

Charles J. Riebel, Sr.,
P.E., P.P., C.M.E.
Charles J. Riebel, Jr.,
P.E., P.L.S., P.P., C.M.E.
Gregory B. Fusco,
P.E., P.P., C.M.E.
Robert S. Smith,
P.L.S., P.P.
Scott E. Lobdell,
P.E., C.M.E.

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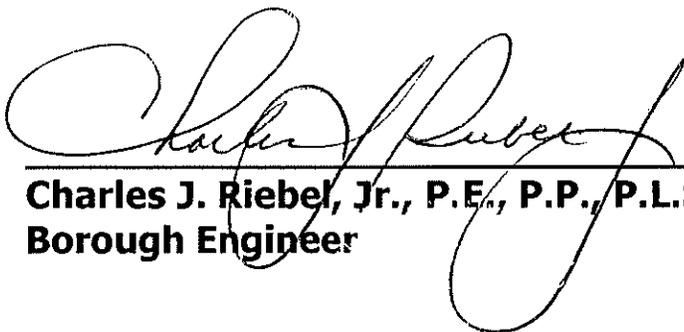
Municipal Stormwater Management Plan

for the

Borough of Stratford Camden County, New Jersey

(KEI #34-35SB)

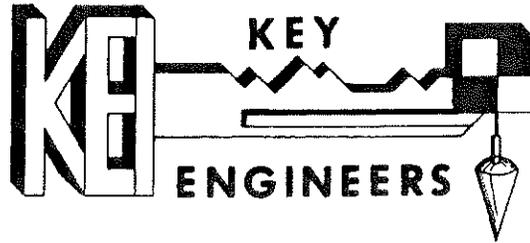
**March 10, 2005
Revised March 22, 2005
Revised April 18, 2005**



**Charles J. Riebel, Jr., P.E., P.P., P.L.S., C.M.E.
Borough Engineer**

4/18/05

Date



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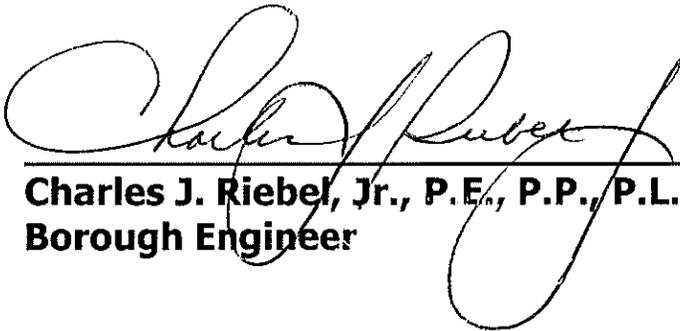
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Table of Contents

Introduction	3
Goals.....	3
Stormwater Discussion	4-5
Background	5-6
Design and Performance Standards	11
Plan Consistency.....	11
Nonstructural Stormwater Management Strategies.....	11-13
Land Use/Build-Out Analysis.....	13
Mitigation Plans.....	18-19
Bibliography.....	19

List of Figures

Figure C-1: Groundwater Recharge in the Hydrologic Cycle.....	4
Figure C-2: Waterways Map	7
Figure C-3: USGS Map.....	8
Figure C-4: Groundwater Recharge Areas Map	9
Figure C-5: Wellhead Protection Areas Map.....	10
Figure C-6: Existing Land Use Map.....	14
Figure C-7: Hydrologic Units (HUC14s) Map	15
Figure C-8: Zoning Map.....	16
Figure C-9: Wetlands & Water Land Uses Map	17

Introduction

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for Stratford Borough ("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 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 major development, defined as development and redevelopment projects that disturb one or more acre 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.

A "build-out" analysis has not been included in this plan since the Borough is, for the most part, fully developed with very little vacant, developable area available for development. 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 final component of this plan is a mitigation strategy for when a variance or exemption of the design and performance standards is sought. As part of the mitigation section of the stormwater plan, specific stormwater management measures are identified to lessen the impact of existing development.

Goals

The goals of this MSWMP are to:

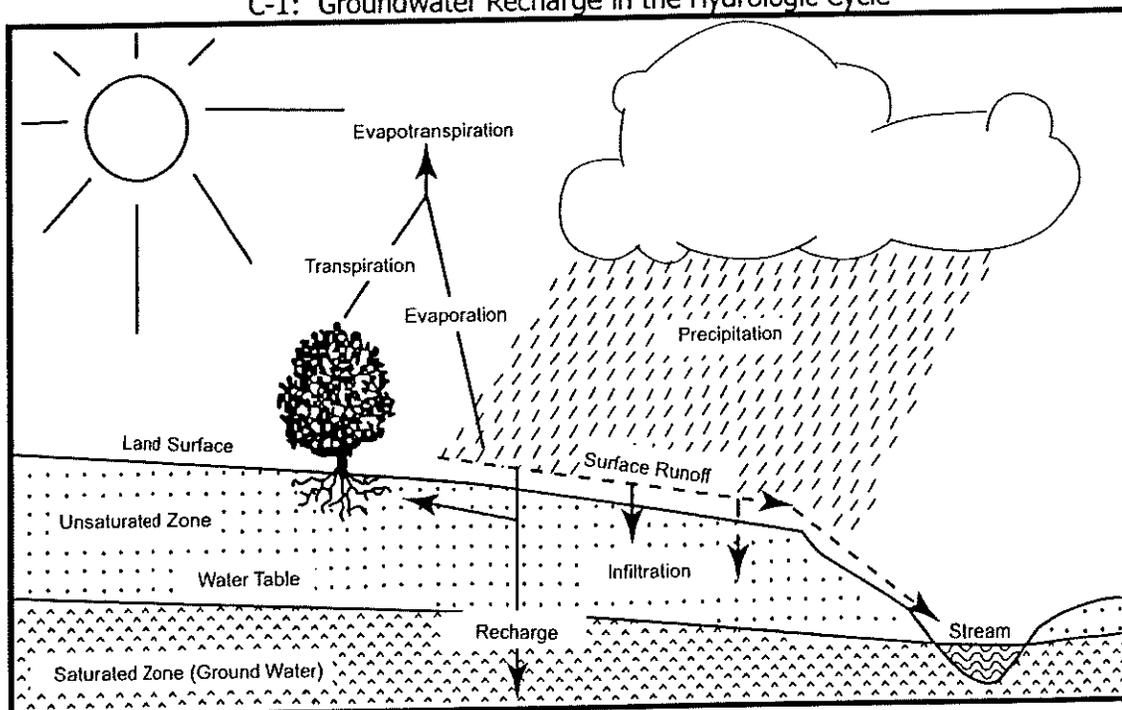
- reduce flood damage, including damage to life and property;
- minimize, to the extent practical, any increase in stormwater runoff from any new development;
- reduce soil erosion from any development or construction project;
- assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
- maintain groundwater recharge;
- prevent, to the greatest extent feasible, an increase in nonpoint pollution;
- maintain the integrity of stream channels for their biological functions, as well as for drainage;
- minimize pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water; and
- protect public safety through the proper design and operation of stormwater basins.

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

Stormwater Discussion

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

C-1: Groundwater Recharge in the Hydrologic Cycle



Source: New Jersey Geological Survey Report GSR-32.

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

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

Background

The Borough is located in the middle of Camden County and consists of approximately 1.59 square miles in Camden County, New Jersey. The population of the Borough, according to the Year 2000 Census Data, is 7,271, which represents a decline of 4.5% since 1990 when the population was 7,614. Due to the build out of the Borough and limited development over the years, there has not been a substantial change in stormwater runoff volumes and pollutant loadings to the waterways in the Borough. Figure C-2 illustrates the Waterways in the Borough. Figure C-3 depicts the Borough boundary on the USGS quadrangle maps.

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 water bodies, which border the Borough, are Signey Run and the North Branch of Big Timber Creek. Quaker Run also lies within the southern section of the Borough which is a tributary of the North Branch of Big Timber Creek. None of the water bodies were tested by the New Jersey Department of Environmental Protection for water quality. However, the North Branch of Big Timber Creek upstream in the Borough of Lindenwold was tested and received a low priority ranking of benthic macroinvertebrate (Site ID #AN0661 at Park Avenue).

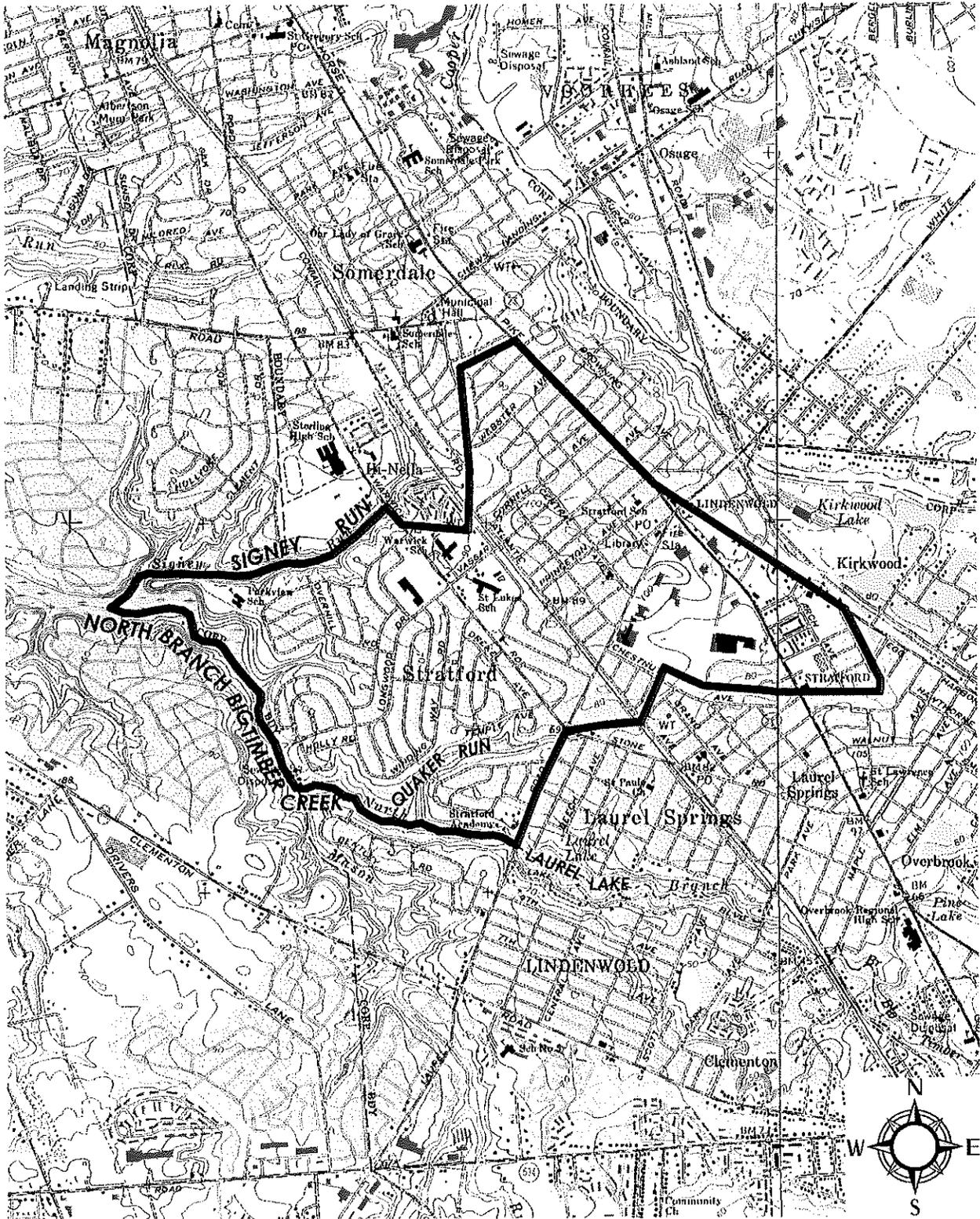
The Borough is bordered to the north by Signey Run and to the south and west by the North Branch of Big Timber Creek.

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 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 water bodies in the vicinity and bordering the Borough, have not, to the best of our knowledge been tested.

The Borough has exhibited severe flooding conditions along sections of East Atlantic Avenue, due to the undersized pipe underneath the railroad. As a result, the Borough has requested that the Camden County Board of Chosen Freeholders consider performing a Storm Drainage Study of East Atlantic Avenue. In addition, the Borough experiences flooding conditions along Vassar Avenue, due to excessive overland flows without stormwater management and existing drainage limitations at the low point, the railroad tracks. As a result, improvements to Vassar Avenue which include inlets, piping and a subsurface management system are proposed to be constructed in the Summer of 2005 to reduce the flooding conditions and better manage the uncontrolled runoff.

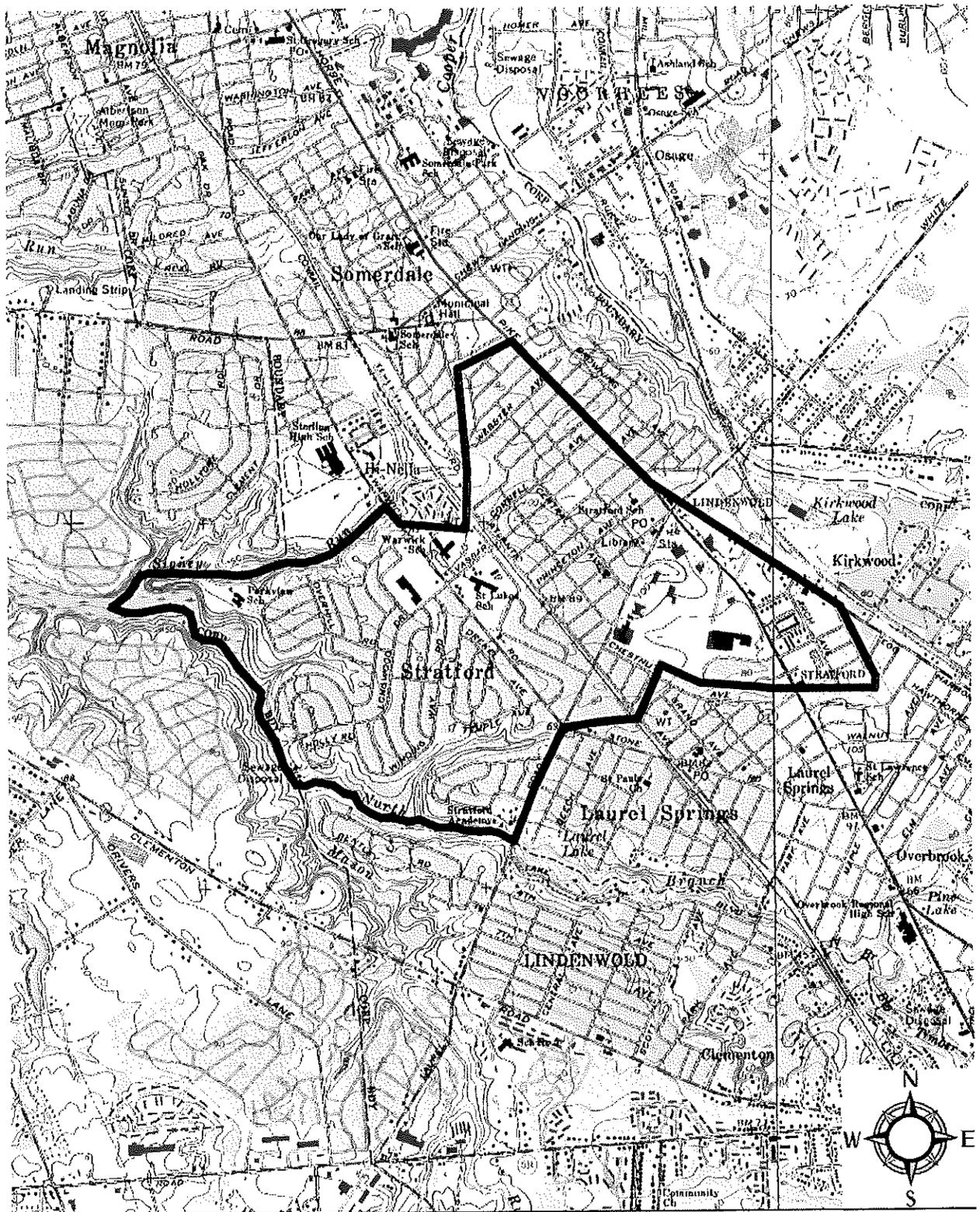
A map of the groundwater recharge areas are shown on Figure C-4. The wellhead protection areas, as required as part of the MSWMP, are depicted on Figure C-5. The Borough may consider adopting an ordinance, in the future, if it is determined to be necessary to protect the wellhead protection areas to minimize the infiltration of pollutants into the aquifers.



WATERWAYS MAP

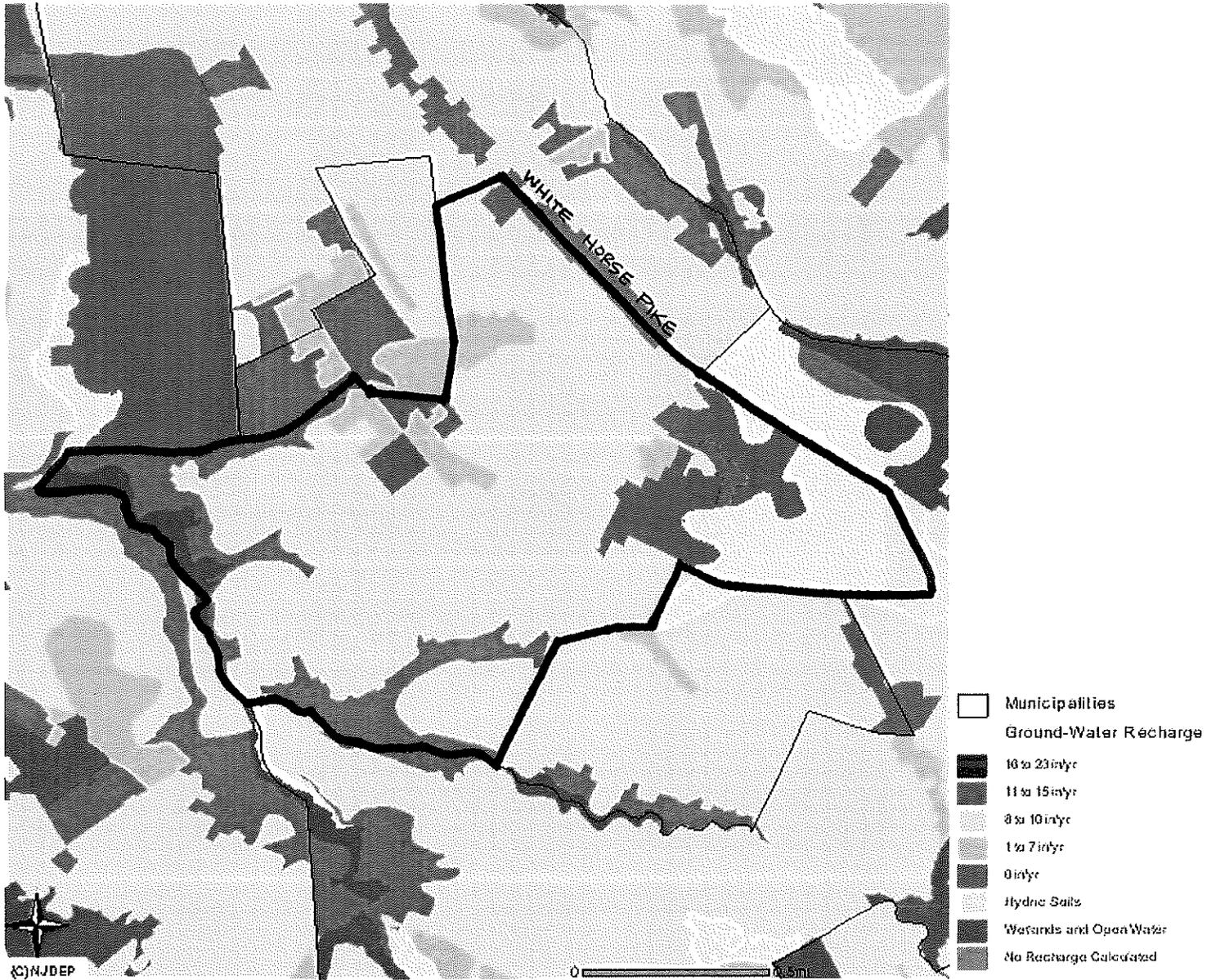
taken from the Runnemede Quadrangle
 Municipal Stormwater Management Plan
 for the Borough of Stratford
 Camden County, New Jersey

FIGURE C-2



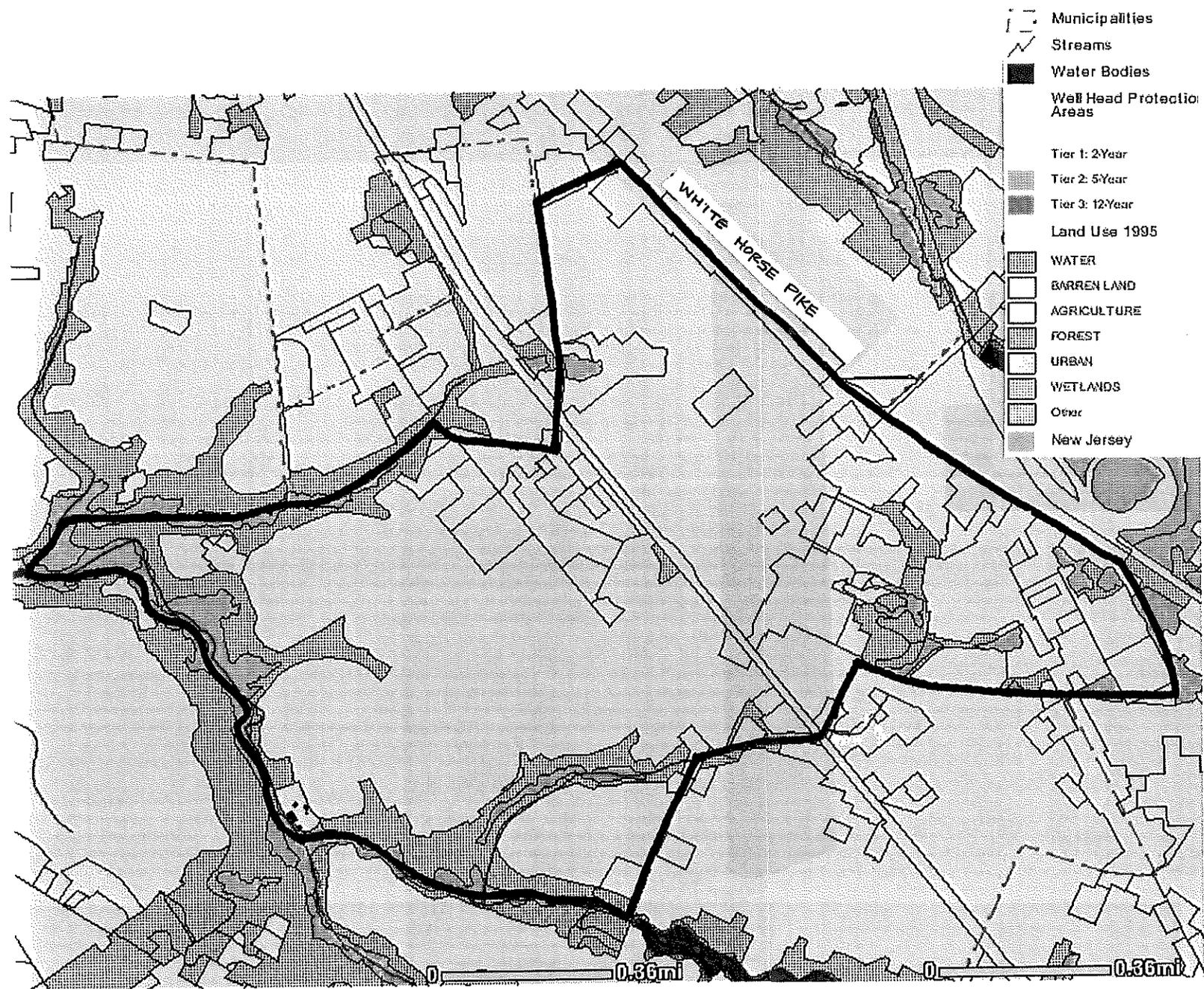
U.S.G.S. MAP
 taken from the Runnemede Quadrangle
 Municipal Stormwater Management Plan
 for the Borough of Stratford
 Camden County, New Jersey

FIGURE C-3



GROUNDWATER RECHARGE AREAS MAP
 Municipal Stormwater Management Plan
 for the Borough of Stratford
 Camden County, New Jersey

FIGURE C-4



WELLHEAD PROTECTION AREA MAP
 Municipal Stormwater Management Plan
 for the Borough of Stratford
 Camden County, New Jersey

FIGURE C-5

Design and Performance Standards

The Borough will adopt 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 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 will be submitted to the County for review and approval within 24 months of the effective date of the Stormwater Management Rules.

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

It is anticipated that these standards will only be utilized for a very small amount of development and redevelopment, since the disturbance of land will be less than one acre and the increase of impervious surface will be less than 0.25 acres.

Plan Consistency

At this time, there is no knowledge of the Borough being within a Regional Stormwater Management Planning Area and no TMDLs have been developed for waters within the Borough; therefore this plan does not need to be consistent with any regional stormwater management plans (RSWMPs) nor any TMDLs. 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 Stormwater Management Ordinance for the Borough requires all new development and redevelopment plans to comply with New Jersey's Soil Erosion and Sediment Control Standards. During construction, Borough inspectors will observe on-site soil erosion and sediment control measures and report any inconsistencies to the local Soil Conservation District.

Nonstructural Stormwater Management Strategies

The Borough has reviewed the master plan and ordinances, and has provided a list of the sections in the Borough land use and zoning ordinances that are to be modified to incorporate nonstructural stormwater management strategies. These are the ordinances 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.

.....

Chapters 16 and 17 of the Borough Code, entitled Land Development Code and Zoning, were reviewed with regard to incorporating nonstructural stormwater management strategies. Several changes will be made to the Chapters, to incorporate these strategies as follows:

.....

Title 16

Chapter 16.36.040: Streets describes the requirements for streets in the Borough. The Borough has several street classifications, ranging from "Arterial," which has a minimum right-of-way of 86 feet, to "Minor and Marginal Access," which has a minimum right-of-way of 50 feet. Street paving widths are a function of the number of units served, whether a street is curbed, whether on-street parking is permitted, whether the interior streets serve lots of two acres or larger, and whether on-site topographical constraints allow design flexibility. Depending on these factors, paving width for minor streets has a range from 20 to 30 feet. This section was amended to encourage developers to limit on-street parking to allow for narrower paved widths. This section also required that cul-de-sacs have a minimum radius of 50 feet. Language was added to this section to reduce the minimum pavement radius of cul-de-sac designs. Cul-de-sacs with flush curbs have a minimum pavement radius of 50.

Chapter 16.36.150: Storm Drainage addresses stormwater runoff, the Borough Ordinance will be updated to include all requirements outlined in N.J.A.C. 7:8-5. These changes were presented earlier in this document.

Chapter 16.36.150: Storm Drainage requires that all streets be provided with inlets and pipes where the same are necessary for proper drainage. This section will be amended to encourage the used of natural vegetated swales in lieu of inlets and pipes.

Chapter 16.36.200: Natural Features requires that natural features, such as trees, brooks, hilltops, and views, be preserved whenever possible in designing any subdivision containing such features. This section will be amended to expand trees to forested areas, to ensure that leaf litter and other beneficial aspects of the forest are maintained in addition to the trees.

Chapter 16.36.210: Soil Erosion and Sediment Control addresses soil erosion and sediment control. This ordinance requires developers to comply with the New Jersey Soil Erosion and Sediment Control Standards. The Standards outlines some general design principles, including: whenever possible, retain and protect natural vegetation; minimize and retain water runoff to facilitate groundwater recharge; and, install diversions, sediment basins, and similar required structures prior to any on-site grading or disturbance.

Chapter 16.36.220: Sidewalks, Curbs and Gutters describe sidewalk, curb and gutter requirements for the Borough. Sidewalks are required along all streets. Borough requires them in areas where the probable volume of pedestrian traffic, the development's location in relation to other populated areas and high vehicular traffic, pedestrian access to bus stops, schools, parks, and other public places, and the general type of improvement intended indicate the advisability of providing a pedestrianway. Sidewalks are to be a minimum of four feet wide and constructed of concrete. Language will be added to this section to require developers to design sidewalks to discharge stormwater to neighboring lawns where feasible to disconnect these impervious surfaces, or use permeable paving materials where appropriate.

Chapter 16.36.220: Sidewalks, Curbs and Gutters requires that concrete curb and gutter, concrete curb, be installed along one or both sides of the street as the Planning Board may direct. This section will be amended to allow for curb cuts or flush curbs with curb stops to allow vegetated swales to be used for stormwater conveyance and to allow the disconnection of impervious areas.

Chapter 16.36.240: Contribution for Off-tract Improvements will be added to describe the mechanism for developers to paying for off-tract improvements which will require that any off-site and off-tract stormwater management and drainage improvements must conform to the "Design Standards" described in this plan and provided in Chapter 16.36.150 of the Borough Code.

Title 17

Chapter 17.64: Buffer Strips requires buffer strips for all non-residential uses, which border a residential zone. The landscape requirements for these buffer areas in the existing section do not recommend the use of native vegetation. The language of this section will be amended to require the use of native vegetation, which requires less fertilization and watering than non-native species. Additionally, language will be included to allow buffer areas to be used for stormwater management by disconnecting impervious surfaces and treating runoff from these impervious surfaces. This section currently requires the preservation of natural wood tracts and limits land disturbance for new construction.

Chapter 17.68: Offstreet Parking and Loading describes the procedure for construction of any new parking area. This section will be amended to allow the use of pervious paving materials to minimize stormwater runoff and promote groundwater recharge.

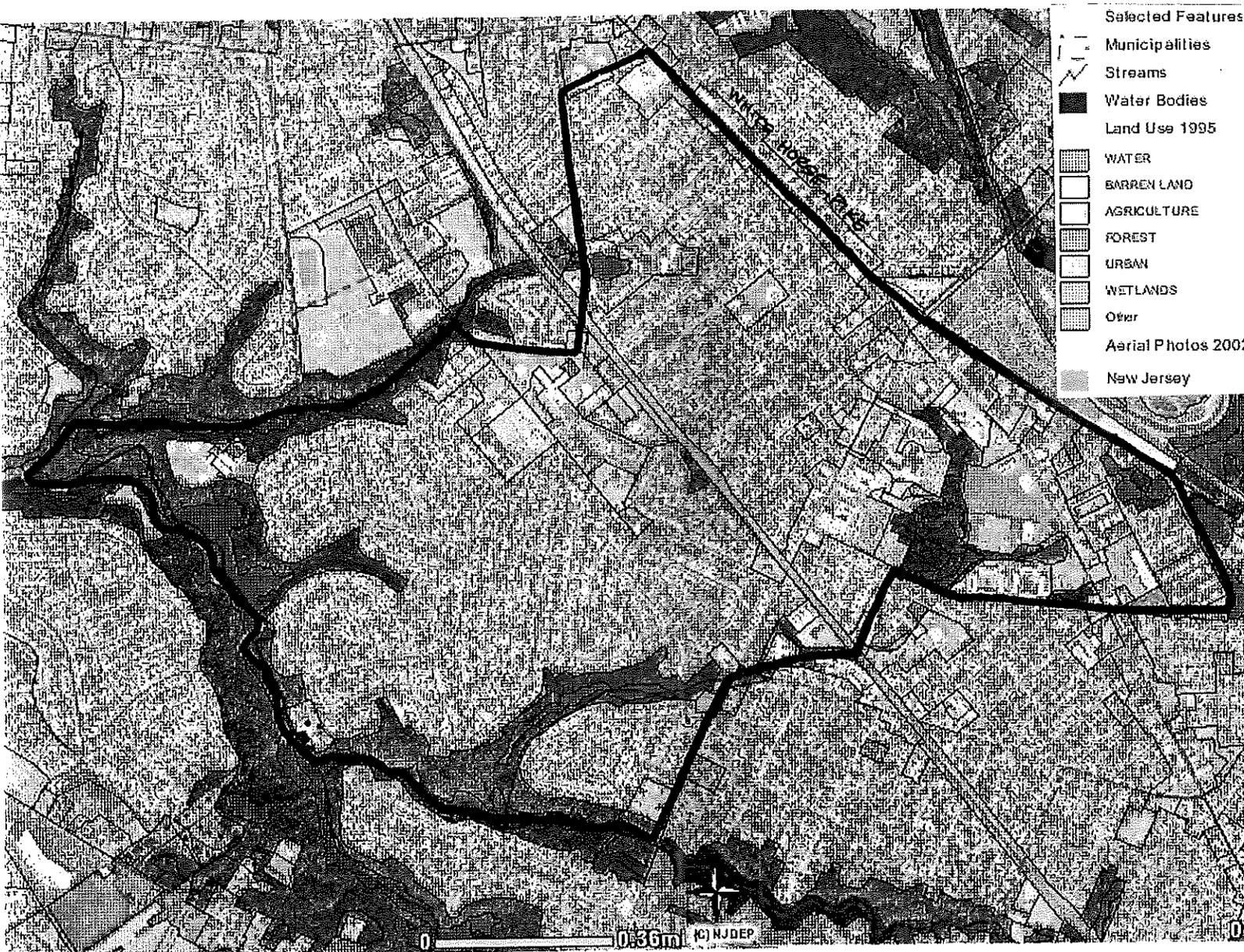
Chapter 17.72: Nonconforming Uses a section will be added requiring a variance for existing single family homes proposing additions that exceed the maximum percent impervious. The homeowner must mitigate the impact of the additional impervious surfaces unless the stormwater management plan for the development provided for these increases in impervious surfaces. This mitigation effort must address water quality, flooding, and groundwater recharge as described in Chapter 16.36.150. A detailed description of how to develop a mitigation plan will be added in the Borough Code.

Title 8

Chapter 8.32: Property Maintenance Code will be amended to provide for pollution source control. It will prohibit materials or wastes to be deposited upon a lot in such form or manner that they can be transferred off the lot, directly or indirectly, by natural forces such as precipitation, evaporation or wind. It will also require that all materials and wastes that might create a pollutant or a hazard be enclosed in appropriate containers.

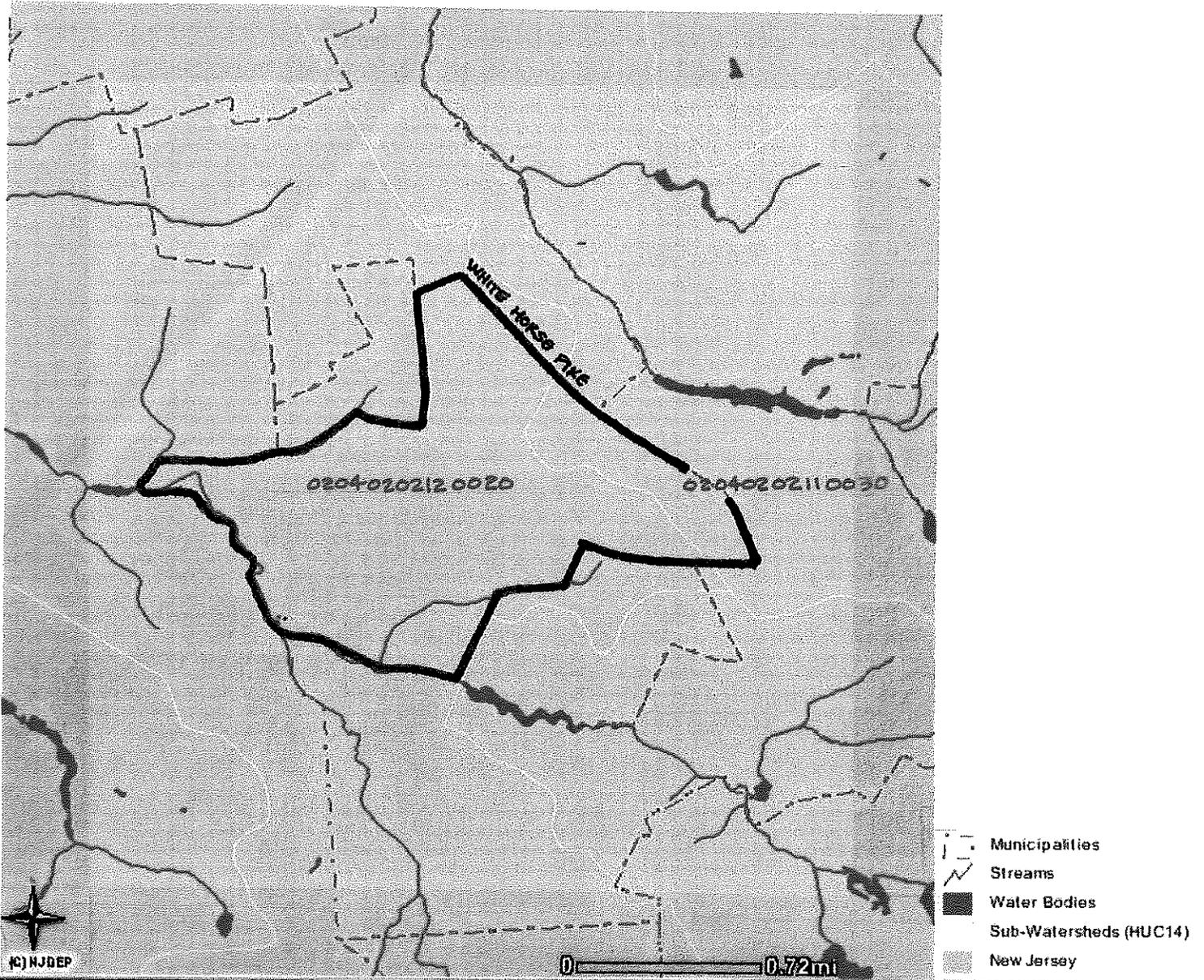
Land Use/Build-Out Analysis

It has been determined that the Borough is, for the most part, fully developed with very little vacant, developable area available for development. In addition, since there is less than one square mile of vacant or agricultural lands. Therefore, a Land/Use/Build-Out Analysis has not been performed.



EXISTING LAND USE MAP
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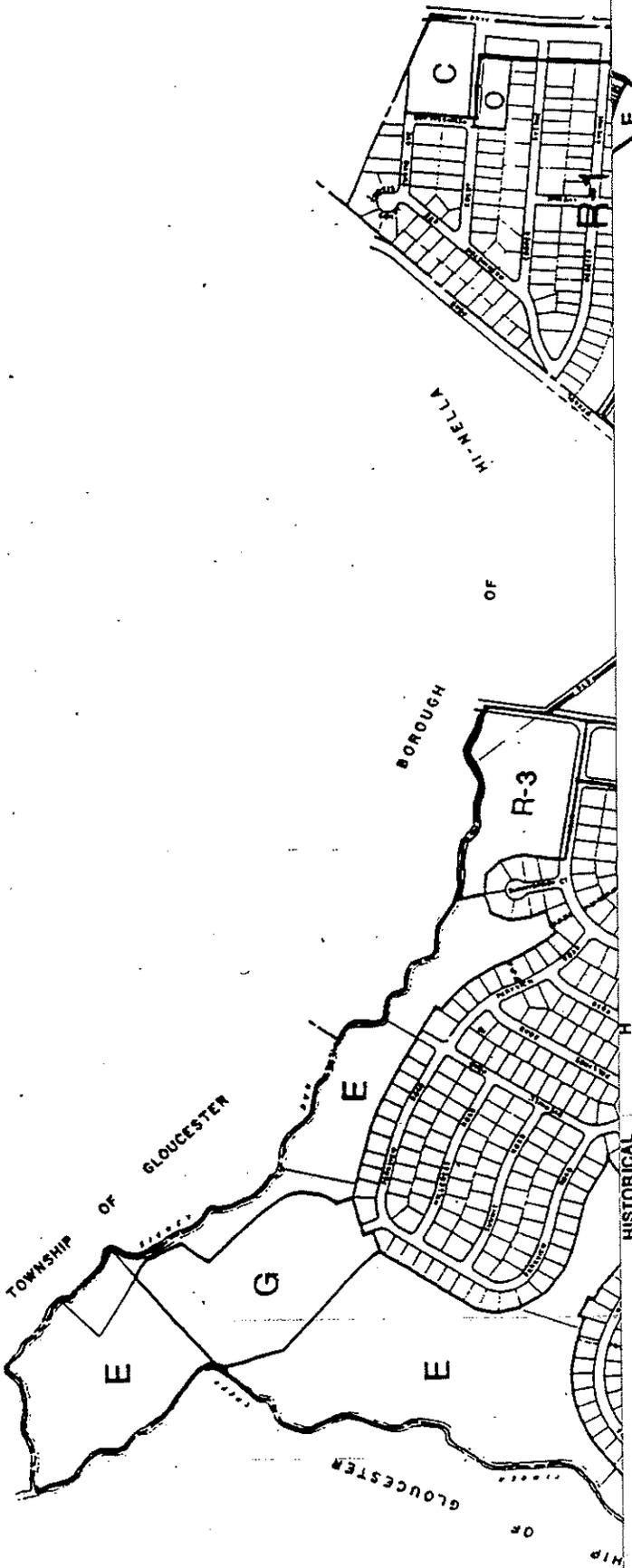
FIGURE C-6



Rec	Sub-Watershed Name	Sub-Watershed ID	Hydrologic Unit Code (14 digit)	Watershed Name	Watershed ID	Watershed Management Area
1	Cooper River (above Evesham Road)	18CA03	02040202110030	Cooper River	18CA	Lower Delaware
2	Big Timber Creek NB (below Laurel Rd)	18DA02	02040202120020	Woodbury / Big Timber / Newton Creeks	18DA	Lower Delaware

HYDROLOGIC UNITS (HUC 14s) MAP
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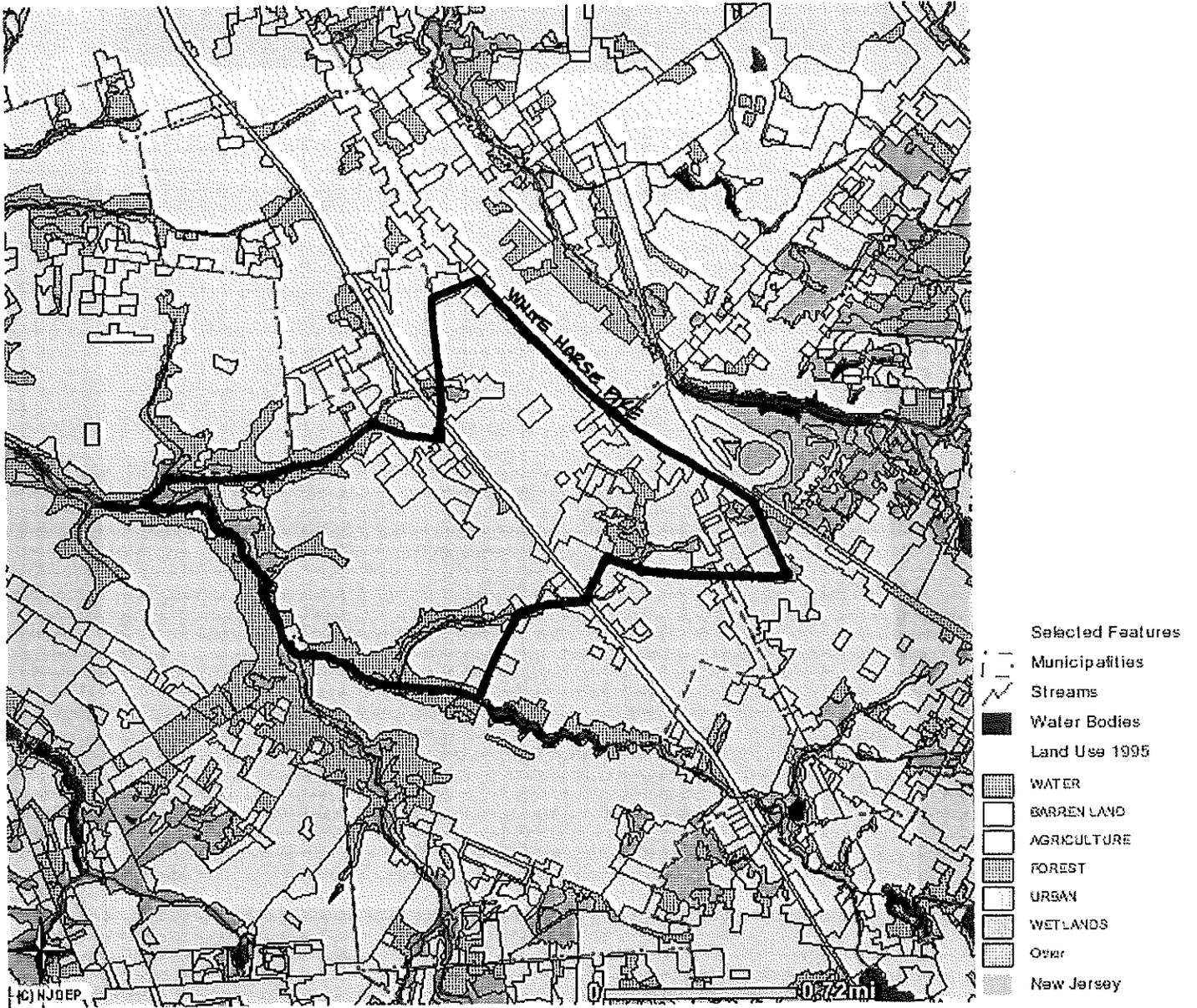
FIGURE C-7



COMMERCIAL C
OFFICE O

HISTORICAL
GOVERNMENTAL G

FIGURE C-8



WETLANDS AND WATER LAND USES MAP
 Municipal Stormwater Management Plan
 for the Borough of Stratford
 Camden County, New Jersey

FIGURE C-9

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.
 - a. The applicant can select one of the following projects listed to compensate for the deficit from the performance standards resulting from the proposed project. More detailed information on the projects can be obtained from the Borough Engineer. Listed below are specific projects that can be used to address the mitigation requirement.

Groundwater Recharge:

- Due to the impermeable soils that exist throughout the Borough, groundwater recharge cannot be achieved.

Water Quality:

- Provide stormwater management facility at Samuel S. Yellin School and the Parkview School to provide the removal of the necessary volume percent of total suspended solids from the parking lot(s) runoff, as determined by the Borough Engineer.
- Retrofit the existing parking area at the Stratford Borough Municipal Building Parking Area, to provide the removal of the necessary volume percent of total suspended solids, as determined by the Borough Engineer. Due to site constraints, the retrofit BMP must be installed underground and cannot reduce the existing number of parking spaces.
- Provide stormwater management facility at Municipal Public Works Complex to provide the removal of the necessary volume percent of total suspended solids from the parking lot(s) runoff, as determined by the Borough Engineer.

Water Quantity:

- Provide stormwater management measures within Samuel S. Yellin School and the Parkview School to reduce the peak flow from the upstream development to Signey Run and the North Branch of Big Timber Creek for the 2, 10, and 100-year storms respectively, as determined by the Borough Engineer.
- Provide stormwater management measures within Municipal Public Works Complex to reduce the peak flow from the upstream development to the North Branch of Big Timber Creek for the 2, 10, and 100-year storms respectively, as determined by the Borough Engineer.

The municipality 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.

Bibliography

Figures C-4, C-5, C-6, C-7 and C-9

I-MapNJDEP, New Jersey Department of Environmental Protection

Geographic Information System (G.I.S.) data, 2005