00
			TOTALS	1.04	0.00
Single Family Residence - (RA1)	Forest	0%	4,515,515	103.66	0.00
		5%	339,768	7.80	0.39
	Water	0%	58,529	1.34	0.00
	Wetlands	0%	183,209	4.21	0.00
	URBAN				
	Other Urban or Built-up Land	0%	147,060	3.38	0.00
	Other Urban or Built-up Land	5%	131,580	3.02	0.15
	Residential, Rural, Single Unit	15%	537,056	12.33	1.85
	Residential, Single Unit, Low Density	20%	2,352,229	54.00	10.80
		25%	76,357	1.75	0.44
	Residential, Single Unit, Medium Density	35%	52,971	1.22	0.43
	Commercial/Services	65%	174,500	4.01	2.60
	Transportation/Communication/Utilities	75%	3,000	0.07	0.05
			TOTALS	196.78	16.71

Huc#3 - Planning Area

ZONING DISTRICT	LAND USE	IS	Area (ft²)	Acres	Existing Impervious
Neighborhood Business - (B1)	Forest	0%	20,000	0.46	0.00
	Wetlands	0%	9,353	0.21	0.00
	URBAN				
	Other Urban or Built-up Land	10%	72,510	1.66	0.17
	Residential, Single Unit, Medium Density	35%	11,292	0.26	0.09
	Commercial/Services	40%	137,085	3.15	1.26
		95%	99,819	2.29	2.18
	Transportation/Communication/Utilities	100%	740	0.02	0.02
			TOTALS	8.05	3.71
Local Business - (B2)	Forest	0%	84,167	1.93	0.00
	Wetlands	0%	73,480	1.69	0.00
	URBAN				
	Other Urban or Built-up Land	5%	43,132	0.99	0.05
	Residential, Rural, Single Unit	15%	10,307	0.24	0.04
	Commercial/Services	45%	63,800	1.46	0.66
		85%	263,890	6.06	5.15
	Transportation/Communication/Utilities	100%	45,170	1.04	1.04
			TOTALS	13.41	6.93
Corporate Office - (CO)	Forest	0%	2,478,589	56.90	0.00
	Water	0%	69,073	1.59	0.00
	Wetlands	0%	610,710	14.02	0.00
	URBAN				
	Other Urban or Built-up Land	0%	118,243	2.71	0.00
	Athletic Fields/Other Urban Land	5%	661,478	15.19	0.76
	Residential, Rural, Single Unit	15%	24,020	0.55	0.08
	Transportation/Communication/Utilities	20%	407,037	9.34	1.87
	Residential, Single Unit, Medium Density	35%	13,793	0.32	0.11
	Recreational Land	45%	74,924	1.72	0.77
	Commercial/Services	80%	265,188	6.09	4.87
	Transportation/Communication/Utilities	85%	74,830	1.72	1.46
	Athletic Fields	90%	58,107	1.33	1.20
	Transportation/Communication/Utilities	100%	317,206	7.28	7.28
			TOTALS	118.76	18.41

Huc#3 - Planning Area

Industrial Office - (I3)	Forest	0%	416,843	9.57	0.00
		5%	58,847	1.35	0.07
	Water	0%	13,430	0.31	0.00
	Wetlands	0%	268,783	6.17	0.00
	URBAN				
	Other Urban or Built-up Land	5%	167,411	3.84	0.19
		10%	92,187	2.12	0.21
	Residential, Single Unit, Low Density	25%	8,773	0.20	0.05
	Commercial/Services	40%	28,703	0.66	0.26
		45%	82,200	1.89	0.85
	Commercial/Services & Industrial	85%	905,009	20.78	17.66
	Transportation/Communication/Utilities	100%	227,460	5.22	5.22
			TOTALS	52.10	24.52
Industrial Park - (IP)	Barren Land	0%	243,429	5.59	0.00
	Forest	0%	1,408,693	32.34	0.00
		5%	624,948	14.35	0.72
	Water	0%	469,261	10.77	0.00
	Wetlands	0%	158,558	3.64	0.00
	URBAN				
	Other Urban or Built-up Land	5%	2,034,266	46.70	2.34
	Residential, Rural, Single Unit	15%	62,255	1.43	0.21
	Residential, Single Unit, Low Density	20%	27,569	0.63	0.13
	Residential, Single Unit, Medium Density	30%	5,800	0.13	0.04
	Industrial	75%	137,955	3.17	2.38
	Commercial/Services & Industrial	80%	555,718	12.76	10.21
	Commercial/Services & Industrial	90%	1,174,700	26.97	24.27
	Industrial	95%	1,716,965	39.42	37.45
			TOTALS	197.89	77.73
Single Family Residence - (RA1)	Barren Land	0%	336,688	7.73	0.00
	Forest	0%	3,155,324	72.44	0.00
		5%	126,248	2.90	0.14
	Water	0%	109,514	2.51	0.00
	Wetlands	0%	648,000	14.88	0.00
	URBAN				

Huc#3 - Planning Area

	Other Urban or Built-up Land	5%	8,073	0.19	0.01
	Residential, Rural, Single Unit	15%	443,347	10.18	1.53
	Residential, Single Unit, Low Density	20%	980,029	22.50	4.50
	Residential, Single Unit, Medium Density	30%	34,280	0.79	0.24
		35%	3,827	0.09	0.03
	Transportation/Communication/Utilities	75%	64,614	1.48	1.11
	Commercial/Services & Industrial	90%	20,750	0.48	0.43
			TOTALS	136.15	7.99
Single Family Residence - (RA2)	Forest	0%	1,431,652	32.87	0.00
	Wetlands	0%	296,794	6.81	0.00
	URBAN				
	Athletic Fields	0%	42,157	0.97	0.00
	Athletic Fields/Other Urban Land	5%	228,719	5.25	0.26
	Residential, Rural, Single Unit	15%	576,523	13.24	1.99
	Residential, Single Unit, Low Density	20%	1,369,110	31.43	6.29
	Commercial/Services	25%	4,288,810	98.46	24.61
	Residential, Single Unit, Medium Density	35%	143,752	3.30	1.16
	Commercial/Services	40%	94,187	2.16	0.86
	Other Urban or Built-up Land	65%	198,035	4.55	2.96
	Athletic Fields	90%	59,953	1.38	1.24
			TOTALS	200.41	39.36
Single Family Residence - (RA3)	Forest	0%	3,007,537	69.04	0.00
	Water	0%	1,366,481	31.37	0.00
	Wetlands	0%	442,690	10.16	0.00
	URBAN				
	Athletic Fields/Other Urban Land	0%	215,831	4.95	0.00
		5%	210,796	4.84	0.24
	Other Urban or Built-up Land	10%	15,923	0.37	0.04
	Residential, Single Unit, Low Density	25%	352,625	8.10	2.02
	Residential, Single Unit, Medium Density	30%	1,952,288	44.82	13.45
		35%	22,147,511	508.44	177.95
	Commercial/Services	40%	40,612	0.93	0.37
		60%	634,714	14.57	8.74
		65%	88,114	2.02	1.31
		75%	253,476	5.82	4.36

Huc#3 - Planning Area

	95%	52,825	1.21	1.15
Transportation/Communication/Utilities	100%	5,164	0.12	0.12
		TOTALS	706.76	209.77