

---

**Township of Downe  
Municipal Stormwater  
Management Plan**

June 2005

Prepared for:

**Downe Township  
Cumberland County, New Jersey  
288 Main Street  
Newport, NJ 08345**

As prepared by:

**FRALINGER ENGINEERING PA  
629 Shiloh Pike  
Bridgeton, NJ 08302**



---

J. Michael Fralinger, Professional Engineer  
New Jersey License No. CB29350

## Table of Contents

<u>Section</u>	<u>Page</u>
Introduction.....	1
Goals .....	1
Stormwater Discussion .....	2
Background .....	3
Design and Performance Standards .....	4
Plan Consistency .....	4
Nonstructural Stormwater Management Strategies .....	5
Land Use/Build-Out Analysis .....	7
Mitigation Plans .....	7

### Figures

Figure No. 1: Groundwater Recharge in the Hydrologic Cycle.....	2
---	---

### Attached Figures

Figure No. 2: Waterways .....	10
Figure No. 3: Boundary on USGS Quadrangles .....	11
Figure No. 4: Groundwater Recharge .....	12
Figure No. 5: Wellhead Protection .....	13
Figure No. 6: Existing Land Use .....	14
Figure No. 7: Hydrologic Units (HUC14s).....	15
Figure No. 8: Zoning Districts .....	16
Figure No. 9: Wetlands and Water Land Uses—Constrained Land .....	17

## Introduction

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for the Township of Downe ("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 and will be submitted under separate cover.

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.

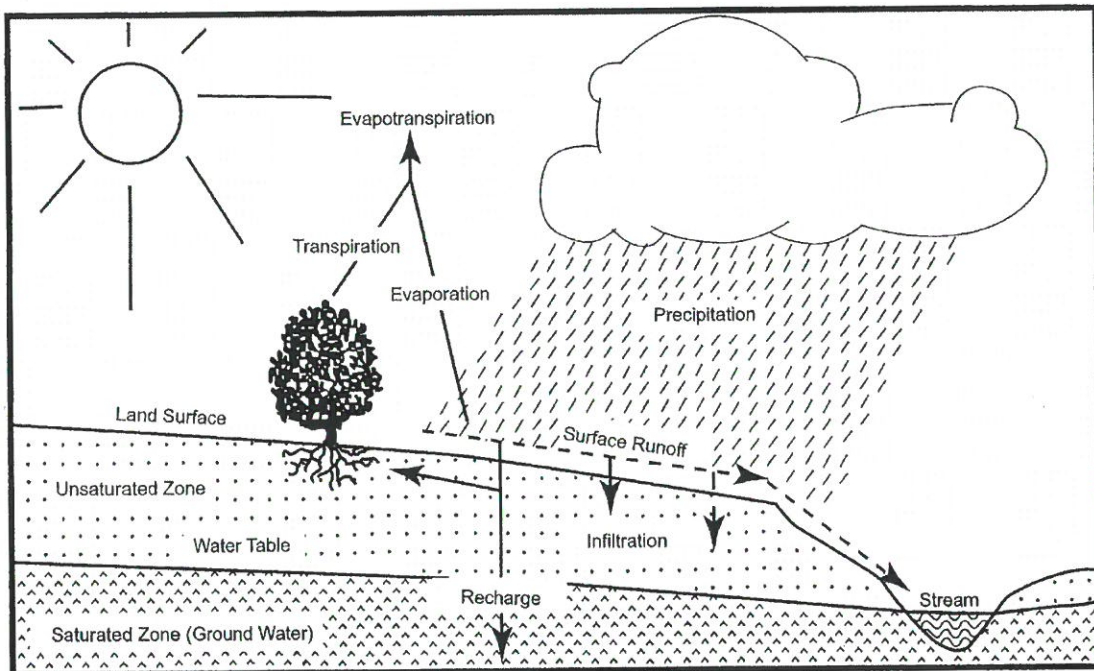
### Stormwater Discussion

Land development can dramatically alter the hydrologic cycle (see Figure No. 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.

Figure No. 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.

As well as 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 Township encompasses ±53.59 square mile area in south central Cumberland County, New Jersey. The Township is bounded by Lawrence Township to the northwest, the city of Millville to the northeast and Commercial Township to the southeast.

The population of the Township has decreased from 1,702 in 1990 to 1,631 in 2000. However, the total housing units has more or less doubled from 631 in 1990 to 1,134 in 2000. The housing and roadway increase, along with changes in the landscape, have most likely increased stormwater runoff volumes and pollutant loads to the waterways of the municipality.

Figure No. 2 (see attached) illustrates the waterways in the Township. Figure No. 3 (see attached) 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 three major streams that border the Township to the south, west and east, Oranoaken Creek, Fortescue Creek and Dividing Creek, respectively, are all not impaired. The tributaries that flow through the Township to these major rivers are also not impaired based on AMNET data.

In addition to the AMNET data, the NJDEP and other regulatory agencies collect water quality chemical data on the streams in the state. These data show that the instream total coliform and dissolved oxygen concentrations of Dividing Creek, total coliform concentrations of Fortescue Creek and total coliform concentrations of Oranoaken Creek frequently exceed the state's criteria. This means that these rivers are impaired waterways and the NJDEP is required to develop a Total Maximum Daily Load (TMDL) for these pollutants for each waterway.

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

residential areas, along with a margin of safety. Provisions may also be made for future sources in the form of reserve capacity. An implementation plan is developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include improved stormwater treatment plants, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems, and other BMPs.

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

A map of the groundwater recharge areas is shown in Figure No. 4 (see attached). Wellhead protection areas, also required as part of the MSWMP, are shown in Figure No. 5 (see attached).

Although there are no wellhead protection areas located within the Township, the Township may want to consider adopting specific ordinances to minimize the infiltration of pollutants into aquifers.

#### **Design and Performance Standards**

The Township 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 4/1/06.

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

#### **Plan Consistency**

The Township 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 will utilize the most current update of the RSIS in the New Jersey Stormwater Best Management Practices Manual for stormwater management review of residential areas. This Municipal Stormwater Management Plan will be updated to be consistent with any future updates to the RSIS.

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

### Nonstructural Stormwater Management Strategies

The Township has reviewed the master plan and ordinances, and has provided a list of the sections in the Township 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 4/1/06. A copy will be sent to the Department of Environmental Protection at the time of submission.

The Township Code was reviewed with regard to incorporating nonstructural stormwater management strategies. We recommend the following strategies be incorporated into the code.

1) Article VII: General Regulations

- a) § 706: Hedge, Fence, Wall at Intersection of Streets defines hedges, fences and walls located at intersections of streets.

We recommend this section be amended to require the use of native vegetation, which requires less fertilization and watering.

2) Article VIII: Special Regulations

- a) § 800: Off Street Parking details off-street parking.

We recommend this section be amended to allow the use of pervious paving materials (i.e. porous concrete or porous asphalt) to minimize stormwater runoff and promote groundwater recharge.

This section should also 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.

3) Article X: Conditional Uses

- a) § 1005: Farm Stands describe the farm stand requirements.

We recommend this section be amended to require the use of pervious materials (i.e. gravel, crushed stone, pavers) for parking or temporary stopping areas to minimize stormwater runoff and promote groundwater recharge.

- b) § 1006: Public Utilities describe the requirements for public utility areas.

We recommend this section be amended to require the use of pervious materials (i.e. gravel, crushed stone, pavers) for parking.

We also recommend this section be amended to require the use of native vegetation for screening, in lieu of fencing. The Township may want to provide a list of approved vegetative species.

- c) § 1007: Quasi-Public Buildings and Recreation Areas describe the standards for quasi-public buildings and recreation areas.

We recommend this section be amended to allow the use of pervious paving materials (i.e. interlocking concrete blocks or bricks) for recreational purposes to minimize stormwater runoff and promote groundwater recharge.

We recommend this section be amended to require the use of native tree and shrub species for landscaped areas.

We also recommend this section be amended to include language requiring paths, walkways and/or bikeways to be mulched, stone or any pervious material to decrease the impervious area.

- d) § 1008: Motor Vehicle Service Stations describes the standards for motor vehicle stations.

The Township may want to consider reducing the maximum percentage of impervious surfaces by the encouraging the following:

- i. Use of pervious paving materials (for overflow parking, therefore reducing the impervious parking area) to minimize stormwater runoff and promote groundwater recharge,
  - ii. 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.
  - iii. Use of vegetative roofs to reduce impervious surfaces by retaining precipitation on and within the planting bed and on the surface of vegetation, ultimately reducing the volume of runoff from the roof.
  - iv. Use of native ground cover and plants for landscaping purposes.
- e) § 1010: Campgrounds describes the requirements for campgrounds. It requires that natural features, natural drainage or existing vegetation be preserved.

We recommend this section be amended to require that leaf litter and other beneficial aspects of the woodlands are maintained in addition to the natural condition of the trees (i.e. prevent cutting tree limbs for firewood).

We also recommend this section incorporate language to encourage the use of pervious materials for driveways and/or access roads to control sedimentation and promote groundwater recharge.

- f) § 1011: Cluster Developments describes the provisions for cluster development.

We recommend this section be amended to encourage/incorporate the following:

- i. Allow the use of pervious paving materials (i.e. porous concrete or asphalt) for driveways, sidewalks, parking areas and access roads in order to minimize stormwater runoff and promote groundwater recharge.
- ii. 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.
- iii. Design sidewalks to discharge stormwater to neighboring lawns where feasible to disconnect these impervious surfaces, and/or use permeable paving materials where appropriate.
- iv. Require paths, walkways and/or bikeways to be mulched, stone or any pervious material.
- v. Require the use of native vegetation for landscaping purposes.



- vi. The Township may want to consider providing a list of approved tree species.
- g) § 1013: Garden Apartments and Townhouses describe the standards for cluster development.

We recommend this section be amended to encourage/incorporate the following:

- i. Allow the use of pervious paving materials (i.e. porous concrete or asphalt) for driveways, sidewalks, parking areas and access roads in order to minimize stormwater runoff and promote groundwater recharge.
- ii. 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.
- iii. Design sidewalks to discharge stormwater to neighboring lawns where feasible to disconnect these impervious surfaces, and/or use permeable paving materials where appropriate.
- iv. Require paths, walkways and/or bikeways to be mulched, stone or any pervious material.
- v. Require the use of native vegetation for landscaping purposes.
- vi. The Township may want to consider providing a list of approved tree species.

The Township has 2 residential districts. Each district has a maximum percent impervious surface allocation, ranging from 20 percent for the R-1 District, which has a minimum lot size of 1 acre for detached single-family homes, to 60 percent for the R-2 District, which has a minimum lot size of 1 acre for single-family homes with no public water or sewer.

The Township has 7 nonresidential districts. Each of these districts has a maximum percent impervious surface allocation, ranging from 10 percent for the C-1 District to 70 percent for the M-1 and M-2 Districts.

We recommend the Township Code be amended to remind developers that satisfying the percent impervious requirements do not relieve them of responsibility for complying with the Design and Performance Standards for Stormwater Management Measures.

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.

#### Land Use/Build-Out Analysis

A detailed land use analysis for the Township shall be submitted under separate cover.

#### 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.

The municipality should set up a trust fund to allow a developer to provide a fee to the municipality for an environmental enhancement project that has been identified by the governing body for Municipal Stormwater Management Planning, or towards the development of a Regional Stormwater Management Plan. The fee or amount of funding shall be determined by the governing body and include costs associated with purchasing the property or easement for

---

mitigation, costs for the design, permitting, construction, inspection and contract administration, costs for operation and maintenance, and the cost associated with the long-term maintenance requirements of the mitigation measure.

---

---

## Figures

---

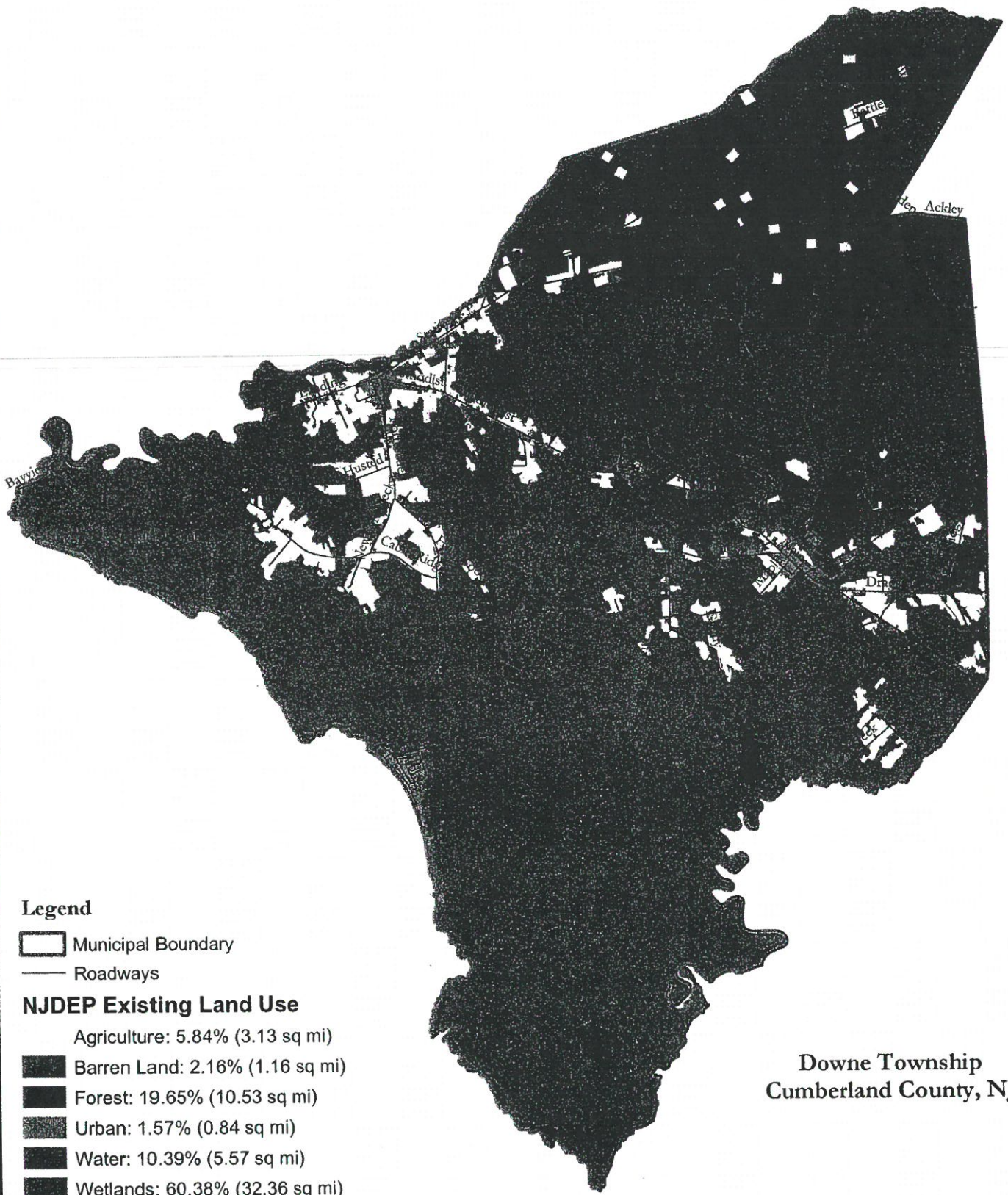
















Land Use Map  
Figure No. 6



Legend

-  Municipal Boundary
-  Roadways

**NJDEP Existing Land Use**

-  Agriculture: 5.84% (3.13 sq mi)
-  Barren Land: 2.16% (1.16 sq mi)
-  Forest: 19.65% (10.53 sq mi)
-  Urban: 1.57% (0.84 sq mi)
-  Water: 10.39% (5.57 sq mi)
-  Wetlands: 60.38% (32.36 sq mi)

Downe Township  
Cumberland County, NJ

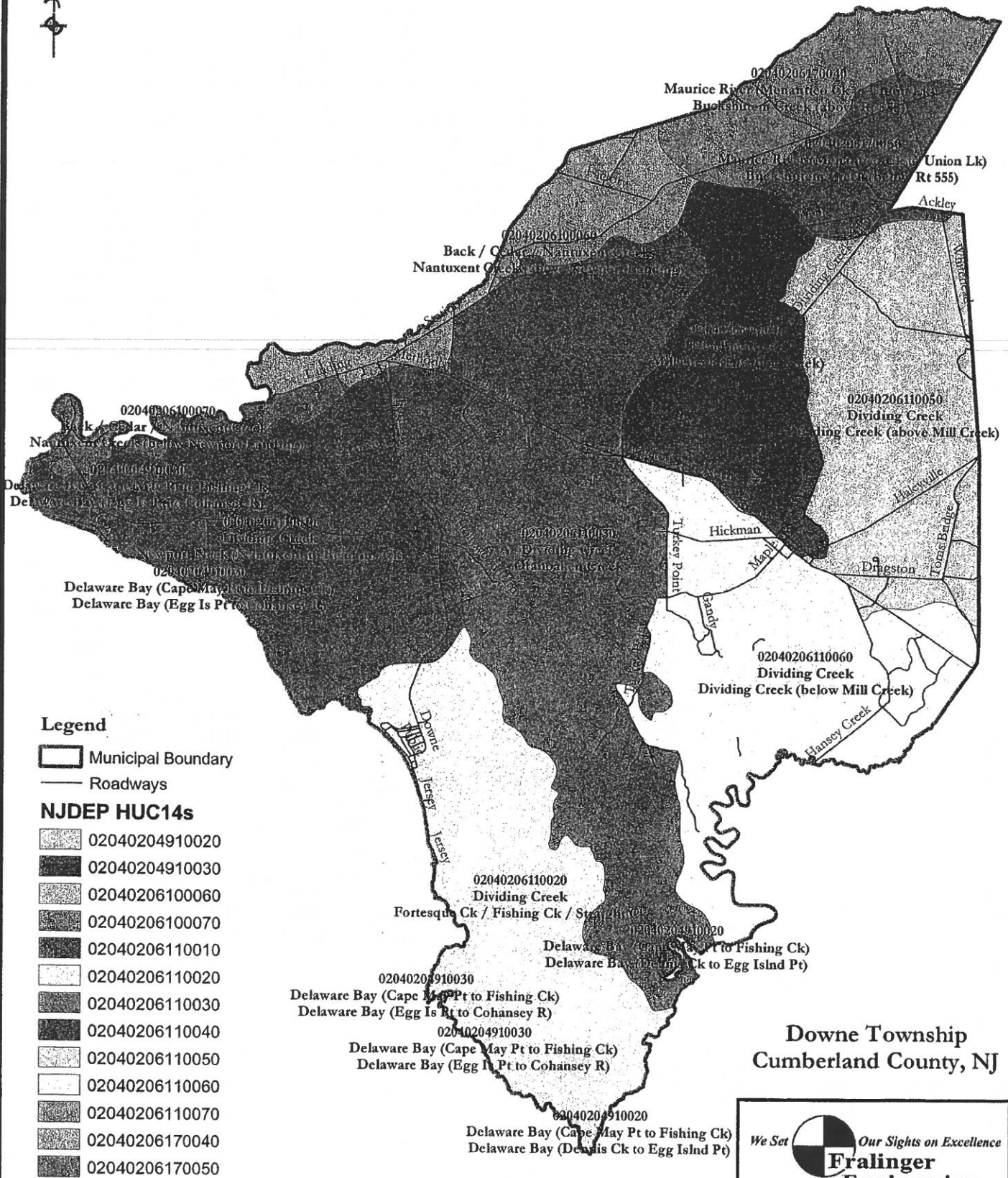


Date: 5/3/05  
File No. 23 241.00

NJDEP Disclaimer:  
"This map was developed using NJDEP  
GIS digital data, but this secondary  
product has not been verified by NJDEP  
and is not state-authorized."



# 14 Digit Hydrologic Unit Code Map (HUC14s) Figure No. 7



### Legend

- Municipal Boundary
- Roadways

### NJDEP HUC14s

- 02040204910020
- 02040204910030
- 02040206100060
- 02040206100070
- 02040206110010
- 02040206110020
- 02040206110030
- 02040206110040
- 02040206110050
- 02040206110060
- 02040206110070
- 02040206170040
- 02040206170050



Date: 5/3/05  
File No. 23 241.00

**NJDEP Disclaimer:**  
"This map was developed using NJDEP GIS digital data, but this secondary product has not been verified by NJDEP and is not state-authorized."

**Downe Township  
Cumberland County, NJ**

We Set Our Sights on Excellence

**Fralinger  
Engineering PA**

CONSULTING ENGINEERS  
PLANNERS  
ENVIRONMENTAL SERVICES  
& LAND SURVEYORS

AN SHILOH FIRM  
BRIDGETON, NJ 08302  
(856) 451-3900 PHONE (856) 451-9702 FAX  
www.fralinger.com

# ZONING MAP

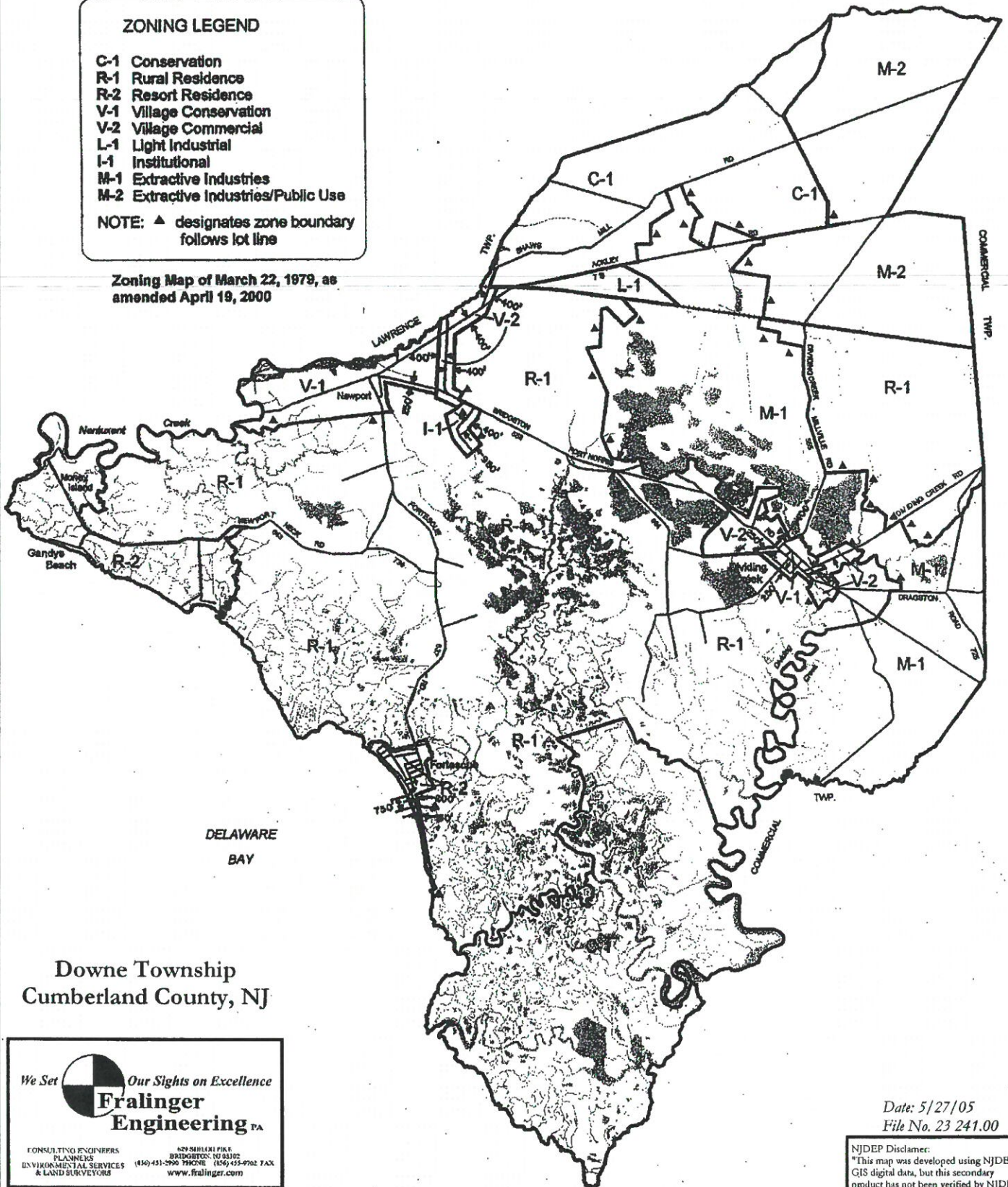
Downe Township  
Cumberland County, NJ

**ZONING LEGEND**

- C-1 Conservation
- R-1 Rural Residence
- R-2 Resort Residence
- V-1 Village Conservation
- V-2 Village Commercial
- L-1 Light Industrial
- I-1 Institutional
- M-1 Extractive Industries
- M-2 Extractive Industries/Public Use

NOTE: ▲ designates zone boundary follows lot line

Zoning Map of March 22, 1979, as amended April 19, 2000



Downe Township  
Cumberland County, NJ

*We Set Our Sights on Excellence*

**Fralinger Engineering PA**

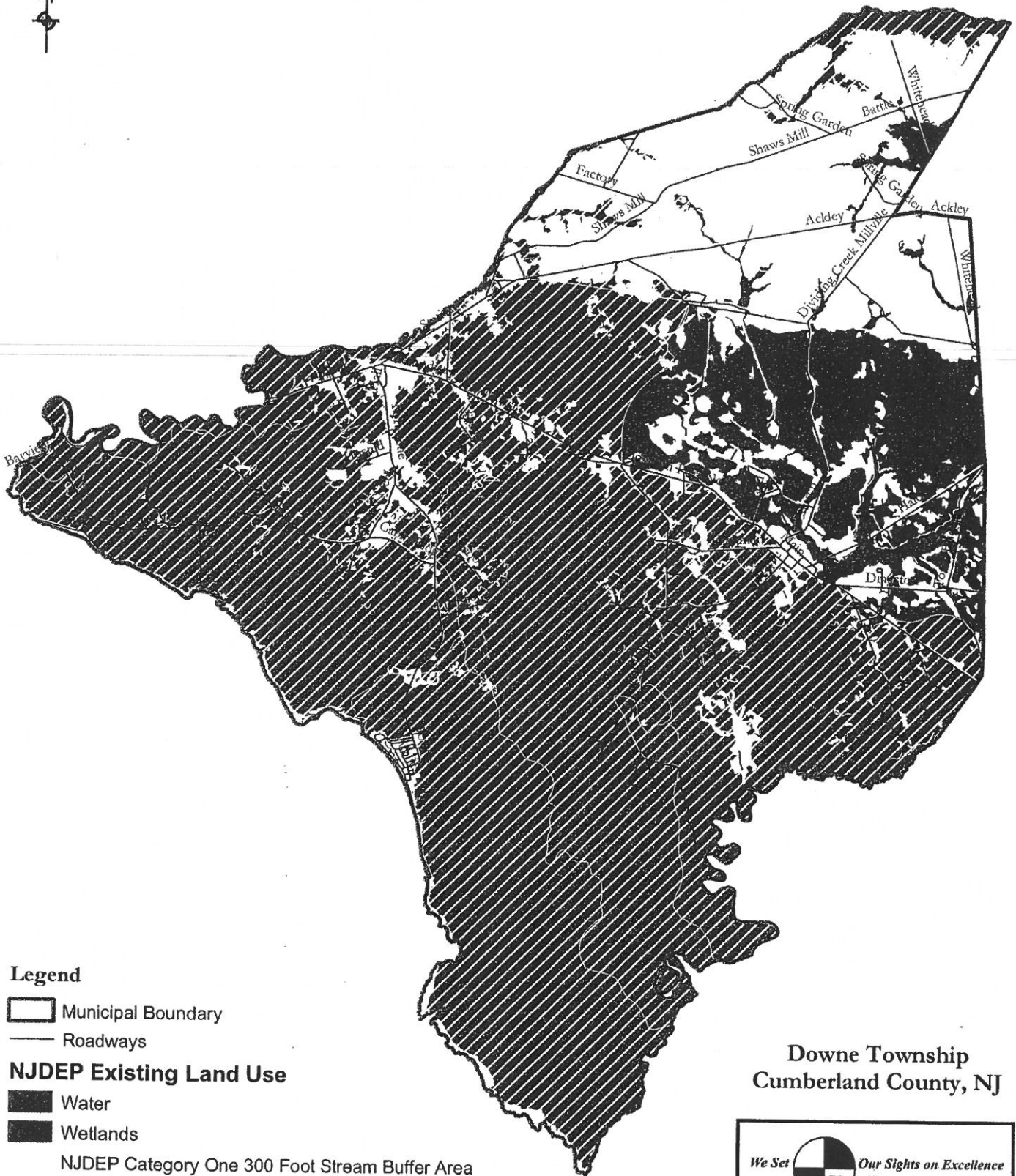
CONSULTING ENGINEERS  
PLANNERS  
ENVIRONMENTAL SERVICES  
& LAND SURVEYORS

629 MILLIKI PIKE  
BRIDGETON, NJ 08302  
(856) 451-5990 PHONE (856) 455-9762 FAX  
www.fralinger.com



Date: 5/27/05  
File No. 23 241.00

NJDEP Disclaimer:  
"This map was developed using NJDEP GIS digital data, but this secondary product has not been verified by NJDEP and is not state-authorized."

Wetlands & Water Land Use Map  
 (Constrained Lands)  
 Figure No. 9



**Legend**

-  Municipal Boundary
-  Roadways

**NJDEP Existing Land Use**

-  Water
-  Wetlands

NJDEP Category One 300 Foot Stream Buffer Area

Downe Township  
 Cumberland County, NJ



Date: 5/3/05  
 File No. 23 241.00

NJDEP Disclaimer:  
 "This map was developed using NJDEP  
 GIS digital data, but this secondary  
 product has not been verified by NJDEP  
 and is not state-authorized."

We Set  Our Sights on Excellence  
**Fralinger  
 Engineering PA**

CONSULTING ENGINEERS  
 PLANNERS  
 ENVIRONMENTAL SERVICES  
 & LAND SURVEYORS

450 BILLOUT PACE  
 BRISTOL, NJ 08812  
 (856) 451-2500 PHONE (856) 453-0982 FAX  
 www.fralinger.com

