

### TOWNSHIP OF BERLIN

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# MUNICIPAL STORMWATER MANAGEMENT PLAN

# BERLIN TOWNSHIP, CAMDEN COUNTY, NEW JERSEY

February 28, 2005

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Township and Planning Board Engineer

9/10/18

Date

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### Introduction

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for Berlin Township ("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 all of the required elements described in N.J.A.C. 7:8 Stormwater Management Rules. The plan addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating stormwater design and performance standards for new major development, defined as projects that disturb one or more 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 baseflow 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 there is less than one square mile of vacant and agricultural lands within the Township. The plan also addresses the review and update of existing ordinances, the Township Master Plan, and other planning documents to allow for project designs that include low impact development techniques. The final component of this plan is a mitigation strategy for when a variance or exemption of the design and performance standards is sought. As part of the mitigation section of the stormwater plan, specific stormwater management measures are identified to lessen the impact of existing development.

#### 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 guickens 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.

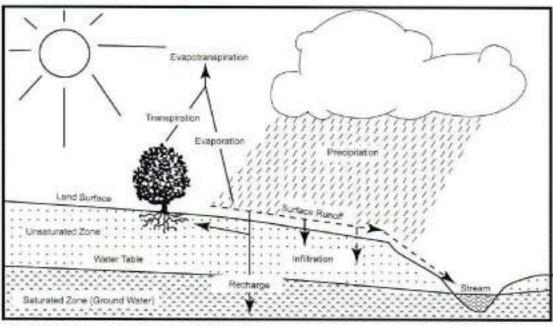


Figure C-1: Groundwater Recharge in the Hydrologic Cycle

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 blota 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 Township encompasses approximately 3.2 square mile area in Camden County, New Jersey. The population of the Township has increased from 5,348 in 1980, to 5,466 in 1990, decreased to 5,290 in 2000 and increased to 5,357 in 2010. Due to the limited development over the years, there has not been a substantial change in stormwater runoff volumes and pollutant loadings to the waterways in the Township. Figure C-2 illustrates the waterways in the Township. Figure C-3 depicts the Township 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 headwaters of the Mullica River (Atlantic Coast Region) and Great Egg Harbor River (Atlantic Coast Region) are located in Berlin Township. The Mullica River begins in the southeasterly end of the Township. The Great Egg Harbor River is located near the center of the Township, along the westerly side. There is also a tributary to the Mullica River known as Kettle Run.

The rivers, which the headwaters are located in the Township are the Mullica River (Atlantic Coast Region) and the Great Egg Harbor River (Atlantic Coast Region).

It appears that the N.J.D.E.P. has not tested the quality of the waterways, within the Township or immediately downstream.

The Great Egg Harbor River is located near the center of the Township. The Mullica River is located, within the Pinelands Area, near the southerly end of the Township.

A water quality monitoring station exists on the Mullica River, in Green Bank (Site ID #01409416, 14-HAM-2). The station and the Great Egg Harbor River is located at Blue Anchor (Site ID #01410820).

Another site, on the Mullica River, is located near Atco (Site ID #01409375). The waters, at this station, are ranked as a medium priority due to the pH levels.

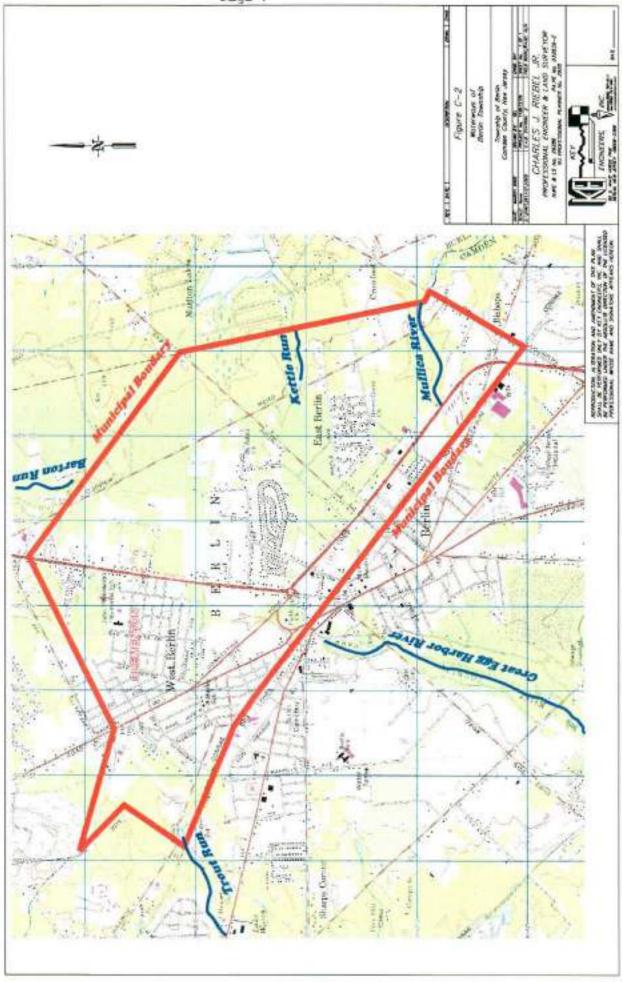
A TMDL is the amount of a pollutant that can be accepted by a waterbody without causing an exceedance of water quality standards or interfering with the ability to use a waterbody for one or more of its designated uses. The allowable load is allocated to the various sources of the pollutant, such as 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.

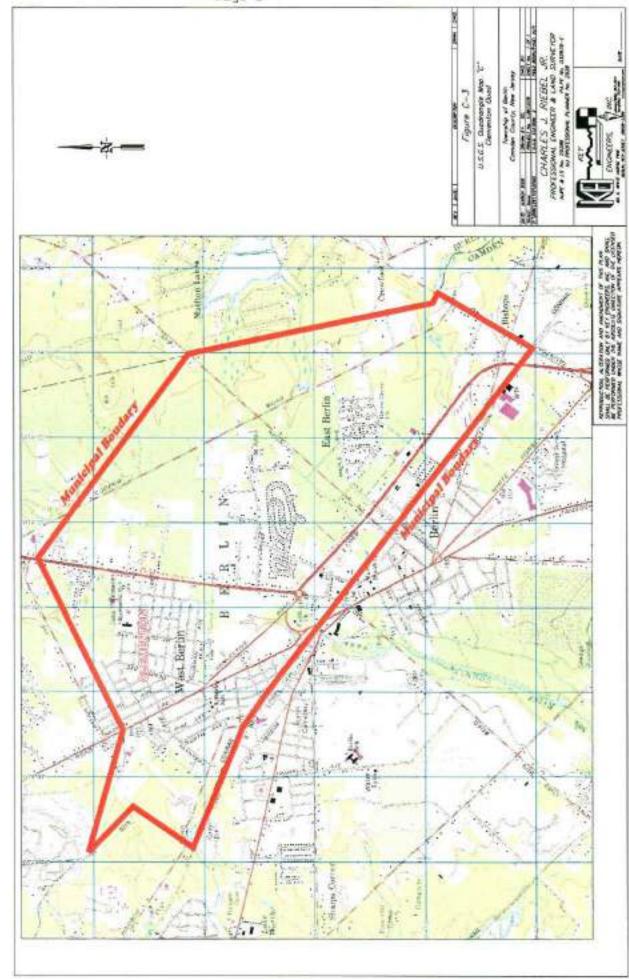
The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)) (Integrated List) is required by the federal Clean Water Act to be prepared biennially and is a valuable source of water quality information. This combined report presents the extent to which New Jersey waters 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.

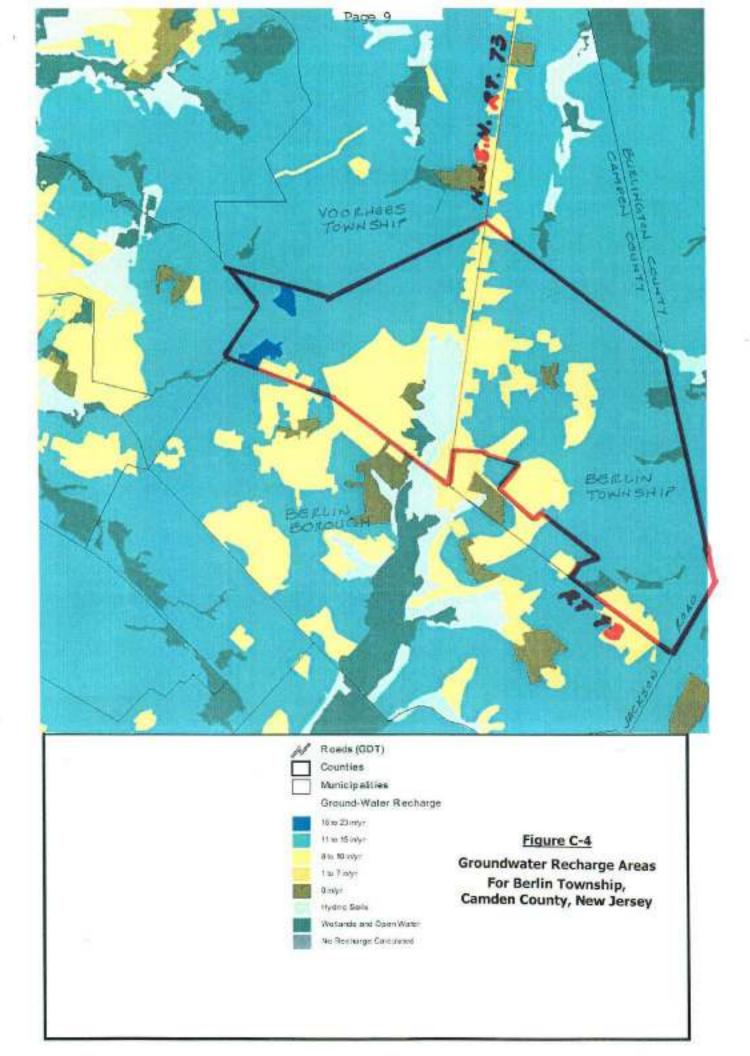
The Township, especially the southwest portion, has experienced severe water quantity problems, including flooding, due to the undersized pipe underneath the railroad new Haddon Avenue. Water quantity and flooding problems exist throughout the Township due to undersized storm drainage piping systems and culverts. During severe storm events, the undersized piping does not have adequate capacity, surcharging the drainage system and resulting in flooding.

The N.J.D.O.T., as part of the Berlin Circle Elimination Project, improved the storm drainage system along N.J.S.H. Route 73 in those areas that were subject to frequent flooding. As part of this project, the N.J.D.O.T. constructed a stormwater management system to address the water quantity problems, generated by the highway. The frequency of flooding along Route 73, within the limits of the circle elimination project, have been reduced substantially. The section of Route 73, north of the project will continue to be subject to flooding during intense storm events.

A majority of the Township is located within a Tier 3 Wellhead Protection Area. The area surrounding the Berlin Borough Water Department Well No. 12, located on the dead-end portion of Chestnut Avenue, within the Township, are within the Tier 1 and Tier 2 Protection Areas. The Township, along with Berlin Borough, may consider adopting wellhead protection ordinances to minimize the potential for contamination of the aquifers by the infiltration of pollutants into the aquifers.







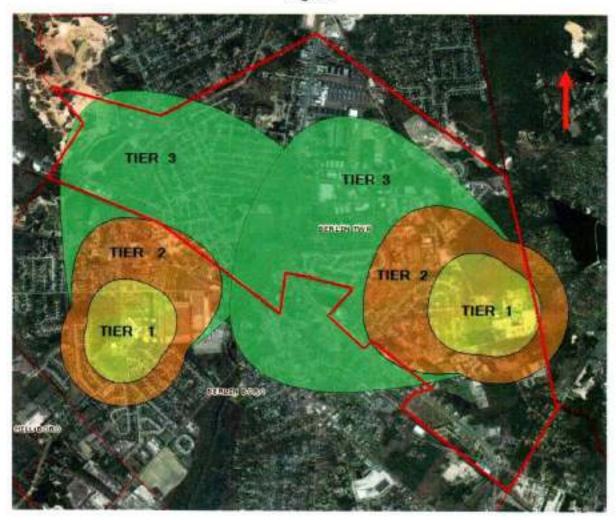
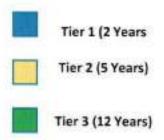


Figure C-5
WELLHEAD PROTECTION AREAS
IN THE Township of Berlin
Camden County, New Jersey



# Design and Performance Standards

The Township has adopted the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies. 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 design and performance standards for the portion of Berlin Township, which is within the Pinelands Area, also conform with the Pinelands Comprehensive Management Plan (CMP). During construction, Township inspectors will observe the construction of the projects to ensure that the stormwater management measures are constructed and function as designed.

#### Plan Consistency

The Township is not within a Regional Stormwater Management Planning Area and no TMDLs have been developed for waters within the Township; therefore, this plan does not need to be consistent with any regional stormwater management plans (RSWMPs) nor any TMDLs. 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 utilizes 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 Municipal Stormwater Management Plan shall conform with the Pinelands Comprehensive Management Plan (CMP).

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

# Nonstructural Stormwater Management Strategies

The Township land use and zoning ordinances have been modified to incorporate nonstructural stormwater management strategies.

Chapter 200 of the Township Code, entitled Land Use and Development Regulations, and Chapter 340, entitled Zoning, were reviewed with regard to incorporating nonstructural stormwater management strategies. Several changes were made to Article XII of this Chapter, entitled "Design Standards" to incorporate these strategies.

Revised 09/10/18

- Section200-90 (formerly 77-82): Streets describes the requirements for streets in the Township. The Township 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.
- Section 200-100 (formerly 77-93): Storm Drainage addresses stormwater runoff by referencing R.S.I.S., the Township Ordinance has been updated to include all requirements outlined in N.J.A.C. 7:8-5. These changes were presented earlier in this document.
- Section 200-100 (formerly 77-93): Storm Drainage requires that all streets be provided with inlets and pipes where the same are necessary for proper drainage. This section was amended to encourage the use of natural vegetated swales in lieu of inlets and pipes.
- Section 200-105 (formerly 77-98): Natural Features requires that natural features, such as trees, brooks, swamps, hilltops, and views, be preserved whenever possible. This section was 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.
- Section 200-106 (formerly 77-99): 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.
- Section 200-107 (formerly 77-100): Sidewalks, Curbs and Gutters describe sidewalk, curb and gutter requirements for the Township. Sidewalks are required along all streets. Township 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 pedestrian way. Sidewalks are to be a minimum of four feet wide and constructed of concrete. Language was 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.
- Section 200-107 (formerly 77-100): Sidewalks, Curbs and Gutters requires that concrete curb and gutter, concrete curb, or Belgian block curb be installed along every street within and fronting on a development. This section was amended to allow for curb cuts or flush curbs with curb stops to allow vegetated swales to be used for stormwater conveyance and to allow the disconnection of impervious areas.

- Section 200-80 (formerly 77-120): Off-site and Off-tract Improvements describes essential off-site and off-tract improvements. Language was added to this section to require that any off-site and off-tract stormwater management and drainage improvements must conform to the "Design and Performance Standards" described in this plan and provided in Chapter 200 of the Township Code. This section was recently amended to conform with the state legislation, enacted in 2018, changing the requirement for those improvements to be bonded.
- Chapter 340, Article XIV (formerly Chapter 129, Article XV): Buffer Strips requires buffer strips for all lots within the R-3, C-1, C-2 and I-1 zoning districts, which border a residential zone and along all street lines where loading and storage areas can be seen from the street. The landscape requirements for these buffer areas in the existing section do not recommend the use of native vegetation. The language of this section was amended to require the use of native vegetation, which requires less fertilization and watering than non-native species. Additionally, language was 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 340, Article XV (formerly Chapter 129, Article XVI): Off-street Parking and Loading describes the procedure for construction of any new parking area. This section was amended to allow the use of pervious paving materials to minimize stormwater runoff and promote groundwater recharge.
- Chapter 340, Article XV (formerly Chapter 129, Article XVI): Off-street Parking and Loading details off-street parking and loading requirements. All parking lots with more than 10 spaces and all loading areas are required to have concrete or Belgian block curbing around the perimeter of the parking and loading areas. This section also requires that concrete or Belgian block curbing be installed around all landscaped areas within the parking lot or loading areas. This section was amended to allow for flush curb with curb stop, or curbing with curb cuts to encourage developers to allow for the discharge of impervious areas into landscaped areas for stormwater management. Also, language was added to allow for use of natural vegetated swales for the water quality design storm, with overflow for larger storm events into storm sewers. This section also provides guidance on minimum parking space requirements. These requirements are based on the number of dwelling units and/or gross floor area. The section allows a developer to demonstrate that fewer spaces would be required, provided area is set aside for additional spaces if necessary. This section was amended to allow pervious paving to be used in areas to provide overflow parking, vertical parking structures, smaller parking stalls, and shared parking.
- Chapter 340, Article XXI (formerly Chapter 129 Article XVII) and Section 340-14 (formerly Section 129-14): Nonconforming Uses, Non-Conforming Lots requires 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 285 (formerly Chapter 101). A detailed description of how to develop a mitigation plan is present in the Township Code.
- Sections 340-74 (formerly 129-68): Performance Standards provide pollution source control. It prohibits 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 also requires that all materials and wastes that might create pollutant or a hazard be enclosed in appropriate containers.

Several changes were made to Chapter 340 Article V (formerly Chapter 129, Article V) of the Township Code entitled "Establishment of Zones". The Township has three types of residential districts and six non-residential districts. Each district has a maximum building coverage, ranging from 20 percent for the R-1 District, which has a minimum lot size of 12,000 square feet for detached single-family homes, to 65 percent for the R-3 District, which have a minimum lot size of 10,000 square feet for multi-family homes. Non-residential districts in the Township range from an FAR of 1.8% for the C-3 District in the Pinelands area to 65 percent for the C-1, C-2I and I-1 Districts. Although each zone has a maximum building coverage, the Township Code was amended to remind developers that satisfying the percent impervious requirements does not relieve them of responsibility for complying with the Design and Performance Standards for Stormwater Management Measures contained in Chapter 285 - Surface Water Runoff and the requirements under the N.J. Pinelands Commission. The Township is re-evaluating the maximum allowable impervious cover for each zone to determine what percentage of impervious cover are appropriate. Also, if a developer is given a variance to exceed the maximum allowable percent imperviousness, the developer must mitigate the impact of the additional impervious surfaces. This mitigation effort must address water quality, flooding, and groundwater recharge as described in Chapter 285. A detailed description of how to develop a mitigation plan is included in this Municipal Stormwater Management Plan.

# Land Use/Build-Out Analysis

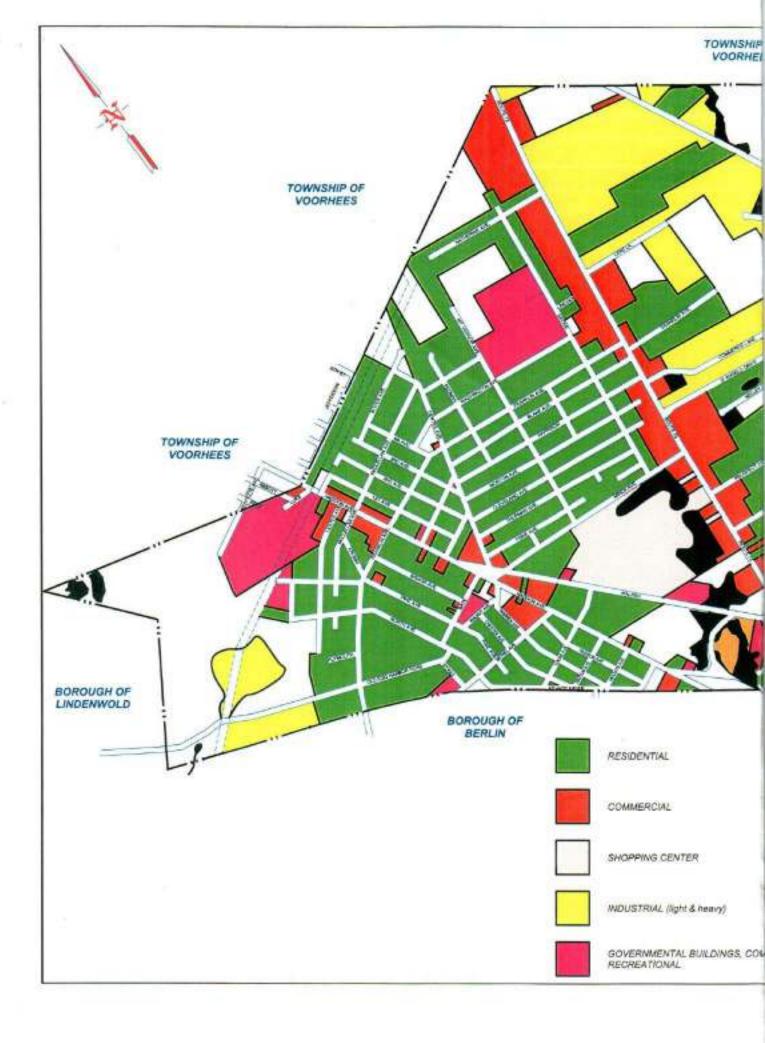
It has been determined that there is less than one square mile of vacant or agricultural land remaining in the Township. Therefore, the Land/Use/Build-Out Analysis has not been performed.

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# EXISTING LAND USE MAP TOWNSHIP OF BERLIN

Camden County, New Jersey OCTOBER 2001

FIGURE C-6



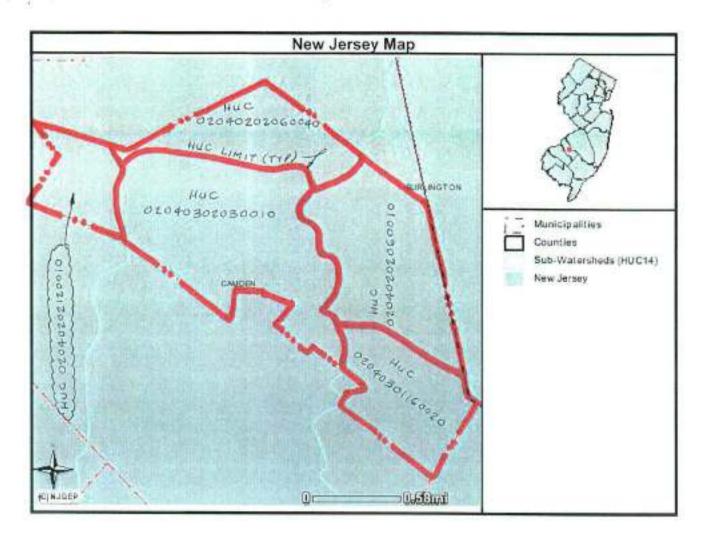
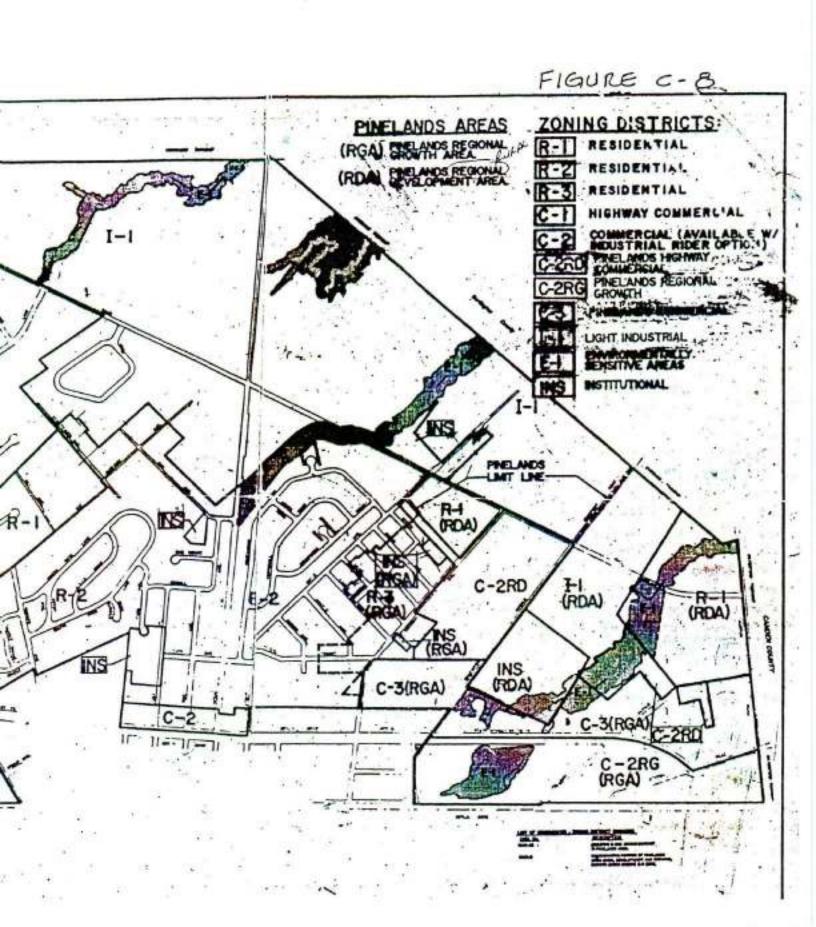
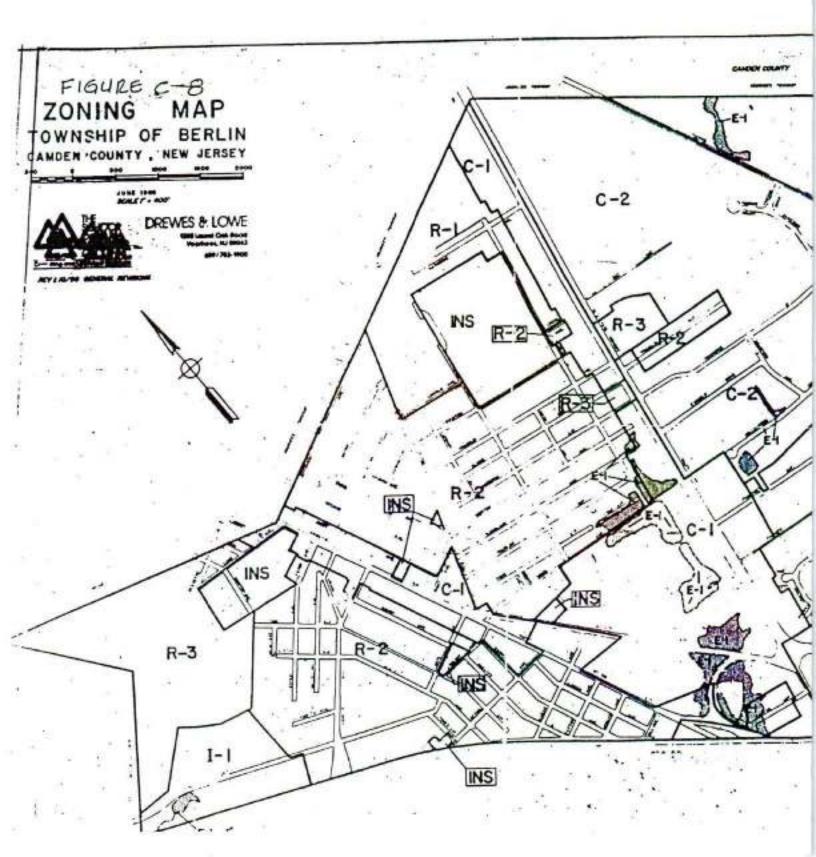
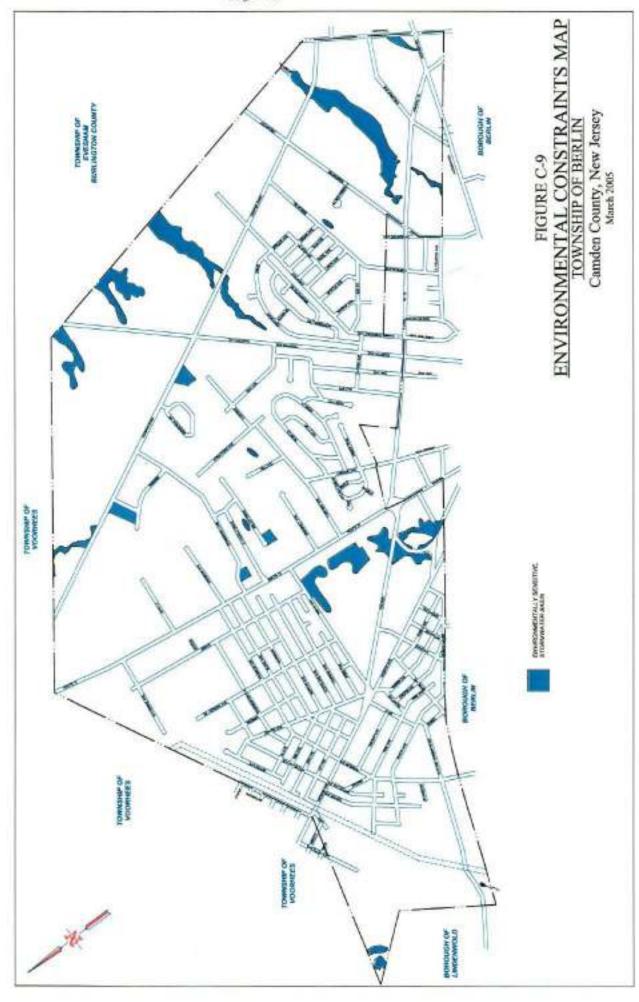


FIGURE C -7 HYDROLOGIC UNITS (HUC14s)

in the Township of Berlin Camden County, New Jersey







## 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

- 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. In the Pinelands Area, the mitigation project must be implemented in the same drainage area as the proposed development AND within the Pinelands Area,
  - 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 Township Engineer. Listed below are specific projects that can be used to address the mitigation requirement.

#### Groundwater Recharge

 Retrofit the elementary school site and stormwater management facility basin to provide a volume of average annual groundwater recharge, as determined to be necessary by the Township Engineer.

#### Water Quality

- Retrofit the existing stormwater management facility at Luke Avenue Recreation Complex and elementary school site to provide the removal of 80 percent of total suspended solids from the parking lot runoff.
- Retrofit the existing parking area at the Berlin Township Municipal Building Parking Area, Public Works Complex and adjacent parking area for the Edgewood Avenue Soccer Complex to provide the removal of 80 percent of total suspended solids. Due to site constraints, the retrofit BMP must be installed underground and cannot reduce the existing number of parking spaces.

#### Water Quantity

 Install stormwater management measures in the open space in the Centaurian Woods development and elementary school site to reduce the peak flow from the upstream development on the receiving stream by flow rates, determined by the Township Engineer for the 2, 10, and 100-year storms.

> Revised 10/25/07 Revised 09/10/18

2. If a suitable site cannot be located in the same drainage area as the proposed development, as discussed in Option 1, the mitigation project may provide mitigation that is not equivalent to the impacts for which the variance or exemption is sought, but 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.

#### Water Quality

- Re-establish a vegetative buffer (minimum 50-foot-wide) along the banks of the stormwater basins on Kelley Drive and Luke Avenue Recreation Complex as a goose control measure and to filter stormwater runoff from the high goose traffic areas.
- Provide goose management measures, including public education at the recreation facilities.
  - Re-establish vegetative buffer along any wetlands buffer areas, within the Township owned properties.

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. The Township must expend any contributions made, in lieu of performing off-site mitigation, within five years of their receipt.

Revised 10/25/07 Revised 09/10/18