# STORMWATER MANAGEMENT PLAN
# FOR
# READINGTON TOWNSHIP
# HUNTERDON COUNTY, NEW JERSEY

## PREPARED FOR:

Readington Township
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**May 2005**
Princeton Hydro, LLC Project No. 160.040

READINGTON TOWNSHIP
STORMWATER MANAGEMENT PLAN
CERTIFICATION

We certify that we have personally prepared and examined, and we are familiar with the information submitted herein including all attached documents, and that based on inquiry of those individuals immediately responsible for obtaining the information, to the best of our knowledge, we believe that the submitted information is true, accurate, and complete.

In addition, we certify that we are familiar with the Phase II Stormwater permitting requirements and that this plan was prepared in accordance with those regulations.

Prepared By: _____ Date: May 6, 2005
Christopher L. Mikolajczyk, Senior Project Scientist

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Project Principal: _____ Date: May 6, 2005
Stephen J. Souza, Ph.D., President

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## 1.0 Introduction

This document has been prepared in accordance with the New Jersey Department of Environmental Protection (herein referred to as NJDEP) *Tier A Stormwater Guidance Document* dated April 2004 in order to document Readington Township's strategy to address and reduce stormwater runoff and related non-point source pollution impacts. It is important to note that this plan will require several updates including a required modification to incorporate the adopted municipal stormwater control ordinances in early 2006 as well as upon adoption of the Pleasant Run/Holland Brook Regional Stormwater Management Plan, anticipated in mid-2006. Readington Township must reexamine the Stormwater Management at each reexamination of the Township's Master Plan in accordance with N.J.S.A. 40:55-D89.

### *1.1 How Does Stormwater Runoff Affect Us?*

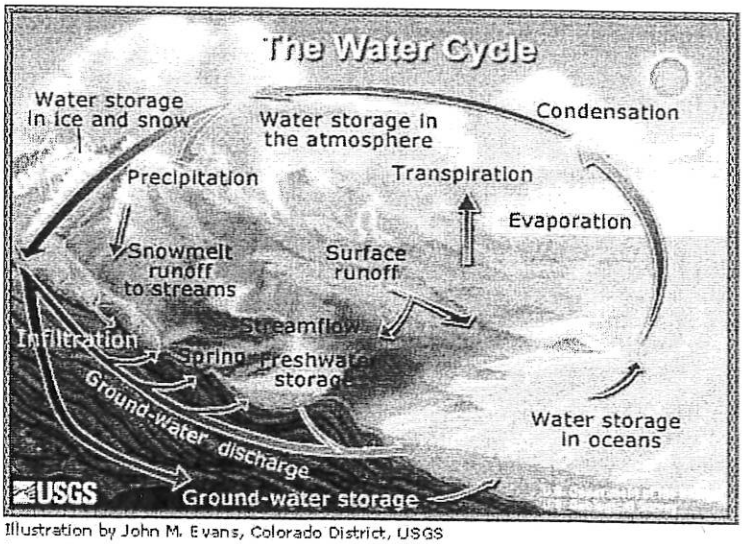


Illustration by John M. Evans, Colorado District, USGS

Stormwater runoff is one of the largest remaining detrimental impacts to our nation's water resources and is a major component of nonpoint source pollution. It is estimated that up to 60 percent of existing water pollution problems are attributable to nonpoint source pollution. Nonpoint source pollution, and particularly, stormwater runoff is difficult to identify, control, and treat. In natural environments, those undisturbed by anthropogenic activities, native vegetation either directly intercepts precipitation or draws from runoff that has infiltrated into the ground and returns it to the atmosphere through the process of evapotranspiration. A portion of precipitation runs off the land's surface replenishing the surface waters. Further, a portion of the rainfall that lands on the ground's surface infiltrates through the soil to the groundwater table and provides natural recharge of the groundwater and either replenishes aquifers or provides baseflow to rivers and streams. This process, known as the hydrologic cycle, functions in equilibrium, but is extremely susceptible to impacts resulting from changes to the cycle's processes.

It has been shown that land development can dramatically impact the hydrology of a watershed if stormwater-runoff related impacts are not considered carefully. Development typically alters natural vegetation through the replacement of forests and fields with lawns and impervious cover, thereby reducing the watershed's evaporation, transpiration and infiltration rates. Construction activities compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. In the past, development typically involved the construction of impervious areas connected to each other through gutters, channels, and storm sewers. These structures can transport runoff more

quickly than natural surfaces and cause erosion, water quality, and flooding problems in areas downstream of development.

Additionally, due to Readington Township's rural nature there is concern regarding stormwater runoff from agriculture. Farms located adjacent to streams in the Township do not always have forested or vegetated riparian buffers to protect the streams from agricultural runoff carrying nutrients and sediment to the streams. Further, livestock and horses that are not kept out of streams by vegetation or fencing can contribute additional nutrient and sediment runoff to streams as well.

Many times people do not know or understand that there are alternatives to the traditional way of managing their property. For example, homeowners can have a green lawn without massive doses of fertilizers and pesticides; horse owners can utilize fencing and vegetated riparian areas to keep horses away from environmentally sensitive areas and protect streams from potential erosion and water quality problems. Typically, people are unaware that untreated stormwater runoff enters waterbodies used for drinking water supplies and recreation.

### *1.2 Municipal Separate Stormwater Systems (MS4) Program*

In response to the United States Environmental Protection Agency (USEPA) National Pollutant Discharge Elimination System (NPDES) Phase II regulations adopted in December 1999, the State of New Jersey developed the Municipal Stormwater Regulation Program. This program addresses pollutants entering our waters from storm drainage systems operated by local, county, state, interstate, and federal government agencies. These systems are referred to as "municipal separate storm sewer systems" or MS4s and are regulated under the New Jersey Pollutant Discharge Elimination System (NJPDES) Rules (N.J.A.C. 7:14A). The NJDEP created four (4) NJPDES Stormwater General Permits for the various MS4s. These permits include the Tier A Municipal Stormwater General Permit, Tier B Municipal Stormwater General Permit, Public Complex Stormwater General Permit, and the Highway Agency Stormwater General Permit. For each General Permit, NJDEP has mandated Statewide Basic Requirements (herein referred to as SBRs), which include minimum standards, measurable goals, and implementation schedules. The minimum standards are one or more actions that must be taken to comply with the requirements of the permit. The measurable goals are the mechanism for reporting to the NJDEP the progress that the Township has made to implement the requirements of the permit and are accomplished primarily through the submittal of the Annual Report and Certification. The implementation schedule sets the deadlines for permit compliance. All municipalities within the State of New Jersey have been classified as either Tier A or Tier B communities depending on population density as determined in the 2000 United States Census.

Statewide Basic Requirements (SBRs) for Readington Township:

- April 1, 2005 – Adopt Borough Stormwater Management Plan
- April 1, 2005 – New storm drain inlets must meet design standards if municipally installed.
- April 1, 2005 – Establish Local Public Education Program
- July 1, 2005 – Submit Annual Report and Certification to NJDEP
- February 2, 2006 – Ensure adequate O&M of BMPs on private property
- April 1, 2006 – Adopt stormwater control ordinances
- April 1, 2006 – New storm drain inlets must meet design standards for all projects.
- April 1, 2009 – Label all municipal storm drain inlets.

Readington Township's physical size resulted in its designation as a Tier A community. As such, the Township is regulated under the NJPDES Stormwater Tier A General Permit, NJPDES No. NJ0141852. As part of the permit, several SBRs were mandated and an associated implementation schedule was established (refer to Appendix A of this plan for a copy). The following minimum standards apply to all Tier A municipalities, including Readington Township:

1. Implementation of a stormwater pollution prevention plan (herein SPPP). The SPPP describes the township's stormwater program, including the details on the implementation of required statewide basic requirements (herein SBRs).

2. Compliance with applicable State and local public notice requirements when providing for public participation.

3. Adoption of a municipal stormwater management plan in accordance with the requirements of N.J.A.C. 7:8-4.

4. Adoption and implementation of municipal stormwater control ordinances in accordance with N.J.A.C. 7:8-4. The ordinances shall address the control of stormwater from non-residential development and redevelopment projects as well as control aspects of residential development and redevelopment projects that are not pre-empted by the Residential Site Improvement Standards.

5. Ensure that any residential development and redevelopment projects that are subject to the Residential Site Improvement Standards (herein referred to as RSIS) for stormwater management comply with those standards. The RSIS for stormwater management address general stormwater management system strategy; runoff estimation techniques; runoff collection system design; inlets, catch basins, manholes, and outlets; detention basins and other stormwater facilities; and water quality.

6. Ensure adequate and long-term operation and maintenance of Best Management Practices (herein referred to as BMPs).

7. All new storm drain inlets must meet the design standards specified in Attachment C of the permit.

8. Copy and distribute an educational brochure annually to residents and businesses, and conduct a yearly educational event, where this brochure can be made available.

9. The labeling of all municipal storm drain inlets that are next to sidewalks, or within plazas, parking areas or maintenance yards. These efforts should be coordinated with local watershed groups and volunteer organizations.

10. The adoption and enforcement of an ordinance requiring owners and keepers to immediately and properly dispose of their pet's solid waste. Information should be distributed with pet licenses regarding the ordinance and the environmental benefits of proper disposal of pet waste.

11. The adoption and enforcement of an ordinance prohibiting spilling, dumping or disposal of any materials other than stormwater into the MS4.

12. The adoption and enforcement of an ordinance that prohibits the feeding of non-confined wildlife in any public park or property (with the exception of environmental education centers) owned or operated by the Township.

13. The adoption and enforcement of an ordinance that prohibits placing non-containerized yard waste in the street, or the collection of yard waste monthly from October through December, once in the spring and "as needed" during the remainder of the year. Additionally, non-containerized yard waste cannot be placed any closer that 10' from a storm drain inlet.

14. The development implementation and enforcement of an ordinance, to the extent allowable under State law, to prohibit illicit connections into the Townships small MS4.

15. The development, implementation and enforcement of a program to detect and eliminate illicit connections into the Township's MS4.

16. The mapping of all municipal storm sewer outfall pipes which discharge to surface water by dividing the Township into two sectors for the purposes of outfall mapping.

17. In predominantly commercial areas, conduct monthly sweeping of curbed streets, roads and highways (with a speed limit $\leq 35$ mph), weather and street surface conditions permitting.

18. The retrofitting of storm drain inlets during road repair, reconstruction, alterations or repaving with inlets that meet the design standards specified in attachment C of the permit.

19. Develop and implement a stormwater facility maintenance program that includes yearly catch basin cleaning and ensures proper function and operation of all municipally operated stormwater facilities.

20. Develop a roadside erosion control maintenance program to identify and stabilize roadside erosion. Make repairs in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey (N.J.A.C. 2:90-1).

21. Develop and implement a stormwater outfall pipe scouring detection, remediation and maintenance program to identify and stabilize loaclaized stream and stream bank scouring in the vicinity of outfall pipes operated by the Township. Repairs shall be in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey (N.J.A.C. 2:90-1).

22. Construct permanent indoor storage with an impermeable floor for deicing materials. Seasonal tarping shall be used as an interim BMP until the permanent structure is completed. Uncovered sand may be stored outside if a 50' setback is maintained from any storm sewer inlet.

23. Develop and implement SOPs for vehicle fueling and bulk delivery and implement with the required practices contained in Attachment D of the permit.

24. Implement required practices for vehicle maintenance, contained in Attachment D of the permit.

25. Implement required practices for good housekeeping, contained in Attachment D of the permit.

26. Develop and conduct an employee-training program for appropriate employees that covers the required topics contained in the permit.

The Township will be responsible for completing an Annual Report and Certification due by July 1 each year (refer to Appendix A for a copy of the report and certification form) to report on progress on completing SBRs and to certify compliance with completed SBRs. Any incidents of noncompliance with the permit conditions must be identified in the Annual Report and Certification. A copy of each Annual Report and Certification will be kept at the Township Municipal Building and shall be made available to the NJDEP for inspection. If there are incidents of noncompliance, the Township shall identify the steps being taken to remedy the noncompliance and to prevent such incidents from reoccurring. The Annual Report and Certification shall be signed and dated by Readington Township and shall be maintained for a period of at least five (5) years.

### *1.3 Stormwater Management Regulations*

On February 2, 2004 the State of New Jersey adopted the revised Stormwater Management Rules (N.J.A.C. 7:8). The revisions to the State's Stormwater Management Rules serve as the first major update to the rules since their inception in 1983 and detail fundamental changes in the management of stormwater runoff in New Jersey. Through the revision of these rules other regulations were modified, including the Residential Site Improvement Standards (herein referred to as RSIS) (N.J.A.C. 5:21), the Freshwater Wetlands Protection Act (N.J.A.C. 7:7A), the Flood Hazard Area Control Act (N.J.A.C. 7:13), the Watershed Management Rules (N.JA.C. 7:15), and the New Jersey Dam Safety Standards (N.J.A.C. 7:20).

The new Stormwater Management Rules provide a framework and incentives for managing runoff and resolving nonpoint source impairment on a drainage area basis for new development, redevelopment and existing developed areas. Additionally, they establish a hierarchy for implementation of BMP stormwater management measures with initial reliance on low impact development (LID) site design techniques to maintain natural vegetation and drainage patterns before incorporating structural measures. These new rules also establish runoff control performance standards for groundwater recharge, water quality, and water quantity, establish special protection area measures for pristine and exceptional value waters; provide regulatory consistency among local and State regulatory agencies; and provide safety standards for stormwater management basins.

As of February 2, 2004, the design requirements identified in the Stormwater Management Rules including groundwater recharge, water quality, and water quantity must be met for all projects regulated under RSIS. The Stormwater Rules (N.J.A.C. 7:8-4) require that all municipalities within the State of New Jersey adopt a municipal stormwater management plan. The Tier A General Permit mandates that

this be completed no later than 12 months from the effective date of permit authorization, which is April 1, 2004. Additionally, N.J.A.C. 7:8-4 mandates that stormwater control ordinances be adopted and implemented for all municipalities in the State no later than 12 months from the date of adoption of the Stormwater Management Plan. Readington Township currently has such an ordinance, § 148-65. Stormwater, found in the Land Development Code.

## 2.0 Stormwater Management Plan Goals

There are nine (9) minimum goals identified for the municipal stormwater management plans for Tier A communities in the NJDEP Guidance document. They are as follows:

- 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 source 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 in order 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;
- Protect public safety through the proper design and operation of stormwater management basins.

To achieve the above 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 protect public safety.

## 3.0 Municipal Background

Readington Township is approximately 47.9 square miles in size and borders Raritan Township, Clinton Township, Branchburg Township, Bedminster Township, and Tewksbury Township. The Township boundary is identified on the USGS Map - Figure 2 in Appendix B of this report. Readington Township's population was 15,803 in the 2000 United States Census, up from 13,400 in 1990, which represents a population increase of 18.0%. Two (2) County roadways are located within the Township and include

County Route 523 and County Route 629. Additionally, three (3) New Jersey Department of Transportation (NJDOT) maintained roadways are located in the Township. These include State Route 22, Interstate Route 78 and United States Highway 202. The aforementioned roadways and their associated stormwater conveyance systems are covered under NJPDES Highway Agency Permits issued to both Hunterdon County and NJDOT and as such are not covered under this Plan and are not the responsibility of Readington Township to operate and maintain. All roadways in the Township are identified on Figure 1 in Appendix B of this plan for reference.

As part of the Cross Acceptance process the Township has been proposed for several planning areas including: Planning Areas 2 (PA2), Planning Area 3 (PA3), Planning Area 4 (PA4), Planning Area 4b (PA4b) and Planning Area 5 (PA5), but these designations are subject to final approval by the New Jersey State Planning Commission. Further, Readington Township has a Special Resource Area designation along South Branch of the Raritan River and the Lamington River. PA2 is considered a Suburban Planning Area, PA3 is considered a Fringe Planning Area, PA4 is considered a Rural Planning Area, PA4b is considered a Rural/Environmentally Sensitive Planning Area and PA5 is considered an Environmentally Sensitive Planning Area.

PA2 designations are generally located adjacent to the more densely developed Metropolitan Planning Areas, but can be distinguished by the lack of high intensity centers, the availability of developable land and by a more dispersed and fragmented pattern of predominantly low density development. The Suburban Planning Area has about 11 percent of the states population and employment. Current development patterns, outside of Centers, lack the compact settlement pattern of the older suburbs in the Metropolitan Planning Area and are almost entirely dependent on the private automobile for transportation. In the low density, automobile dependent pattern of single-use enclaves prevalent in the Suburban Planning Area, there are few links connecting residential subdivisions, office and industrial parks, distribution centers, big box retail and multi-family developments. The effect of local planning efforts has been to isolate land uses from each other. Although Suburban Planning Areas, may, as they build out, achieve densities characteristic of Metropolitan Planning Areas, if these trends continue they will remain fragmented.

PA3 designations are a predominantly rural landscape that is not prime agricultural or environmentally sensitive land, with scattered small communities and freestanding residential, commercial and industrial development. Readington Township is one of the few areas in the state where a large block of Fringe Planning Area exists. In most cases, Fringe Planning Areas serve as a transition between suburban and rural landscapes. In the Fringe Planning Area large investments in water, sewer and local road networks have not taken place. Circulation is primarily provided by a state and county maintained system of highways supplemented by locally maintained roads.

PA4 designations comprise much of the countryside of New Jersey, where large masses of cultivated or open land surround rural Designated Centers, and distinguish other sparse residential, commercial and industrial sites from typical suburban development. Some lands have one or more environmentally sensitive features (qualifying for PA4b or PA5). Rural Planning Areas are supportive of agriculture and other related economic development efforts. Adequate water resources and large, contiguous tracts of land with minimal land-use conflicts are essential to sustaining successful farming operations and farmland productivity. More intensive farming operations and the growing encroachment of housing are creeping into previously agriculturally dominated areas. Prudent land development practices are required

to protect these resources and retain large contiguous areas of agricultural land. Tools and techniques need to be tailored to address the distinctive situation. In particular, new development may require additional attention in areas with environmentally sensitive features.

PA5 designations contain large contiguous land areas with valuable ecosystems, geological features and wildlife habitats, particularly in the Highlands Region. Some of these lands have remained somewhat undeveloped or rural in character. Environmentally Sensitive Planning Areas are characterized by watersheds of pristine waters, trout streams, and drinking water supply reservoirs; recharge areas for potable water aquifers; habitats of endangered and threatened plant and animal species; coastal and freshwater wetlands, prime forested areas, scenic vistas, and other significant topographical, geological or ecological features. Existing Centers within the Environmentally Sensistive Planning Area have been, and often remain, the focus of residential and commercial growth and public faculties and services for their region, as well as supporting the recreation and tourism industries. These Centers are generally linked to each other by rural roads and separated by other development by open spaces or linked by state highways crossing waterways. Recreational facilities often have assonated residential or commercial development. Mining, forestry and other resource-based industrial development are found in these areas. In addition, over 60,000 acres of agricultural land is found in this area. The Environmentally Sensistive Planning Area is highly vulnerable to damage of many sorts from new development in the Environs, including fragmentation of landscapes, degradation of aquifers and potable water, habitats destruction, extinction of plant and animal species and destruction of other irreplaceable resources which are vital for the preservation of the ecological integrity of new Jersey's natural resources.

Currently a large majority of the Township is zoned for both agricultural and residential use. The remaining portions of the Township are zoned as village (Whitehouse Station and Three Bridges), and research office/manufacturing, the latter especially along the Highway 22 corridor.

### *3.1 Environmental, Historic, and Cultural Resources*

**Historic.** The historic preservation goal of Readington Township is included in the Township Master Plan and is as follows: "*to protect significant historic sites and villages through the preservation of structures.*" Readington Township has five National Register Historic Districts: Potterstown Rural, Taylor's Mill, Stanton Rural, Readington Village and the South Branch Districts. In addition, the Readington Train Station Library is a National Register Building. Throughout the Township, there are hundreds of buildings that are listed in the Historic Sites of Hunterdon County book, which was adopted as the historic element of the Hunterdon County Master Plan. Subsequently, Readington Township adopted the Readington element and incorporated it into their Master Plan.

**Waterway classifications.** Several sets of wetlands and tributary to major waterways are also identified on Figure 4 as mentioned above. A listing of these waterways and their tributary are classified by the New Jersey Surface Water Quality Standards as the following:

South Branch of the Raritan River – Freshwater Non-Trout (FW2-NT)

North Branch of the Rockaway Creek – Freshwater Trout Production and Freshwater Trout Maintenance (FW2-TP (C1) and FW2-TM)
South Branch of the Rockaway Creek - Freshwater Trout Maintenance (FW2-TM (C1))

Rockaway Creek – Freshwater Non-trout (FW2-NT)

Pleasant Run – Freshwater Non-Trout (FW2-NT)

Hollands Brook – Freshwater Non-Trout (FW2-NT)

Chambers Brook – Freshwater Non-Trout (FW2-NT)

Lamington River – Freshwater Trout Maintenance (FW2-TM)

Prescott Brook – Freshwater Trout Maintenance (FW2-TM)

**HUC 14 watersheds.** As can also be seen on Figure 4, the Township possesses 11 separate HUC 14 watersheds. Although there are 11 separate HUC 14 watersheds within the Township, all of the Township lies within the Raritan River watershed. **Please note that a Regional Stormwater Management Plan for the Pleasant Run/Holland Brook region is currently being prepared. Therefore, the Township's Stormwater Management Plan will require modification when the Regional Stormwater Management Plan is completed and adopted.**

**Current Stream Health.** 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 South Branch of the Raritan River was classified as non and moderately impaired, the Pleasant Run was classified as non-impaired, the Holland Brook was classified as non-impaired, Chambers Brook was classified as non-impaired, the Rockaway Creek was classified as non and moderately impaired and the North Branch of the Rockaway Creek was classified as non-impaired in the Raritan River Drainage Basin 1997-98 Benthic Macroinvertebrate Data. There are currently eight (8) AMNET biological monitoring sites located within Readington Township.

The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)) (Integrated List) are required by the federal Clean Water Act to be prepared biennially. This combined report presents the extent to which New Jersey waters are attaining water quality standards, and identifies waters that are impaired. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more Total Maximum Daily Loads (TMDLs) are needed. The June 2004 Integrated Water Quality Assessment identifies the following impairments for the following waterways in Readington Township:

**South Branch of the Raritan River at Stanton Station – Fecal coliform, pH, temperature, cadmium, mercury, phosphorous, dissolved oxygen, nitrate, total suspended solids, total dissolved solids, unionized ammonia, chromium, copper, lead, nickel, selenium and zinc.** The water quality standards are not attained based on data collected by the NJDEP and USGS. As such a TMDL will be required for these pollutants.

**North Branch of the Rockaway Creek - Fecal coliform, pH, temperature, cadmium, mercury, phosphorous, dissolved oxygen, nitrate, total suspended solids, total dissolved solids, unionized ammonia, chromium, copper, lead, nickel, selenium and zinc.** The water quality standards are not attained based on data collected by the NJDEP and USGS. As such a TMDL will be required for these pollutants.

**South Branch of the Rockaway Creek – Benthic Macroinvertebrates.** The water quality standards for benthic macroinvertebrates are not attained based on data collected by NJDEP AMNET. As such, a TMDL will be required for this pollutant.

**Pleasant Run - Benthic Macroinvertebrates.** The water quality standards for benthic macroinvertebrates are not attained based on data collected by NJDEP AMNET. As such, a TMDL will be required for this pollutant.

**Hollands Brook – Benthic Macroinvertebrates.** The water quality standards for benthic macroinvertebrates are not attained based on data collected by NJDEP AMNET. As such, a TMDL will be required for this pollutant.

**Chambers Brook - Benthic Macroinvertebrates.** The water quality standards for benthic macroinvertebrates are not attained based on data collected by NJDEP AMNET. As such, a TMDL will be required for this pollutant.

**Lamington River - pH, temperature, dissolved oxygen, nitrate, total suspended solids, total dissolved solids, unionized ammonia.** The water quality standards are not attained based on data collected by the NJDEP and USGS. As such a TMDL will be required for these pollutants.

**Contaminated Sites.** Currently, there are thirty-five (35) contaminated sites within the Township as identified in the *Known Contaminated Sites in New Jersey* report last updated in 2001. The *Known Contaminated Sites in New Jersey* report is a municipal listing of sites where contamination of soil and/or ground water is confirmed at levels greater than the applicable cleanup criteria or standards. Remedial activities are underway or required at the sites with an on-site source(s) of contamination and at locations where the source(s) of contamination is unknown. Sites with completed remedial work that require engineering and/or institutional controls have reporting measures in place to ensure the effectiveness of past actions, and some include maintenance and/or monitoring.

**Wellhead Protection Areas.** According to the Readington township Environmental Resource Inventory, 2000, there are four (4) existing Public Community Water Supply (PCWS) wells located within the Township, however, there are no Well Head Protection Areas corresponding to these wells.

There are small areas of well head protection areas located in the northwestern portion of the Township, however, the wells are located in the township of Clinton. The New Jersey Geological Survey (herein referred to as NJGS) delineated Wellhead Protection Areas (herein referred to as WHPAs) for each of these supply wells. A WHPA in New Jersey is a mapped area calculated around a Public Community Water Supply (PCWS) well in New Jersey and is defined as the portion of an aquifer, which contributes water to a well over a specified time interval. WHPAs are divided into three sequential tiers based on

Time of Travel (herein referred to as TOT) to a supply well. TOT is the time it takes for a given particle of groundwater to flow to a supply well. The TOT is directly related to the distance the water has to travel to arrive at the well once it starts pumping. For any given TOT, the distance will vary from well to well depending on the rate of pumping and aquifer characteristics. Tier 1, the 2-year TOT, is based on findings that bacteria have polluted wells and viruses have survived in groundwater up to 270 days. Tier 2, the 5-year TOT, is based on the lag time of a pollution plume caused by adsorption/desorption, the variable rate of pollutant travel, and the acceleration of groundwater once it comes close to a supply well. Tier 3, the 12-year TOT, is defined to provide sufficient time so that monitoring and cleanup response to potential pollution sources/releases can be completed before contamination reaches a pumping well. The three (3) tiers, over two-, five-, and twelve-years, are defined using line boundaries and polygon areas generated with the ARC/INFO Geographic Information System (GIS). Refer to Figure 3 in Appendix B of this plan for the delineated Wellhead Protection Areas in the northwestern portion of the Township.

**Groundwater Recharge.** As can be seen in Figure 5 in Appendix B of this plan, the Township's soils indicate that a groundwater recharge rate of 13 to 16 inches per year can be achieved for more than 50% of the Township. The remaining areas of the Township achieve 10 to 12 inches per year, are hydric soils, or are areas where minimal recharge is achieved. The overall recharge rates established and depicted in Figure 5 were obtained from the NJGS and are based on the New Jersey Geological Survey Report GSR-32 – A method for Evaluating Ground-Water-Recharge Areas in New Jersey. Additionally, the Hunterdon County Soil Survey indicates that there is an area of steep slopes within the Township boundaries.

### *3.2 Existing Stormwater Infrastructure*

Currently, there are no existing stormwater inlet and storm sewer network maps for the Township. The Department of Public Works will work to complete a map identifying these locations. The locations will be identified using a Global Positioning System (GPS) device and a map will be compiled at a future date. The Township will utilize this map for the SBR for stormwater inlet labeling as well as future maintenance.

Additionally, it is recommended that all existing inlets be retrofitted to meet the requirements of Attachment A of the NJPDES Tier A Municipal Stormwater Permit. All new inlets must meet the requirements of Attachment A of the permit.

**Public Education Program.** Readington Township must provide for the duplication and annual mailing (or other means of delivery) to all residents and businesses within the municipality of the informational brochure included in Appendix A of this plan. NJDEP may periodically provide Readington Township with an updated brochure for duplication and distribution. As part of this program, Readington Township must also conduct each year, at minimum, one (1) education effort in the form of an "event."

## 4.0 Design and Performance Standards

As previously mentioned in this plan, it is important to note that the Township's stormwater management design and performance standards are subject to change pending the conclusions and recommendations of the Pleasant Run/Holland Brook Regional Stormwater Management Plan. The design and performance standards identified in this plan will be further detailed upon adoption of the Pleasant Run/Holland Brook Regional Stormwater Management Plan.

The design and performance standards for stormwater management measures for Readington Township include those presented in N.J.A.C. 7:8-5 and will be required for all major development projects as defined in Section 9.0 – Applicable Definitions of this plan.

### *4.1 Design Standards*

Stormwater management measures for major development shall be designed to meet the following standards, as required under N.J.A.C. 7:8-5: In addition, stormwater management measures are subject to the Readington Township Stormwater Ordinance, §148-65 of the Land Development Code.

- **Erosion control** – all proposed land disturbance must follow the *Standards for Soil Erosion and Sediment Control in New Jersey*;
- **Groundwater recharge** – all major development projects that are considered new construction must maintain 100% of the pre-developed groundwater recharge under post-developed conditions or demonstrate that the increase of runoff from pre-construction to post-construction for the Natural Resources Conservation Service (NRCS) 2-year frequency, 24-hour duration Type III storm (consistent with the most recent NRCS Technical Paper 40 release or replacement) is infiltrated.
- **Stormwater runoff quantity** – all major development projects must demonstrate compliance with one of the following: peak runoff flow rate mitigation, runoff volume mitigation, or hydrograph mitigation; and
- **Stormwater runoff quality standards** – all major development projects must demonstrate an 80% Total Suspended Solids removal rate.
- **Threatened and Endangered Species Searches** – all major development projects subject to review by NJDEP's Land Use Regulation Program must conduct a Threatened and Endangered Species search using the Natural Heritage Database.

#### 4.1.1 Soil Erosion and Sediment Control

Soil Erosion and Sediment Control
Key Facts:
- Projects disturbing 5,000 sf or more of land require Soil Erosion Certification
- A NJPDES RFA Permit is required for projects one (1) acre or more
- A Stormwater Pollution Prevention Plan is required for all NJPDES RFA projects

**State Required Minimum Standards.** The Hunterdon County Soil Conservation District will be responsible for the review of all projects identified as major development for compliance with the *Standards*

*for Soil Erosion and Sediment Control in New Jersey.* Projects that involve the disturbance of 5,000 square feet or more of land will be required to obtain Soil Erosion and Sediment Control Certifications from the Hunterdon County Soil Conservation District. In accordance with the minimum goals identified in Section 2.0 of this plan, it is important that the Township also ensure that all soil erosion measures comply with the current standards and that proper measures are installed and maintained on projects under construction and after completion.

**Recommendations.** A copy of this plan will be provided to the Hunterdon County Soil Conservation District for their review and records. Maintenance personnel will document erosion within the Township and corrective measures will be discussed with the Soil Conservation District on a case-by-case basis.

### 4.1.2 Groundwater Recharge

Infiltration measures should be utilized for water quality and/or quantity control and as such; there are several key issues that should be considered. Infiltration is prohibited from sites with high pollutant loading or industrial stormwater exposed to "source material." As there are thirty-five (35) known contaminated sites within the Township, infiltration is prohibited for these properties and all future identified contaminated properties in accordance with N.J.A.C. 7:8-5.4(a) 2iii. The design engineer (or qualified professional) shall assess the impacts on the groundwater table and design the site so as to avoid adverse hydrogeologic impacts. There are several potential adverse hydrogeologic impacts, including, but not limited to, exacerbating a naturally or seasonally high water table so as to cause surficial ponding, flooding of basements, or interference with the proper operation of subsurface sewage disposal systems and other subsurface structures in the vicinity or down gradient of the infiltration area. For all structural and nonstructural infiltration measures it is necessary to determine soil characteristics and depth to groundwater on a subject property prior to designing infiltration measures.

Key Water Quantity Mitigation Components:

- Established watershed points of analysis
- Assessment of pre-developed and post-developed runoff conditions
- Pre-developed site conditions must be documented for at least five (5) years or assumed to be woods in good condition

### 4.1.3 Stormwater Runoff Quantity

**State Required Minimum Standards.** For all three options identified below, the applicant must establish Point(s) of Analysis (POAs) based on natural watershed divisions on the subject site in accordance with Section 5 of the BMP Manual. These POAs must then be analyzed under pre- and post-construction conditions as discussed below. In order to control stormwater runoff quantity impacts, the design engineer shall complete one of the following:

1. Hydrograph Mitigation - demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the two, 10, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events;

2. Runoff Volume Mitigation - demonstrate through hydrologic and hydraulic analysis that there is no increase, as compared to the pre-developed condition, in the peak runoff rates of stormwater leaving the site for the 2-, 10-, and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. This analysis shall include the analysis of impacts to existing land uses and projected land

uses assuming full development under existing zoning and land use ordinances in the drainage area;

3. Peak Runoff Flow Rate Mitigation - design stormwater management measures so that the post-construction peak runoff rates for the 2-, 10-, and 100-year storm events are reduced by 50, 75 and 80 percent, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed under all phases of the project.

**Agricultural activities are not exempt for the stormwater regulations**. Any application for a new agricultural development that meets the definition of major development shall be submitted to the Hunterdon County Soil Conservation District for review and approval in accordance with the requirements of this section and the *Standards for Soil Erosion and Sediment Control in New Jersey* for stormwater runoff quantity and erosion control.

Stormwater runoff shall be calculated in accordance with the following:

1. The United States Department of Agriculture (USDA) NRCS methodology, including the NRCS Runoff Equation and Dimensionless Unit Hydrograph, as described in Section 4 of the National Engineering Handbook (NEH-4), dated July 2002, last updated September 8, 2003, and incorporated herein by reference as amended and supplemented (refer to Appendix C of this plan for a copy of the rainfall frequency data). This methodology is additionally described in Technical Release 55 - Urban Hydrology for Small Watersheds (TR-55), dated June1986, incorporated herein by reference as amended and supplemented; or

2. The Rational Method for peak flow and the Modified Rational Method for hydrograph computations. The rational and modified rational methods are described in "Appendix A-9 Modified Rational Method" in the *Standards for Soil Erosion and Sediment Control in New Jersey.*

For the purpose of calculating runoff coefficients, there is a presumption that the pre-developed condition of a site is a wooded land use with good hydrologic condition. Alternatively, a runoff coefficient or a groundwater recharge land cover for an existing condition may be used on all or a portion of the site if the design engineer verifies that the hydrologic condition has existed on the site or portion of the site for at least five (5) years without interruption prior to the time of application. If more than one land cover has existed on the site during the five (5) years immediately prior to the time of application, the land cover with the lowest runoff potential shall be used for the computations. In addition, there is the presumption that the site is in good hydrologic condition (if the land use type is pasture, lawn, or park), with good cover (if the land use type is woods), or with good hydrologic condition and conservation treatment (if the land use type is cultivation.)

When computing pre-construction stormwater runoff, the design engineer shall account for all significant land features and structures, such as ponds, wetlands, depressions, hedgerows, or culverts that may reduce pre-construction stormwater runoff rates and volumes. Additionally, when computing stormwater runoff from all design storms, the design engineer shall consider the relative stormwater runoff rates and/or volumes of pervious and impervious surfaces separately to accurately compute the rates and volume of

stormwater runoff from the site. To calculate runoff from unconnected impervious cover, urban impervious area modifications as described in the NRCS Technical Release-55, Urban Hydrology for Small Watersheds or other methods described in the BMP Manual may be employed. If the invert of the outlet structure of a stormwater management measure is below the Flood Hazard Design Flood elevation of the South Branch Raritan River, Holland Brook, Pleasant Run, Rockaway Creek or Lamington River or any associated tributaries, the design engineer shall take into account the effects of tailwater in the design of structural stormwater management measures.

**Recommendations.** Runoff quantity can be controlled using both nonstructural (Section 5.1) and structural BMPs (Section 5.2) or combination thereof. Volume control is essential in protecting downstream channels and properties from erosion and flooding. Nonstructural measures can serve to increase times of concentration and slow the rate that stormwater runs off of a property. By disconnecting impervious surfaces, runoff rates will also be reduced. For detailed design guidance on the various BMPs to satisfy the requirements of 4.1.3 above, the applicant's professional(s) should refer to the BMP Manual.

### 4.1.4 Stormwater Runoff Quality

**State Required Minimum Standards.** Stormwater management measures shall only be required for water quality control if an additional one-quarter acre of impervious surface is being proposed on a major development project. Stormwater management measures shall be designed to reduce the post-construction load of Total Suspended Solids (TSS) in stormwater runoff generated from the water quality design storm by 80 percent of the anticipated load from the developed site, expressed as an annual average. The water quality design storm is 1.25 inches of rainfall in two (2) hours. Water quality calculations shall take into account the distribution of rain from the water quality design storm, as reflected in Table 1 in Appendix C of this plan. The calculation of the volume of runoff may take into account the implementation of non-structural and structural stormwater management measures. The requirement to reduce TSS does not apply to any stormwater runoff in a discharge regulated under a numeric effluent limitation for TSS imposed under the New Jersey Pollutant Discharge Elimination System (NJPDES) rules, N.J.A.C. 7:14A, or in a discharge specifically exempt under a NJPDES permit from this requirement.

Key Water Quality Components:
- Volume for treatment should be based on 1.25-inch 2-hour water quality storm
- TSS removal rate required is 80% for each drainage area

For purposes of TSS reduction calculations, Table 2 in Appendix C of this plan presents the presumed removal rates for certain BMPs designed in accordance with the *New Jersey Stormwater Best Management Practices Manual*. Alternative removal rates and calculation methods may be considered if the design engineer provides documentation demonstrating the capability of the alternative rates and methods to the Township Engineer. A copy of any Township approved alternative rate or method of calculating the removal rate shall be provided to NJDEP as required under N.J.A.C. 7:8-5.5.

If more than one BMP in series is necessary to achieve the required 80 percent TSS reduction requirement, the applicant shall utilize the following formula to calculate TSS reduction:

R = A + B – (AXB)/100 where
R = total TSS percent load removal from application of both BMPs, and
A = the TSS percent removal rate applicable to the first BMP
B = the TSS percent removal rate applicable to the second BMP

If there is more than one onsite drainage area, the 80 percent TSS removal rate shall apply to each drainage area, unless the runoff from the sub-areas converge onsite. Stormwater management measures shall also be designed to reduce, to the maximum extent feasible, the post-construction stormwater runoff nutrient load from the developed site generated during the water quality design storm. In achieving a reduction of nutrients to the maximum extent feasible, the design of the site shall include nonstructural strategies and structural measures that optimize nutrient removal while still achieving the performance standards identified above.

Currently, several watercourses within the municipal boundaries are classified as Category One (C1) in the New Jersey Surface Water Quality Standards, N.J.A.C. 7:9B. Special Water Resource Protection Areas are mandated for all C1 watercourses in the State identified on either USGS or Soil Survey maps and perennial or intermittent streams that drain into these watercourses. All USGS streams are identified on Figure 2 and the Hunterdon County Soil Survey streams identified in blue on the maps included in Appendix B. These areas shall be established for the protection of water quality, aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance and exceptional fisheries significance of those C1 waters. Since there are several major watercourses with this designation, the Township will be responsible for ensuring that the requirements of the special water resource protections areas are upheld. The requirements for these areas are as follows:

- All major development projects shall preserve and maintain a 300-foot special water resource protection area on each side of the waterway, measured perpendicular to the waterway form the top of the bank outwards, or form the centerline of the waterway where the bank is not defined, consisting of existing vegetation or vegetation allowed to follow natural succession is provided.

- Encroachment within a designated 300-foot special water resource protection area shall only be allowed where previous development or disturbance has occurred (for example, active agricultural use, parking area or maintained lawn area). The encroachment will only be allowed where sufficient documentation has been provided to ensure that the functional value and overall condition of the special water resource protection area will be maintained. In no case shall the remaining special water resource protection area be reduced to less than 150 feet as measured perpendicular to the top of the bank of the waterway or centerline of the waterway where the bank is undefined. **The NJDEP will review all encroachments proposed under this item.**

- All stormwater must be discharged outside of the special water resource protection area and must comply with the Standard for Off-Site Stability in the NJ Soil Erosion Standards. It is important to note that stormwater can sheet flow through the special water resource protection area.

- If stormwater discharged outside of the special water resource protection area cannot comply with the Standard for Off-Site Stability in the NJ Soil Erosion Standards, then stabilization measures may be placed within the special water resource protection area, provided that these stabilization are not placed within 150 feet of the waterway. Additionally, the stormwater discharged must achieve a 95 percent TSS post construction removal rate and temperature must be addressed to ensure no impact on the receiving stream. A conceptual project design meeting shall be held with NJDEP and Hunterdon County Soil Conservation District staff to identify necessary stabilization measures.

**Recommendations.** Non-structural and structural BMPs may be required to achieve the required 80 percent TSS removal rate. Disconnecting impervious surfaces and the use of vegetative filter strips are critical in reducing the amount of sediment and other pollutants entering the Township's watercourses. Professionals are directed to the BMP Manual for detailed design guidance on several BMPs that can provide the required water quality treatment individually or in combination with other BMPs.

#### 4.1.5 Threatened and Endangered Species Searches

For projects regulated by NJDEP under the Land Use Regulation Program, a Natural Heritage Database search must be conducted to confirm the presence or absence of threatened and endangered species (T&E). This can be accomplished by completing a Natural Heritage Data Request Form and sending to the Natural Heritage Program.

#### 4.1.6 Exemption/Waiver Criteria from Design Standards

A 50% TSS removal rate is required for proposed redevelopment projects involving only existing areas of impervious cover. Additionally, the following linear development projects are exempt from the stormwater runoff quantity and stormwater runoff quality requirements:

1. The construction of an underground utility line provided that the disturbed areas are revegetated upon completion;

2. The construction of an aboveground utility line provided that existing conditions are maintained to the maximum extent practicable; and

3. The construction of a public pedestrian access, such as a sidewalk or trail with a maximum width of 14 feet, provided that the access is made of permeable material.

A waiver from strict compliance from the stormwater runoff quantity and stormwater runoff quality requirements may be obtained for the enlargement of an existing public roadway or railroad, or the construction or enlargement of a public pedestrian access, provided that all of the following conditions are met:

1. The applicant demonstrates that there is a public need for the project that cannot be accomplished by any other means;

2. The applicant demonstrates through an alternatives analysis, that through the use of nonstructural and structural stormwater management strategies and measures, the option selected complies with the above requirements to the maximum extent practicable;

3. The applicant demonstrates that, in order to meet the requirements above existing structures currently in use, such as homes and buildings would need to be condemned; and

4. The applicant demonstrates that he/she does not own or have rights to areas that would provide opportunities to mitigate for the requirements above that are not achievable on-site.

Additionally, it is noted that applicants that cannot meet one or more of the design requirements identified above can complete a project identified under Section 6.0 – Mitigation Plan as identified in this plan with prior approval from the Township.

### *4.2 Performance Standards*

**Existing Maintenance and Performance Problems.** Typically, the stormwater management structure maintenance is the responsibility of a private resident or homeowner's association. Often maintenance responsibilities are forgotten or lost as properties are bought and sold. To remedy this, the State has mandated that municipalities take responsibility for stormwater management maintenance in their communities.

Required Maintenance Plan Components:
- Required tasks and schedules
- Cost estimates for removal of debris, and sediment removal
- Responsible party for operation and maintenance
- Logs of all preventive and corrective maintenance

**State Required Minimum Standards.** In order to ensure proper operation of all structural and nonstructural stormwater management measures, the Township requires that all projects considered major development incorporate maintenance plans for proposed stormwater management measures. These plans are essential to the long-term functionality of best management practices. All maintenance plans shall contain specific preventative maintenance tasks and schedules; cost estimates, including estimated cost of sediment, debris, or trash removal; and the name, address, and telephone number of the person or persons responsible for preventative and corrective maintenance (including replacement). Preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of non-vegetated linings. Specific maintenance guidelines for structural stormwater management measures are available in the BMP Manual.

If a person other than the developer (for example, a public agency or homeowners' association) is responsible for maintenance, the plan shall include documentation of such person's agreement to assume this responsibility, or of the developer's obligation to dedicate a stormwater management facility to that person or entity. In no instance shall the responsibility for maintenance be assigned or transferred to the owner of an individual property in a residential development or project, unless the owner owns the entire residential development or project. If the person responsible for maintenance identified above is not a

public agency, the maintenance plan and any future revisions shall be recorded upon the deed of record for each property on which the maintenance described in the maintenance plan must be undertaken.

The person or entity responsible for maintenance (herein referred to as the responsible party) shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders. Additionally, the responsible party shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed. All maintenance records and the maintenance plan shall be retained by the responsible party and made available, upon request by any public entity with administrative, health, environmental or safety authority over the site. Nothing in this section shall preclude Readington Township from requiring the posting of a performance or maintenance guarantee in accordance with N.J.S.A. 40:55D-53.

During construction for all major development projects, Township inspectors will be onsite to observe the construction of the project to ensure that the stormwater management measures are constructed and function as designed. After construction, the Township will regularly follow up with the person responsible for maintenance of the stormwater management structures associated with all major development projects.

As previously stated, each year the Township is responsible to submit an Annual Certification Form to NJDEP for their records and approval. This form requires that the Township certify that all stormwater management facilities are being properly operated and maintained. To ensure this, the Township will request all responsible parties to submit annual statements documenting the operation and maintenance of their facilities. This will assist the Township in completing the Annual Certification Form as well as provide documentation of all operations and maintenance not conducted by Township personnel on stormwater management facilities. Should the responsible parties not submit annual statements, the Township will not assume responsibility for assessing the condition of the stormwater facilities and penalties may be assigned for non-compliance.

## 5.0 Stormwater Runoff Best Management Practices (BMPs)

It is noted that although attempts to mimic pre-existing natural conditions may be adequate to satisfy the State stormwater rules, alteration of land always modifies hydrology. Therefore, some measure (or BMP) will be required for every project qualifying as a major development.

### *5.1 Nonstructural BMPs/ Low Impact Development (LID)*

With the increasing emphasis on nonpoint source pollution and concerns over the environmental impacts of land development, it has become necessary to develop effective alternatives to the centralized conveyance and treatment strategy that has been the basis for much of the historical stormwater management systems and programs in the State. New strategies must be developed to minimize and even prevent adverse stormwater runoff impacts from occurring. If elimination of adverse impacts is not possible treatment closer to the origin of those impacts must be provided. Such strategies, known collectively as Low Impact Development (LID) design seek to reduce and/or prevent adverse runoff impacts through sound site planning and both nonstructural and structural techniques that preserve or closely mimic the site's natural or pre-developed hydrologic response to precipitation. Rather than

responding to the rainfall-runoff process using centralized structural facilities, LID design techniques control stormwater runoff and pollutants closer to the source and provide site design measures that can significantly reduce the overall impact of land development on stormwater runoff.

Any land area containing a nonstructural stormwater management measure to meet the above identified design standards shall be dedicated to Readington Township, Hunterdon County, or the State, subjected to a conservation restriction filed with the County Clerk's office, or subject to NJDEP approved or equivalent restriction that ensures the specific measure or an equivalent stormwater management measure approved by the reviewing agency is maintained in perpetuity. Additionally, in general all proposed stormwater management measures must avoid creating concentrated stormwater runoff flows or discharges on habitat for threatened and endangered species as documented in the NJDEP's Landscape Project or Natural Heritage Database (see Section 3.1 above).

To the maximum extent practicable, the design standards identified in Section 4.1 above shall be met by incorporating nonstructural stormwater management strategies into the design. The person(s) submitting an application for review shall identify the nonstructural strategies incorporated into the design of the project and shall complete a Low LID Checklist as provided in the BMP Manual (a sample is included in Appendix D of this report) to be included in the application to the Township for review. In accordance with the Stormwater Management Rules, nonstructural stormwater management strategies incorporated into site design shall:

1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss;

2. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces;

3. Maximize the protection of natural drainage features and vegetation;

4. Minimize the decrease in the "time of concentration" from pre-construction to post-construction;

5. Minimize land disturbance including clearing and grading;

6. Minimize soil compaction;

7. Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides;

8. Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas; and

9. Provide other source controls to prevent or minimize the use or exposure of pollutants at the site in order to prevent or minimize the release of those pollutants into stormwater runoff. These source controls include, but are not limited to:

i. Site design features that help to prevent accumulation of trash and debris in drainage systems;

ii. Site design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments; and

iii. When establishing vegetation after land disturbance, applying fertilizer at the rates in accordance with the requirements established under the *Standards for Soil Erosion and Sediment Control in New Jersey*. No more fertilizer shall be applied than listed.

While the nonstructural stormwater management strategies listed above represent a wide range of both objectives and practices, Strategies 1 through 8 can be directly addressed through the use of specific nonstructural LID-BMPs that can be grouped into four general categories:

- Vegetation and Landscaping;
- Minimizing Site Disturbance;
- Impervious Area Management; and
- Time of Concentration Modifications.

Information on the specific nonstructural LID-BMPs recommended for each of these categories in Readington Township is presented below. Prior to utilizing any of the specific nonstructural LID-BMPs described below, applicants should review the land development regulations of the municipality and/or agency from which they are seeking development approval. It is especially important to note that the BMPs listed below are examples. The Readington Township stormwater ordinance lists specific technical standards for BMPs. Not all of the BMPs listed below may comply with all of the standards required by Readington Township.

Engineers and site designers should recognize the importance of accurately computing existing or pre-developed runoff at a land development site. While this is an important computation at all development sites, it is particular important at those sites where nonstructural LID-BMPs will be utilized. This is because, to a large degree, these nonstructural measures will utilize and/or mimic the pre-developed site's rainfall-runoff response. As such, accurate computation of pre-developed hydrologic conditions is vital to successful LID-BMP development. It is recommended that engineers and site designers consult with regulatory entities, such as the State, municipality, or local soil conservation district, regarding pre-developed hydrologic conditions. A pre-design meeting with the Township Engineer will help to refine concepts before final design.

### 5.1.1 Vegetation and Landscaping Techniques

There are three (3) key types of vegetation and landscaping nonstructural measures that should be considered in land development proposed within the Township.

- **Best Management Practice #1:** Preservation of existing natural vegetated areas

**Description/Implementation:** This should be considered throughout the design of a land development project. As indicated in Section 3.0 – Municipal Background above, there are several areas with significant hydrologic functions including forested areas, riparian corridors, and threatened and endangered species habitat that have been identified within the Township limits. Close attention should be placed on the preservation of natural vegetation within these areas in particular.

**Maintenance Responsibilities:** The maintenance responsibilities for this technique are minimal in that the area should be placed in an easement or deed restriction to ensure that the natural vegetation is not removed.

**Recommended applications:** Water quality, soil erosion and sediment control, and water quantity control.

- **Best Management Practice #2:** Native ground cover

**Description/Implementation:** As indicated in Section 1.0 above, areas covered with turf grass typically generate more runoff pollution than other types of vegetation. This is especially true when comparing grass areas with naturally wooded areas or wild meadows. Therefore, the amount of lawns and other grass areas at land development sites should be minimized. Instead, alternative vegetation, particularly native plants, should be used to re-vegetate disturbed site areas. Native ground cover can create infiltration characteristics similar to those of natural areas. Naturally wooded areas or wild meadows should also be restored or reestablished at land development sites where opportunity exists

**Maintenance Responsibilities:** The use of native plants decreases maintenance in the form of reduced mowing frequency and reduced use of fertilizers, when compared to turf grass.

**Recommended applications:** Water quality, soil erosion and sediment control, and water quantity control.

- **Best Management Practice #3:** Vegetative Filters/Buffers

**Description/Implementation:** Native ground cover can provide a vegetated buffer to help filter stormwater runoff and provide locations for runoff from impervious areas to infiltrate. Water flowing as sheet flow across a vegetated area is slowed and filtered prior to infiltrating into the soil. Dense vegetative cover, long flow path lengths, and low surface slopes provide the most effective vegetated filters. Vegetative filters and buffers can be created by preserving existing vegetated areas over which runoff will flow or by planting new vegetation. Vegetative filters located immediately downstream of impervious surfaces such as roadways and parking lots can achieve pollutant removal, groundwater recharge, and runoff volume reduction. Vegetated buffers adjacent to streams, creeks, and other waterways and water bodies can also help mitigate

thermal runoff impacts, maintain stream base flow, provide wildlife habitat, and increase site aesthetics.

**Maintenance Responsibilities:** The use of vegetative filters decreases the use of curbs stormwater collection systems and subsequently their respective maintenance and inspection requirements. Vegetative filters should be inspected for erosion and loss of vegetation. Debris should be removed after large rainfall events and at least once (1) per year.

**Recommended applications:** Water quality, groundwater recharge, and water quantity control.

Key Land Disturbance Considerations:
- Do not concentrate flow
- Minimize grading
- Build within the existing topography
- Do not alter natural drainage areas
- Minimize impervious cover
- Increased structural loads contribute to ground failures
- Minimize changes to existing soil profiles including cut/fill

- **Best Management Practice #4:** Minimizing land disturbance

**Description/Implementation:** Minimizing land disturbance at a development site is a nonstructural LID-BMP that can be used during all phases of a land development project. Additionally, minimizing land disturbance can help reduce post-construction site runoff volumes and pollutant loads and maintain existing groundwater recharge rates and other hydrologic characteristics by preserving existing site areas. Minimum disturbance begins during the project's planning and design phases by fitting the development into the terrain, as opposed to changing the terrain to fit the development. Roadway and building patterns that match the existing land forms and limit the amount of required clearing and grading should be chosen.

**Maintenance Requirements:** The applicant will ensure compliance by including these requirements in soil erosion and sediment control plans, construction plans, and contract documents.

**Recommended applications:** Water quality, Groundwater recharge, soil erosion and sediment control, and water quantity control.

**Impervious Area Management.** Reductions in impervious area translate into more surface storage, infiltration and groundwater recharge, less stormwater runoff, and reduced storm sewer construction, maintenance, and repair costs. It is important to note that all reductions in the amount and dimensions of impervious surfaces at a land development site must also recognize safety and the level of use of the impervious surfaces. There are three (3) impervious area management techniques that may be considered for major development projects proposed within the Township.

- **Best Management Practice #5:** Minimizing parking area and driveways

**Description/Implementation:** Parking area and driveway requirements are mandated by the Township Land Development Ordinances and, in the case of residential areas, the RSIS. The RSIS provides flexibility in selecting parking and driveway size, provided that supporting local data is available. A mix of residential and nonresidential uses at a development site can share

parking areas, thereby reducing the total parking area and impervious cover. The RSIS also allows a reduction in the standard 18-foot parking space length provided that room is provided for overhang by the vehicle. The overhang area can then be vegetated to further reduce (and possibly help disconnect) impervious surfaces. Non-residential uses can follow suit in the Township as well. At all development sites, consideration should be given to constructing some or all driveways and parking areas from pervious paving material. This is particularly true for overflow parking areas as well as driveways (and other access roadways) that are used relatively infrequently by maintenance and emergency vehicles. Parking can also be located underground or beneath buildings, which can help reduce the site's overall impervious coverage.

**Maintenance Requirements:** Should pervious paving materials be utilized as part of this BMP there is some maintenance required. Refer to Best Management Practice #16 for more details.

**Recommended applications:** Water quality, water quantity control, and soil erosion and sediment control.

- **Best Management Practice #6:** Unconnected impervious areas

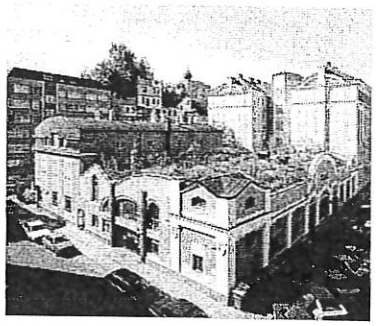
**Description/Implementation:** This technique includes impervious surfaces that are not directly connected to a site's drainage system. In this strategy runoff from an unconnected impervious area is allowed to sheet flow from the impervious area across a downstream pervious surface, where it has the opportunity to re-infiltrate into the soil, thereby reducing the total runoff volume. In most circumstances, impervious areas can be considered unconnected under the following conditions:

1. All runoff from the unconnected impervious area must be sheet flow;
2. Upon entering the downstream pervious area, all runoff must remain as sheet flow;
3. Flow from the impervious surface must enter the downstream pervious area as sheet flow or, in the case of roofs, from downspouts equipped with elongated splash pads, level spreaders, or dispersion trenches that reduce flow velocity and induce sheet flow in the downstream pervious area;
4. All discharges onto the downstream pervious surfaces must be stable and non-erosive;
5. The shape, slope, and vegetated cover in the downstream pervious area must be sufficient to maintain sheet flow throughout its length. Maximum slope of the downstream pervious area is eight (8) percent;
6. The maximum roof area that can be drained by a single downspout is 600 square feet.

**Maintenance Requirements:** There is minimal maintenance required for this BMP, however, some repair may be necessary of eroded surfaces.

**Recommended applications:** Water quality and water quantity control.

- **Best Management Practice #7:** Vegetated Roofs



**Description/Implementation:** Vegetated roofs, also known as green roofs, are an innovative way to reduce impervious surfaces at development sites, and are relatively new in New Jersey. A vegetated or green roof consists of a lightweight vegetated planting bed that is installed on a new or existing roof. Vegetated roofs can be implemented using specialized commercial products. It is important to note that the structural integrity of the roof must be taken into consideration when designing a green roof. The Township Building Code Official must be consulted prior to use of this technique.

**Maintenance Requirements:** Except for periodic limited or as needed fertilization and watering, a meadow-like planting of perennial plants can require minimal maintenance.

**Recommended applications:** Water quantity and soil erosion and sediment control.

**Time of Concentration (Tc) Modifications.** Changes in peak flow result from changes in Tc from drainage areas, with longer times yielding smaller peak runoff rates and shorter times causing greater ones. Site factors that affect a drainage area's Tc include precipitation, flow length, flow regime, surface roughness, channel shape, and slope. Typically, land development modifies most of these factors in ways that cause the time of concentration of a drainage area to become shorter (and, therefore the peak runoff rates to be greater) after development than prior to development. However, during site design, it is possible to minimize this decrease in time of concentration by controlling the various site factors that affect it. Considerations for three (3) factors are presented below.

- **Best Management Practice #8:** Surface roughness changes

**Description/Implementation:** Based upon hydraulic theory, surface roughness coefficients used in sheet flow computations are based on the land cover of a drainage area, with areas of dense vegetation having generally higher coefficients (and longer times of concentration) than smoother surfaces such as paved or grassed areas. Site designers should preserve existing native vegetation or use native plants with varied topography to restore disturbed areas as discussed above in order to increase surface roughness and time of concentration, and consequently reduce the peak flows from a drainage area.

**Maintenance Requirements:** Not applicable.

**Recommended applications:** Water quantity control and soil erosion and sediment control.

- **Best Management Practice #9:** Slope reduction

  **Description/Implementation:** Ground slope is an important factor in determining a drainage area's Tc and peak discharge. Reducing slopes in graded areas can help minimize Tc reductions and peak flow increases. In addition, terraces and reduced slope channels with grade breaks can be constructed on a sloping area to provide additional travel time. Terraces can also be used to redirect runoff to flow along rather than across the slope, decreasing the slope and increasing the flow length and, subsequently, the time of concentration. Care should also be taken to ensure that the grading of vegetated areas is sufficient to allow for positive drainage as required by local or state regulations, particularly adjacent to buildings and other structures.

  **Maintenance Requirements:** Not applicable.

  **Recommended applications:** Water quantity control and soil erosion and sediment control.

- **Best Management Practice #10:** Vegetated conveyance

  **Description/Implementation:** The use of vegetated conveyance measures such as channels and swales can increase the surface roughness along the Tc flow path and increase the overall Tc. In addition, vegetated channels can provide opportunities for runoff treatment, runoff infiltration, and evapotranspiration. In designing vegetated conveyance measures, care should be taken to protect transitions to and from culverts from erosion caused by flow acceleration and turbulence. The vegetation must be tolerant of the hydrologic regime associated with the channel.

  **Maintenance Requirements:** Maintenance of vegetated conveyance involves mowing at least once (1) per year to inhibit woody vegetation growth and removal of any debris at least once (1) per year and after any storm event larger than 1 inch of rainfall.

  **Recommended applications:** Water quality, water quantity control, and soil erosion and sediment control.

At the time this plan was prepared, no actual quantitative values for pollutant removal efficiency had been assigned to nonstructural BMPs by NJDEP. NJDEP is currently in the process of establishing a "point" system for the use of these techniques and projects designed will then be required to have a minimum number of points before approval will be granted.

### *5.2 Structural BMPs*

As mentioned previously, wherever possible, all major development projects proposed in the Township must utilize nonstructural stormwater management measures to meet the requirements of the Stormwater Management Rules, where feasible. When structural measures are required, the following standards apply:

1. Structural stormwater management measures shall be designed to take into account the existing site conditions, including environmentally critical areas; wetlands; flood-prone areas; slopes;

depth to seasonal high water table; soil type, permeability and texture; and drainage area and drainage patterns;

2. Structural stormwater management measures shall be designed to minimize maintenance, facilitate maintenance and repairs, and ensure proper functioning

3. Structural stormwater management measures shall be designed, constructed, and installed to be strong, durable, and corrosion resistant;

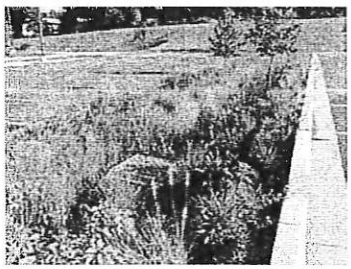
4. Stormwater management basins shall be designed to meet the minimum safety standards for stormwater management basins at N.J.A.C. 7:8-6 and as identified below;

5. Stormwater management measure guidelines are available in the BMP Manual and as described below. Other stormwater management measures may be utilized provided the design engineer demonstrates that the proposed measure and its design will accomplish the required water quantity, ground water recharge and water quality design and performance standards established by this subsection;

6. For all proposed structural stormwater management measures the Township Engineer must evaluate the ability to clean out the selected structural BMP(s); the expense of replacement equipment, safety, and training for the BMP(s); and the ease of access to maintain the structure(s).

There are ten (10) types of structural BMPs identified in the BMP Manual; however, this plan details the recommended structural BMPs for use specifically in Readington Township. These include the following:

- **Best Management Practice #11:** Bioretention system



**Description/Implementation:** A bioretention system consists of a soil bed planted with native vegetation located above an underdrained sand layer. It can be configured as either a bioretention basin or a bioretention swale. Stormwater runoff entering the bioretention system is filtered first through the vegetation and then the sand/soil mixture before being conveyed downstream by the underdrain system. Runoff storage depths above the planting bed surface are typically shallow. **The adopted TSS removal rate for bioretention systems is 90 percent.** Bioretention systems can be used to filter runoff from both residential and nonresidential developments. Bioretention systems are most effective if they receive runoff as close to its source as possible. They can vary in size and can receive and treat runoff from a variety of drainage areas within a land development site. They can be installed in lawns, median strips, parking lot islands, unused lot areas, and certain easements. The elevation of the Seasonal High Water Table (SHWT) is critical to ensure proper functioning of the bioretention basin, and must be evaluated to ensure that the SHWT is at least 1 foot below the bottom of the bioretention basin's underdrain system during non-drought conditions. Additionally for areas within Tier I

and Tier II of the WHPAs in the Township, an impermeable bottom layer must be installed to ensure no stormwater runoff enters the groundwater table.

**Maintenance Requirements:** Effective bio-retention system performance requires regular and effective maintenance. All bioretention system components expected to receive and/or trap debris and sediment must be inspected for clogging and excessive debris and sediment accumulation after every storm exceeding one (1) inch of rainfall and at least four (4) times annually. Sediment removal should take place when the basin is thoroughly dry. Vegetation should be trimmed and grass should be mowed at least once a month during the growing season. Vegetated areas should be inspected for a decrease in vegetative cover as well as invasive species. Corrective action must be taken within one (1) month to ensure proper operation of the bioretention system. All structural components must be thoroughly inspected for cracking, subsidence, spalling, erosion, and deterioration at least once per year and should be reviewed after every storm exceeding 1 inch of rainfall. The maintenance plan for a bioretention system must indicate the approximate time it would normally take to drain the maximum design storm runoff volume below the ground surface in the bioretention system. If significant increases or decreases in the normal drain time are observed or if the 72 hour maximum is exceeded, the system's planting soil bed, underdrain system, and both groundwater and tailwater levels must be evaluated and appropriate measures taken to comply with the maximum drain time requirements and maintain the proper functioning of the system. Additionally, the planting soil bed at the bottom of the swale should be inspected after every storm exceeding one (1) inch of rainfall.

**Recommended applications:** Water quality, water quantity control, and groundwater recharge.

- **Best Management Practice #12:** Constructed stormwater wetland

**Description/Implementation:** Constructed stormwater wetlands are designed to maximize the removal of pollutants from stormwater runoff through settling and, uptake and filtering by vegetation. Constructed stormwater wetlands temporarily store runoff in relatively shallow pools that support conditions suitable for the growth of wetland plants. **The adopted TSS removal rate for constructed stormwater wetlands is 90 percent.** Constructed stormwater wetlands are used to remove a wide range of stormwater pollutants from land development sites as well as provide wildlife habitat and aesthetic features. The minimum drainage area to a constructed stormwater wetland is 10 acres to 25 acres, depending on the type of wetland. Constructed stormwater wetlands should not be constructed within natural wetland areas,

Key Considerations for Constructed Wetland systems:

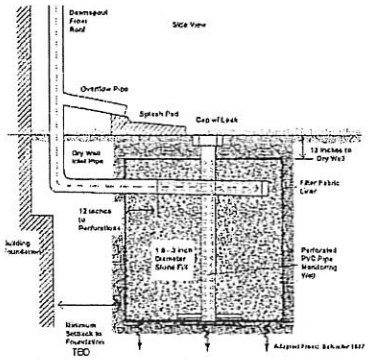
- Medium-fine texture soils are optimal
- An impermeable liner may be required where infiltration is too rapid
- Shallow depths to bedrock may make these systems not cost effective
- Pretreatment can reduce incoming velocities and capture coarse sediments

since they will typically not have the same full range of ecological functions and is not permitted by regulation. It is important to note that a constructed stormwater wetland must be able to maintain its permanent pool level.

**Maintenance Requirements:** Effective constructed stormwater wetland performance requires regular and effective maintenance. All constructed stormwater wetland components expected to receive and/or trap debris and sediment must be inspected for clogging and excessive debris and sediment accumulation after every storm exceeding one (1) inch of rainfall and at least four (4) times annually. Mowing and/or trimming of vegetation must be performed at least once a month during the growing season. The vegetative cover should be maintained at 85 percent. If vegetation has greater than 50 percent damage, the area should be reestablished in accordance with the original specifications after a professional assessment of the vegetation loss has been conducted. The assessment may include modifications to the original specifications to alleviate the vegetation loss as appropriate. All structural components must be thoroughly inspected for cracking, subsidence, spalling, erosion, and deterioration at least once per year and should be visually observed at all inspections of the constructed wetland system. The maintenance plan for the constructed wetland must indicate the approximate time it would normally take to drain the maximum design storm runoff and return the various wetland pools to their normal standing water levels. If significant increases or decreases in the normal drain time are observed, the wetland's outlet structure, forebay, and groundwater and tailwater levels must be evaluated and appropriate measures taken to comply with the maximum drain time requirements and maintain the proper functioning of the wetland.

**Recommended applications:** Water quality, water quantity control, and soil erosion and sediment control.

- **Best Management Practice #13:** Dry well




**Description/Implementation:** A dry well is a subsurface storage facility that receives and temporarily stores stormwater runoff from roofs of structures. Discharge of detained runoff within a dry well occurs through infiltration into the surrounding soils. A dry well may be either a structural chamber and/or an excavated pit filled with aggregate. Due to the relatively low level of expected pollutants in roof runoff, a dry well cannot be used to directly comply with the suspended solids and nutrient removal requirements contained in the NJDEP Stormwater Management Rules at N.J.A.C. 7:8. However, due to its storage capacity, a dry well may be used to reduce the total stormwater quality design storm runoff volume that a roof would ordinarily discharge to downstream stormwater management facilities. Dry wells can also be used to meet the groundwater recharge requirements of the NJDEP Stormwater Management Rules. The use of dry wells is applicable only where their subgrade soils have the required permeability rates. Like other BMPs that rely on infiltration, dry wells are not appropriate for areas where high pollutant or sediment loading is anticipated due to the potential for groundwater contamination. As noted above, this structure cannot be utilized for sites with known contamination and caution

should be utilized in selecting these units in Tier I and II of WHPAs. Dry wells are not assigned any TSS removal rate and pre-treatment is required for any stormwater runoff other than rooftop stormwater runoff directed to these units.

**Maintenance Requirements:** Effective dry well performance requires regular and effective maintenance. A dry well should be inspected after every storm exceeding 1 inch of rainfall and at least four (4) times annually. The maintenance plan must indicate the approximate time it would normally take to drain the maximum design storm runoff volume from the dry well. If significant increases in the normal drain time are observed or if it exceeds the 72-hour maximum, appropriate measures must be taken to comply with the drain time requirements and maintain the proper functioning of the dry well.

Key Considerations for Dry Wells:
- The drainage area to the unit must not exceed 1 acre
- Tests for permeability and soil characteristics must be conducted at exact location prior to final design
- Roof gutter guards and sumps or traps should be included in the conduits of the dry well

**Recommended applications:** Water quantity control and groundwater recharge.

- **Best Management Practice #14:** Extended Detention Basin

**Description/Implementation:** An extended detention basin is a facility constructed through filling and/or excavation that provides temporary storage of stormwater runoff. It has an outlet structure that detains and attenuates runoff inflows and somewhat promotes the settlement of pollutants. An extended detention basin is normally designed as a multistage facility that provides runoff storage and attenuation for both stormwater quality and quantity management. **The adopted TSS removal rate for extended detention basins is 40 to 60 percent, depending on the duration of detention time provided in the basin, which does not meet the requirements of the Stormwater Management Rules exclusively.** Extended detention basins can be used in part to address both the stormwater runoff quantity and quality impacts of land development. Extended detention basins are designed for complete evacuation of runoff and normally remain dry between storm events. Extended detention basins may be used at sites where significant increases in runoff are expected from site development. In addition, standard detention basins may be retrofitted or converted to extended detention by increasing the time over which the basin releases the stormwater quality design storm runoff volume, provided that erosion and flood control volumes and outflow rates are not adversely altered. It is stressed that extended detention basins have a limited

Key Considerations for Extended Detention Basins:
- Should collect as much site runoff as possible to be effective
- Shallow bedrock depths may make construction not cost effective
- Forebays are recommended for sediment capture.

effectiveness in removing both particulate and soluble pollutants, which may preclude their use for complying with regulated TSS removal rates.

**Maintenance Requirements:** Extended detention basin performance requires regular and somewhat intensive maintenance. All extended detention basin components expected to receive and/or trap debris and sediment must be inspected for clogging and excessive debris and sediment accumulation after every storm exceeding one (1) inch of rainfall and at least four (4) times annually. Sediment removal should take place when the basin is thoroughly dry. Grass, if used, should be mowed at least once a month during the growing season. Native vegetation such as wildflower meadow or wet meadow cover is preferred, and will require less frequent mowing (1 to 4 times per year). Low-flow channels should be eliminated. The vegetative cover should be maintained at 85 percent and corrective action must be taken should the vegetation become more than 50 percent damaged. All structural components must be thoroughly inspected for cracking, subsidence, spalling, erosion, and deterioration at least once (1) per year and should be visually observed at each inspection of the extended detention basin. The maintenance plan must indicate the approximate time it would normally take to completely drain the maximum design storm runoff volume from the basin. If significant increases or decreases in the normal drain time are observed, the basin's outlet structure, underdrain system, and both groundwater and tailwater levels must be evaluated and appropriate measures taken to comply with the maximum drain time requirements and maintain the proper functioning of the basin.

**Safety Requirements:** All new stormwater management basins within the Township must, at a minimum, include trash racks, overflow grates, and escape provisions at outlet structures. Trash racks shall be installed at the intake to the outlet from the stormwater management basin to ensure proper functioning of the basin outlets. Stormwater management basins shall include escape provisions as follows:

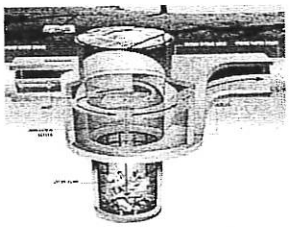
1. If a stormwater management basin has an outlet structure, escape provisions shall be incorporated in or on the structure. Escape provisions include the installation of permanent ladders, steps, rungs, or other features that provide easily accessible means of egress from stormwater management basins. With the prior approval of the reviewing agency pursuant to N.J.A.C. 7:8-6.3(a), a freestanding outlet structure may be exempted from this requirement.

2. Safety ledges shall be constructed on the slopes of all new stormwater management basins having a permanent pool of water deeper than two and one-half feet. Safety ledges shall be comprised of two steps. Each step shall be four to six feet in width. One step shall be located approximately two and one-half feet below the permanent water surface, and the second step shall be located one to one and one-half feet above the permanent water surface. See N.J.A.C. 7:8-6 Appendix A for an illustration of safety ledges in a stormwater management basin.

3. In new stormwater management basins, the maximum interior slope for an earthen dam, embankment, or berm shall not be steeper than three horizontal to one vertical.

**Recommended applications:** Water quantity control.

- **Best Management Practice #15:** Manufactured Treatment Device

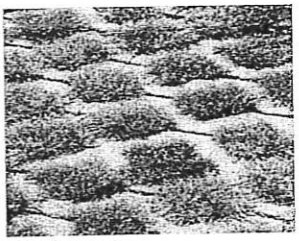


**Description/Implementation:** A manufactured treatment device is a pre-fabricated stormwater treatment structure utilizing settling, filtration, absorptive/adsorptive materials, vortex separation, vegetative components, and/or other appropriate technology to remove pollutants from stormwater runoff. Manufactured treatment devices may be used to meet the requirements of the Stormwater Management Rules, provided the pollutant removal rates are verified by the New Jersey Corporation for Advanced Technology (NJCAT) and certified by NJDEP. Other manufactured treatment devices not certified under the NJCAT program may be utilized if they are approved by NJDEP prior to their use. Other pollutants, such as nutrients, metals, hydrocarbons, and bacteria can be included in the verification/certification process if the data supports their removal efficiencies. Manufactured treatment devices are intended to capture sediments, metals, hydrocarbons, floatables, or other pollutants in stormwater runoff before being conveyed to a storm sewer system, additional stormwater quality treatment measure, or waterbody. A manufactured treatment device is adequate for small drainage areas that contain a predominance of impervious cover that is likely to contribute high hydrocarbon and sediment loadings, such as small parking lots and gas stations. For larger sites, multiple devices may be necessary. Devices are normally used for pretreatment of runoff before discharging to other, more effective stormwater quality treatment facilities. The Township Engineer should be consulted about each manufactured treatment device proposed and consideration should be given to maintenance, training, and future costs to the Township before approval.

**Maintenance Requirements:** The maintenance of manufactured treatment devices depends on the manufacturer's guidance. All manufacturer maintenance requirements must be followed to ensure proper operation of these BMPs.

- **Best Management Practice #16:** Pervious paving

**Description/Implementation:** Pervious paving materials can be used at some site locations in the Township to replace standard impervious pavement in parking lots and driveways in the Township. For all sites where pervious paving is proposed, care should be taken in assessing soil conditions, high groundwater conditions, and potential sources of contamination. Further, it is recommended that some form of pre-treatment (i.e. filter strips) be utilized to minimize the chance of clogging the pervious paving. All design criteria identified in the BMP Manual should be followed if this technique is selected. Also, the use of pervious paving materials shall be discussed with



Key Considerations for pervious paving systems:
- Maximum surface slope is 5 percent
- Permeability rate must be 2 times the maximum design storm rainfall intensity
- 80% TSS removal pretreatment required for runoff directed to system that does not pass through surface course

Township officials and the Hunterdon County Soil Conservation District prior to use on a project site. Careful consideration must be given to freezing weather and to drainage and flooding if clogging occurs.

**Maintenance Requirements:** Effective pervious paving system performance requires regular and effective maintenance. The surface course of all pervious paving systems must be inspected for cracking, subsidence, spalling, deterioration, erosion, and the growth of unwanted vegetation at least once a year. Care must be taken when removing snow from the pervious paving surface courses. Pervious paving surface courses can be damaged by snowplows or loader buckets that are set too low to the ground. This is particularly true with permeable paver systems where differential settlement of pavers has occurred. Sand, grit, or cinders should not be used on pervious paving surface courses for snow or ice control. If mud or sediment is tracked onto the surface course of a pervious paving system, it must be removed as soon as possible. Removal should take place when the surface course is thoroughly dry. The surface course of a porous paving systems must be vacuum swept at least four (4) times a year. A high pressure hosing should follow vacuum sweeping. All dislodged sediment and other particulate matter must be removed and properly disposed. Maintenance of permeable pavers should be consistent with the manufacturer's recommendations. Grass should be mowed at least once a month during the growing season. Vegetated areas should be inspected at least annually. The vegetative cover should be maintained at 85 percent. The maintenance plan must indicate the approximate time it would normally take to drain the maximum design storm runoff volume below the pervious paving system's surface course. If a significant increase or decrease in the normal drain time or prolonged ponding is observed, the various system components and groundwater levels must be evaluated and appropriate measures taken to comply with the maximum drain time requirements and maintain the proper functioning of the system.

**Recommended applications:** Water quantity and groundwater recharge.

- **Best Management Practice #17:** Sand filter

**Description/Implementation:** A sand filter consists of a forebay and underdrained sand bed. It can be configured as either a surface or subsurface facility. Runoff entering the sand filter is conveyed first through the forebay, which removes trash, debris, and coarse sediment, and then through the sand bed to an outlet pipe. Sand filters use solids settling, filtering, and adsorption processes to reduce pollutant concentrations in stormwater. **The adopted TSS removal rate for sand filters is 80 percent.** Sand filters are normally used in highly impervious areas with relatively high TSS, heavy metal, and hydrocarbon loadings such as roads, driveways, drive-up lanes, parking lots, and urban areas. However, due to their relatively high sediment removal capabilities, sand filters are not generally recommended in pervious drainage areas where high coarse sediment loads and organic material such as leaves can quickly clog the sand bed. Where such loadings cannot be avoided, effective pretreatment is absolutely required. Since sand filters can be located underground, they can also be used in areas with limited surface space.

Key Considerations for Sand Filters:
- A drain and valve must be provided to facilitate sediment removal
- Underground sand filters must be completely watertight
- Pretreatment is recommended

**Maintenance Requirements:** Effective sand filter performance requires regular and effective maintenance. All sand filter components expected to receive and/or trap debris and sediment must be inspected for clogging and excessive debris and sediment accumulation after every storm exceeding 1 inch of rainfall and at least four (4) times annually. Such components may include inlets and diversion structures, forebays, sand beds, and overflows. Sediment removal should take place when all runoff has drained from the sand bed and the sand is reasonably dry. In addition, runoff should be properly drained or pumped from forebays with permanent pools before removing sediment. In surface sand filters with turf grass bottom surfaces, mowing and/or trimming of vegetation must be performed on a regular schedule based on specific site conditions. Grass should be mowed at least once a month during the growing season. Vegetated areas must also be inspected at least annually. The filter bottom must be inspected for unwanted underbrush and tree growth at least once a year. Inspections of vegetation health, density, and diversity should be performed during both the growing and non-growing season. All structural components must be thoroughly inspected for cracking, subsidence, spalling, erosion, and deterioration at least once per year. A visual observation of all structural components should be part of every inspection of the sand filter. The maintenance plan must indicate the approximate time it would normally take to drain the maximum design storm runoff volume below the top of the filter's sand bed. If significant increases or decreases in the normal drain time are observed, the filter's sand bed, underdrain system, and tailwater levels must be evaluated and appropriate measures taken to comply with the maximum drain time requirements and maintain the proper functioning of the filter. The infiltration rate of the sand bed should be retested at least once per year.

**Recommended applications:** Water quality and groundwater recharge.

- **Best Management Practice #18:** Vegetative filter

**Description/Implementation:** Similar to BMP #3 described above, a structural vegetative filter strip can be employed using native ground cover or other vegetation to provide pollutant removal from stormwater runoff. A vegetative filter is an area designed to remove suspended solids and other pollutants from stormwater runoff flowing through a length of vegetation called a vegetated filter strip. The vegetation in a filter strip can range from turf (least effective) and native grasses to herbaceous and woody vegetation. It is important to note that all runoff to a vegetated filter strip must both enter and flow through the strip as sheet flow. Failure to do so can severely reduce and even eliminate the filter strip's pollutant removal capabilities. The total suspended solid (TSS) removal rate for vegetative filters will depend upon the vegetated cover in the filter strip. Vegetated filter strips can be effective in reducing sediment and other solids and particulates, as well as associated pollutants such as hydrocarbons, heavy metals, and nutrients. The pollutant removal mechanisms include sedimentation, filtration, adsorption, infiltration, biological uptake, and microbacterial activity. Vegetated filter strips with planted or indigenous woods may also create shade along water bodies that lower aquatic temperatures, provide a source of detritus and large woody debris for fish and other aquatic organisms, and provide habitat and corridors for wildlife. Depending upon their TSS removal

Key Considerations for Vegetative Filters:
- Adequate filter area and length of flow is essential to water quality treatment
- Slopes less than 5 percent are most effective
- Mulching is required

rate, vegetated filter strips can be used separately or in conjunction with other stormwater quality practices to achieve an overall pollutant removal goal.

**Maintenance Requirements:** Effective vegetated filter strip performance requires regular and effective maintenance. All vegetated filter strip components expected to receive and/or trap debris and sediment must be inspected for clogging and excessive debris and sediment accumulation after every storm exceeding 1 inch of rainfall and at least four (4) times annually. Such components may include vegetated areas and stone cutoffs and, in particular, the upstream edge of the filter strip where coarse sediment and/or debris accumulation could cause inflow to concentrate. Sediment removal should take place when the filter strip is thoroughly dry. Grass should be mowed at least once a month during the growing season. Vegetated areas must be thoroughly inspected at least once per year. Visual observations should be noted at the time of each inspection of the filter. The vegetative cover should be maintained at 85 percent. All areas of the filter strip should be inspected for excess ponding after significant storm events. The maintenance plan must indicate the approximate time it would normally take for the filter strip to drain the maximum design storm runoff volume and begin to dry. If significant increases or decreases in the normal drain time are observed or if the 72 hour maximum is exceeded, the filter strip's planting soil bed, vegetation, and groundwater levels must be evaluated and appropriate measures taken to comply with the maximum drain time requirements and maintain the proper functioning of the filter strip.

**Recommended applications:** Water quality, water quantity, and soil erosion and sediment control.

## 6.0 Mitigation Plan

§ 148-65.2. Technical Standards. C. Mitigation measures of the Readington Township stormwater ordinance states "If the natural or existing physical characteristics of the project site preclude achievement of any of the above provisions, the municipality may grant a variance from strict compliance with the specific provisions that are precluded, provided that acceptable mitigation measures are provided. However, to be eligible for a variance, the applicant must demonstrate to the satisifaction of the Township professionals that the immediate downstream waterways will not be subject to:

- Deterioration of existing culverts, bridges, dams and other structures;
- Deterioration of their biological functions, as well as for drainage and other purposes;
- Streambank or streambed erosion or siltation;
- Increased threat of flood damage to public health, life and property.

Furthermore, where partial compliance with a specific provision is possible, the Township professionals will direct the applicant to satisfy a reduced performance criterion. Mitigation measures will be required to compensate for the unfulfilled component of the no-net increase provision.

In all cases, however, those stormwater design provisions that are not precluded by the site's physical characteristics shall be met. Mitigation measures may include, but are not limited to, the following. If one or more of the stormwater management provisions of this chapter cannot be met on-site than the

applicant shall meet the provisions of this chapter, precluded by the site's physical characteristics, by employing one or more of the following mitigation measures, in this order of preference:

- The purchase or donation of privately owned lands within the Readington Township Stream Corridor Preservation Area that are not currently protected by NJDEP's Freshwater Wetlands Protection Act Rules or NJDEP's Flood Hazard Area Control Regulations, said lands to be dedicated for preservation and/or reforestations.

- Mitigation on previously developed properties, public or private, that currently lacks stormwater management facilities designed and constructed in accordance with the purposes and standards of this chapter.

- Cash contributions to fund stormwater management related studies within Readington Township, including wetland delineation studies, stream-monitoring studies for water quality and macroinvertebrates, stream flow monitoring, and threatened and endangered species studies.

- Other stormwater enhancement, Stormwater Management Resource Protection/Restoration Mitigation options deemed acceptable by the Township Professionals.

## 7.0 Land Use/Build Out Analysis

A Land Use/Build Out Analysis will be prepared using information and data provided by the Hunterdon County Planning Board in the year 2005. Once this analysis is completed, this section will be amended accordingly. Figure 6 provides the current land use of the Township.

## 8.0 Plan Consistency and Recommended Stormwater Control Ordinances

As stated in Section 2.0 above, the following goals were identified and were met as summarized below:

- **GOAL: Reduce flood damage, including damage to life and property** – By requiring that all major development projects address stormwater quantity in accordance with the new Stormwater Management Rules and the requirements identified in Sections 4 and 5 above, the Township should be able to mitigate increased flood damage. Further, the Township should mandate mitigation measures for projects that cannot strictly comply with the Stormwater Rules or the Township's ordinances for stormwater, retrofits to existing stormwater collection systems and stormwater quantity control devices can be employed to further reduce existing flood damage.

- **GOAL: Minimize, to the extent practical, any increase in stormwater runoff from any new development** – By mandating the use of various nonstructural stormwater management techniques as discussed in Section 5.1 above, the Township may minimize the increase in stormwater runoff from new development. Additionally, requiring projects to meet the stormwater runoff quantity control requirements of the new rules further decreases the potential for stormwater runoff impacts from new development projects in the Township.

- **GOAL: Reduce soil erosion from any development or construction project** – The Township's Stormwater Management Plan identifies that the *Standards for Soil Erosion and Sediment*

*Control in New Jersey* be followed for all major development projects. Further, the Township will mandate mitigation measures for projects that cannot strictly comply with the Stormwater Rules or the Township's ordinances for stormwater through retrofits to existing stormwater management features. This approach may reduce erosion from existing development and construction projects.

- **GOAL: Assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures** – There are no known flooding problems associated with the bridges and culverts in the Township.

- **GOAL: Maintain groundwater recharge** – By mandating that all major development projects complete Groundwater Recharge Spreadsheet analyses, it will be possible for the Township to identify the pre-developed and post-developed groundwater recharge conditions. Through the use of BMPs for infiltration the existing groundwater recharge conditions will be maintained post-construction. The groundwater recharge requirements cannot be met for all projects within Tier I and Tier II WHPAs or areas currently identified as containing contaminated soil or groundwater. As such, the Township has mandated mitigation measures to compensate for this shortfall.

- **GOAL: Prevent, to the greatest extent feasible, an increase in nonpoint pollution** – By strongly encouraging the use of LID and preservation, the Township is working to minimize nonpoint pollution. Since the Township is mandating that all major development projects meet an 80% Total Suspended Solids removal rate, nonpoint pollution is mitigated to an even greater extent. Further, the Township will mandate mitigation measures for projects that cannot strictly comply with the Stormwater Rules or the Township's ordinances for stormwater, retrofits to existing stormwater management features can be employed to reduce nonpoint pollution from existing development and construction projects.

- **GOAL: Maintain the integrity of stream channels for their biological functions, as well as for drainage** – The biological function of the Holland Brook and Pleasant Run and their tributaries within the Township's municipal boundaries will be fully assessed under the Regional Stormwater Management Plan. As we understand, the Plan will ensure that the integrity of the stream channels will be maintained.

- **GOAL: Minimize pollutants in stormwater runoff from new and existing development in order 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** - By mandating that all major development projects meet an 80% Total Suspended Solids removal rate, nonpoint pollution is mitigated. Further, the Township will mandate mitigation measures for projects that cannot strictly comply with the Stormwater Rules or the Township's ordinances for stormwater, retrofits to existing stormwater management features can be employed to reduce nonpoint pollution from existing development and construction projects.

- **GOAL: Protect public safety through the proper design and operation of stormwater management basins** – Public safety will be protected as the Township is mandating all new

stormwater management basins be designed in accordance with the public safety requirements of the Stormwater Management Rules.

- **GOAL: Remain primarily a residential community** – Since the Township plans to remain primarily a residential and agricultural community through zoning, a majority of the major development projects will be regulated under the Residential Site Improvement Standards and regulated under the Township's stormwater control ordinances to follow one year after the final adoption of this plan.

- **GOAL: Maintain and promote the commercial areas that serve both the local and regional population** – All commercial areas will be regulated solely by the Township's stormwater control ordinances with the exception of projects regulated under NJDEP rules.

- **GOAL: All development and redevelopment should be harmonious with the agricultural character of the community** – The Township's stormwater control ordinances will take into account the agricultural character of the community and all structural stormwater management features are recommended with this in mind.

- **GOAL: Promote opportunities that will maintain and enhance the sections of Readington Township known as villages** – Through the use of nonstructural and low impact development stormwater management techniques, the Township will be able to meet this goal harmoniously.

- **GOAL: Conserve and protect natural resources and preserve farmland and open space in the Township and surrounding areas** – Through the conservation of natural resources, farmland, and open space in the Township a reduction in the amount of nonpoint source pollution will be realized. Additionally, the Township will mandate mitigation measures for projects that cannot strictly comply with the Stormwater Rules or the Township's ordinances for stormwater, retrofits to existing stormwater management features can be employed to reduce nonpoint pollution from existing development and construction projects.

### *8.1 Plan Consistency*

In preparation of this plan, the stormwater control ordinance of Readington Township, and the Readington Township ERI were reviewed. The municipal assessment involved the review of Readington Township's land use ordinances, policies, best management practices, and the Master Plan.

### *8.2 Recommended Stormwater Control Ordinances*

Presently the Township has a stormwater control ordinance, § 148-65. A copy of this ordinance can be found in Appendix E. This stormwater control also addresses stream corridor protection, above and beyond the required NJDEP protection buffers. Therefore the following ordinances are recommended:

**Pet Waste Management Ordinance** – the Township may consider the adoption of a pet waste management (or "pooper scooper") ordinance. A sample ordinance is included in Appendix E of this plan.

**Wellhead Protection Ordinance** – the Township may consider the adoption of a wellhead protection ordinance.

## 9.0 Applicable Definitions

"Agricultural development" means land uses normally associated with the production of food, fiber and livestock for sale. Such uses do not include the development of land for the processing or sale of food and the manufacturer of agriculturally related products.

"Development" includes the division of a parcel of land into two or more parcels, the construction, reconstruction, conversion, structural alteration, relocation or enlargement of any building or structure, any mining excavation or landfill, and any use or change in the use of any building or other structure, or land or extension of use of land. In the case of development on agricultural land, development means: any activity that requires a State permit; any activity reviewed by the County Agricultural Boards (CAB) and the State Agricultural Development Committee (SADC), and municipal review of any activity not exempted by the Right to Farm Act, N.J.S.A. 4:1C-1 et seq.

"High pollutant loading areas" are areas in industrial and commercial developments where solvents and/or petroleum products are loaded/unloaded, stored, or applied, areas where pesticides are loaded/unloaded or stored; areas where hazardous materials are expected to be present in greater than 'reportable quantities' as defined by the United States Environmental Protection Agency (EPA) at 40 CFR 302.4; areas where recharge would be inconsistent with NJDEP approved remedial action work plan or landfill closure plan and areas with high risks for spills of toxic materials, such as gas stations and vehicle maintenance facilities.

"Impervious surface" means a surface that has been covered with a layer of material so that it is highly resistant to infiltration by water. Impervious surfaces include areas such as paved parking lots and concrete sidewalks.

"Major development projects" include those projects that disturb one (1) or more acres of land. For projects regulated by the NJDEP, this also includes projects that increase impervious surfaces by 0.25 acres or more. Disturbance includes the placement of impervious surface or exposure and/or movement of soil or bedrock or clearing, cutting, or removing of vegetation. Projects undertaken by any government agency which otherwise meet the definition of "major development" but which do not require approval under the Municipal Land Use Law, N.J.S.A. 40:55D-1 et seq., are also considered "major development."

"Nonpoint source pollution" refers to all sources that cannot be identified as a point discharge. These include stormwater surface runoff and agricultural runoff, among others.

"Redevelopment" refers to alterations that change the "footprint" of a site or building in such a way that results in the disturbance of one acre or more of land. The term is not intended to include such activities as exterior remodeling, which would not be expected to cause adverse stormwater quality impacts and offer no new opportunity for stormwater controls. The NJDEP does not consider pavement resurfacing projects that do not disturb the underlying or surrounding soil, remove surrounding vegetation, or increase the area of impervious surface to be "redevelopment projects."

"Source material" means any material(s) or machinery, located at an industrial facility that is directly or indirectly related to process, manufacturing or other industrial activities, which could be a source of pollutants in any industrial stormwater discharge to groundwater. Source materials include, but are not limited to, raw materials; intermediate products; final products; waste materials; by-products; industrial machinery and fuels, and lubricants, solvents, and detergents that are related to process, manufacturing, or other industrial activities that are exposed to stormwater.

"Time of Concentration" is defined as the time it takes for runoff to travel from the hydraulically most distant point of the drainage area to the point of interest within a watershed.

"Total Suspended Solids" refers to particles that are suspended in water. Suspended solids in water reduce light penetration in the water column, can clog the gills of fish and invertebrates, and are often associated with toxic contaminants because organics and metals tend to bind to particles. Differentiated from total dissolved solids (TDS) by a standardized filtration process, the dissolved portion passing through the filter.

"Water Quality Design Storm" refers to the rainfall event used to analyze and design structural and nonstructural stormwater quality measures (known as Best Management Practices or BMPs). As described in the Stormwater Management Rules, the NJDEP stormwater quality design storm has a total rainfall depth of 1.25 inches and a total duration of two hours. During its duration, the rain falls in a nonlinear pattern as depicted in Table 2 in Appendix C. This rainfall pattern or distribution is based on Trenton, New Jersey rainfall data collected between 1913 and 1975 and contains intermediate rainfall intensities that have the same probability or recurrence interval as the storm's total rainfall and duration. As such, for times of concentration up to two hours, the stormwater quality design storm can be used to compute runoff volumes, peak rates, and hydrographs of equal probability. This ensures that all stormwater quality BMPs, whether they are based on total runoff volume or peak runoff rate, will provide the same level of stormwater pollution control.

**References:**

Township of Readington, County of Hunterdon, State of New Jersey. Chapter 148 Land Development.

Readington Township. "Master Plan – Township of Readington, Hunterdon County, NJ,"

New Jersey Administrative Code (N.J.A.C.) 7:8 – Stormwater Management Rules, adopted February 2, 2004.

New Jersey Department of Environmental Protection. "New Jersey Stormwater Best Management Practices Manual," dated April 2004.

New Jersey Department of Environmental Protection. *Stormwater Management Rule Frequently Asked Questions*. Retrieved October 3, 2004, from NJ Stormwater Web site: http://www.nj.gov/dep/watershedmgt/stormwaterfaqs.htm.

New Jersey Department of Environmental Protection. "Tier A Municipal Stormwater Guidance Document – NJPDES General Permit No. NJ0141861," dated April 2004.

New Jersey State Soil Conservation Committee. "Standards for Soil Erosion and Sediment Control in New Jersey," adopted July 1999.

United States Department of Agriculture. "Soil Survey of Hunterdon County, New Jersey,"

# APPENDICES

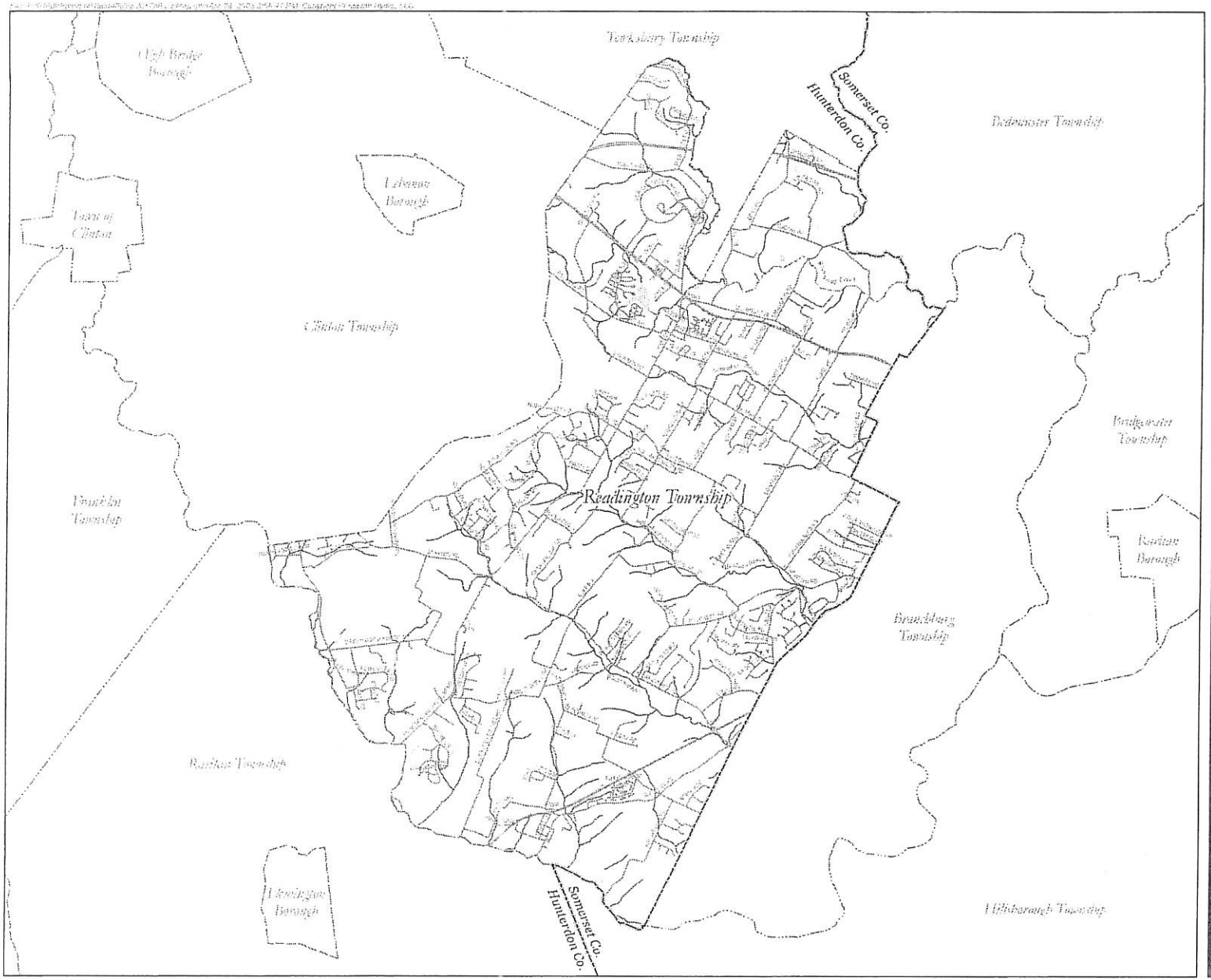
# Appendix A: NJPDES Tier A Stormwater General Permit Information

# NJPDES Municipal Stormwater Regulation Program
## Summary of Statewide Basic Requirements (SBRs)
Tier A Municipal Stormwater Permit (NJ0141852)
(Please refer to final permit for details on SBRs)

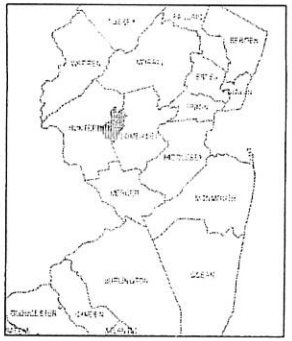
| Statewide Basic Requirement | Minimum Standard | Implementation Schedule |
|---|---|---|
| **Stormwater Pollution Prevention Plan (SPPP)** | SPPP describes the municipality's stormwater program, which includes details on the implementation of required SBRs. | 12 months from effective date of permit authorization (EDPA) |
| Public Notice | Comply with applicable State and local public notice requirements when providing for public participation. | Upon EDPA |
| **Post-Construction Stormwater Management in New Development and Redevelopment** | | |
| Stormwater Management Plan | Adopt stormwater management (SWM) plan in accordance with N.J.A.C. 7:8-4. | Complete 12 mos. from EDPA |
| Stormwater Control Ordinance | Adopt and implement stormwater control ordinance in accordance with N.J.A.C. 7:8-4. | Adopt ordinance 12 months from SWM plan adoption. |
| Residential Site Improvement Standards | Ensure compliance with Residential Site Improvement Standards for stormwater management (N.J.A.C. 5:21-7), including any exception, waiver, or special area standard approved under N.J.A.C. 5:21-3. | Upon EDPA |
| BMP Operation and Maintenance | Ensure adequate long-term operation and maintenance of BMPs. | EDPA for BMPs on municipal property, 24 months for BMPs elsewhere. |
| Storm Drain Inlets Design Standard for New Construction | New storm drain inlets must meet the design standards specified in Attachment C of the permit. | 12 months from EDPA if municipally installed. Otherwise 24 mos. from EDPA |
| **Local Public Education** | | |
| Local Public Education Program | Copy and distribute educational brochure (provided by the Department) annually to residents and businesses, and conduct a yearly educational "event". Have brochure available at this event. | Start 12 months from EDPA |
| Storm Drain Labeling | Label all municipal storm drain inlets that are next to sidewalks, or within plazas, parking areas or maintenance yards. Coordinate efforts with watershed groups and volunteer organizations. | Within 60 months from EDPA |
| **Improper Disposal of Waste** | | |
| Pet Waste Ordinance | Adopt and enforce an ordinance requiring owners and keepers to immediately and properly dispose of their pet's solid waste. Distribute information with pet licenses regarding the ordinance and the environmental benefits of proper disposal of pet waste. | Complete 18 mos. and ongoing |
| Litter Ordinance | Adopt and enforce a litter ordinance, or enforce the existing State litter statute (N.J.S.A. 13:1E-99.3). | Complete 18 mos. and ongoing |
| Improper Waste Disposal Ordinance | Adopt and enforce an ordinance prohibiting spilling, dumping or disposal of any materials other than stormwater into the MS4. | Complete 18 mos. from EDPA and ongoing |

| | | |
|---|---|---|
| Wildlife Feeding Ordinance | Adopt and enforce an ordinance that prohibits feeding of non-confined wildlife in any public park or property owned/operated by the municipality (except environmental education centers). | Complete 18 months from EDPA and ongoing |
| Yard Waste | Adopt and enforce an ordinance that prohibits placing non-containerized yard waste in the street, **OR** collect yard waste monthly Oct.-Dec., once in spring, and "as needed" during remainder of year. Non-containerized yard waste cannot be placed any closer than 10' from a storm drain inlet. | Start 18 months from EDPA and ongoing |
| Illicit Connection Ordinance | Develop, implement and enforce a ordinance, to the extent allowable under State law, to prohibit illicit connections to the MS4. | Develop & implement 18 months from EDPA |
| Illicit Connection Elimination Program | Develop, implement and enforce a program to detect and eliminate illicit connections into the municipality's small MS4. | Develop & implement 18 months from EDPA |
| MS4 Outfall Pipe Mapping | Map all municipal storm sewer outfall pipes which discharge to surface water by dividing the municipality into two sectors for the purposes of outfall mapping. | Map 1st sector 36 mos. from EDPA. Map 2nd sector 60 mos. from EDPA |
| **Solids and Floatable Controls** | | |
| Street Sweeping | In predominantly commercial areas, conduct monthly sweeping of curbed streets, roads and highways (with a speed limit ≤ 35 mph), weather and street surface conditions permitting. | Start 12 months from EDPA and ongoing |
| Storm Drain Inlet Retrofitting | Retrofitting of storm drain inlets during road repair, reconstruction, alterations or repaving with inlets that meet the design standards specified in Attachment C of the permit. | Start 12 months from EDPA and ongoing |
| Stormwater Facility Maintenance | Develop and implement a stormwater facility maintenance program that includes yearly catch basin cleaning and ensures proper function and operation of all municipally operated stormwater facilities. | Start 12 months from EDPA and ongoing |
| Road Erosion Control Maintenance | Develop a roadside erosion control maintenance program to identify and stabilize roadside erosion. Make repairs in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey (N.J.A.C. 2:90-1). | Start 18 months from EDPA and ongoing |
| Outfall Pipe Stream Scouring Remediation | Develop and implement a stormwater outfall pipe scouring detection, remediation and maintenance program to identify and stabilize localized stream and stream bank scouring in the vicinity of outfall pipes operated by the municipality. Repairs shall be in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey (N.J.A.C. 2:90-1). | Start 18 months from EDPA and ongoing |
| **Maintenance Yard Operations** | | |
| De-icing Material Storage | Construct permanent indoor storage with an impermeable floor for deicing materials. Seasonal tarping shall be used as an interim BMP until the permanent structure is completed. Uncovered sand may be stored outside if a 50' setback is maintained from any storm sewer inlet. | Comply w/ tarping & sand storage requirements w/in 12 mos, complete perm. structure w/in 36 mos. from EDPA. |
| Fueling Operations | Develop and implement SOPs for vehicle fueling and bulk delivery and implement with the required practices contained in Attachment D of the permit. | Start 12 months from EDPA and ongoing |
| Vehicle Maintenance | Implement required practices for vehicle maintenance contained in Attachment D of the permit. | Start 12 mos. from EDPA & ongoing |
| Good Housekeeping | Implement required practices for good housekeeping, contained in Attachment D of the permit. | Start 12 mos. from EDPA & ongoing |
| **Employee Training** | | |
| Employee Training | Develop and conduct an employee training program for appropriate employees that covers the required topics contained in the permit. | Start 12 mos. from EDPA & ongoing |

# Appendix B: Municipal Background Mapping




NEW JERSEY COUNTY MAP



PRINCETON HYDRO, LLC.
1108 OLD YORK ROAD
P.O. BOX 720
RINGOES, NJ 08551

N W E S

0 3,250 6,500
Feet

1 inch equals 6,500 feet

SOURCES:

1. Stream, lake, township boundary, and county boundary spatial data were obtained from the NJDEP GIS website.
2. Readington Township boundary and roads spatial data were obtained from the Hunterdon County Planning Committee.

*FIGURE 1*
*LOCATION MAP*

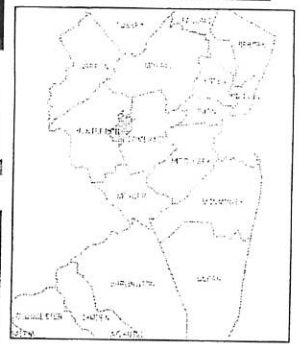
READINGTON TOWNSHIP
MUNICIPAL STORMWATER
MANAGEMENT PLAN -
AMENDMENT TO THE MASTER PLAN
HUNTERDON COUNTY, NEW JERSEY

## LEGEND

- County Boundary
- Municipal Boundary
- Water
- Streams
- Roads

Princeton Hydro

NEW JERSEY COUNTY MAP



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RINGOES, NJ 08551

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SOURCES:

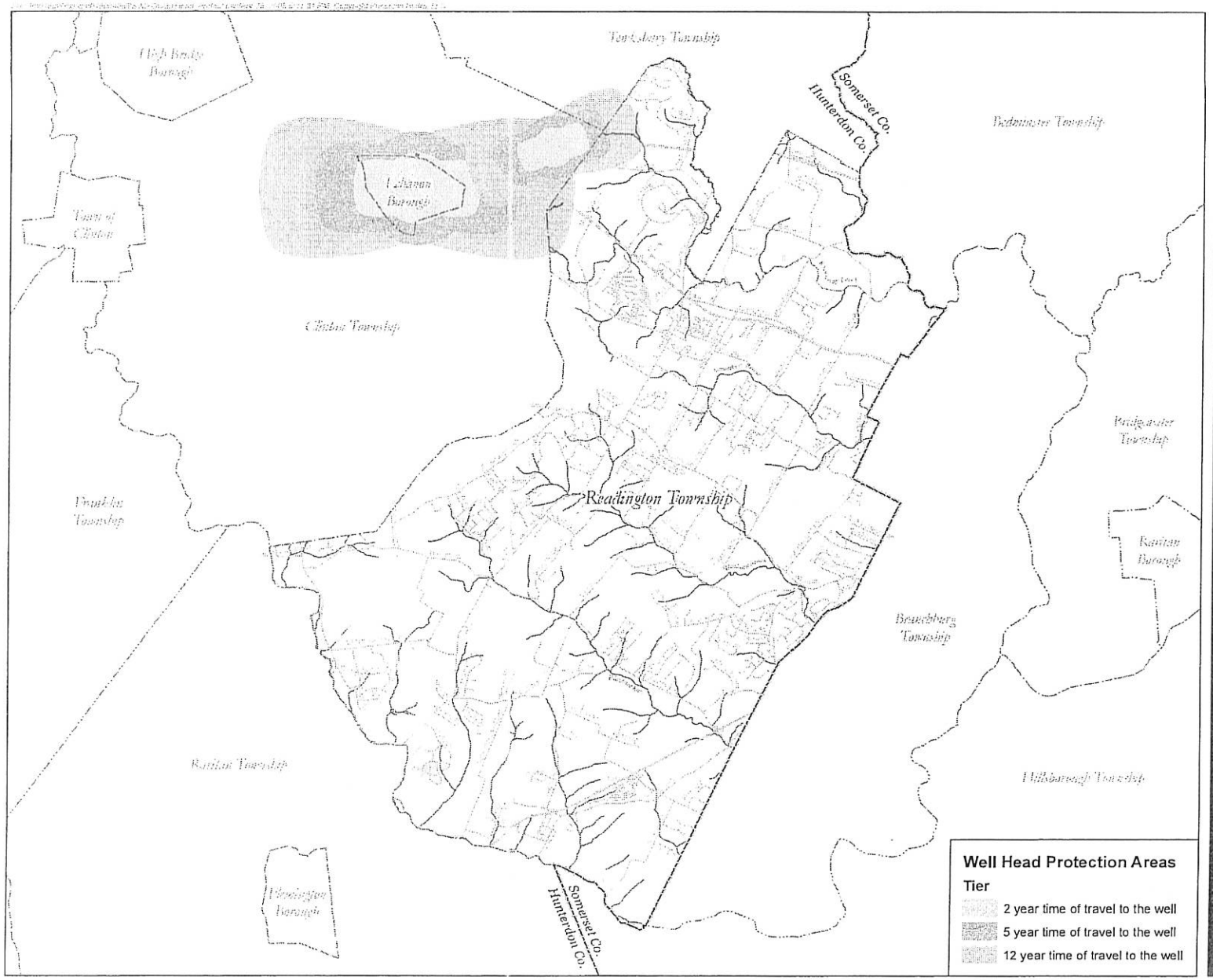
1. USGS 7.5 Minute Series Quadrangle maps for Califon (NJ), Flemington (NJ), Gladstone (NJ), High Bridge (NJ), Hopewell (NJ), Pittstown (NJ), Raritan (NJ), Rocky Hill (NJ), and Stockton (PA-NJ) as obtained from the NJDEP GIS website.
2. Readington municipal boundary data obtained from the NJDEP GIS website.

*FIGURE 2*
*USGS 7.5 MINUTE QUADRANGLE MAP*

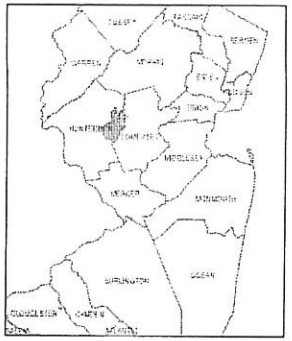
READINGTON TOWNSHIP
MUNICIPAL STORMWATER
MANAGEMENT PLAN -
AMENDMENT TO THE MASTER PLAN
HUNTERDON COUNTY, NEW JERSEY

LEGEND

Readington Township Boundary




NEW JERSEY COUNTY MAP



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P.O. BOX 720
RINGOES, NJ 08551

N W E S

0 3,250 6,500
Feet

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SOURCES:

1. Well Head Protection Areas obtained from the New Jersey Geological Survey (NJGS).
2. Public Community Water Supply Wells, stream, lake, township boundary and county boundary spatial data were obtained from the NJDEP GIS website.

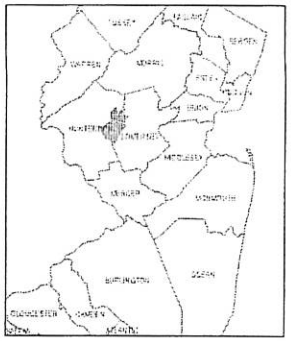
*FIGURE 3*
*WELL HEAD PROTECTION AREAS MAP*

READINGTON TOWNSHIP
MUNICIPAL STORMWATER MANAGEMENT PLAN -
AMENDMENT TO THE MASTER PLAN
HUNTERDON COUNTY, NEW JERSEY

## LEGEND

- County Boundary
- Municipal Boundary
- Water
- Streams
- Roads


NEW JERSEY COUNTY MAP



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1108 OLD YORK ROAD
P.O. BOX 720
RINGOES, NJ 08551

N W E S

0 3,250 6,500
Feet

1 inch equals 6,500 feet

SOURCES:

1. HUC 14 watershed data and surface water quality standards data obtained from the NJDEP GIS website.
2. Township and county boundary data were obtained from the NJDEP GIS website.
3. Readington Township boundary and roads spatial data were obtained from the Hunterdon County Planning Committee.

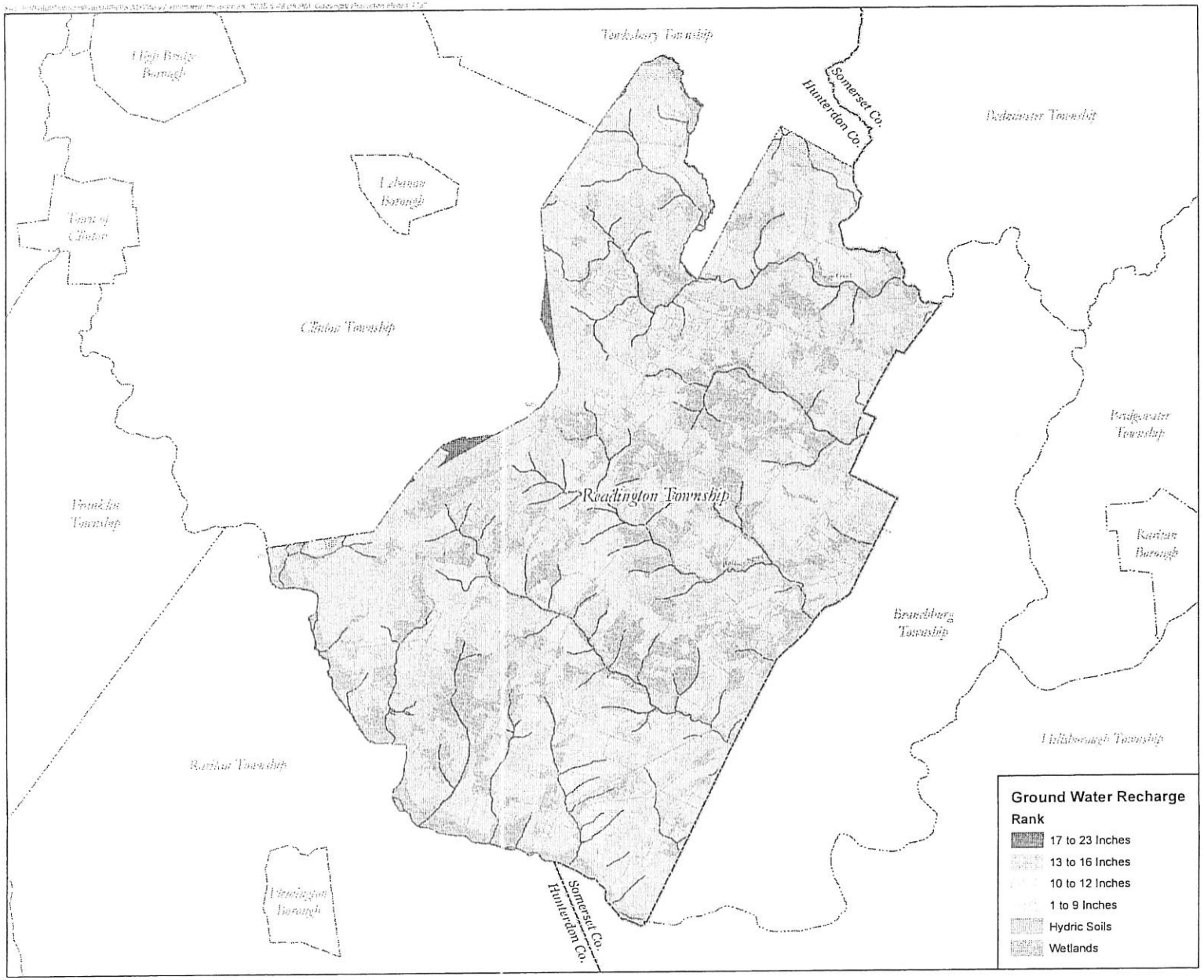
*FIGURE 4*
*HYDROLOGY & HUC 14 WATERSHED MAP*

READINGTON TOWNSHIP
MUNICIPAL STORMWATER MANAGEMENT PLAN - AMENDMENT TO THE MASTER PLAN
HUNTERDON COUNTY, NEW JERSEY

## LEGEND

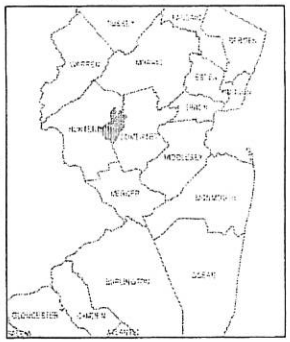
- County Boundary
- Municipal Boundary
- Roads
- HUC 14

Princeton Hydro




Princeton Hydro

NEW JERSEY COUNTY MAP



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P.O. BOX 720
RINGOES, NJ 08551

N W E S

0 3,250 6,500
Feet

1 inch equals 6,500 feet

SOURCES:

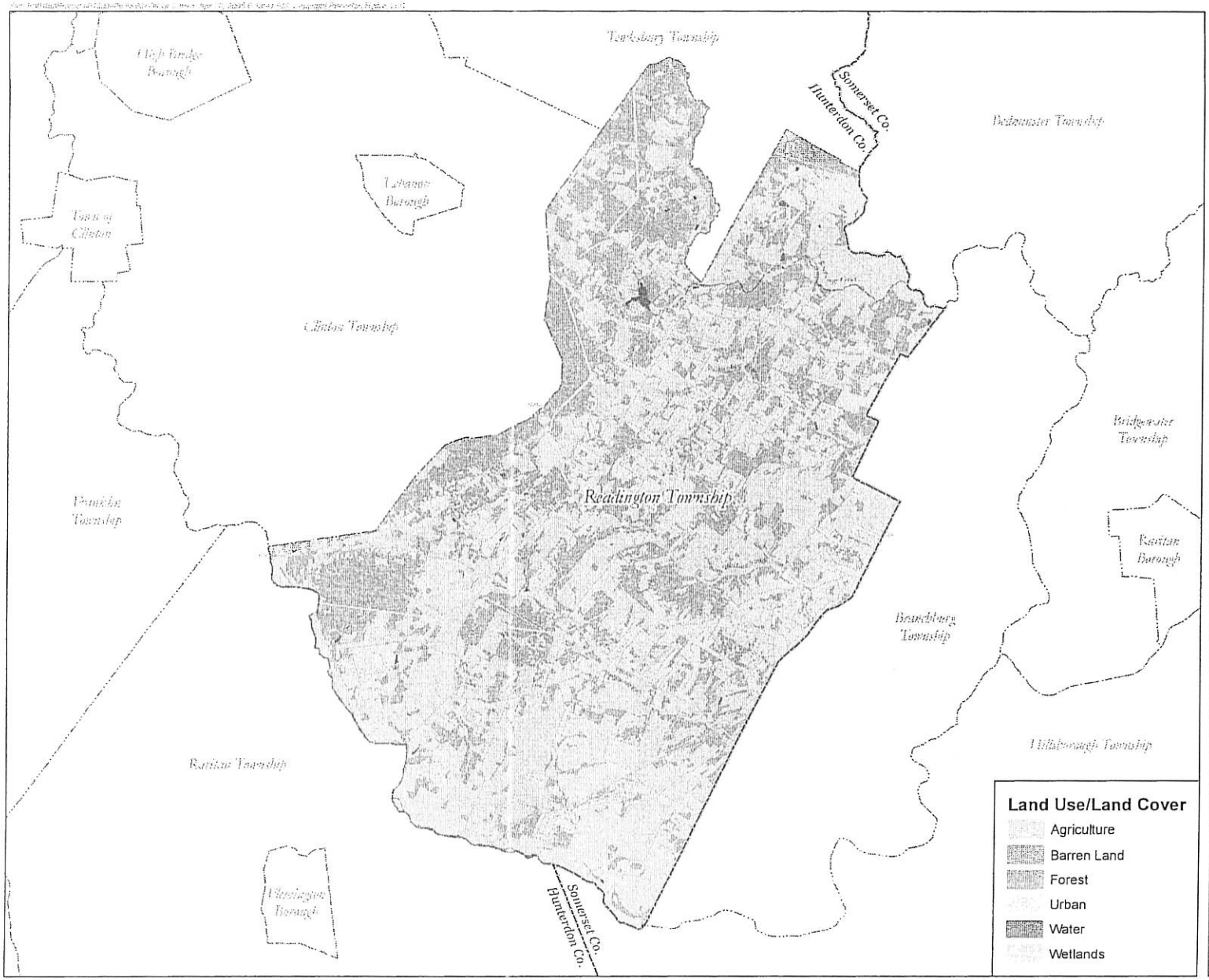
1. Groundwater Recharge areas/rates obtained from NJ Geological Survey. Recharge rates/areas calculated using methodolgy from NJGS's GSR-32 report. Data displayed here reflects the County recharge by inches per year.
2. Stream, lake, township boundary, and county boundary spatial data were obtained from the NJDEP GIS website.
3. Readington Township boundary and roads spatial data were obtained from the Hunterdon County Planning Committee.

*FIGURE 5*
*GROUNDWATER RECHARGE MAP*

READINGTON TOWNSHIP
MUNICIPAL STORMWATER MANAGEMENT PLAN -
AMENDMENT TO THE MASTER PLAN
HUNTERDON COUNTY, NEW JERSEY

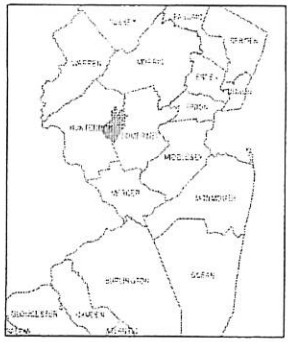
## LEGEND

- County Boundary
- Municipal Boundary
- Streams
- Roads




Princeton Hydro

NEW JERSEY COUNTY MAP



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P.O. BOX 720
RINGOES, NJ 08551

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Feet

1 inch equals 6,500 feet

SOURCES:

1. Land Use / Land Cover data (1995) were obtained from the NJDEP GIS website.
2. Stream, township boundary, and county boundary spatial data were obtained from the NJDEP GIS website.
3. Readington Township boundary and roads spatial data were obtained from the Hunterdon County Planning Committee.

*FIGURE 6*
*LAND COVER / LAND USE MAP*

READINGTON TOWNSHIP
MUNICIPAL STORMWATER
MANAGEMENT PLAN -
AMENDMENT TO THE MASTER PLAN
HUNTERDON COUNTY, NEW JERSEY

## LEGEND

- County Boundary
- Municipal Boundary
- Streams
- Roads

# Appendix C: Stormwater Design Information

Table 1. NJDEP 1.25-Inch/ 2-Hour Stormwater Quality Design Storm
Cumulative and Incremental Rainfall Distributions

| Time (minutes) | Cumulative Rainfall (inches) | Incremental Rainfall (inches) |
|---|---|---|
| 0 | 0.0000 | 0.0000 |
| 5 | 0.0083 | 0.0083 |
| 10 | 0.0166 | 0.0083 |
| 15 | 0.0250 | 0.0084 |
| 20 | 0.0500 | 0.0250 |
| 25 | 0.0750 | 0.0250 |
| 30 | 0.1000 | 0.0250 |
| 35 | 0.1330 | 0.0330 |
| 40 | 0.1660 | 0.0330 |
| 45 | 0.2000 | 0.0340 |
| 50 | 0.2583 | 0.0583 |
| 55 | 0.3583 | 0.1000 |
| 60 | 0.6250 | 0.2667 |
| 65 | 0.8917 | 0.2667 |
| 70 | 0.9917 | 0.1000 |
| 75 | 1.0500 | 0.0583 |
| 80 | 1.0840 | 0.0340 |
| 85 | 1.1170 | 0.0330 |
| 90 | 1.1500 | 0.0330 |
| 95 | 1.1750 | 0.0250 |
| 100 | 1.2000 | 0.0250 |
| 105 | 1.2250 | 0.0250 |
| 110 | 1.2334 | 0.0084 |
| 115 | 1.2417 | 0.0083 |
| 120 | 1.2500 | 0.0083 |

Table 2. TSS Removal Rates for BMPs

| Best Management Practice (BMP) | Adopted TSS Removal Rate (%) |
|---|---|
| Bioretention System | 90 |
| Constructed Stormwater Wetland | 90 |
| Dry Well | Volume Reduction Only |
| Extended Detention Basin | 40 to 60 |
| Manufactured Treatment Device | Requires NJDEP approval |
| Pervious Paving System | Volume Reduction or 80 |
| Sand Filter | 80 |
| Vegetative Filter | 60-80 |

# NEW JERSEY DEPARTMENT OF AGRICULTURE
# STATE SOIL CONSERVATION COMMITTEE
## Chapter 251, PL 1975 as amended,
## Engineering Policies- Technical Bulletin

| Technical Bulletin: 2004-4.0 | Effective Date: January 1, 2005 |
|---|---|
| Subject: NRCS revisions to 24 hr design storm depths | From: Hunter Birckhead, P.E., Section Chief |

### 1.01 PURPOSE

To distribute the revised 24 hr NRCS design rainfall depth tables for use in runoff modeling with NRCS procedures such as TR-55 and TR-20

### 1.02 SUMMARY

The National Oceanographic and Atmospheric Administration (NOAA) is responsible for developing statistical estimates of rainfall amounts for various return periods. Based on recent updates by NOAA, these changes have been incorporated by NRCS into their 24 hr design storm depth tables and have been released for use in New Jersey.

The attached table provides the previous and revised 24hr rainfall depths for each county in New Jersey for the 1, 2, 5, 10, 25, 50 and 100 year return periods. These new depths are to be used in calculating stormwater runoff effective immediately.

NRCS 24 hr Design Storm Rainfall Depths Revised September 2004 (revised)

SSCC - NJDA - SCD

| Storm Period | 1 yr | | 2 yr | | 5yr | | 10yr | | 25yr | | 50yr | | 100yr | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| County | old | *new* | old | *new* | old | *new* | old | *new* | old | *new* | old | *new* | old | *new* |
| Atlantic | 2.8 | *2.8* | 3.5 | *3.3* | 4.5 | *4.3* | 5.5 | *5.2* | 6.2 | *6.6* | 6.8 | *7.6* | 7.6 | *8.9* |
| Bergen | 2.7 | *2.8* | 3.3 | *3.3* | 4.3 | *4.3* | 5.3 | *5.1* | 5.7 | *6.3* | 6.5 | *7.3* | 7.5 | *8.4* |
| Burlington | 2.8 | *2.8* | 3.4 | *3.4* | 4.4 | *4.3* | 5.3 | *5.2* | 6.0 | *6.4* | 6.6 | *7.6* | 7.4 | *8.8* |
| Camden | 2.8 | *2.8* | 3.4 | *3.4* | 4.4 | *4.3* | 5.3 | *5.1* | 5.9 | *6.3* | 6.6 | *7.3* | 7.4 | *8.5* |
| Cape May | 2.9 | *2.8* | 3.5 | *3.3* | 4.6 | *4.2* | 5.6 | *5.1* | 6.3 | *6.4* | 6.9 | *7.5* | 7.7 | *8.8* |
| Cumberland | 2.8 | *2.8* | 3.4 | *3.3* | 4.5 | *4.2* | 5.4 | *5.1* | 6.0 | *6.4* | 6.8 | *7.5* | 7.5 | *8.8* |
| Essex | 2.7 | *2.8* | 3.3 | *3.4* | 4.3 | *4.4* | 5.3 | *5.2* | 5.7 | *6.4* | 6.4 | *7.5* | 7.5 | *8.7* |
| Gloucester | 2.8 | *2.8* | 3.4 | *3.3* | 4.4 | *4.2* | 5.3 | *5.0* | 5.9 | *6.2* | 6.6 | *7.3* | 7.4 | *8.6* |
| Hudson | 2.7 | *2.7* | 3.3 | *3.3* | 4.3 | *4.2* | 5.3 | *5.0* | 5.7 | *6.2* | 6.4 | *7.2* | 7.5 | *8.3* |
| Hunterdon | 2.6 | *2.9* | 3.2 | *3.4* | 4.2 | *4.3* | 5.0 | *5.0* | 5.7 | *6.1* | 6.5 | *7.0* | 7.3 | *8.0* |
| Mercer | 2.7 | *2.8* | 3.3 | *3.3* | 4.3 | *4.2* | 5.2 | *5.0* | 5.8 | *6.2* | 6.4 | *7.2* | 7.5 | *8.3* |
| Middlesex | 2.7 | *2.8* | 3.3 | *3.3* | 4.3 | *4.3* | 5.2 | *5.1* | 5.9 | *6.4* | 6.4 | *7.4* | 7.5 | *8.6* |
| Monmouth | 2.8 | *2.9* | 3.4 | *3.4* | 4.4 | *4.4* | 5.3 | *5.2* | 6.0 | *6.6* | 6.5 | *7.7* | 7.5 | *8.9* |
| Morris | 2.6 | *3.0* | 3.3 | *3.5* | 4.3 | *4.5* | 5.2 | *5.2* | 5.7 | *6.3* | 6.5 | *7.8* | 7.5 | *8.3* |
| Ocean | 2.8 | *3.0* | 3.5 | *3.4* | 4.5 | *4.5* | 5.4 | *5.4* | 6.2 | *6.7* | 6.6 | *7.9* | 7.5 | *9.2* |
| Passaic | 2.6 | *3.0* | 3.3 | *3.5* | 4.3 | *4.4* | 5.4 | *5.3* | 5.7 | *6.6* | 6.5 | *7.5* | 7.6 | *8.7* |
| Salem | 2.8 | *2.8* | 3.3 | *3.3* | 4.4 | *4.2* | 5.3 | *5.0* | 5.9 | *6.2* | 6.6 | *7.3* | 7.4 | *8.5* |
| Somerset | 2.7 | *2.8* | 3.3 | *3.3* | 4.3 | *4.3* | 5.2 | *5.0* | 5.7 | *6.2* | 6.5 | *7.2* | 7.5 | *8.2* |
| Sussex | 2.6 | *2.7* | 3.2 | *3.2* | 4.2 | *4.0* | 5.0 | *4.7* | 5.7 | *5.7* | 6.6 | *6.6* | 7.5 | *7.6* |
| Union | 2.7 | *2.8* | 3.3 | *3.4* | 4.3 | *4.4* | 5.3 | *5.2* | 5.8 | *6.4* | 6.4 | *7.5* | 7.5 | *8.7* |
| Warren | 2.6 | *2.8* | 3.2 | *3.3* | 4.1 | *4.2* | 4.9 | *4.9* | 5.6 | *5.9* | 6.5 | *6.8* | 7.2 | *7.8* |

# Appendix D: Low Impact Development Checklist

# Low Impact Development Checklist

**A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development**

Municipality: _____

County: _____ Date: _____

Review board or agency: _____

Proposed land development name: _____

Lot(s): _____ Block(s): _____

Project or application number: _____

Applicant's name: _____

Applicant's address: _____

_____

Telephone: _____ Fax: _____

Email address: _____

Designer's name: _____

Designer's address: _____

_____

Telephone: _____ Fax: _____

Email address: _____

## Part 1: Description of Nonstructural Approach to Site Design

In narrative form, provide an overall description of the nonstructural stormwater management approach and strategies incorporated into the proposed site's design. Attach additional pages as necessary. Details of each nonstructural strategy are provided in Part 3 below.

## Part 2: Review of Local Stormwater Management Regulations

Title and date of stormwater management regulations used in development design:

_____

Do regulations include nonstructural requirements? Yes: _____ No: _____

If yes, briefly describe: _____

_____

_____

List LID-BMPs prohibited by local regulations: _____

_____

_____

Pre-design meeting held? Yes: _____ Date: _____ No: _____

Meeting held with: _____

_____

_____

Pre-design site walk held? Yes: _____ Date: _____ No: _____

Site walk held with: _____

_____

_____

Other agencies with stormwater review jurisdiction:

Name: _____

Required approval: _____

Name: _____

Required approval: _____

Name: _____

Required approval: _____

# Part 3: Nonstructural Strategies and LID-BMPs in Design

## 3.1 Vegetation and Landscaping

Effective management of both existing and proposed site vegetation can reduce a development's adverse impacts on groundwater recharges and runoff quality and quantity. This section of the checklist helps identify the vegetation and landscaping strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to help maintain existing recharge rates and/or minimize or prevent increases in runoff quantity and pollutant loading.

A. Has an inventory of existing site vegetation been performed? Yes: _____ No: _____

If yes, was this inventory a factor in the site's layout and design? Yes: _____ No: _____

B. Does the site design utilize any of the following nonstructural LID-BMPs?

Preservation of natural areas? Yes: _____ No: _____ If yes, specify % of site: _____

Native ground cover? Yes: _____ No: _____ If yes, specify % of site: _____

Vegetated buffers? Yes: _____ No: _____ If yes, specify % of site: _____

C. Do the land development regulations require these nonstructural LID-BMPs?

Preservation of natural areas? Yes: _____ No: _____ If yes, specify % of site: _____

Native ground cover? Yes: _____ No: _____ If yes, specify % of site: _____

Vegetated buffers? Yes: _____ No: _____ If yes, specify % of site: _____

D. If vegetated filter strips or buffers are utilized, specify their functions:

Reduce runoff volume increases through lower runoff coefficient: Yes: _____ No: _____

Reduce runoff pollutant loads through runoff treatment: Yes: _____ No: _____

Maintain groundwater recharge by preserving natural areas: Yes: _____ No: _____

## 3.2 Minimize Land Disturbance

Minimizing land disturbance is a nonstructural LID-BMP that can be applied during both the development's construction and post-construction phases. This section of the checklist helps identify those land disturbance strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to minimize land disturbance and the resultant change in the site's hydrologic character.

A. Have inventories of existing site soils and slopes been performed? Yes: _____ No: _____

If yes, were these inventories factors in the site's layout and design? Yes: _____ No: _____

B. Does the development's design utilize any of the following nonstructural LID-BMPs?

Restrict permanent site disturbance by land owners? Yes: _____ No: _____

If yes, how: _____

_____

Restrict temporary site disturbance during construction? Yes: _____ No: _____

If yes, how: _____

_____

Consider soils and slopes in selecting disturbance limits? Yes: _____ No: _____

If yes, how: _____

_____

C. Specify percentage of site to be cleared: _____ Regraded: _____

D. Specify percentage of cleared areas done so for buildings: _____

For driveways and parking: _____ For roadways: _____

E. What design criteria and/or site changes would be required to reduce the percentages in C and D above?

_____

_____

_____

F. Specify site's hydrologic soil group (HSG) percentages:

HSG A: _____ HSG B: _____ HSG C: _____ HSG D: _____

G. Specify percentage of each HSG that will be permanently disturbed:

HSG A: _____ HSG B: _____ HSG C: _____ HSG D: _____

H. Locating site disturbance within areas with less permeable soils (HSG C and D) and minimizing disturbance within areas with greater permeable soils (HSG A and B) can help maintain groundwater recharge rates and reduce runoff volume increases. In light of the HSG percentages in F and G above, what other practical measures if any can be taken to achieve this?

_____

_____

_____

I. Does the site include Karst topography? Yes: _____ No: _____

If yes, discuss measures taken to limit Karst impacts:

_____

_____

_____

_____

_____

_____

## 3.3 Impervious Area Management

New impervious surfaces at a development site can have the greatest adverse effect on groundwater recharge and stormwater quality and quantity. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into a proposed development's design to comprehensively manage the extent and impacts of new impervious surfaces.

A. Specify impervious cover at site: Existing: _____ Proposed: _____

B. Specify maximum site impervious coverage allowed by regulations: _____

C. Compare proposed street cartway widths with those required by regulations:

| Type of Street | Proposed Cartway Width (feet) | Required Cartway Width (feet) |
|---|---|---|
| Residential access – low intensity | | |
| Residential access – medium intensity | | |
| Residential access – high intensity with parking | | |
| Residential access – high intensity without parking | | |
| Neighborhood | | |
| Minor collector – low intensity without parking | | |
| Minor collector – with one parking lane | | |
| Minor collector – with two parking lanes | | |
| Minor collector – without parking | | |
| Major collector | | |

D. Compare proposed parking space dimensions with those required by regulations:

Proposed: _____ Regulations: _____

E. Compare proposed number of parking spaces with those required by regulations:

Proposed: _____ Regulations: _____

F. Specify percentage of total site impervious cover created by buildings:

By driveways and parking: _____ By roadways: _____

G. What design criteria and/or site changes would be required to reduce the percentages in F above?

_____

_____

_____

_____

H. Specify percentage of total impervious area that will be unconnected:

Total site: _____ Buildings: _____ Driveways and parking: _____ Roads: _____

I. Specify percentage of total impervious area that will be porous:

Total site: _____ Buildings: _____ Driveways and parking: _____ Roads: _____

J. Specify percentage of total building roof area that will be vegetated: _____

K. Specify percentage of total parking area located beneath buildings: _____

L. Specify percentage of total parking located within multi-level parking deck: _____

## 3.4 Time of Concentration Modifications

Decreasing a site's time of concentration (Tc) can lead directly to increased site runoff rates which, in turn, can create new and/or aggravate existing erosion and flooding problems downstream. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to effectively minimize such Tc decreases.

When reviewing Tc modification strategies, it is important to remember that a drainage area's Tc should reflect the general conditions throughout the area. As a result, Tc modifications must generally be applied throughout a drainage area, not just along a specific Tc route.

A. Specify percentage of site's total stormwater conveyance system length that will be:

Storm sewer: _____ Vegetated swale: _____ Natural channel: _____

Stormwater management facility: _____ Other: _____

Note: the total length of the stormwater conveyance system should be measured from the site's downstream property line to the downstream limit of sheet flow at the system's headwaters.

B. What design criteria and/or site changes would be required to reduce the storm sewer percentages and increase the vegetated swale and natural channel percentages in A above?

_____

_____

_____

C. In conveyance system subareas that have overland or sheet flow over impervious surfaces or turf grass, what practical and effective site changes can be made to:

Decrease overland flow slope: _____

_____

_____

Increase overland flow roughness: _____

_____

_____

## 3.5 Preventative Source Controls

The most effective way to address water quality concerns is by pollution prevention. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to reduce the exposure of pollutants to prevent their release into the stormwater runoff.

A. Trash Receptacles

Specify the number of trash receptacles provided: _____

Specify the spacing between the trash receptacles: _____

Compare trash receptacles proposed with those required by regulations:

Proposed: _____ Regulations: _____

B. Pet Waste Stations

Specify the number of pet waste stations provided: _____

Specify the spacing between the pet waste stations: _____

Compare pet waste stations proposed with those required by regulations:

Proposed: _____ Regulations: _____

C. Inlets, Trash Racks, and Other Devices that Prevent Discharge of Large Trash and Debris

Specify percentage of total inlets that comply with the NJPDES storm drain inlet criteria: _____

D. Maintenance

Specify the frequency of the following maintenance activities:

Street sweeping: Proposed: _____ Regulations: _____

Litter collection: Proposed: _____ Regulations: _____

Identify other stormwater management measures on the site that prevent discharge of large trash and debris:

_____

_____

E. Prevention and Containment of Spills

Identify locations where pollutants are located on the site, and the features that prevent these pollutants from being exposed to stormwater runoff:

Pollutant: _____ Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

## Part 4: Compliance with Nonstructural Requirements of NJDEP Stormwater Management Rules

1. Based upon the checklist responses above, indicate which nonstructural strategies have been incorporated into the proposed development's design in accordance with N.J.A.C. 7:8-5.3(b):

| No. | Nonstructural Strategy | Yes | No |
|---|---|---|---|
| 1. | Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss. | | |
| 2. | Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces. | | |
| 3. | Maximize the protection of natural drainage features and vegetation. | | |
| 4. | Minimize the decrease in the pre-construction time of concentration. | | |
| 5. | Minimize land disturbance including clearing and grading. | | |
| 6. | Minimize soil compaction. | | |
| 7. | Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides. | | |
| 8. | Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas. | | |
| 9. | Provide preventative source controls. | | |

2. For those strategies that have not been incorporated into the proposed development's design, provide engineering, environmental, and/or safety reasons. Attached additional pages as necessary.

# Appendix E: Stormwater Control Ordinance

## § 148-65. Stormwater. [Amended 6-17-2002 by Ord. No. 15-2002; 10-7-2002 by Ord. No. 40-2002]

See §§ 148-65.1 through 148-65.4.

## § 148-65.1. Drainage of streets. [Amended 6-17-2002 by Ord. No. 15-2002; 10-7-2002 by Ord. No. 40-2002]

All streets shall be provided with manholes, catch basins and pipes where the same may be necessary for proper drainage.

A. The system shall include the natural drainage basin area and shall be adequate to carry off the stormwater and natural drainage water which originates not only within the lot or tract boundaries but also that which originates beyond the lot or tract boundaries in their current state of development. The system shall be extended along the full length of any road improvement. No stormwater runoff or natural drainage water shall be so diverted as to overload existing drainage systems to create flooding or the need for additional drainage structures on other private properties or public lands without proper and approved provisions being made for taking care of these conditions.

B. All materials used in the construction of storm sewers, bridges and other drainage structures shall be in accordance with current specifications of NJDOT for Road and Bridge Construction, as prepared by the New Jersey Department of Transportation and any supplements, addenda and modifications thereto unless otherwise specified by the reviewing municipal agency. Modifications or changes of these specifications may be requested by the applicant but may be implemented only with the knowledge and written consent of the Township Engineer after discussion with the reviewing municipal agency.

C. Pipe sizes shall be determined by acceptable drainage design procedures, provided that the pipe size in a surface water drainage system shall in no instance be less than 15 inches in diameter.

D. Drainage inlets shall be located at all intersections, with inlets on both sides of a street at intervals of not more than 300 feet or such shorter distances as required to prevent the flow of surface water from exceeding six cubic feet per second at the drainage inlet. Access manholes shall be placed at maximum four-hundred-foot intervals throughout the system and at pipe junctions where there are no drainage inlets.

E. Surface water in all paved areas shall be collected at intervals so that it will not obstruct the flow of vehicular or pedestrian traffic and will not create ponding in paved areas. Gutters or paved swales shall be used whenever, in the judgment of the Township Engineer, they are necessary to avoid erosion.

F. Lots shall be graded away from the building(s) at a minimum two-percent grade in order to secure proper drainage. Additionally, drainage shall be provided in a manner which will prevent the collection of stormwater in pools or other unauthorized

concentrations of flow and water shall not flow across adjacent property lines at greater than predevelopment rates.

G. Approval of drainage structures shall be obtained from the appropriate municipal, county, state and federal agencies and office. Where required, each applicant shall make application to NJDEP, the Hunterdon County Engineering Department and the Township Engineer. Final approval shall not be effective until letters of approval from the proper governmental authorities shall be furnished to the Secretary of the Planning Board or the Secretary of the Zoning Board of Adjustment, as the case may be, with a copy of each letter forwarded to the Township Engineer.

H. When required by the Township and as indicated on an approved development plan, a drainage right-of-way easement shall be provided to the Township where a tract or lot is traversed by a watercourse, surface or underground drainageway or drainage system, channel or stream. Said easement and right-of-way shall include provisions assuring the following: preservation of the channel of the watercourse; prohibition of alteration of the contour, topography or composition of the land within the easement and right-of-way; prohibition of construction within the boundaries of the easement and right-of-way which will obstruct or interfere with the natural flow of the watercourse; and reservation to the Public Works Department of a right of entry (but not the obligation) for the purpose of maintaining the natural flow or drainage of the watercourse, of maintaining any and all structures related to the exercise of the easement and right-of-way and of installing and maintaining a storm or sanitary sewer system or other public utility. The drainage right-of-way easement shall conform substantially with the thread of such watercourse and, in any event, shall meet any minimum widths and locations as shown on any adopted Official Map or Master Plan but not less than 25 feet in width. Such easement shall be expressed on the plat as follows: "Drainage easement granted for the purposes provided and expressed in the Land Development Ordinance of Readington Township." All developments shall adhere to the regulations from water and erosion control as specified in the Readington Township Soil and Surface Water Management Ordinance, October 18, 1976.[EN]

I. Surface drainage of each lot will be reviewed to assure that stormwater flows will not cascade from one lot to another in a manner that would be detrimental to the use of an adjoining lot. This may require surface water controls such as swales, surface drainage inlets and appropriate easements.

**§ 148-65.2. Technical standards. [Added 6-17-2002 by Ord. No. 15-2002; amended 10-7-2002 by Ord. No. 40-2002]**

A. Post-Development Controls

(1) Nonpoint sourcepollution control. Stormwater control systems shall be designed to prevent degradation of water quality in the receiving watercourse due to nonpoint source pollution associated with stormwater runoff. NJDEP's Surface

Water Quality Standards, N.J.A.C. 7:9B, and NJDEP's Stormwater Management Regulation, N.J.A.C. 7:8B, shall be used as guidelines for this determination.

(2) Stormwater control systems shall be designed to reduce pollutant loading (according to the requirements of Table 3-1[iiEN]) generated by the development for storm events up to the water quality design storm and to retain, as closely as possible, the predevelopment hydrologic response of the site, and the watershed.

(3) Stormwater control systems shall be designed so that the postdevelopment stormwater runoff rates, from the site, and at any point in the watershed between the site and the receiving body of water, shall be reduced according to N.J.A.C. 7:8. Therefore, the postdevelopment peak runoff rate for the two-year storm event shall be 50% of the predevelopment peak runoff rate and the postdevelopment peak runoff rate for the ten- and one-hundred-year storm events shall be 80% of the predevelopment peak runoff rates, respectively.

(4) No net increase in stormwater runoff volumes. The goal of stormwater control systems shall be to infiltrate all stormwater runoff into the ground for the 1.25 inch, two-hour storm. In addition, as a goal, the runoff generated from the first .25 inches of rainfall from all larger storms shall also be infiltrated into the ground.

B. Procedures for measuring compliance with the Post-Development Control provisions of this chapter.

(1) Hydrologic/hydraulic analyses; suitability of soil for infiltration.

(a) Hydrologic/hydraulic analyses shall be prepared and submitted demonstrating that the postdevelopment stormwater runoff rates do not exceed the standards set forth in this chapter for the water quality storm and the two-, ten-, and one-hundred-year storms. The water quality storm shall be the NJDEP defined 1.25 inches of rain, uniformly distributed over a two-hour period.

(b) The hydrologic and hydraulic analyses shall follow generally accepted methodologies for evaluating stormwater runoff rates and volumes, including the methodologies specified in NJDEP's Stream Encroachment Manual, the USDA/SCS's TR-55 and TR-20 methodologies, and the US Army Corps of Engineers HEC-1 model.

(c) For infiltration facilities proposed to meet the no-net-change provisions of this chapter, the results of soil tests demonstrating the suitability of the area's soils for infiltration of runoff shall also be provided. Computation shall be conducted in accordance with NJCA 7:8, the 2004 NJDEP Best Management Practices Manual and GSR-32 Recharge Methodology.

(2) A nonpoint source pollutant loading analysis shall be prepared and submitted demonstrating that the postdevelopment nonpoint source pollutant and sediment loadings do not exceed the standards set forth in this chapter as a result of the proposed land development project. In preparing the required analysis it shall be acceptable to utilize the average removal efficiency statistics provided in the

Stormwater and Nonpoint Source Pollution Control Best Management Practices Manual, dated December 1994 and May 2000, and any subsequent revisions thereto, prepared by the New Jersey Department of Environmental Protection and the New Jersey Department of Agriculture.

C. Mitigation measures.

(1) If the natural or existing physical characteristics of the project site preclude achievement of any of the above provisions, the municipality may grant a variance from strict compliance with the specific provisions that are precluded, provided that acceptable mitigation measures are provided. However, to be eligible for a variance, the applicant must demonstrate to the satisfaction of the Township professionals that the immediately downstream waterways will not be subject to:

(a) Deterioration of existing culverts, bridges, dams and other structures;

(b) Deterioration of their biological functions, as well as for drainage and other purposes;

(c) Streambank or streambed erosion or siltation;

(d) Increased threat of flood damage to public health, life and property.

(2) Furthermore, where partial compliance with a specific provision is possible, the Township professionals will direct the applicant to satisfy a reduced performance criterion. Mitigation measures will be required to compensate for the unfulfilled component of the no-net-increase provision.

(3) In all cases, however, those stormwater design provisions that are not precluded by the site's physical characteristics shall be met. Mitigation measures may include, but are not limited to, the following. If one or more of the Stormwater Management provisions of this chapter cannot be met on-site then the applicant shall meet the provisions of this chapter, precluded by the site's physical characteristics, by employing one or more of the following mitigation measures, in this order of preference:

(a) The purchase or donation of privately owned lands within the Readington Township Stream Corridor Preservation Area that are not currently protected by NJDEP's Freshwater Wetlands Protection Act Rules or NJDEP's Flood Hazard Area Control Regulations, said lands to be dedicated for preservation and/or reforestations.

(b) Mitigation on previously developed properties, public or private, that currently lack stormwater management facilities designed and constructed in accordance with the purposes and standards of this chapter.

(c) Cash contributions to fund stormwater management related studies within Readington Township, including wetland delineation studies, stream monitoring studies for water quality and macroinvertebrates, stream flow monitoring, and threatened and endangered species studies.

(d) Other stormwater enhancement, Stormwater Management Resource Protection / Restoration Mitigation options deemed acceptable by the Township Professionals.

D. Detention/retention basins for stream flooding and erosion control. The standards for detention/retention basins shall be conducted in accordance with NJAC 7:8, as follows:

(1) Detention and /or retention basins shall be designed to capture and retain all stormwater runoff from the site's impervious surfaces during the water quality storms, and from all smaller storms. The runoff shall then be slowly released in accordance with the requirements presented in Section 3.7.1. For detention basins with the use of other BMP's such as drywells, infiltration systems, grassed swales, etc., used in concert with detention and retention basins.

(2) The postdevelopment peak runoff rate for the two-year storm event shall be 50% of the predevelopment peak runoff rate and the postdevelopment peak runoff rate for the ten- and one-hundred-year storm events shall be 80% of the predevelopment peak runoff rates.

(3) Most water quality control and infiltration measures will also provide some benefit in runoff peak control. Where water quality control or infiltration measures are instituted, appropriate adjustments to the postdevelopment peak runoff may be incorporated by the introduction of modified runoff coefficients (e.g., time of concentration, initials abstraction, SCS runoff curve number). Procedures used by the applicant to adjust runoff coefficients to take credit for the detention properties of miscellaneous stormwater control measures (i.e., measures not specifically designed for providing runoff peak control) must be approved by the Township professionals.

(4) The US Soil Conservation Service procedures, such as Urban Hydrology for Small Watersheds, Technical Release No. 55, or other generally accepted methodologies, may be used for computing predevelopment and postdevelopment runoff rates and volumes.

(5) In computing preproject construction runoff, all significant land features, such as ponds, depressions, or hedgerows which increase the ponding factors, shall be accounted for.

(6) The applicant shall provide plans and calculations which show that the discharge attributable to the proposed project will not cause erosion along the flow path between the outfall and the receiving waterbody.

(7) Soil erosion and sediment control shall be provided in accordance with Standards for Soil Erosion and Sediment Control promulgated by the State Soil Conservation Committee pursuant to N.J.A.C. 4:24-42 administered by the Hunterdon County Soil Conservation District.

(8) If detention basins or other detention facilities are provided through which water passes at times other than following rainfall, the Township professionals shall be

consulted concerning design criteria. It will be necessary for detention requirements to be met, despite the necessity of passing certain low flows. This applies to all on-stream or on-line detention basins.

(9) Detention basins located in freshwater wetlands may be allowed only in accordance with Freshwater Wetlands Protection Act, N.J.S.A. 13:9B-1 et seq., and any rules adopted pursuant thereto.

(10) Any detention facility that impounds water through the use of any artificial dike, levee or other barrier and raises the water level five feet or more above the usual mean low-water height when measured from the downstream toe-of-dam to the emergency spillway crest is classified as a dam and subject to the New Jersey dam safety standards, N.J.A.C. 7:20. All such dams must be designed, constructed, operated and maintained in compliance width the rules of N.J.A.C. 7:20.

E. Water quality control and infiltration measures.

(1) In most instances, the water quality control and infiltration performance requirements of this chapter will be satisfied by multiple structures or devices (see section 3.6 of this chapter). Furthermore, most structures or devices will achieve both a water quality control and infiltration benefit. Compliance with the provisions of this chapter will be based on a project-wide summation of runoff characteristics. The applicant will show how the collection of structures or devices incorporated in the stormwater management plan will jointly satisfy the performance requirements of this chapter.

(2) In order to meet the provisions of this chapter with regard to stormwater runoff volumes, sediment loadings and other nonpoint source loadings, stormwater management facilities shall provide for the control of a water quality design storm, in accordance with the following basic principles:

(a)Infiltration facilities shall be designed to achieve no net change in recharge under post-developed conditions as compared to pre-developed conditions (tabulated on an annual basis). This will be achieved by the implementation of measures which will retain and infiltrate runoff generated by the two-hour storm. In general, multiple infiltration facilities may be required to collectively satisfy the infiltration requirement.

(b)Concentrations of stormwater volume shall be minimized by designing small impervious surface drainage units where appropriate.

(c)Runoff shall be collected, attenuated and managed as close to its source as practicable.

(d)The design of water quality and infiltration device treatment trains shall utilize to the fullest extent possible the existing natural qualities of the landscape.

(e)Due to the difficulties associated with their design and maintenance, detention/retention basins are not suitable as infiltration facilities. Therefore,

retention volumes associated with basins may not be used to comply with the provision of this chapter as it regards runoff volume. However, retention basins (or wet basins) may be used to satisfy the water quality requirements of this chapter.

(f)The incorporation of porous pavement systems, including porous asphalt pavement and modular paving block systems, are encouraged as a means of lowering the effective runoff curve number for a developed site. By increasing the perviousness of the developed site, benefits will be achieved in the form of reduced infiltration and peak runoff control requirements.

(3)Utilizing the above design principles, a stormwater management plan shall be designed for the project area, utilizing the stormwater control Best Management Practices (BMPs) presented in The NJDEP Stormwater and Nonpoint Source Pollution Control Best Management Practices Manual, dated 2004, and any subsequent revisions thereto, prepared by the New Jersey Department of Environment Protection and the new Jersey Department of Agriculture.

(4)The provisions of this chapter shall be deemed to have been met regarding nonpoint source pollutants if the estimated postdevelopment nonpoint source annual pollutant load after water quality treatment, has been reduced by 80% prior to discharge.

(5) In estimating the total suspended solidsremoval efficiencies of the water quality control measures proposed, it shall be acceptable to utilize the removal efficiency statistics provided in the Stormwater and Nonpoint Source Pollution Control Best Management Practices Manual, dated 2004, and any subsequent revisions thereto, prepared by the New Jersey Department of Environmental Protection and the New Jersey Department of Agriculture.

F. Requirements for selected stormwater management measures. Considerations will be given to other innovative BMP's not listed in this chapter, however, the applicant will be required, when proposing the use of alternative BMP's, to provide the Planning Board with detailed engineering plans and performance capabilities. Any vegetation used in the creation of BMP's shall be noninvasive, nonexotic species.[iii]EN

(1) For detention basins:

(a) Detention basins shall not be located within the floodway of any watercourse;

(b) The construction of detention basins in floodplains should be avoided, but where this is unavoidable, a special examination to determine adequacy of a proposed detention facility during extreme storm events shall be required. This examination is required to determine what effects, if any, the tailwaters created by the floodplain have on the outflow from and effective storage within the detention facility. All designs of basins in floodplains, therefore, should be based upon an accurate and thorough determination of tailwater effects resulting from runoff from the site and the watershed contributing to the floodplain;

(c) Beginning at the time of peak storage in the basin for the water quality design storm, (1.25" / 2 hour) no more than 90% of the total peak storage volume is released over an eighteen-hour period for residential developments or over a twenty-four-hour period for commercial developments. Longer drawdowns are permissible, but in no case shall the drawdown period exceed 72 hours. The rate of release shall be as uniform as possible;

(d) The minimum outlet diameter, width or height is 2.5 inches. If this minimum outlet size does not allow for the detention times required in this chapter, then alternative techniques for the removal of TSS prior to discharge into the basin shall be provided; and

(e) The species of native, nonintrusive, nonexotic vegetation used in the basin shall be approved by Readington Township and the Hunterdon County Soil Conservation District.

(2) For wetponds/retention basins:

(a) Such basins shall not be located within the floodway of any watercourse;

(b) The volume of the permanent pool shall be at least four times the volume of the expected runoff from the water quality design storm (1.25" / 2 hour event);

(c) The pool shall be shallow enough to avoid thermal stratification and deep enough to minimize algal bloom and resuspension of decomposing organics and other previously deposited materials;

(d) An applicant, when proposing the use of a wetpond, shall submit data (e.g., average monthly flushing rates) which document that the wetpond will not be subject to excessive stagnation during periods of nominal inflow. If the wetpond will become stagnant, the applicant may be required to provide some form of aeration or circulation to eliminate such conditions and associated negative water quality and public health consequences;

(e) The configuration of the permanent pool shall promote maximum sedimentation and minimize plug flow;

(f) Where feasible, native fish stock shall be used to control mosquitoes; and

(g) There shall be no adverse effects to the receiving watercourse resulting from differences in temperature between the discharge and the waters in the receiving watercourse.

(3) For artificial wetlands:

(a) A least one-half of the perimeter of the water area shall be graded to form a shallow bench for aquatic emergents;

(b) The surface area of the artificial wetlands shall be at least three percent of the total area contributing flow into the artificial wetland;

(c) Vegetation shall be commercial native wetland plant stock, either live plants or dormant rhizomes, instead of transplants from existing wetlands areas or seeding;

(d) At least two hardy and rapid colonizing indigenous primary wetlands species shall be planted in three or four monospecific stands with individual plants spaced two to three feet apart. Up to three less aggressively colonizing secondary wetlands species shall be randomly distributed in clumps around the perimeter of the marsh; and

(e) At least 25% of the total surface area of a basin designed exclusively to act as a shallow marsh shall be open water with a depth of at least two feet in order to provide habitat for waterfowl and other marsh birds.

(4) For vegetated or biofilter swales:

(a) The water velocity shall not exceed two feet per second (FPS) to allow for settlement of TSS during the water quality design storms. The slope shall not be less than 0.5% so that positive drainage is maintained. The bottom of the swale shall not be compacted during construction to preserve infiltration value. The swale slope shall not exceed 5% and shall be of sufficient length to allow for settlement of TSS taking into consideration the velocity, depth of flow and expected loading of TSS;

(b) Where feasible, vegetation shall be used in the swale to filter out the TSS and to provide a secondary treatment by absorption of pollutants leached into the soil. Vegetation used in the swale shall be native, nonintrusive, nonexotic species approved by Readington Township and the Hunterdon County Soil Conservation District;[iv]EN

(c) If the swale is designed to provide infiltration, the soil texture shall be sand, loamy sand or sandy loam as defined by the US Department of Agriculture and there shall be a minimum of three feet separation between the bottom of the swale and the seasonal high water table; and

(d) The swale shall be used internally within the stormwater collection system and in conjunction with other methods such as vegetated filter strips to increase their effectiveness.

(5) For above-grade infiltration facilities:

(a) There shall be at least three feet vertical separation between the bottom of the facility and the seasonal high-water table;

(b) The maximum depth of impoundment shall be two feet;

(c) The soil texture of the upper six inches of the facility (i.e., immediately below the surface layer of turf, gravel, paving blocks, etc.) shall be sand, loamy sand or sandy loam, as described by the US Department of

Agriculture. As necessary, the applicant will import appropriate cover material to comply with this requirement;

(d) The surface of the facility may be stabilized by turf, gravel, modular paving blocks, or other measures approved by the Township professionals;

(e) The entire volume of the runoff impounded during a storm shall be recharged to groundwater within 72 hours; and

(f) The design of the infiltration facility shall be based on infiltration rates measured using procedures outlined in the design standards presented in the the 2004 NJDEP Best Management Practices Manual for aboveground infiltration systems.

(6) For below-grade infiltration facilities.

(a) Where porous media are used (e.g., gravel surfaced parking areas, gravel filled trenches), the applicant shall provide documentation of the in-place porosity of the media for purposes of estimating the retained runoff volume;

(b) A media separation (e.g., geotextile or graded sand filter) shall be used to maintain the integrity of the interface between porous media and the native soil;

(c) The design of the facility shall be based on infiltration rates measured using procedures outlined in the design standards presented in the 2004 NJDEP Best Management Practices Manual for aboveground infiltration systems;

(d) The entire volume of the runoff impounded during a storm shall be recharged to groundwater within 72 hours. Standpipes are required in all below-grade infiltration facilities for the purpose of inspecting water levels; and

(e) As required by the Township professionals, runoff shall be pre-treated prior to discharge into the below-grade infiltration facility to remove TSS and other nonpoint source pollutants. Treatment may consist of a vegetated buffer strip, sediment trap, manufactured treatment devices, etc.

(7) For porous pavement:

(a) The soil beneath the pavement shall be sand, loamy sand or sandy loam as defined by the US Department of Agriculture, or the applicant could create a suitable subgrade reservoir for the storage of runoff using gravel or other appropriate medium;

(b) The porous pavement shall be buffered with vegetative screening to prevent the intrusion of aeolin sand and silt;

(c) A strict maintenance schedule including but not limited to vacuum sweeping on a weekly basis and high-pressure water washing on a monthly basis will be required of any approved porours pavement.

(d) The porous pavement shall be used in light traffic areas subject to automobiles only and is marked by a sign restricting traffic to only passenger vehicles;

(e) No asphalt sealer may be used;

(f) No sand shall be applied to porous pavement during periods of snow and ice;

(g) Refer to the design standards presented in the 2004 NJDEP Best Management Practices Manual for aboveground infiltration systems; and

(h) The area where porous pavement is being used should be disconnected from stormwater flows generated from all adjacent areas, and should be designed to manage the volume runoff generated only from the area in which the porous pavement is being installed. This disconnect of the area from adjacent areas limits the hydrologic load that the system will manage and decreases the opportunity for fine sediment that could potentially clog the pavement from being directed onto the surface.

(8) For modular paving block systems:

(a) The upper six inches of soil beneath the paving system shall be sand, loamy sand or sandy loam as defined by the US Department of Agriculture. As necessary, the applicant will import appropriate cover material to comply with this requirement;

(b) In-place infiltration rates shall be measured using procedures outlined in NJDEP guidance or other methods acceptable to the Township professionals;

(c) Permissible paving blocks include, but are not limited to, bricks bedded in sand (minimum one-half inch separation between blocks) and interlocking concrete blocks with open-work cutouts;

(d) Paving block systems shall be used in pedestrian and in light traffic areas subject to automobiles only and marked by a sign restricting traffic to only passenger vehicles;

(e) A semiannual program of inspection and maintenance shall be required of all modular paving block systems;

(f) Modification of paved areas to provide benefits associated with below grade infiltration facilities can be obtained by constructing pavement over a layer of coarse aggregate or similar porous media.

(9) Manufactured treatment devices:

(a) The applicant shall submit design calculations and performances curves for all devices.

(b) Devices should be used for pretreatment, not posttreatment.

(c) Manufactured treatment devices shall be used to treat mostly impervious surfaces. No large tracts of pervious surfaces should be routed into the device.

(d) All considered manufactured treatment devices shall be recognized by NJDEP and deemed suitable for use in New Jersey.

(e) Removal of TSS by such approved devices shall be in accordance with the removal rates established by NJDEP.

G. Planning and design standards for maintenance and repair.

(1) The goal for the planning and design of a stormwater management facility is for its operation with the least practical amount of maintenance. To accomplish this, the facility shall be developed to eliminate avoidable maintenance tasks, minimize the long-term amount of regular maintenance, facilitate the performance of required maintenance tasks, and reduce the potential for extensive, difficult, and costly remedial or emergency maintenance efforts.

(2) Strong, durable, and noncorrodible materials, components, and fasteners shall be used to reduce required maintenance efforts. These include but are not limited to: lightweight noncorrodible metals such as aluminum for trash racks, orifice plates, and access hatches; hardy, disease resistant grasses for bottoms and side slopes as prescribed by soil erosion and sediment control standards administered by the Hunterdon County Soil Conservation District; reinforced concrete for outlet structures and let headwalls; and gabions for channel and outlet linings.

(3) Detention facilities shall be designed to minimize propagation of insects, particularly mosquitoes.

(4) Detention facilities should be designed in a harmonious and attractive manner.

(5) Detention facility outlets shall be designed to function without manual, electric or mechanical controls. Design specifications shall be consistent with those required by NJDEP.

(6) Maintenance shall be required as part of all stormwater management plans. Specific maintenance techniques and schedules shall be provided for each type of system used on the site. If maintenance of the system will be the responsibility of a person other than a state, county or municipal agency, then the maintenance plan approved by the municipality shall be recorded upon the deed of record for the property.

(a) The maintenance plan shall include the name, address and telephone number of the party or parties responsible for long-term maintenance. Documentation of their assumption of this responsibility shall be submitted as part of the permit application. The transfer of maintenance responsibility to individual property owners in residential subdivisions is prohibited except through a homeowners' association agreement.

(b) Written maintenance and repair records for all stormwater management systems shall be maintained for at least five years by the person's identified in Subsection G(6) above and shall be provided to the municipality upon request.

(c) Maintenance of artificial wetlands shall include, but not be limited to:

[1] Documented visual inspection of all components of the system at least once every six months;

[2] Documented removal of silt, litter and other debris from all catch basins, inlets and drainage pipes at least once every six months or upon noticeable buildup; and

[3] Vegetation removal and replacement, as necessary, at least once a year.

(d) Maintenance of detention basins shall include, but not be limited to:

[1] Documented visual inspection of all components of the system at least once every six months;

[2] Documented removal of silt, litter and other debris from all catch basins, inlets and drainage pipes at least once every six months or upon noticeable buildup;

[3] Documented maintenance, including grass cutting, and necessary replacement of all landscape vegetation within the basin at least once a year; and

[4] Documented aeration of basin bottoms at least once a year and scraping and replanting at least once every five years to prevent the sealing of the basin bottom.

(e) Maintenance of wet ponds/retention basins shall include, but not be limited to, annual documented monitoring of water quality, dissolved oxygen, vegetative growth, temperature and fish population for a period of three years to ensure that the wet pond/retention basin is working as intended.

H. Safety measures. Safety measures are to be incorporated in the design of all stormwater and infiltration control projects. These may include but not be limited to fencing, warning signs/stadia rod indicating depth at lowest point, and outlet structures designed to limit public access as deemed needed and appropriate by the Township Professionals.

**§ 148-65.3. Requirements for a site development/stormwater plan. [Added 6-17-2002 by Ord. No. 15-2002; amended 10-7-2002 by Ord. No. 40-2002]**

A. Submission of site development stormwater plan.

(1) Whenever an applicant seeks municipal approval of a development subject to this chapter, the applicant shall submit all of the required components of the Checklist for the Site Development Stormwater Plan, 4.3, as part of the submission of the application for subdivision of site plan approval.

(2) The applicant shall demonstrate that the project meets the standards set forth in this chapter.

(3) The submission requirements set forth in the checklist in 4.3 are in addition to any other required development checklists. Failure to provide all items will result in an application being deemed incomplete.

B. Site development stormwater plan approval. The applicant's plans for development shall be reviewed as a part of the subdivision or site plan review process by the approving authority. The approving authority may consult its professionals (as appropriate) to determine if all the checklist requirements have been satisfied and to determine if the project meets the standards set forth in this chapter.

C. Checklist requirements. The following information shall be required:

(1) Topographic base map. A topographic base map of the site shall be submitted which extends a minimum of 200 feet beyond the limits of the proposed development, at a scale of one inch equals 200 feet or greater, showing two-foot contour intervals. The map shall indicate existing surface water drainage; marshlands and other wetlands; pervious or vegetative surfaces; existing man-made structures; roads; bearing and distances of property lines; and significant natural and manmade features not otherwise shown. The reviewing professionals may require upstream tributary drainage system information as necessary.

(2) Environmental site analysis. A written and graphic description of the natural and man-made features of the site and its environs shall be provided. This description should include a discussion of soil conditions, slopes, wetlands, and vegetation on the site. Particular attention should be given to unique, unusual, or environmentally sensitive features and to those that provide particular opportunities or constraints for development.

(3) Project description and site plan(s). A map (or maps) at the scale of the topographical base map indicating the location of existing and proposed buildings, roads, parking areas, utilities, structural facilities for stormwater management and sediment control, and other permanent structures. The map(s) shall also clearly show areas where alterations occur in the natural terrain and cover, including lawns and other landscaping, and seasonal high groundwater elevations. A written description of the site plan and justification of proposed changes in natural conditions may also be provided.

(4) Stormwater management facilities map. The following information shall be provided and illustrated on a map of the same scale as the topographic base map:

(a) Total area to be paved or built upon, proposed surface contours, estimated land area to be occupied by the stormwater management facilities and the

type of vegetation thereon, and details of the proposed plan to control and dispose of surface water.

(b) Details of all stormwater management facility designs, during and after construction, including discharge provisions, discharge capacity for each outlet at different levels of detention and emergency spillway provisions with maximum discharge capacity of each spillway.

(5) Calculations.

(a) Comprehensive hydrologic and hydraulic design calculations for the predevelopment and postdevelopment conditions for the design storms as specified in Section 3 of this chapter.

(b) When the proposed stormwater management control measures (e.g., infiltration basins) depend on the hydrologic properties of soils, then a soils report shall be submitted. This soils report shall be based on on-site boring logs or soil pit profiles. The number and location of required soil borings or soil sites shall be determined based on what is needed to determine the suitability and distribution of soil types present at the location of the control measure. Borings must be conducted within the footprint of the proposed stormwater control measure.

(6) Maintenance and repair plan.

(a) The design and planning of the stormwater management facility shall meet the objectives of Section 3.8.

(b) Preventative, corrective and aesthetic functional maintenance procedures shall be detailed which ensure the continuation of the intended function of the facility.

(c) Maintenance and repair plans for stormwater management facilities shall identify the parts or components of the facility that need to be maintained, and when repairs are required, the equipment and skills or training necessary. Plans for stormwater management facilities shall detail the accessibility of maintenance personnel and equipment. Costs and sources of funds shall be identified when possible.

(d) A mandatory schedule shall be developed of when and how often maintenance will occur to maintain proper function of the stormwater management facility. To reduce the potential for extensive and costly remedial or emergency maintenance efforts, the schedule of maintenance activities shall include inspections to ensure proper performance of the facility between scheduled cleanouts.

(e) Where a stormwater management facility is used for sediment control during construction, a debris and sediment disposal site shall be confirmed before the facility is constructed. The disposal site may or may not be at the site of the proposed development. The responsible party shall demonstrate that he or

she is capable of financing the removal and disposal of debris and sediment before the facility is operating. Disposal site(s) shall be included in the soil erosion and sediment control plan and certified by the Hunterdon County Soil Conservation District.

(f) Provisions for periodic review and evaluations to determine the overall effectiveness of the maintenance programs and the need for revised or additional maintenance procedures, personnel and equipment shall be included in the facilities maintenance and repair plan.

**§ 148-65.4. Continued maintenance, repair and safety. [Added 6-17-2002 by Ord. No. 15-2002; amended 10-7-2002 by Ord. No. 40-2002]**

A. Applicability. Projects subject to review as specified in Section 1.4 of this chapter shall comply with the requirements of Section 5.2 and 5.3.

B. Responsibility for continued maintenance, repair and safety.

(1) The requirements of this section do not apply to stormwater management facilities that are dedicated to and accepted by the municipality or another governmental agency. Responsibility for operation and maintenance of stormwater management facilities, including periodic removal and disposal of accumulated particulate material and debris, shall remain with the property owner, unless assumed by a governmental agency, with permanent arrangements that it shall pass to any successor or owner. If portions of the land are to be sold, legally binding arrangements shall be made to pass the basic responsibility to successors in title. These arrangements shall designate for each project the property owner, governmental agency, or other legally established entity to be permanently responsible for inspection and maintenance, hereinafter in this section referred to as the "responsible person."

(2) Prior to granting approval or as a condition of final subdivision or site plan approval to any project subject to review under this chapter, the applicant shall enter into an agreement with the municipality to ensure the operation and maintenance of the stormwater management facility. In cases where property is subdivided and sold separately, a homeowners' association or similar permanent entity shall be established as a responsible person. Absent an agreement by a governmental agency to assume responsibility, it shall be demonstrated to the municipality that a proposed new responsible entity has the capability to complete and finance necessary maintenance.

(3) In the event that the stormwater management facility becomes a danger to public safety or public health, or if it is in need of maintenance, the municipality shall so notify the responsible person in writing. Upon receipt of that notice, the responsible person shall have 14 days to effect maintenance and repair of the facility in a manner that is approved by the Township professionals. If the responsible person fails or refuses to perform

such maintenance and repair, the municipality may immediately proceed to do so and shall bill the cost thereof to the responsible person.

(4) In no case shall the maintenance of a stormwater management facility intended to manage stormwater generated by multiple lots be the responsibility of an individual lot owner.

C. Continued maintenance and repair procedures.

(1) Preventive maintenance procedures are required to maintain the intended operation and safe condition of the stormwater management facility by reducing the occurrence of problems and malfunctions. To be effective, preventive maintenance shall be performed on a regular basis and include such routine procedures as training of staff, periodic inspections, grass cutting and fertilizing, silt and debris removal and disposal, upkeep of moving parts, elimination of mosquito breeding habitats, pond maintenance, and review of maintenance and inspection work to identify where the maintenance program could be more effective.

(2) Corrective maintenance procedures are required to correct a problem or malfunction at a stormwater management facility and to restore the facility's intended operation and safe condition. Based upon the severity of the problem, corrective maintenance must be performed on an as-needed or emergency basis and include such procedures as structural repairs, mosquito extermination, removal of debris, sediment and trash removal which threaten discharge capacity, erosion repair, snow and ice removal, fence repair and restoration of vegetated and nonvegetated lining.

D. Violations and penalties. Any responsible person who violates any portion of Section 5.2.3 or Section 5.3 of this chapter shall be subject to penalties and, upon conviction, shall be liable to a fine not exceeding $1,000, imprisonment for a term not exceeding 90 days and/or a period of community service not exceeding 90 days. Each and every day such violation continues shall be deemed to be a separate violation.