

**Stormwater Management Plan  
Amendment to Master Plan**

**For**

**Bernardsville Borough  
Somerset County, New Jersey**

**Prepared by:**



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NJPE 32978**

**February 2005  
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## **Introduction**

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for Bernardsville 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 new major development. 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 is included in this plan. It is based upon existing zoning and land available for development. This 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 includes 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.

## **MSWMP 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, any increase in non-point pollution;
- Maintain the integrity of stream channels for their biological functions and drainage capabilities;
- Minimize pollutants in stormwater 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. Preventive 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. This plan will ultimately address all of the requirements of the Borough's Stormwater Management Discharge (NJPDES) permit.

### **Stormwater Discussion**

Land development can dramatically alter the hydrologic cycle (see Figure 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, reduce 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 create disruption to habitat to which some species cannot adapt.

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.

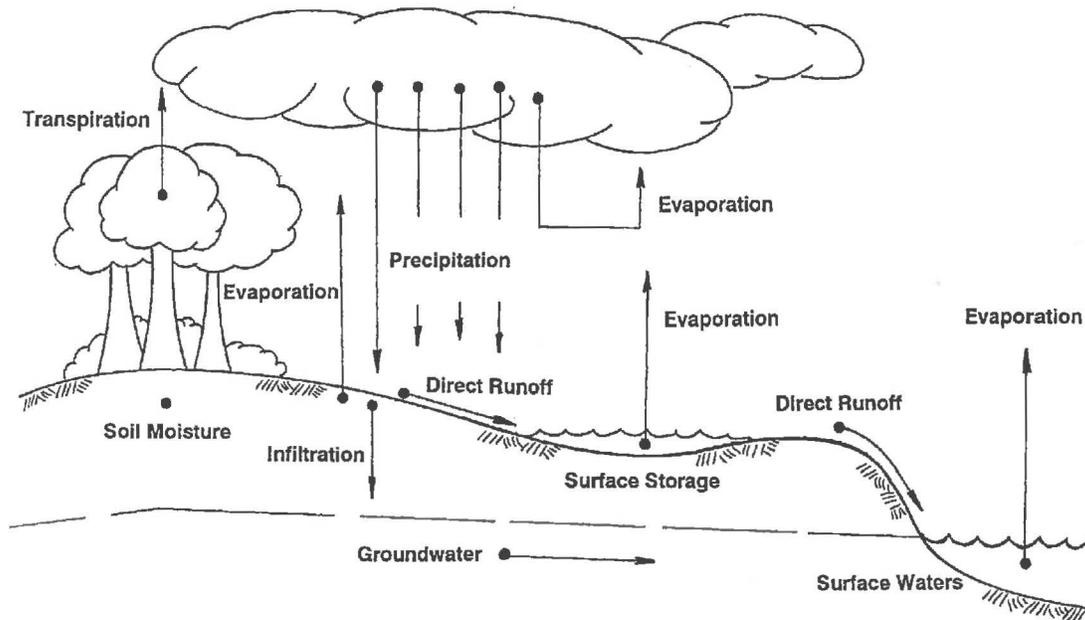


Figure 1 – Hydrologic Cycle

## Background

The Borough encompasses 12.85 square miles in the northern most part of Somerset County and is primarily known for its small-town charm where prominent and wealthy New York visitors came to spend their summers in the past. The Borough was originally a section of Bernards Township known as Vealtown. In 1840, Vealtown was renamed Bernardsville after Sir Francis Bernard, Colonial Governor of New Jersey from 1758 to 1760. The Borough did not become a separate borough until 1924 when it split from Bernards Township, although the area attracted people well before then. It attracted people because of the railroad line, which was built in 1872.

Although the lands in the Borough are lightly developed, there is a town area, located in the southeastern section of the Borough.

Bernardsville Borough has made efforts at preserving open space for future generations. With aggressive planning and 10-acre zoning in the central portion of the Borough, the rural character will be retained. Private land owners have been supporting these efforts, and Borough residents, present and future, are most grateful for these acts of vision.

Bernardsville is bounded on its western side by Far Hills Borough. There are a number of waterways within Bernardsville Borough that are classified as Category I waterways. They include Mine Brook, the North Branch of the Raritan River, the Passaic River, and the Indian Grave Brook [please note that the NJDEP I-Map website (<http://www.state.nj.us/dep/gis/dep splash.htm#>) labels this brook as Indian Grove Brook]. These exceptional streams are trout production streams. Streams and rivers within the Borough are shown in Figure 2 and the topography of the Borough is shown in Figure 3.

According to the 2000 census, the Borough has 7,345 residents. The population rose approximately 11.3 percent since the 1990 census. This population increase is more than the overall state increase of 8.9 percent but less than the County increase of 23.8 percent over the same period.

The Borough is bordered along its northwest side by the North Branch of the Raritan River and its northeast side by the Passaic River. It is located in Watershed Management Area (WMA) 8 – North and South Branch Raritan River as well as Watershed Management Area (WMA) 6 – Upper Passaic, Whippany and Rockaway Rivers. The Borough contains portions of seven Hydrologic Unit Code (HUC) areas:

<b>HUC14 Area</b>	<b>Watershed</b>
02030103010010	Upper Passaic River
02030103010070	Upper Passaic River
02030103010090	Upper Passaic River
02030103010080	Upper Passaic River
02030105060030	N. Branch Raritan River
02030105060040	N. Branch Raritan River
02030105060070	N. Branch Raritan River

These HUC14 areas are shown in Figure 4.

The New Jersey Department of Environmental Protection (NJDEP) has established an Ambient Bio-monitoring Network (AMNET) to document the health of the state’s waterways. There are over 800 AMNET sites throughout New Jersey. These sites are sampled for benthic macro-invertebrates 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 macro-invertebrate community dynamics.

There are two AMNET sites within or bordering Bernardsville Borough as follows:

<b>Site Number</b>	<b>Location</b>
AN0214	Indian Grove Brook at Hardscrabble Road
AN0352	Mine Brook at Bernardsville Road

Based on the AMNET data, Indian Grave Brook [please note that the NJDEP I-Map website (<http://www.state.nj.us/dep/gis/depsplash.htm#>) labels this brook as Indian Grove Brook] is not impaired, although Mine Brook at Bernardsville Road is moderately to severely impaired.

In addition to the AMNET data, the NJDEP and other regulatory agencies collect water quality chemical data on the streams in the state. This data shows that Mine Brook is impaired based upon the in stream total benthic macroinvertebrate assessment. This data shows that the in stream total mercury of the Passaic River exceeds the allowed amount. This data also shows that the Raritan River exceeds the allowed amounts of contaminants. This means that the water bodies are impaired waterways and the NJDEP is required to develop Total Maximum Daily Loads (TMDL's) for these pollutants.

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 non-point 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 Best Management Practices (BMP's).

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 TMDL's are needed.

In addition to water quality problems, the Borough has occasional flooding problems. The 100-year floodplain, shown in Figure 5, depicts the floodplains within the borough.

The USGS operates a Flood Information System for municipalities within the state. The Flood Information System consists of a network of stream and precipitation gauges throughout the state. Information from these gauges is automatically transmitted to a central location via telephone, radio and satellite. The information is then processed and appropriate actions are taken. These actions include notifying municipal police, fire and emergency management personnel with flood potential and water level information.

There are several stream and precipitation gauges near Bernardsville Borough. There are stream gauges on the following streams:

Passaic River near Bernardsville New Jersey

Information from these latter gauges is available on the United States Geological Survey (USGS) web site in real time (<http://waterdata.usgs.gov/nj/nwis>).

The Borough has a moderate amount of developable land. The existing land use, based on 1995/1997 aerial photography, is shown in Figure 6. The existing zoning is shown in Figure 7. A current aerial photo with parcel lot lines overlain on it is shown in Figure 8. The Borough is not within the State Plan Designation PA1 Metropolitan Planning Area. Groundwater recharge rates for native soils in this area are generally between 0 and 19 inches annually. The average annual groundwater recharge rates are shown graphically in Figure 9.

According to the NJDEP, “A Well Head Protection Area (WHPA) in New Jersey is a map area calculated around a Public Community Water Supply (PCWS) well in New Jersey that delineates the horizontal extent of ground water captured by a well pumping at a specific rate over a two-, five-, and twelve-year period of time for unconfined wells. ... The confined wells have a fifty foot radius delineated around each well serving as the well head protection area to be controlled by the water purveyor in accordance with Safe Drinking Water Regulations (see NJAC 7:10-11.7(b)1).”

WHPA delineations are conducted in response to the Safe Drinking Water Act Amendments of 1986 and 1996 as part of the Source Water Area Protection Program (SWAP). The delineations are the first step in defining the sources of water to a public supply well. Within these areas, potential contamination will be assessed and appropriate monitoring will be undertaken as subsequent phases of the NJDEP SWAP.

As shown in Figure 10, portions of the Borough are located in a Tier 3 well head protection area.

In addition to the rivers and streams that run through and along the Borough, there are a number of wetland areas. These wetland areas, shown in Figure 11, provide flood storage, non-point pollutant removal and habitat for flora and fauna.

### **Design and Performance Standards**

The Borough 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.

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

## **Plan Consistency**

The Borough is not within a Regional Stormwater Management Planning Area and no TMDL's have been developed for waters within the Borough; therefore this plan does not need to be consistent with any regional stormwater management plans (RSWMPs) or any TMDL's. If any RSWMPs or TMDLs are developed in the future, this Municipal Stormwater Management Plan will be updated to be consistent.

The Borough is within the Raritan Basin and much information on the basin and its characteristics has been developed as part of the Raritan Plan. Additional information concerning this plan can be found at: <http://www.raritanbasin.org>. The Borough supports the Raritan Plan. The following summarizes the plan:

- Protection and preservation of lands that play a critical role in the protection of Raritan Basin water resources, including headwaters streams.
- Maintenance and restoration of ground water recharge to ensure sufficient supplies for dry weather stream flow and public use, and to minimize stormwater runoff.
- Improved control of stormwater through watershed-based management plans, improved site design techniques and attention to the impacts of stormwater on stream stability and flooding.
- Management of water supply resources on a subwatershed, watershed and regional basis so that substantial levels of resources use are not exceeded, ensuring adequate water for both human and ecosystem uses.
- Restoration of streams and riparian areas that have been physically damaged by harmful land use and stormwater management practices, and protection of high-quality streams and riparian areas.
- Restoration and protection of ground and surface waters that are currently or prospectively impaired by excessive pollutant loads, through a combination of regulatory and non-regulatory programs affecting both point and nonpoint sources of pollutants.
- Understanding by residents, landowners, businesses and government decision-makers of the basic aspects of water resources and critical watershed management issues in the Raritan River Basin and tools to resolve them, so that they are moved to help solve these issues.

The Borough supports the Raritan Plan as the Raritan Plan's strategy is similar in nature to the principles mandated by Phase II of the EPA Clean Water Act.

The Municipal Stormwater Management Plan is consistent with the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21. The Borough utilizes the most current update of the RSIS in the stormwater review of all projects. The Borough ordinances require that all projects, both residential and non-residential, be designed in accordance with the Stormwater Design Standards of the Residential Site Improvement Standards. This Municipal Stormwater Management Plan will be updated to be consistent with any future updates of the RSIS.

The Borough'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, Borough inspectors and those from the Somerset-Union Soil Conservation District 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 does not wish to introduce any changes at this time. Nonstructural stormwater management strategies contained in the Residential Site Improvement Standards, which have been adopted by the Borough, will be encouraged as much as possible and to the greatest extent practicable.

### **Land Use/Build-Out Analysis**

Since the Borough of Bernardsville has a combined total of more than one square mile of vacant lands, the Borough is required to do a build-out analysis. A build-out analysis has been performed for the Borough of Bernardsville as described below.

The first of two phases of the build out analysis was to construct a map that includes the municipal boundary, existing roads, surface water bodies, HUC-14 boundaries, impervious cover, existing development by land use types, groundwater recharge areas, and wellhead protection area layers. A majority of the layers described above were taken directly from the website provided by the state of New Jersey, at <http://www.nj.gov/dep/gis/>. After constructing the map, the identification and delineation of land that cannot be developed because of legal restrictions, physical constraints, and environmental sensitivity were performed. Examples of the restrictions include lands in permanently preserved open space, public ownership, deed restrictions, utility easements, steep slopes, wetlands, floodplains, and Category 1 Waters with associated special resource protection areas. Next, the identification and delineation of developable land under current zoning and land use regulations, as well as land that is vacant or not restricted as discussed above were performed. The identification and delineation of the developed areas within the municipality that have significant redevelopment potential and that have not been developed to the maximum allowed were also performed. For these undeveloped and underdeveloped areas, the maximum future development by projecting the largest number of housing units allowed in residential zones and the largest number of buildings and most intensive land uses in commercial and industrial zones was determined.

The second phase of the build-out analysis quantified the impact of the changes based on information provided by the maps. This included calculations of percentage of impervious surfaces, number of housing units and their density, and remaining farmland and open space acreage. GIS can also assist in this computation by providing values for specific sets of layers such as the combination of the municipality, HUC14, and impervious area layers. This set of variables can provide the maximum impervious cover for each HUC14 permitted by the Stormwater Management Rules. Values can be

exported to other programs from GIS for more comprehensive computations, including the pollutant loading calculations also required by the regulations.

In simpler terms, all of the HUC-14's within the municipality were identified as well as the zones within each HUC-14. The area for each zone within each HUC-14 was calculated. The existing impervious areas were calculated in acres and in a percentage for each zone within each HUC-14. The same was done for the wetlands/constrained areas. An area was then calculated for the developable area within each zone for each HUC-14. A table was created itemizing each calculation described above. The maximum allowable impervious coverage in a percentage was applied to the developable area within each zone for each HUC-14. The result was the "Build-Out Impervious" area for each zone within each HUC-14. One will then be able to compare the build-out impervious to the existing impervious within each zone for each HUC-14. The build-out analysis is complete and the tables and maps are presented in Appendix C.

### **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 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 or more 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.

*Stream Stabilization at Sanitary Sewer Crossing behind Friendly's Restaurant*

*Municipal Building Pond Dredging*

*Addition of Storm Filters or other Mechanical Devices at Major Outfalls*

*Acquisition of Open Space especially in Well Head Protection Areas.*

*Retrofitting of Stormwater Inlets.*

Labeling of Stormwater Inlets.

Mapping of Stormwater Inlet System.

Water Quality studies on streams

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 that impact aquatic life along a certain stream. Listed below are specific projects that can be used to address the mitigation options.

Stream Cleaning at High School

Addition of Storm Filters or other Measures at Municipally owned property  
Such as Library, Train Station, Municipal Building, etc.

Acquisition of Open Space especially in Well Head Protection Areas.

Retrofitting of Stormwater Inlets.

Labeling of Stormwater Inlets.

Mapping of Stormwater Inlet System.

Water Quality studies on streams

The Borough may allow a developer to provide funding or partial funding to the Borough 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.

## **APPENDIX A**

### **Copy of Bernardsville Borough's NJPDES Tier A Municipal Stormwater General Permit NJG0151068**

For Complete Copy of Permit See  
Stormwater Pollution Prevention Plan



State of New Jersey

CHRIS CHRISTIE  
Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION  
Mail Code - 401-02B

BOB MARTIN  
Commissioner

KIM GUADAGNO  
Lt. Governor

Water Pollution Management Element  
Bureau of Nonpoint Pollution Control  
P.O. Box 420 - 401 E. State St.  
Trenton, NJ 08625-0420  
Tel: (609) 633-7021 / Fax: (609) 777-0432  
[http://www.state.nj.us/dep/dwq/bnpc\\_home.htm](http://www.state.nj.us/dep/dwq/bnpc_home.htm)

November 9, 2017

Re: R9 - Tier A Municipal Stormwater General Permit  
NJPDES: NJ0141852 PI ID #: 50577  
NJPDES MASTER GENERAL PERMIT PROGRAM INTEREST  
Trenton City, Mercer

Dear Interested Party:

Enclosed is a **final** New Jersey Pollutant Discharge Elimination System (NJPDES) permit action identified above which has been issued in accordance with N.J.A.C. 7:14A. The Tier A Municipal Stormwater General Permit authorizes the discharge of stormwater from small municipal separate storm sewer systems (MS4). The permit was issued in response to USEPA's Phase II rules. Tier A municipalities are generally located within the more densely populated regions of the state or along or near the coast. The Tier A permit addresses stormwater quality issues related to both new and existing development.

A summary of the significant and relevant comments received on the draft action during the public comment period, the Department's responses, and an explanation of any changes from the draft action have been included in the Response to Comments document attached hereto as per N.J.A.C. 7:14A-15.16.

The final Tier A MS4 NJPDES permit and supporting documents are also posted at [http://www.nj.gov/dep/dwq/tier\\_a.htm](http://www.nj.gov/dep/dwq/tier_a.htm). Here you can find a crosswalk which provides a detailed comparison of changes from 2009 to this 2017 permit, and a Frequently Asked Questions document. These documents will be useful in understanding the final permit.

Questions or comments regarding the final action should be addressed to Stephen Boyer at (609) 633-7021.

Sincerely,

James J. Murphy, Chief  
Bureau of Nonpoint Pollution Control

Enclosures  
c: Permit Distribution List



# NEW JERSEY POLLUTANT DISCHARGE ELIMINATION SYSTEM

The New Jersey Department of Environmental Protection hereby grants you a NJPDES permit for the facility/activity named in this document. This permit is the regulatory mechanism used by the Department to help ensure your discharge will not harm the environment. By complying with the terms and conditions specified, you are assuming an important role in protecting New Jersey's valuable water resources. Your acceptance of this permit is an agreement to conform with all of its provisions when constructing, installing, modifying, or operating any facility for the collection, treatment, or discharge of pollutants to waters of the state. If you have any questions about this document, please feel free to contact the Department representative listed in the permit cover letter. Your cooperation in helping us protect and safeguard our state's environment is appreciated.

**Permit Number: NJ0141852**

**Final: Stormwater Discharge Master General Permit Renewal**

**Permittee:**

Master General Permit  
Per Individual Notice of Authorization

**Co-Permittee:**

**Property Owner:**

NJDEP DIVISION OF WATER QUALITY  
401 E STATE ST  
Trenton, NJ 08625

**Location Of Activity:**

Master General Permit  
Per Individual Notice of Authorization

Authorization(s) Covered Under This Approval	Issuance Date	Effective Date	Expiration Date
R9 - Tier A Municipal Stormwater General Permit	11/09/2017	01/01/2018	12/31/2022

**By Authority of:**  
Commissioner's Office

DEP AUTHORIZATION  
James J. Murphy, Chief  
Bureau of Nonpoint Pollution Control  
Water Pollution Management Element

(Terms, conditions and provisions attached hereto)

## **APPENDIX B**

### **FIGURES**

**APPENDIX C**  
**BUILD OUT TABLES**

**APPENDIX D**  
**STORMWATER CONTROL ORDINANCE**