

**§ 175-140. Stormwater management. [Amended 4-16-1986 by Ord. No. 86; 10-3-1988 by Ord. No. O-21-1988; 12-17-1990 by Ord. No. O-29-90; 12-4-2006 by Ord. No. O:53-2006]**

A. General provisions.

(1) Purpose.

(a) It is hereby determined that:

- [1] Land development projects and associated disturbance of vegetation and soil and changes in land cover, including increases in impervious cover, alter the hydrologic response of local watersheds and increase stormwater runoff rates and volumes. If inadequately or improperly managed, this stormwater runoff can deplete groundwater resources and increase flooding, stream channel erosion, and sediment transport and deposition.
- [2] This stormwater runoff from land development projects contributes to increased quantities of waterborne pollutants.
- [3] Increases of stormwater runoff, soil erosion and nonpoint source pollutants have occurred in the past as a result of land development and contribute to the degradation of the water resources of the Township of Monroe and downstream municipalities.
- [4] Certain lands of the Township of Monroe lie within the Pinelands Area, and therefore, development in this portion of the Township of Monroe is subject to the requirements of the Pinelands Protection Act (N.J.S.A. 13:18A-1 et seq.) and the implementing regulations and minimum standards contained in the Pinelands Comprehensive Management Plan (N.J.A.C. 7:50-1.1 et seq.) (CMP). One purpose and intent of these regulations and standards is to promote orderly development of the Pinelands so as to preserve and protect the significant and unique natural, ecological, agricultural, archaeological, historical, scenic, cultural and recreational resources of the Pinelands. **[Amended 4-24-2007 by Ord. No. O:25-2007]**
- [5] Pinelands Area resources are to be protected in accordance with Pinelands Comprehensive

Management Plan at N.J.A.C. 7:50 et seq., New Jersey's Stormwater Management Rules at N.J.A.C. 7:8-1.1 et seq., and New Jersey's surface water quality anti-degradation policies contained in the New Jersey Surface Water Quality Standards at N.J.A.C. 7:9B-1.1 et seq. Permitted uses shall maintain the ecological character and quality of the Pinelands, including good water quality and natural rates and volumes of flow.

[6] Increased stormwater rates and volumes and the sediments and pollutants associated with stormwater runoff from future development projects within the Pinelands Area have the potential to adversely affect the Township of Monroe's streams and water resources and the streams and water resources of downstream municipalities.

[7] Stormwater runoff, soil erosion and nonpoint source pollution can be controlled and minimized through the regulation of stormwater runoff from development sites.

[8] It is in the public interest to regulate the discharge of stormwater runoff from major development projects, as defined in Subsection G of this section, conducted within the Pinelands Area, as provided in this section, in order to control and minimize increases in stormwater runoff rates and volumes, to maintain groundwater recharge, and to control and minimize soil erosion, stream channel erosion and nonpoint source pollution associated with stormwater runoff.

(b) Therefore, it is the purpose of this section to establish minimum stormwater management requirements and controls for major development, consistent with the statewide stormwater requirements at N.J.A.C. 7:8, the regulations and standards contained in the Pinelands CMP, and the provisions of the adopted master plan and land use ordinances of Monroe Township.

(2) Goals and techniques.

(a) Through this section, the Township of Monroe has established the following goals for stormwater control:

- [1] To reduce flood damage, including damage to life and property;
  - [2] To minimize any increase in stormwater runoff from new development;
  - [3] To reduce soil erosion from any development or construction project;
  - [4] To assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
  - [5] To maintain groundwater recharge;
  - [6] To minimize any increase in nonpoint pollution;
  - [7] To maintain the integrity of stream channels for their biological functions, as well as for drainage;
  - [8] To restore, protect, maintain and enhance the ecological character and quality of the streams and water resources of the Township of Monroe and the ecological character and quality of the Pinelands Area;
  - [9] To minimize pollutants in stormwater runoff from new and existing development in order to restore, protect, enhance and maintain the chemical, physical and biological integrity of the surface and groundwaters of the Township of Monroe, to protect public health and to enhance the domestic, municipal, recreational, industrial and other uses of water; and
  - [10] To protect public safety through the proper design and operation of stormwater management basins.
- (b) In order to achieve the goals for stormwater control set forth in this section, the Township of Monroe has identified the following management techniques:
- [1] Implementation of multiple stormwater management best management practices (BMPs) may be necessary to achieve the performance standards for stormwater runoff quantity and rate, groundwater recharge, erosion control, and stormwater runoff quality established through this section.
  - [2] Compliance with the stormwater runoff quantity and rate, groundwater recharge, erosion control, and

stormwater runoff quality standards established through N.J.A.C. 7:8-1.1 et seq., and this section, shall be accomplished to the maximum extent practicable through the use of nonstructural BMPs, before relying on structural BMPs.

- [3] Nonstructural BMPs shall include both environmentally sensitive site design and source controls that prevent pollutants from being placed on the site or from being exposed to stormwater.
- [4] Source control plans shall be developed based upon physical site conditions and the origin, nature and the anticipated quantity or amount of potential pollutants.
- [5] Structural BMPs, where necessary, shall be integrated with nonstructural stormwater management strategies and proper maintenance plans.
- [6] When using structural BMPs, multiple stormwater management measures, smaller in size and distributed spatially throughout the land development site, shall be used wherever possible to achieve the performance standards for water quality, quantity and groundwater recharge established through this section before relying on a single, larger stormwater management measure to achieve these performance standards.

(3) Applicability. This section shall apply to:

- (a) All site plans and subdivisions for major developments that require preliminary or final site plan or subdivision review; and **[Amended 4-24-2007 by Ord. No. O:25-2007]**
- (b) All major development projects undertaken by the Township of Monroe. (Note: This clause is intended to provide consistency with DEP's stormwater management requirements. As per normal practice, all development within the Pinelands Area which is undertaken by a Pinelands Area municipality shall comply with all of the requirements of the CMP.

- (4) Procedures. In addition to other development review procedures set forth in the Code of the Township of Monroe, major developments located within the Pinelands Area shall comply with the stormwater management requirements and specifications set forth in this section. New agricultural development that meets the definition of major development in Subsection G of this section shall be submitted to the appropriate Soil Conservation District for review and approval in accordance with the requirements of N.J.A.C. 5.4(b) 7:8.
- (5) Compatibility with other permit and ordinance requirements.
  - (a) Development approvals issued for subdivisions and site plans pursuant to this section are to be considered an integral part of development approvals under the subdivision and site plan review process and do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable ordinance, code, rule, regulation, statute, act or other provision of law.
  - (b) In their interpretation and application, the provisions of this section shall be held to be the minimum requirements for the promotion of the public health, safety, and general welfare. This section is not intended to interfere with, abrogate, or annul any other ordinances, rule or regulation, statute, or other provision of law except that, where any provision of this section imposes restrictions different from those imposed by any other ordinance, rule or regulation, or other provision of law, the more restrictive or stringent provisions or higher standards shall control.
  - (c) In the event that a regional stormwater management plan(s) is prepared and formally adopted pursuant to N.J.A.C. 7:8-1.1 et seq. for any drainage area(s) or watershed(s) of which the Township of Monroe is a part, the stormwater provisions of such a plan(s) shall be adopted by the Township of Monroe within one year of the adoption of a Regional Stormwater Management Plan (RSWMP) as an amendment to an Areawide Water Quality Management Plan. Local ordinances proposed to implement the RSWMP shall be submitted to the Commission for certification within six months of the

adoption of the RSWMP per N.J.A.C. 7:8 and the Pinelands CMP (N.J.A.C. 7:50).

B. Site development stormwater plan requirements.

- (1) Submission of site development stormwater plan.
  - (a) Whenever an applicant seeks municipal approval of a site development that is subject to this section, the applicant shall submit all of the required components of the checklist for the site development stormwater plan at Subsection B(3) below as part of the applicant's application for subdivision or site plan approval. These required components are in addition to any other information required under any provisions of the Township of Monroe's land use ordinance or by the Pinelands Commission pursuant to N.J.A.C. 7:50-1.1 et seq.
  - (b) The applicant shall demonstrate that the site development project meets the standards set forth in this section.
  - (c) The applicant shall submit three copies of the materials listed in the checklist for site development stormwater plans in accordance with Subsection B(3) of this section.
- (2) Site development stormwater plan approval. The applicant's site development stormwater plan shall be reviewed as a part of the subdivision or site plan review process by the municipal board or official from whom municipal approval is sought. That municipal board or official shall consult the engineer retained by the Planning and/or Zoning Board (as appropriate) to determine if all of the checklist requirements have been satisfied and to determine if the project meets the standards set forth in this section.
- (3) Checklist requirements.
  - (a) Any application for approval of a major development shall include at least the following information. All required engineering plans shall be submitted to the Township of Monroe and the Pinelands Commission in CAD Format 15 or higher, registered and rectified to NJ State Plane Feet NAD 83 or Shape Format NJ State Plan Feet NAD 83, and all other documents shall be submitted in both paper and commonly used electronic file formats such as PDF, word processing, database or spreadsheet files. Three copies of

each item shall be submitted. The municipality may choose to revise these criteria for consistency with its own software requirements.

- [1] Topographic base map. The applicant shall submit a topographic base map of the site which extends a minimum of 300 feet beyond the limits of the proposed development, at a scale of one inch equals 200 feet or greater, showing one-foot contour intervals. The map shall indicate the following: existing surface water drainage, shorelines, steep slopes, soils, highly erodible soils, perennial or intermittent streams that drain into or upstream of any Category One or Pinelands Waters, wetlands and floodplains along with their appropriate buffer strips, marshlands and other wetlands, pervious or vegetative surfaces, existing surface and subsurface human-made structures, roads, bearing and distances of property lines, and significant natural and man-made features not otherwise shown. The Township of Monroe or the Pinelands Commission may require upstream tributary drainage system information as necessary.
- [2] Environmental site analysis. The applicant shall submit a written description along with the drawings of the natural and human-made features of the site and its environs. This description should include:
  - [a] A discussion of environmentally critical areas, soil conditions, slopes, wetlands, waterways and vegetation on the site. Particular attention should be given to unique, unusual or environmentally sensitive features and to those that provide particular opportunities for or constraints on development; and
  - [b] Detailed soil and other environmental conditions on the portion of the site proposed for installation of any stormwater BMPs, including, at a minimum, a soils report based on on-site soil tests; locations and spot elevations in plan view of test pits and permeability tests; permeability test data and calculations; and any other required soil data (e.g., mounding analyses results) correlated with location and elevation of each test site;

cross-section of proposed stormwater BMP with side-by-side depiction of soil profile drawn to scale and seasonal high water table elevation identified; and any other information necessary to demonstrate the suitability of the specific proposed structural and nonstructural stormwater management measures relative to the environmental conditions on the portion(s) of the site proposed for implementation of those measures.

[3] Project description and site plan(s). The applicant shall submit 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 will 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 for proposed changes in natural conditions shall also be provided.

[4] Land use planning and source control plan.

[a] The applicant shall submit a detailed land use planning and source control plan which provides a description of how the site will be developed to meet the erosion control, groundwater recharge and stormwater runoff quantity and quality standards at Subsection D through use of nonstructural or low-impact development techniques and source controls to the maximum extent practicable before relying on structural BMPs. The land use planning and source control plan shall include a detailed narrative and associated illustrative maps and/or plans that specifically address how each of the following nine nonstructural strategies identified in Subchapter 5 of the NJDEP Stormwater Management Rules (N.J.A.C. 7:8-5) and set forth below Subsection B(3)(a)[4][i] through [ix] will be implemented to the maximum extent practicable to meet the standards at Subsection D of this

section on the site. If one or more of the nine nonstructural strategies will not be implemented on the site, the applicant shall provide a detailed rationale establishing a basis for the contention that use of the strategy is not practicable on the site.

- [i] Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss;
- [ii] Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces;
- [iii] Maximize the protection of natural drainage features and vegetation;
- [iv] Minimize the decrease in the predevelopment "time of concentration";
- [v] Minimize land disturbance including clearing and grading;
- [vi] Minimize soil compaction and all other soil disturbance;
- [vii] Provide low-maintenance landscaping that provides for the retention and planting of native plants and minimizes the use of lawns, fertilizers and pesticides within the entire Township; and specifically within the Pinelands Areas of the Township, this shall be in accordance with N.J.A.C. 7:50-6.24. **[Amended 4-24-2007 by Ord. No. O:25-2007]**
- [viii] Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas; and
- [ix] 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 shall include, but are not limited to:

- [A] Site design features that help to prevent accumulation of trash and debris in drainage systems;
  - [B] Site design features that help to prevent discharge of trash and debris from drainage systems;
  - [C] Site design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments; and
  - [D] Applying fertilizer in accordance with the requirements established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq., and implementing rules, when establishing vegetation after land disturbance.
- [b] For sites where stormwater will be generated from high pollutant loading areas or where stormwater will be exposed to source material, as defined in Subsection G of this section, the applicant shall also demonstrate in the land use planning and source control plan that the requirements of Subsection D have been met.
- [c] The use of nonstructural strategies to meet the performance standards in Subsection D of this section is not required for development sites creating less than one acre of disturbance. However, each application for major development within the Pinelands Areas of the Township shall contain a landscaping or revegetation plan in accordance with the Pinelands CMP standards at N.J.A.C. 7:50-6.24(c). In addition, the applicant shall demonstrate that, at a minimum, existing trees and vegetation on the development site will be preserved and protected according to the minimum standards established by provisions of the Monroe Township Land Use Ordinance, Zoning Ordinance or by conditions of zoning or variance approval, in all areas of the Township. **[Amended 4-24-2007 by Ord. No. O:25-2007]**

- [5] Stormwater management facilities map. The applicant shall submit a map, at the same scale as the topographic base map, depicting the following information:
- [a] The total area to be disturbed, paved and/or built upon, proposed surface contours, land area to be occupied by the stormwater management facilities and the type of vegetation thereon, and details of the proposed plan to manage and dispose of stormwater; and
  - [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 (if applicable) and emergency spillway provisions with maximum discharge capacity of each spillway.
- [6] Calculations (groundwater recharge and stormwater runoff rate, volume and quality). The applicant shall submit comprehensive hydrologic and hydraulic design calculations for the predevelopment and post-development conditions for the design storms specified in Subsection C. The standards for groundwater recharge and stormwater runoff rate, volume and quality required by Subsection D shall be met using the methods, calculations and assumptions provided in Subsection C.
- [7] Inspection, maintenance and repair plan. The applicant shall submit a detailed plan describing how the proposed stormwater management measure(s) shall meet the maintenance and repair requirements of Subsection F of this section. Said plan shall include, at a minimum, the following elements:
- [a] The frequency with which inspections will be made;
  - [b] The specific maintenance tasks and requirements for each proposed structural and nonstructural BMP;

- [c] The name, address and telephone number for the entity responsible for implementation of the maintenance plan;
  - [d] The reporting requirements; and
  - [e] Copies of the inspection and maintenance reporting sheets.
- (b) Exception from submission requirements. An exception may be granted from submission of any of these required components (except Subsection B(3)(a)[7] above, Inspection, Maintenance, and repair plan) if its absence will not materially affect the review process. However, items required pursuant to the application requirements in the Pinelands CMP [N.J.A.C. 7:50-4.2(b)] shall be submitted to the NJ Pinelands Commission unless the Executive Director waives or modifies the application requirements.
- C. Methodologies for the calculation of stormwater runoff rate and volume, stormwater runoff quality, and groundwater recharge.
- (1) Method of calculating stormwater runoff rate and volume.
- (a) In complying with the stormwater runoff quantity and rate standards in Subsection D(2) the design engineer shall calculate the stormwater runoff rate and volume using the USDA Natural Resources Conservation Service (NRCS) Runoff Equation, Runoff Curve Numbers, and Dimensionless Unit Hydrograph, as described in the NRCS National Engineering Handbook Part 630 — Hydrology and Technical Release 55 - Urban Hydrology for Small Watersheds incorporated herein by reference, as amended and supplemented. Alternative methods of calculation may be utilized, provided such alternative methods are at least as protective as the NRCS methodology when considered on a regional stormwater management basis.
  - (b) In calculating stormwater runoff using the NRCS methodology, the design engineer shall separately calculate and then combine the runoff volumes from pervious and directly connected impervious surfaces within each drainage area within the parcel.
  - (c) Calculation of stormwater runoff from unconnected impervious surfaces shall be based, as applicable, upon

the two-step method described in the current New Jersey Stormwater Best Management Practices Manual or the NRCS methodology.

- (d) In calculating stormwater runoff using the NRCS methodology, the design engineer shall use appropriate twenty-four-hour rainfall depths as developed for the project site by the National Oceanic and Atmospheric Administration, available online at <http://hdsc.nws.noaa.gov/hdsc/pfds/index.html>.
- (e) When calculating stormwater runoff for predeveloped site conditions, the design engineer shall use the following criteria:
  - [1] When selecting or calculating runoff curve numbers (CNs) for predeveloped project site conditions, the project site's land cover shall be assumed to be woods in good condition. However, another land cover may be used to calculate runoff coefficients if:
    - [a] Such land cover has existed at the site or portion thereof without interruption for at least five years immediately prior to the time of application; and
    - [b] The design engineer can document the character and extent of such land cover through the use of photographs, affidavits, and/or other acceptable land use records.
  - [2] If more than one land cover has existed on the site during the five years immediately prior to the time of application, the land cover with the lowest runoff potential shall be used for the computations.
  - [3] All predeveloped land covers shall be assumed to be in good hydrologic condition and, if cultivated, shall be assumed to have conservation treatment.
  - [4] In calculating predevelopment site stormwater runoff, the design engineer shall include the effects of all land features and structures, such as ponds, wetlands, depressions, hedgerows, and culverts, which affect predeveloped site stormwater runoff rates and/or volumes.
  - [5] Where tailwater will affect the hydraulic performance of a stormwater management measure, the design

engineer shall include such effects in the measure's design.

- (2) Method of calculating stormwater runoff quality.
  - (a) In complying with the stormwater runoff quality standards in Subsection D(6)(a), the design engineer shall calculate the stormwater runoff rate and volume using the USDA Natural Resources Conservation Service (NRCS) Runoff Equation, Runoff Curve Numbers, and Dimensionless Unit Hydrograph, as described in the NRCS National Engineering Handbook Part 630 - Hydrology and Technical Release 55 - Urban Hydrology for Small Watersheds, as amended and supplemented.
  - (b) The design engineer shall also use the NJDEP water quality design storm, which is 1.25 inches of rainfall falling in a nonlinear pattern in two hours. Details of the Water Quality Design Storm are shown in Table 1.
  - (c) Calculation of runoff volumes, peak rates, and hydrographs for the water quality design storm may take into account the implementation of nonstructural and structural stormwater management measures.

**Table 1: Water Quality Design Storm Distribution**  
**Source: N.J.A.C. 7:8-5.5(a).**

<b>Time (minutes)</b>	<b>Cumulative Rainfall (inches)</b>
0	0.0000
5	0.0083
10	0.0166
15	0.0250
20	0.0500
25	0.0750
30	0.1000
35	0.1330
40	0.1660
45	0.2000
50	0.2583
55	0.3583

**Table 1: Water Quality Design Storm Distribution**  
**Source: N.J.A.C. 7:8-5.5(a).**

<b>Time (minutes)</b>	<b>Cumulative Rainfall (inches)</b>
60	0.6250
65	0.8917
70	0.9917
75	1.0500
80	1.0840
85	1.1170
90	1.1500
95	1.1750
100	1.2000
105	1.2250
110	1.2334
115	1.2417
120	1.2500

(d) Total suspended solids (TSS) reduction calculations.

[1] If more than one stormwater BMP in series is necessary to achieve the required eighty-percent TSS reduction for a site, the applicant shall utilize the following formula to calculate TSS reduction:

$$R = A + B - (A \times B)/100$$

where:

- R = total TSS percent load removal from application of both BMPs;
- A = TSS percent removal rate applicable to the first BMP; and
- B = TSS percent removal rate applicable to the second BMP

[2] If there is more than one on-site drainage area, the eighty-percent TSS removal rate shall apply to each drainage area, unless the runoff from the subareas converge on site, in which case the removal rate can

be demonstrated through a calculation using a weighted average.

(e) TSS removal rates for stormwater BMPs.

[1] For purposes of TSS reduction calculations, Table 2 presents the presumed removal rates for certain BMPs designed in accordance with the New Jersey BMP Manual. The BMP Manual may be obtained from the address identified in Subsection L(1) or found on the NJDEP's website at [www.njstormwater.org](http://www.njstormwater.org). TSS reduction shall be calculated based on the removal rates for the BMPs in Table 2.

[2] Alternative stormwater management measures, removal rates and methods of calculating removal rates may be used if the design engineer provides documentation demonstrating the capability of these alternative rates and methods to the Township of Monroe. Any alternative stormwater management measure, removal rate or method of calculating the removal rate shall be subject to approval by the Township of Monroe and a copy shall be provided to the following:

[a] The Division of Watershed Management, New Jersey Department of Environmental Protection, P.O. Box 418, Trenton, NJ 08625-0418; and

[b] The New Jersey Pinelands Commission, P.O. Box 7, New Lisbon, NJ 08064.

**Table 2: Pollutant Removal Rates for BMPs**

**Source: 7:8-5.5(c) and New Jersey BMP Manual Chapter 4.**

<b>Best Management Practice</b>	<b>TSS Percent Removal Rate</b>	<b>Total Phosphorus Percent Removal Rate</b>	<b>Total Nitrogen Percent Removal Rate</b>
Bioretention systems	90%	60%	30%
Constructed stormwater wetland	90%	50%	30%

**Table 2: Pollutant Removal Rates for BMPs**

**Source: 7:8-5.5(c) and New Jersey BMP Manual Chapter 4.**

<b>Best Management Practice</b>	<b>TSS Percent Removal Rate</b>	<b>Total Phosphorus Percent Removal Rate</b>	<b>Total Nitrogen Percent Removal Rate</b>
Extended detention basin	40% to 60% (final rate based upon detention time; see New Jersey BMP Manual, Chap. 9)	20%	20%
Infiltration basin	80%	60%	50%
Manufactured treatment device	Pollutant removal rates as certified by NJDEP; see Subsection C.	Pollutant removal rates as certified by NJDEP; see Subsection C.	Pollutant removal rates as certified by NJDEP; see Subsection C.
Pervious paving systems	80% (porous paving)  80% (permeable pavers with storage bed)	60%	50%

**Table 2: Pollutant Removal Rates for BMPs**

**Source: 7:8-5.5(c) and New Jersey BMP Manual Chapter 4.**

<b>Best Management Practice</b>	<b>TSS Percent Removal Rate</b>	<b>Total Phosphorus Percent Removal Rate</b>	<b>Total Nitrogen Percent Removal Rate</b>
	0 - volume reduction only (permeable pavers without storage bed)	0 - volume reduction only (permeable pavers without storage bed)	0 - volume reduction only (permeable pavers without storage bed)
Sand filter	80%	50%	35%

**Table 2: Pollutant Removal Rates for BMPs**

**Source: 7:8-5.5(c) and New Jersey BMP Manual Chapter 4.**

<b>Best Management Practice</b>	<b>TSS Percent Removal Rate</b>	<b>Total Phosphorus Percent Removal Rate</b>	<b>Total Nitrogen Percent Removal Rate</b>
Vegetative filter strip (For filter strips with multiple vegetated covers, the final TSS removal rate should be based upon a weighted average of the adopted rates shown in Table 2, based upon the relative flow lengths through each cover type.)	60% (turf grass) 70% (native grasses, meadow and planted woods) 80% (indigenous woods)	30%	30%

**Table 2: Pollutant Removal Rates for BMPs**

**Source: 7:8-5.5(c) and New Jersey BMP Manual Chapter 4.**

<b>Best Management Practice</b>	<b>TSS Percent Removal Rate</b>	<b>Total Phosphorus Percent Removal Rate</b>	<b>Total Nitrogen Percent Removal Rate</b>
Wet pond/retention basin	50% to 90% (final rate based upon pool volume and detention time; see NJ BMP Manual)	50%	30%

(f) Nutrient removal rates for stormwater BMPs. For purposes of post-development nutrient load reduction calculations, Table 2 presents the presumed removal rates for certain BMPs designed in accordance with the New Jersey BMP Manual. If alternative stormwater BMPs are proposed, the applicant shall demonstrate that the selected BMPs will achieve the nutrient removal standard required in Subsection D(6).

(3) Methods of calculating groundwater recharge.

(a) If complying with the groundwater recharge standards contained in Subsection D(3)(a)[1], the design engineer may calculate groundwater recharge in accordance with the New Jersey Groundwater Recharge Spreadsheet (NJGRS) computer program incorporated herein by reference as amended and supplemented. Information regarding the methodology is available in Subsection L(1) or from the New Jersey BMP Manual.

(b) Alternative groundwater recharge calculation methods to meet these requirements may be used upon approval by the municipal engineer.

(c) If complying with the groundwater recharge standards contained in Subsection D(3)(a)[2], the design engineer shall:

- [1] Calculate stormwater runoff volumes in accordance with the USDA Natural Resources Conservation Service (NRCS) methodology, including the NRCS Runoff Equation and Runoff Curve Numbers, as described in the NRCS National Engineering Handbook Part 630 - Hydrology and Technical Release 55 - Urban Hydrology for Small Watersheds as amended and supplemented; and
  - [2] Use appropriate two-year, twenty-four-hour rainfall depths as developed for the project site by the National Oceanic and Atmospheric Administration, available online at <http://hdsc.nws.noaa.gov/hdsc/pfds/index.html>.
- (d) When calculating groundwater recharge or stormwater runoff for predeveloped site conditions, the design engineer shall use the following criteria:
- [1] When selecting land covers or calculating runoff curve numbers (CNs) for predeveloped project site conditions, the project site's land cover shall be assumed to be woods. However, another land cover may be used to calculate runoff coefficients if:
    - [a] Such land cover has existed at the site or portion thereof without interruption for at least five years immediately prior to the time of application; and
    - [b] The design engineer can document the character and extent of such land cover through the use of photographs, affidavits, and/or other acceptable land use records.
  - [2] If more than one land cover, other than woods, has existed on the site during the five years immediately prior to the time of application, the land cover with the lowest runoff potential (including woods) shall be used for the computations.
  - [3] All predeveloped land covers shall be assumed to be in good hydrologic condition and, if cultivated, shall be assumed to have conservation treatment.
- D. Stormwater management performance standards for major development.
- (1) Nonstructural stormwater management strategies.

- (a) To the maximum extent practicable, the performance standards in Subsection D for major development shall be met by incorporating the nine nonstructural strategies identified in Subchapter 5 of the NJ Stormwater Management Rules (N.J.A.C. 7:8-5), and set forth in Subsection B(3)(a)[4][a], into the design. The applicant shall identify within the land use planning and source control plan required by Subsection B(3)(a)[4] of this section how each of the nine nonstructural measures will be incorporated into the design of the project to the maximum extent practicable.
- (b) If the applicant contends that it is not practical for engineering, environmental or safety reasons to incorporate any of the nine nonstructural strategies into the design of a particular project, the applicant shall provide a detailed rationale establishing a basis for the contention that use of the strategy is not practical on the site. This rationale shall be submitted in accordance with the checklist requirements established by Subsection B to the Township of Monroe. A determination by the Township of Monroe that this rationale is inadequate or without merit shall result in a denial of the application unless one of the following conditions are met:
- [1] The land use planning and source control plan is amended to include a description of how all nine nonstructural measures will be implemented on the development site, and the amended plan is approved by the Township of Monroe;
  - [2] The land use planning and source control plan is amended to provide an alternative nonstructural strategy or measure that is not included in the list of nine nonstructural measures, but still meets the performance standards in Subsection D, and the amended plan is approved by the Township of Monroe; or
  - [3] The land use planning and source control plan is amended to provide an adequate rationale for the contention that use of the particular strategy is not practical on the site, and the amended plan is approved by the Township of Monroe.

- (c) In addition to all other requirements of this subsection, each applicant shall demonstrate that, at a minimum, existing trees and vegetation on the development site will be preserved, protected and maintained according to the minimum standards established by provisions of the Township of Monroe's Land Use Ordinance, Zoning Ordinance or by conditions of zoning or variance approval. Existing trees and vegetation shall be protected during construction activities in accordance with the Standard for Tree Protection During Construction provided in the NJ State Soil Conservation Committee Standards for Soil Erosion and Sediment Control in New Jersey, which is incorporated herein by reference as amended and supplemented.
- (d) In addition to all other requirements of this section, each application for major development within the Pinelands Areas of the Township shall contain a landscaping or revegetation plan in accordance with the Pinelands CMP standards at N.J.A.C. 7:50-6.24(c). **[Amended 4-24-2007 by Ord. No. O:25-2007]**
- (e) Any land area used as a nonstructural stormwater management measure to meet the performance standards in Subsection D shall be dedicated to a government entity; shall be subjected to a conservation easement filed with the appropriate County Clerk's office; or shall be subjected to an equivalent form of restriction approved by the Township of Monroe that ensures that that measure, or equivalent stormwater management measure, is maintained in perpetuity, as detailed in Subsection F of this section.
- (f) Guidance for nonstructural stormwater management strategies is available in the New Jersey BMP Manual, which may be obtained from the address identified in Subsection L(1) or found on the NJDEP's website at [www.njstormwater.org](http://www.njstormwater.org).
- (g) Exception for major development sites creating less than one acre of disturbance. The use of nonstructural strategies to meet the performance standards in Subsection D of this section is not required for major development creating less than one acre of disturbance. However, the following requirements shall be met: **[Amended 4-24-2007 by Ord. No. O:25-2007]**

- [1] Each application for major development within the Pinelands Areas of the Township shall contain a landscaping or revegetation plan in accordance with the Pinelands CMP standards at N.J.A.C. 7:50-6.24(c).
  - [2] Each applicant shall demonstrate that, at a minimum, existing trees and vegetation on the development site will be preserved and protected according to the minimum standards established by provisions of the Monroe Township Land Use Ordinance, Zoning Ordinance, or by conditions of zoning or variance approval, in all areas of the Township; and
  - [3] Existing trees and vegetation shall be protected in all areas of the Township during construction activities in accordance with the Standard for Tree Protection During Construction provided in the NJ State Soil Conservation Committee Standards for Soil Erosion and Sediment Control in New Jersey, which is incorporated herein by reference as amended and supplemented.
- (2) Stormwater runoff quantity and rate standards.
- (a) For all developments proposed in the Pinelands portion of the municipality only, there shall be no direct discharge of stormwater runoff from any point or nonpoint source to any wetland, wetlands transition area or surface water body. In addition, stormwater runoff shall not be directed in such a way as to increase the volume and/or rate of discharge into any surface water body from that which existed prior to development of the site.
  - (b) To the maximum extent practical, there shall be no direct discharge of stormwater runoff onto farm fields in all areas of the Township so as to protect farm crops from damage due to flooding, erosion and long-term saturation of cultivated crops and cropland. **[Amended 4-24-2007 by Ord. No. O:25-2007]**
  - (c) For all major developments proposed in the Pinelands portion of the municipality only, the total runoff volume generated from the net increase in impervious surfaces by a ten-year, twenty-four-hour storm shall be retained and infiltrated on-site.

- (d) In all areas of the Township, the design engineer, using the assumptions and factors for stormwater runoff and groundwater recharge calculations contained in Subsection C, shall either: **[Amended 4-24-2007 by Ord. No. O:25-2007]**
- [1] Demonstrate through hydrologic and hydraulic analysis that the post-development stormwater runoff hydrographs from the project site for the two-, ten-, and one-hundred-year storms do not exceed, at any point in time, the site's predeveloped runoff hydrographs for the same storms;
  - [2] Demonstrate through hydrologic and hydraulic analysis that, under post-development site conditions:
    - [a] There is no increase in predevelopment stormwater runoff rates from the project site for the two-, ten-, and one-hundred-year storms; and
    - [b] Any increased stormwater runoff volume or change in stormwater runoff timing for the two-, ten-, and one-hundred-year storms will not increase flood damage at or downstream of the project site. When performing this analysis for predevelopment site conditions, all off-site development levels shall reflect existing conditions. When performing this analysis for post-development site conditions, all off-site development levels shall reflect full development in accordance with current zoning and land use ordinances; or
  - [3] Demonstrate that the peak post-development stormwater runoff rates from the project site for the two-, ten-, and one-hundred-year storms are 50%, 75% and 80%, respectively, of the site's peak predevelopment stormwater runoff rates for the same storms. Peak outflow rates from on-site stormwater measures for these storms shall be adjusted where necessary to account for the discharge of increased stormwater runoff rates and/or volumes from project site areas not controlled by the on-site measures. These percentages do not have to be applied to those portions of the project site that are not proposed for

development at the time of application, provided that such areas:

[a] Are protected from future development by imposition of a conservation easement, deed restriction, or other acceptable legal measures; or

[b] Would be subject to review under these standards if they are proposed for any degree of development in the future.

(e) In tidal flood hazard areas, a stormwater runoff quantity analysis in accordance with Subsection D(2)(d)[1], [2] and [3] above shall only be applied if the increased volume of stormwater runoff could increase flood damages below the point of discharge.

(f) The standards for stormwater runoff quantity and rate required by this subsection shall be met using the methods, calculations and assumptions provided in Subsection C.

(3) Groundwater recharge standards.

(a) For all major developments, with the exception of those described in Subsection D(3)(d) below, the design engineer, using the assumptions and factors for stormwater runoff and groundwater recharge calculations contained in Subsection C, shall either:

[1] Demonstrate through hydrologic and hydraulic analysis that the post-development project site maintains 100% of the site's predevelopment average annual groundwater recharge volume; or

[2] Demonstrate through hydrologic and hydraulic analysis that any increase in the project site's stormwater runoff volume for the two-year, twenty-four-hour storm from predevelopment to post-development conditions is infiltrated on-site.

(b) The design engineer shall assess the hydraulic impact on the groundwater table and design the project site and all site groundwater recharge measures so as to avoid adverse hydraulic impacts. Adverse hydraulic impacts include, but are not limited to, raising the groundwater table so as to cause surface ponding; flooding of

basements and other subsurface structures and areas; preventing a stormwater infiltration basin from completely draining via infiltration within 72 hours of a design storm event; and interference with the proper operation of subsurface sewage disposal systems and other surface and subsurface facilities in the vicinity of the groundwater recharge measure.

(c) The standards for groundwater recharge required by this subsection shall be met using the methods, calculations and assumptions provided in Subsection C.

(d) Exceptions.

[1] The preceding groundwater recharge standards shall not apply to sites that create less than one acre of disturbance. The municipality may choose to remove this exception in its adoption of this section.

[2] The preceding groundwater recharge standards shall not apply to projects within the urban redevelopment area, or to projects subject to Subsection D(3)(d)[3] below, proposed in the Non-Pinelands portion of the municipality only.

[3] The following types of stormwater shall not be recharged:

[a] Stormwater from areas of high pollutant loading. 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 a department-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; and

[b] Industrial stormwater exposed to source material. "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.

- (4) Erosion control standards. The minimum design and performance standards for erosion control are those established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq., and its implementing regulations, N.J.A.C. 2:90-1.1 through 1.4.
- (5) Stormwater runoff quality standards.
  - (a) In the Pinelands Areas of the Township, there should be no direct discharge of stormwater runoff from any point or nonpoint source to any surface water body.
  - (b) In all areas of the Township, stormwater management measures shall be designed to reduce the total suspended solids (TSS) load in the stormwater runoff from the post-development site by 80%, expressed as an annual average. **[Amended 4-24-2007 by Ord. No. O:25-2007]**
  - (c) In all areas of the Township, stormwater management measures shall also be designed to reduce the nutrient load in the stormwater runoff from the post-development site by the maximum extent practicable. In achieving this reduction, the design of the development site shall include nonstructural and structural stormwater management measures that optimize nutrient removal while still achieving the groundwater recharge, runoff quantity and rate, and TSS removal standards in this section. **[Amended 4-24-2007 by Ord. No. O:25-2007]**
  - (d) The standards for stormwater runoff quality required by this subsection shall be met using the methods, calculations, assumptions and pollutant removal rates provided in Subsection C.

## (e) Exceptions.

[1] The preceding stormwater runoff quality standards shall not apply to the following major development sites:

[a] Major development sites where less than 0.25 acre of additional impervious surface is proposed; or

[b] Major residential development sites that create less than one acre of disturbance.

[2] The TSS reduction requirement in Subsection D(6)(b) shall not apply to any stormwater runoff in a discharge regulated under a numeric effluent limitation for TSS imposed under the NJPDES rules (N.J.A.C. 7:14A) or in a discharge specifically exempt under a NJPDES permit from this requirement.

[3] The stormwater runoff quantity and rate standards in Subsection D(2) shall still be met for all major development sites.

(6) Additional stormwater quality standards for high pollutant loading areas and areas where stormwater runoff is exposed to source material.

(a) This subsection applies to the following areas of a major development, as defined in Subsection G of this section, proposed in the Pinelands portion of the municipality only:

[1] High pollutant loading areas (HPLAs); and

[2] Areas where stormwater is exposed to source material.

(b) For a major development in areas described in Subsection D(6)(a)[1] or [2] above, in addition to the infiltration requirements specified in Subsection D(2)(c) and the groundwater recharge requirements specified in Subsection D(3), the applicant shall demonstrate in the land use planning and source control plan required in Subsection B(3)(a)[4] that the following requirements have been met: **[Amended 4-24-2007 by Ord. No. O:25-2007]**

- [1] The extent of the areas described in Subsection D(6)(a)[1] and [2] above have been minimized on the development site to the maximum extent practicable;
- [2] The stormwater runoff from the areas described in Subsection D(6)(a)[1] and [2] above is segregated to the maximum extent practicable from the stormwater runoff generated from the remainder of the site such that comingling of the stormwater runoff from the areas described in Subsection D(6)(a)[1] and [2] above and the remainder of the site will be minimized;
- [3] The amount of precipitation falling directly on the areas described in Subsection D(6)(a)[1] and [2] above is minimized to the maximum extent practicable by means of a canopy, roof or other similar structure that reduces the generation of stormwater runoff; and
- [4] The stormwater runoff from or commingled with the areas described in Subsection D(6)(a)[1] and [2] above for the water quality design storm, defined in Subsection C(2), Table 1 shall be subject to pretreatment by one or more of the following stormwater BMPs, designed in accordance with the New Jersey BMP Manual, to provide ninety-percent TSS removal:
  - [a] Bioretention system;
  - [b] Sand filter;
  - [c] Wet ponds which shall be hydraulically disconnected by a minimum of two feet of vertical separation from seasonal high water table and shall be designated to achieve a minimum eighty-percent TSS removal rate;
  - [d] Constructed stormwater wetlands; and/or
  - [e] Media filtration system manufactured treatment device with a minimum eighty-percent TSS removal as verified by the New Jersey Corporation for Advanced Technology and as certified by NJDEP.

- [5] If the potential for contamination of stormwater runoff by petroleum products exists on-site, prior to being conveyed to the pretreatment BMP required in Subsection D(6)(b)[4] above, the stormwater runoff from the areas described in Subsection D(6)(a)[1] and [2] above shall be conveyed through an oil/grease separator or other equivalent manufactured filtering device to remove the petroleum hydrocarbons. The applicant shall provide the reviewing agency with sufficient data to demonstrate acceptable performance of the device.
- (7) Threatened and endangered species and associated habitat standards. Stormwater management measures shall avoid adverse impacts of the development on habitat for threatened and endangered species, in accordance with N.J.A.C. 7:8-5.2(c), N.J.A.C. 7:50-6.27, and N.J.A.C. 7:50-6.33 and 34.
- (8) Exceptions and mitigation requirements.
- (a) For projects proposed within the Pinelands Areas of the Township only, exceptions from strict compliance from the groundwater recharge, stormwater runoff quantity, and stormwater runoff quality requirements established by this section may be granted, at the discretion of the Township of Monroe, and subject to approval by the Pinelands Commission, provided that all of the following conditions are met: **[Amended 4-24-2007 by Ord. No. O:25-2007]**
- [1] The exception is consistent with that allowed by the Township of Monroe;
- [2] The Township of Monroe has an adopted and effective municipal stormwater management plan in accordance with N.J.A.C. 7:8-4.4, which includes a mitigation plan in accordance with N.J.A.C. 7:8-4.2(c)11, and is also certified by the Pinelands Commission. The mitigation plan shall identify what measures are necessary to offset the deficit created by granting the exception and the municipality shall submit a written report to the county review agency and the NJDEP describing the exception and the required mitigation. Guidance for developing municipal stormwater management plans, including mitigation plans, is available from the NJDEP, Division

of Watershed Management, and the New Jersey BMP Manual.

[3] The applicant demonstrates that mitigation, in addition to the requirements of mitigation plan discussed in Subsection D(8)(a)[2] above, will be provided consistent with one of the following options:

[a] Mitigation may be provided off-site, but within the Pinelands Area and within the same drainage area as the development site, and shall meet or exceed the equivalent recharge, quality or quantity performance standard which is lacking on the development site due to the exception; or

[b] In lieu of the required mitigation, a monetary "in lieu contribution" may be provided by the applicant to the Township of Monroe in accordance with the following:

[i] The amount of the in-lieu contribution shall be determined by the Township of Monroe, but the maximum in-lieu contribution required shall be equivalent to the cost of implementing and maintaining the stormwater management measure(s) for which the exception is granted;

[ii] The in-lieu contribution shall be used to fund an off-site stormwater control mitigation project(s) located within the Pinelands Area, within the same drainage area as the development site, and shall meet or exceed the equivalent recharge, quality or quantity performance standards which is lacking on the development site. Such mitigation project shall be identified by the Township of Monroe in the Township's adopted municipal stormwater management plan. The stormwater control project to which the monetary contribution will be applied shall be identified by the Township of Monroe at the time the exception is granted. The applicant shall amend the project description and site plan required in Subsection B(3)(a)[3] to incorporate a description of both the

standards for which an on-site exception is being granted and of the selected off-site mitigation project.

[iii] The Township of Monroe shall expend the in-lieu contribution to implement the selected off-site mitigation project within five years from the date that payment is received. Should the Township of Monroe fail to expend the in-lieu contribution within the required time frame, the mitigation option provided in Subsection D(8)(a)[3][b] of this section shall be void and the Township of Monroe shall be prohibited from collecting in-lieu contributions.

(b) An exception from strict compliance granted in accordance with Subsection D(8)(a) above shall not constitute a waiver of strict compliance from the requirements of the Pinelands Comprehensive Management Plan at N.J.A.C. 7:50. An applicant should contact the Pinelands Commission to determine whether a waiver of strict compliance is also required in accordance with N.J.A.C. 7:50, Subchapter 4, Part V.

E. Design, construction, and safety standards for structural stormwater management measures.

(1) General design and construction standards. **[Amended 4-24-2007 by Ord. No. O:25-2007; 6-5-2014 by Ord. No. O:12-2014]**

(a) Structural stormwater management measures shall be designed to meet the standards established in this subsection. These standards have been developed to protect public safety, conserve natural features, create an aesthetically pleasing site and promote proper on-site stormwater management. (Note: Though not required by N.J.A.C. 7:8, pursuant to their authority, municipalities may have the option to require existing basins that pose a public health or safety hazard to be retrofitted to comply with the standards in this subsection.

(b) The following structural stormwater management measures may be utilized as part of a stormwater management system at a major land development in the Pinelands, provided that the applicant demonstrates that

they are designed, constructed and maintained so as to meet the standards and requirements established by this section. If alternative stormwater management measures are proposed, the applicant shall demonstrate that the selected measures will achieve the standards established by this section.

- [1] Bioretention systems;
  - [2] Constructed stormwater wetlands;
  - [3] Extended detention basins;
  - [4] Infiltration basins;
  - [5] Vegetated filter strips;
  - [6] Infiltration basins and trenches;
  - [7] Wet ponds with suitable liners;
  - [8] Pervious paving systems; and
  - [9] Manufactured treatment devices, provided their pollutant removal rates are verified by the New Jersey Corporation for Advanced Technology and certified by the NJDEP.
- (c) 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.
- (d) Structural stormwater management measures shall be designed and constructed to be strong, durable, and corrosion-resistant (measures that are consistent with the relevant portions of the Residential Site Improvement Standards at N.J.A.C. 5:21-7.3, 7.4, and 7.8 shall be deemed to meet this requirement); to minimize and facilitate maintenance and repairs; and to ensure proper functioning.
- (e) The use of corrugated polyethylene pipe shall have a minimum cover of 18 inches below the bottom of the stabilized subgrade for H525 live loads for up to thirty-six-inch-diameter pipe. Pipe greater than 36 inches in

diameter shall only be permitted after review and approval of the Planning or Zoning Board engineer.

- (f) Extreme care must be taken when heavy equipment crosses the pipe trench during construction, including construction of the various elements of the site plan or subdivision, including curb, sidewalk, pavement, etc. Compacted fill in the form of a ramp shall be constructed to a minimum elevation of three feet above the top of the pipe trench and maintained during the duration of the construction until pavement is installed.
- (g) Strict backfill requirements shall be approved by the Township Engineer upon submission by the project engineer prior to any installation. Backfill shall include the use of engineered flowable fill to a depth of 2/3 of the pipe diameter. Strict compliance to the manufacturer's installation standards will be observed.
- (h) Full-time inspection by Township personnel of the installation of corrugated polyethylene pipe shall be required.
- (i) Mandrel testing of all HDPE pipe shall be completed before paving begins. Any pipe exceeding a deflection of 7.5% shall be removed and replaced.
- (j) Video inspection of the stormwater collection system will be required before final paving is completed.
- (k) Use of perforated corrugated polyethylene pipe for recharge purposes shall not be permitted under roadways, drives or parking lots.
- (l) For all stormwater management measures at a development site, each applicant shall submit a detailed inspection, maintenance and repair plan consistent with the requirements of Subsection E of this section.
- (m) To the maximum extent practicable, the design engineer shall design structural stormwater management measures on the development site in a manner that:
  - [1] Limits site disturbance, maximizes stormwater management efficiencies, and maintains or improves aesthetic conditions;

- [2] Utilizes multiple stormwater management measures, smaller in size and distributed spatially throughout the land development site, instead of a single larger structural stormwater management measure;
  - [3] Incorporates pretreatment measures. Pretreatment can extend the functional life and increase the pollutant removal capability of a structural stormwater management measure. Pretreatment measures may be designed in accordance with the New Jersey BMP Manual or other sources approved by the municipal engineer.
- (n) Stormwater management basins shall be designed in a manner that complements and mimics the existing natural landscape, including but not limited to the following design strategies:
- [1] Use of natural, nonwetland wooded depressions for stormwater runoff storage; and
  - [2] Establishment of attractive landscaping in and around the basin that mimics the existing vegetation and, in the Pinelands Areas of the Township, incorporates native Pinelands plants, including, but not limited to, the species listed in N.J.A.C. 7:50-6.25 and 6.26.
- (o) Stormwater management basins shall be designed with gently sloping sides. The maximum allowable basin side slope shall be three horizontal to one vertical.
- (p) Guidance on the design and construction of structural stormwater management measures may be found in the New Jersey BMP Manual. Other guidance sources may also be used upon approval by Planning Board or Zoning Board engineer.
- (q) After all construction activities and required field testing have been completed on the development site, as-built plans depicting design and as-built elevations of all stormwater management measures shall be prepared by a licensed land surveyor and submitted to the Township Engineer. Based upon the Township Engineer's review of the as-built plans, all corrections or remedial actions deemed by the Township Engineer to be necessary due to the failure to comply with the standards established by

this section and/or any reasons of public health or safety shall be completed by the applicant. In lieu of review by the Township Engineer, the Township of Monroe reserves the right to engage a professional engineer to review the as-built plans. The applicant shall pay all costs associated with such review.

- (2) Design and construction standards for stormwater infiltration BMPs.
  - (a) Stormwater infiltration BMPs, such as bioretention systems with infiltration, dry wells, infiltration basins, pervious paving systems with storage beds, and sand filters with infiltration, shall be designed, constructed and maintained to completely drain the total runoff volume generated by the basin's maximum design storm within 72 hours after a storm event. Runoff storage for greater times can render the BMP ineffective and may result in anaerobic conditions, odor and both water quality and mosquito breeding problems.
  - (b) Stormwater infiltration BMPs shall be designed, constructed and maintained to provide a minimum separation of at least two feet between the elevation of the lowest point of the bottom of the infiltration BMP and the seasonal high water table.
  - (c) For all developments proposed in the Pinelands portion of the municipality only, a stormwater infiltration BMP shall be sited in suitable soils verified by field testing to have permeability rates between one inch and 20 inches per hour. If such site soils do not exist or if the design engineer demonstrates that it is not practical for engineering, environmental or safety reasons to site the stormwater infiltration BMP(s) in such soils, then the stormwater infiltration BMP(s) may be sited in soils verified by field testing to have permeability rates in excess of 20 inches per hour, provided that a bioretention system, designed, installed and maintained in accordance with the New Jersey BMP Manual, is installed to meet one of the following conditions:
    - [1] The bioretention system is constructed as a separate measure designed to provide pretreatment of stormwater and to convey the pretreated stormwater into the infiltration BMP; or

- [2] The bioretention system is integrated into and made part of the infiltration BMP and, as such, does not require an underdrain system. If this option is selected, the infiltration BMP shall be designed and constructed so that the maximum water depth in the bioretention system portion of the BMP during treatment of the stormwater quality design storm is 12 inches in accordance with the New Jersey BMP Manual.
- (d) The minimum design permeability rate for the soil within a BMP that relies on infiltration shall be 0.5 inch per hour. A factor of safety of two shall be applied to the soil's field-tested permeability rate to determine the soil's design permeability rate. For example, if the field-tested permeability rate of the soil is four inches per hour, its design permeability rate would be two inches per hour. The minimum design permeability rate for the soil within a stormwater infiltration basin shall also be sufficient to achieve the minimum seventy-two-hour drain time described in Subsection E(2)(a) above. The maximum design permeability shall be 10 inches per hour.
- (e) A soil's field-tested permeability rate shall be determined in accordance with the following:
- [1] The predevelopment field test permeability rate shall be determined according to the methodologies provided in Subsection K(3)(c) of this section;
- [2] The results of the required field permeability tests shall demonstrate a minimum tested infiltration rate of one inch per hour;
- [3] After all construction activities have been completed on the site and the finished grade has been established in the infiltration BMP, post-development field permeability tests shall also be conducted according to the methodologies provided in Subsection K(3)(c) of this section;
- [4] If the results of the post-development field permeability tests fail to achieve the minimum required design permeability rates in Subsection E(2)(e) above utilizing a factor of safety of two, the stormwater infiltration BMP shall be renovated and

retested until such minimum required design permeability rates are achieved; and

[5] The results of all field permeability tests shall be certified by a professional engineer and transmitted to the municipal engineer.

- (f) To help ensure maintenance of the design permeability rate over time, a six-inch layer of K5 soil shall be placed on the bottom of a stormwater infiltration BMP. This soil layer shall meet the textural and permeability specifications of a K5 soil as provided at N.J.A.C. 7:9A, Appendix A, Figure 6, and be certified to meet these specifications by a professional engineer licensed in the State of New Jersey. The depth to the seasonal high water table shall be measured from the bottom of the K5 sand layer.
- (g) The design engineer shall assess the hydraulic impact on the groundwater table and design the project site and all stormwater infiltration basins so as to avoid adverse hydraulic impacts. Adverse hydraulic impacts include, but are not limited to, raising the groundwater table so as to cause surface ponding; flooding of basements and other subsurface structures and areas; preventing a stormwater infiltration basin from completely draining via infiltration within 72 hours of a design storm event; and interference with the proper operation of subsurface sewage disposal systems and other surface and subsurface structures in the vicinity of the stormwater infiltration basin.
- (h) The design engineer shall conduct a mounding analysis, as defined in Subsection G, of all stormwater infiltration BMPs. The mounding analysis shall be conducted in accordance with the requirements in Subsection K(3)(c)[1]. Where the mounding analysis identifies adverse impacts, the stormwater infiltration BMP shall be redesigned or relocated, as appropriate.
- (i) Stormwater infiltration BMPs shall be constructed in accordance with the following:
  - [1] To avoid sedimentation that may result in clogging and reduce the basin's permeability rate, stormwater infiltration basins shall be constructed according to the following:

- [a] Unless the conditions in Subsection E(2)(i)[1][b] below are met, a stormwater infiltration BMP shall not be placed into operation until its drainage area is completely stabilized. Instead, upstream runoff shall be diverted around the BMP and into separate, temporary stormwater management facilities and sediment basins. Such temporary facilities and basins shall be installed and utilized for stormwater management and sediment control until stabilization is achieved in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey, which is incorporated herein by reference as amended and supplemented.
- [b] If the design engineer determines that, for engineering, environmental or safety reasons, temporary stormwater management facilities and sediment basins cannot be constructed on the site, the stormwater infiltration basin may be placed into operation prior to the complete stabilization of its drainage area, provided that the basin's bottom during this period is constructed at a depth at least two feet higher than its final design elevation. All other infiltration BMP construction requirements in this section shall be followed. When the drainage area is completely stabilized, all accumulated sediment shall be removed from the infiltration BMP, which shall then be excavated to its final design elevation in accordance with the construction requirements of this section and the performance standards in Subsection D.
- [2] To avoid compaction of subgrade soils of BMPs that rely on infiltration, no heavy equipment such as backhoes, dump trucks or bulldozers shall be permitted to operate within the footprint of the BMP. All excavation required to construct a stormwater infiltration BMP shall be performed by equipment placed outside the BMP. If this is not possible, the soils within the excavated area shall be renovated and tilled after construction is completed to reverse the effects of compaction. In addition, post-development soil permeability testing shall be performed in

accordance with Subsection E(2)(e) of this subsection.

[3] Earthwork associated with stormwater infiltration BMP construction, including excavation, grading, cutting or filling, shall not be performed when soil moisture content is above the lower plastic limit.

(3) Safety standards for structural stormwater management measures.

(a) If a structural stormwater management measure has an outlet structure, escape provisions shall be incorporated in or on the structure. "Escape provisions" means the permanent installation of ladders, steps, rungs, or other features that provide readily accessible means of ingress and egress from the outlet structure.

(b) A trash rack is a device intended to intercept runoff-borne trash and debris that might otherwise block the hydraulic openings in an outlet structure of a structural stormwater management measure. Trash racks shall be installed upstream of such outlet structure openings as necessary to ensure proper functioning of the structural stormwater management measure in accordance with the following:

[1] The trash rack should be constructed primarily of bars aligned in the direction of flow with one-inch spacing between the bars to the elevation of the water quality design storm. For elevations higher than the water quality design storm, the bars shall be spaced no greater than 1/3 the width of the hydraulic opening it is protecting or six inches, whichever is less. Transverse bars aligned perpendicular to flow should be sized and spaced as necessary for rack stability and strength.

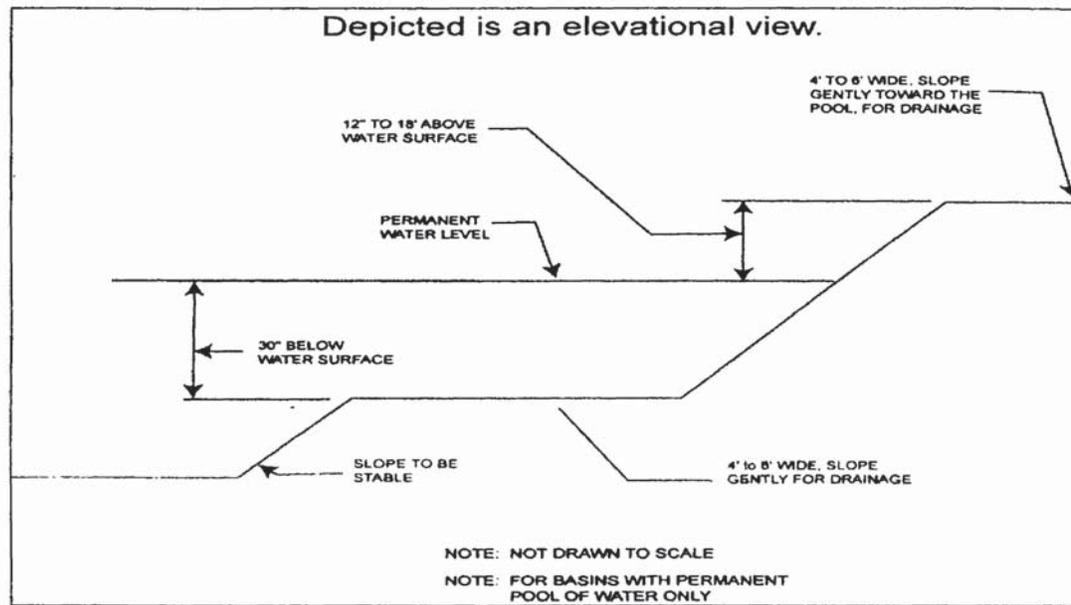
[2] The trash rack shall not adversely affect the hydraulic performance of either the outlet structure opening it is protecting or the overall outlet structure.

[3] The trash rack shall have sufficient net open area under clean conditions to limit the peak design storm velocity through it to a maximum of 2.5 feet per second.

[4] The trash rack shall be constructed and installed to be rigid, durable, and corrosion-resistant, and shall

be designed to withstand a perpendicular live loading of 300 pounds per square foot.

- (c) An overflow grate is a device intended to protect the opening in the top of a stormwater management measure outlet structure. If an outlet structure has an overflow grate, such grate shall meet the following requirements:
  - [1] The overflow grate shall be secured to the outlet structure but be removable for emergencies and maintenance;
  - [2] The overflow grate spacing shall be no more than two inches across the smallest dimension; and
  - [3] The overflow grate shall be constructed and installed to be rigid, durable, and corrosion-resistant, and shall be designed to withstand a perpendicular live loading of 300 pounds per square foot.
- (d) The maximum side slope for an earthen dam, embankment, or berm shall not be steeper than three horizontal to one vertical.
- (e) Safety ledges shall be constructed on the slopes of all new structural stormwater management measures having a permanent pool of water deeper than 2 1/2 feet. Such safety ledges shall be comprised of two steps. Each step shall be four feet to six feet in width. One step shall be located approximately 2 1/2 feet below the permanent water surface, and the second step shall be located one foot to 1 1/2 feet above the permanent water surface. See below, for an illustration of safety ledges in a stormwater management basin.
  - [1] Illustration of safety ledges.



Source: N.J.A.C. 7:8-6 Appendix A.

- F. Inspection, maintenance and repair of stormwater management measures.
  - (1) Applicability. Projects subject to review pursuant to Subsection A(3) of this section shall comply with the requirements of Subsection F(2) and (3) below.
  - (2) General inspection, maintenance and repair plan.
    - (a) The design engineer shall prepare an inspection, maintenance and repair plan for the stormwater management measures, including both structural and nonstructural measures incorporated into the design of a major development. This plan shall be submitted as part of the checklist requirements established in Subsection B(3). Inspection and maintenance guidelines for stormwater management measures are available in the New Jersey BMP Manual.
    - (b) The inspection, maintenance and repair plan shall contain the following:
      - [1] Accurate and comprehensive drawings of the site's stormwater management measures;

- [2] Specific locations of each stormwater management measure identified by means of longitude and latitude as well as block and lot number;
  - [3] Specific preventative and corrective maintenance tasks and schedules for such tasks for each stormwater BMP;
  - [4] Cost estimates, including estimated cost of sediment, debris or trash removal; and
  - [5] The name, address and telephone number of the person or persons responsible for regular inspections and preventative and corrective maintenance (including repair and replacement). If the responsible person or persons is a corporation, company, partnership, firm, association, municipality or political subdivision of this state, the name and telephone number of an appropriate contact person shall also be included.
- (c) The person responsible for inspection, maintenance and repair identified under Subsection F(2)(b) above shall maintain a detailed log of all preventative and corrective maintenance performed for the site's stormwater management measures, including a record of all inspections and copies of all maintenance-related work orders in the inspection, maintenance and repair plan. Said records and inspection reports shall be retained for a minimum of five years. (Note: Retention time is not addressed in N.J.A.C. 7:8, but five years is required for retention of data collected for monitoring under a NJPDES permit. The Pinelands Commission should consider an appropriate time frame for record retention, especially if staff is interested in pursuing future assessment of long-term BMP maintenance practices on water quality, etc.)
- (d) If the inspection, maintenance and repair plan identifies a person other than the developer (for example, a public agency or homeowners' association) as having the responsibility for inspection and 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

measure to such person under an applicable ordinance or regulation.

- (e) If the person responsible for inspection, maintenance and repair identified under Subsection F(2)(b) above is not a public agency, the maintenance plan and any future revisions based on Subsection F(2)(f) below shall be recorded upon the deed of record for each property on which the maintenance described in the maintenance plan shall be undertaken.
  - (f) The person responsible for inspection, maintenance and repair identified under Subsection F(2)(b) above shall evaluate the effectiveness of the inspection, maintenance and repair plan at least once per year and update the plan and the deed as needed.
  - (g) The person responsible for inspection, maintenance and repair identified under Subsection F(2)(b) above shall submit the updated inspection, maintenance and repair plan and the documentation required by Subsection F(2)(b) and (c) above to the Township of Monroe once per year.
  - (h) The person responsible for inspection, maintenance and repair identified under Subsection F(2)(b) above shall retain and make available, upon request by any public entity with administrative, health, environmental or safety authority over the site, the inspection, maintenance and repair plan and the documentation required by Subsection F(2)(b) and (c) above.
- (3) Responsibility for inspection, repair and maintenance shall not be assigned or transferred to the owner or tenant of an individual property in a residential development or project, unless such owner or tenant owns or leases the entire residential development or project.
- (4) Preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including, but not limited to, repairs or replacement to any associated appurtenance of the measure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; repair or replacement of linings; and restoration of infiltration function.

- (5) Stormwater management measure easements shall be provided by the property owner as necessary for facility inspections and maintenance and preservation of stormwater runoff conveyance, infiltration, and detention areas and facilities. The purpose of the easement shall be specified in the maintenance agreement.
- (6) In the event that the stormwater management measure becomes a public health nuisance or danger to public safety or public health, or if it is in need of maintenance or repair, the Township of Monroe 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 municipal engineer or the municipal engineer's designee. The Township of Monroe, at its discretion, may extend the time allowed for effecting maintenance and repair for good cause. If the responsible person fails or refuses to perform such maintenance and repair within the allowable time, the Township of Monroe may immediately proceed to do so with its own forces and equipment and/or through contractors. The costs and expenses of such maintenance and repair by the Township of Monroe shall be entered on the tax roll as a special charge against the property and collected with any other taxes levied thereon for the year in which the maintenance and repair was performed.
- (7) Requirements for inspection, maintenance and repair of stormwater BMPs that rely on infiltration.
  - (a) If a stormwater infiltration BMP is incorporated into the design of a major development, the applicant shall include the following requirements in its inspection, maintenance and repair plan:
    - [1] Once per month (if needed): mow side slopes, remove litter and debris, stabilize eroded banks, repair erosion at inflow structure(s);
    - [2] After every storm exceeding one inch of rainfall: ensure that infiltration BMPs drain completely within 72 hours after the storm event. If stored water fails to infiltrate 72 hours after the end of the storm, corrective measures shall be taken. Raking or tilling by light equipment can assist in maintaining infiltration capacity and break up clogged surfaces;

- [3] Four times per year (quarterly): inspect stormwater infiltration BMPs for clogging and excessive debris and sediment accumulation within the BMP, remove sediment (if needed) when completely dry;
  - [4] Two times per year: inspect for signs of damage to structures, repair eroded areas, check for signs of petroleum contamination and remediate;
  - [5] Once per year: inspect BMPs for unwanted tree growth and remove if necessary, disc or otherwise aerate bottom of infiltration basin to a minimum depth of six inches; and
  - [6] After every storm exceeding one inch of rainfall: inspect and, if necessary, remove and replace K5 sand layer and accumulated sediment, to restore original infiltration rate.
- (b) Additional guidance for the inspection, maintenance and repair of stormwater infiltration BMPs can be found in the New Jersey BMP Manual.
- (8) Maintenance guarantee.
- (a) The applicant shall provide a maintenance guarantee in accordance with N.J.S.A. 40:55D-53 to ensure that all stormwater management measures required under the provisions of this section will be maintained in accordance with the specifications established herein.
  - (b) Additionally, for those stormwater management measures that are to be inspected, maintained and repaired by a public agency, the Township of Monroe shall collect an up-front fee from the applicant in the amount the Township of Monroe determines is needed to provide long-term inspection, maintenance and repair of all stormwater management measures. This up-front fee shall be placed in a dedicated cash management account and expended by the Township of Monroe for the sole purpose of conducting inspection, maintenance and repair activities for all stormwater management measures required under the applicant's major development application approval. The calculation of the fee shall be based upon the inspection, maintenance and repair plan (plan) required to be prepared by the applicant and approved by the Township of Monroe. The

plan shall include an estimate of the present value of the cost to inspect, maintain and repair the stormwater management measure(s) in accordance with the plan for the useful life of those measure(s). The Township of Monroe shall furnish the applicant its published hourly rates as prescribed by its salary ordinance for public works and other personnel having responsibilities associated with stormwater management. Added to this fee shall be an amount mutually determined by the Township of Monroe and the applicant to account for the reconstruction of stormwater management measures that are reasonably anticipated to be subject to long-term failure. After an agreed number of years, depending on the type of measure(s), the measure(s) will need to be reconstructed. The amount shall be based on the future value of the measure(s) being reconstructed. Both inflation rates and bank interest rates shall be based on the ten-year average published in the Wall Street Journal or other approved publication. Interest accruing in the account must also be accounted for at an agreed-upon interest rate, to arrive at an amount. The costs for reconstructing the measure(s) shall be taken from the engineer's probable cost estimate that is utilized to determine the amount of the required performance guarantee. It is acceptable to attach a percentage of failure to certain line items in the estimate.

- (c) Additionally, for those stormwater management measures that are to be inspected, maintained and repaired by a homeowners' association, condominium association or some other form of non-public ownership, no fee shall be collected by the Township of Monroe. Instead, the ownership entity shall establish and maintain a fund for the annual inspection and testing program, annual maintenance and repair program and annual contribution to a contingency fund for long-term reconstruction.

[1] The initial costs agreed to for the annual inspection and testing program and annual maintenance and repair program shall be based upon actual itemized proposals offered to the applicant by prospective vendors. The annual cost expended on inspection, testing and maintenance shall be reported to the Township of Monroe to verify that maintenance is not

being deferred and to inform the Township of Monroe on the magnitude of those services.

[2] The contingency fund shall require sufficient funds to be committed for long-term reconstruction of the stormwater management measure(s). Major reconstruction activities will necessitate proper financial planning. After an agreed number of years, depending on the type of measure(s), the measure(s) will need to be reconstructed. The contingency fund in the financial schedule shall be based on the future value of the measure being reconstructed. Both inflation rates and bank interest rates shall be based on the ten-year average published in the Wall Street Journal or other approved publication. Interest accruing in the account must also be accounted for at an agreed-upon interest rate, to arrive at an annual contribution amount.

G. Definitions. Unless specifically defined below, words or phrases used in this section shall be interpreted so as to give them the meaning they have in common usage and to give this section its most reasonable application. When used in this section, the following terms shall have the meanings herein ascribed to them:

**AQUACULTURE** — The propagation, rearing and subsequent harvesting of aquatic organisms in controlled or selected environments, and their subsequent processing, packaging and marketing, including, but not limited to, activities to intervene in the rearing process to increase production such as stocking, feeding, transplanting and providing for protection from predators.

**CERTIFICATION** — Either a written statement signed and sealed by a licensed New Jersey professional engineer attesting that a BMP design or stormwater management system conforms to or meets a particular set of standards or to action taken by the Commission pursuant to N.J.A.C. 7:50-3, Part II or Part IV. Depending upon the context in which the term is use, the terms "certify" and "certified" shall be construed accordingly.

**COMPACTION** — The increase in soil bulk density caused by subjecting soil to greater-than-normal loading. Compaction can also decrease soil infiltration and permeability rates.

**CONSTRUCTION** — The construction, erection, reconstruction, alteration, conversion, demolition, removal or equipping of buildings, structures or components of a stormwater

management system, including but not limited to collection inlets, stormwater piping, culverts, swales and all other conveyance systems, and stormwater BMPs.

COUNTY REVIEW AGENCY — An agency designated by the County Board of Chosen Freeholders to review municipal stormwater management plans and implementing ordinances. The county review agency may either be:

- (1) A county planning agency; or
- (2) A county water resource association created under N.J.S.A. 58:16A-55.5, if the ordinance or resolution delegates authority to approve, conditionally approve, or disapprove municipal stormwater management plans and implementing ordinances.

DESIGN ENGINEER — A person professionally qualified and duly licensed in the State of New Jersey to perform engineering services that may include, but not necessarily be limited to, development of project requirements, creation and development of project design and preparation of drawings and specifications.

DESIGN PERMEABILITY — The tested permeability rate with a factor of safety of two applied to it (e.g., if the tested permeability rate of the soils is four inches per hour, the design rate would be two inches per hour).

DEVELOPMENT —

- (1) The change of or enlargement of any use or disturbance of any land, the performance of any building or mining operation, the division of land into two or more parcels, and the creation or termination of rights of access or riparian rights, including, but not limited to:
  - (a) A change in type of use of a structure or land;
  - (b) A reconstruction, alteration of the size, or material change in the external appearance of a structure or land;
  - (c) A material increase in the intensity of use of land, such as an increase in the number of businesses, manufacturing establishments, offices or dwelling units in a structure or on land;
  - (d) Commencement of resource extraction or drilling or excavation on a parcel of land;
  - (e) Demolition of a structure or removal of trees;

- (f) Commencement of forestry activities;
  - (g) Deposit of refuse, solid or liquid waste or fill on a parcel of land;
  - (h) In connection with the use of land, the making of any material change in noise levels, thermal conditions, or emissions of waste material; and
  - (i) Alteration, either physically or chemically, of a shore, bank, or floodplain, seacoast, river, stream, lake, pond, wetlands or artificial body of water.
- (2) In the case of development on agricultural land, i.e., lands used for an agricultural use or purpose as defined at N.J.A.C. 7:50-2.11, "development" means:
- (a) Any activity that requires a state permit;
  - (b) Any activity reviewed by the County Agricultural Boards (CAB) and the State Agricultural Development Committee (SADC); and
  - (c) Municipal review of any activity not exempted by the Right to Farm Act, N.J.S.A. 4:1C-1 et seq.

DEVELOPMENT, MAJOR — Any division of land into five or more lots; any construction or expansion of any housing development of five or more dwelling units; any construction or expansion of any commercial or industrial use or structure on a site of more than three acres; or any development, grading, clearing or disturbance of an area in excess of 5,000 square feet. "Disturbance" for the purpose of this section is the placement of impervious surface or exposure and/or movement of soil or bedrock or clearing, cutting or removing of vegetation.

DEVELOPMENT, MINOR — All development other than major development.

DRAINAGE AREA — A geographic area within which stormwater, sediments, or dissolved materials drain to a BMP, a stormwater management system, a particular receiving water body or a particular point along a receiving water body.

ENVIRONMENTALLY CRITICAL AREA — An area or feature which is of significant environmental value, including, but not limited to, stream corridors; natural heritage priority sites; habitat of endangered or threatened animal species; threatened or endangered plants of the Pinelands pursuant to N.J.A.C.

7:5-6.27(a); large areas of contiguous open space or upland forest; steep slopes; and wellhead protection and groundwater recharge areas. T & E habitat constitutes habitat that is critical for the survival of a local population of threatened and endangered species or habitat that is identified using the Department's Landscape Project as approved by the Department's Endangered and Nongame Species Program, whichever is more inclusive. Threatened and endangered wildlife shall be protected in conformance with N.J.A.C. 7:50-6.33.

EXCEPTION — The approval by the approving authority of a variance or other material departure from strict compliance with any section, part, phrase or provision of this section. An exception may be granted only under certain specific, narrowly defined conditions described herein and does not constitute a waiver of strict compliance with any section, part, phrase or provision of the Pinelands Comprehensive Management Plan (N.J.A.C. 7:50-1.1 et seq.).

EXTENDED DETENTION BASIN — 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 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 term "stormwater detention basin" shall have the same meaning as "extended detention basin."

FINISHED GRADE — The elevation of the surface of the ground after completion of final grading, either via cutting, filling or a combination thereof.

GRADING — Modification of a land slope by cutting and filling with the native soil or redistribution of the native soil which is present at the site.

GROUNDWATER — Water below the land surface in a zone of saturation.

GROUNDWATER MOUNDING ANALYSIS — A test performed to demonstrate that the groundwater below a stormwater infiltration basin will not "mound up," encroach on the unsaturated zone, break the surface of the ground at the infiltration area or downslope, and create an overland flow situation.

HEAVY EQUIPMENT — Equipment, machinery, or vehicles that exert ground pressure in excess of eight pounds per square inch.

HIGH POLLUTANT LOADING AREA — An area in an industrial or commercial development site where solvents and/or petroleum products are loaded/unloaded, stored, or applied; where pesticides are loaded/unloaded or stored; 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; where recharge would be inconsistent with a NJDEP-approved remedial action work plan or landfill closure plan; and/or where a high risk exists for spills of toxic materials, such as gas stations and vehicle maintenance facilities. The term "HPLA" shall have the same meaning as "high pollutant loading area."

IMPERVIOUS SURFACE — A surface that has been covered with a layer of material so that it is highly resistant to infiltration by water.

INFILTRATION — The process by which precipitation enters the soil through its surface.

IN-LIEU CONTRIBUTION — A monetary fee collected by the Township of Monroe in lieu of requiring strict on-site compliance with the groundwater recharge, stormwater runoff quantity and/or stormwater runoff quality standards established in this section.

INSTALL — To assemble, construct, put in place or connect components of a stormwater management system.

MITIGATION — Acts necessary to prevent, limit, remedy or compensate for conditions that may result from those cases where an applicant has demonstrated the inability or impracticality of strict compliance with the stormwater management requirements set forth in N.J.A.C. 7:8, in an adopted regional stormwater management plan, or in a local ordinance which is as protective as N.J.A.C. 7:8, and an exception from strict compliance is granted by the Township of Monroe and the Pinelands Commission.

NEW JERSEY STORMWATER BEST MANAGEMENT PRACTICES MANUAL — Guidance developed by the New Jersey Department of Environmental Protection, in coordination with the New Jersey Department of Agriculture, the New Jersey Department of Community Affairs, the New Jersey Department of Transportation, municipal engineers, county engineers, consulting firms, contractors, and environmental organizations, to address the standards in the New Jersey Stormwater Management Rules, N.J.A.C. 7:8. The BMP Manual provides examples of ways to meet the standards contained in the rules.

An applicant may demonstrate that other proposed management practices will also achieve the standards established in the rules. The Manual, and notices regarding future versions of the Manual, are available from the Division of Watershed Management, NJDEP, P.O. Box 418, Trenton, New Jersey 08625; and on the NJDEP's website, [www.njstormwater.org](http://www.njstormwater.org). The term "New Jersey BMP Manual" shall have the same meaning as "New Jersey Stormwater Best Management Practices Manual."

NJDEP — The New Jersey Department of Environmental Protection.

NJPDES — The New Jersey Pollutant Discharge Elimination System as set forth in N.J.S.A. 58:10A-1 et seq. and in N.J.A.C. 7:14A.

NJPDES PERMIT — A permit issued by the NJDEP pursuant to the authority of the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq., and N.J.A.C. 7:14A for a discharge of pollutants.

NONPOINT SOURCE —

(1) Means:

- (a) Any human-made or human-induced activity, factor, or condition, other than a point source, from which pollutants are or may be discharged;
- (b) Any human-made or human-induced activity, factor, or condition, other than a point source, that may temporarily or permanently change any chemical, physical, biological, or radiological characteristic of waters of the state from what was or is the natural, pristine condition of such waters, or that may increase the degree of such change; or
- (c) Any activity, factor, or condition, other than a point source, that contributes or may contribute to water pollution.
- (d) The term "NPS" shall have the same meaning as "nonpoint source."

NONSTRUCTURAL BMP — A stormwater management measure, strategy or combination of strategies that reduces adverse stormwater runoff impacts through sound site planning and design. Nonstructural BMPs include such practices as minimizing site disturbance, preserving important site features, reducing and disconnecting impervious cover, flattening slopes, utilizing

native vegetation, minimizing turf grass lawns, maintaining natural drainage features and characteristics and controlling stormwater runoff and pollutants closer to the source. The term "low-impact development technique" shall have the same meaning as "nonstructural BMP."

**NUTRIENT** — A chemical element or compound, such as nitrogen or phosphorus, which is essential to and promotes the development of organisms.

**PERMEABILITY** — The rate at which water moves through a saturated unit area of soil or rock material at hydraulic gradient of one, determined as prescribed in N.J.A.C. 7:9A-6.2 (Tube Permeameter Test), N.J.A.C. 6.5 (Pit Bailing Test) or N.J.A.C. 6.6 (Piezometer Test). Alternative permeability test procedures may be accepted by the approving authority, provided the test procedure attains saturation of surrounding soils, accounts for hydraulic head effects on infiltration rates, provides a permeability rate with units expressed in inches per hour and is accompanied by a published source reference. Examples of suitable sources include hydrogeology, geotechnical, or engineering text and design manuals, proceedings of American Society for Testing and Materials (ASTM) symposia, or peer-review journals. Neither a Soil Permeability Class Rating Test, as described in N.J.A.C. 7:9A-6.3, nor a Percolation Test, as described in N.J.A.C. 7:9A-6.4, is an acceptable test for establishing permeability values for the purpose of complying with this section.

**PERMEABLE** — Having a permeability of one inch per hour or faster. The terms "permeable soil," "permeable rock" and "permeable fill" shall be construed accordingly.

**PERSON** — Any individual, corporation, company, partnership, firm, association, municipality or political subdivision of this state subject to municipal jurisdiction pursuant to the Municipal Land Use Law, N.J.S.A. 40:55D-1 et seq.

**PINELANDS CMP** — The New Jersey Pinelands Comprehensive Management Plan (N.J.A.C. 7:50 1.1 et seq.).

**PINELANDS COMMISSION or COMMISSION** — The Commission created pursuant to Section 5 of the Pinelands Protection Act, N.J.S.A. 13:18A-5.

**POINT SOURCE** — Any discernible, confined, and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate

collection system, vessel, or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture.

**POLLUTANT** — Any dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, refuse, oil, grease, sewage sludge, munitions, chemical wastes, biological materials, medical wastes, radioactive substances (except those regulated under the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 et seq.), thermal waste, wrecked or discarded equipment, rock, sand, suspended solids, cellar dirt, industrial, municipal, agricultural, and construction waste or runoff, or other residue discharged directly or indirectly to the land, groundwaters or surface waters of the state, or to a domestic treatment works. "Pollutant" includes both hazardous and nonhazardous pollutants.

**PROFESSIONAL ENGINEER** — A person licensed to practice professional engineering in the State of New Jersey pursuant to N.J.S.A. 45:8-27 et seq.

**RECHARGE** — The amount of water from precipitation that infiltrates into the ground and is not evapotranspired.

**REPLICATE** — One of two or more soil samples or tests taken at the same location (within five feet of each other) and depth, within the same soil horizon or substratum. In the case of fill material, replicate tests are tests performed on subsamples of the same bulk sample packed to the same bulk density.

**SAND** — A particle size category consisting of mineral particles which are between 0.05 millimeter and 2.0 millimeters in equivalent spherical diameter. Also, a soil textural class having 85% or more of sand and a content of silt and clay such that the percentage of silt plus 1.5 times the percentage of clay does not exceed 15, as shown in Subsection K(3)(a) (USDA Soil Textural Triangle).

**SEASONALLY HIGH WATER TABLE** — The upper limit of the shallowest zone of saturation which occurs in the soil, identified as prescribed in N.J.A.C. 7:9A-5.8.

**SEDIMENT** — Solid material, mineral or organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water or gravity as a product of erosion.

**SITE** — The lot or lots upon which a major development is to occur or has occurred.

SOIL — All unconsolidated mineral and organic material of any origin which is not a rock substratum, including sediments below the biologically active and/or weathered zones.

SOURCE MATERIAL — Any material(s) or machinery, located at an industrial facility, which 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.

STORMWATER — Water resulting from precipitation (including rain and snow) that runs off the land's surface, is transmitted to the subsurface, or is captured by separate storm sewers or other sewage or drainage facilities, or conveyed by snow removal equipment.

STORMWATER INFILTRATION BMP — A basin or other facility constructed within permeable soils that provides temporary storage of stormwater runoff. An infiltration BMP does not normally have a structural outlet to discharge runoff from the stormwater quality design storm. Instead, outflow from an infiltration BMP is through the surrounding soil. The terms "infiltration measure" and "infiltration practice" shall have the same meaning as "stormwater infiltration basin."

STORMWATER MANAGEMENT MEASURE — Any structural or nonstructural strategy, practice, technology, process, program, or other method intended to control or reduce stormwater runoff and associated pollutants, or to induce or control the infiltration or groundwater recharge of stormwater or to eliminate illicit or illegal nonstormwater discharges into stormwater conveyances. This includes, but is not limited to, structural and nonstructural stormwater best management practices described in the New Jersey BMP Manual and designed to meet the standards for stormwater control contained within this section. The terms "stormwater best management practice" and "stormwater BMP" shall have the same meaning as "stormwater management measure."

STORMWATER RUNOFF — Water flow on the surface of the ground or in storm sewers, resulting from precipitation.

SUITABLE SOIL — Unsaturated soil, above the seasonally high water table, which contains less than 50% by volume of coarse fragments and which has a tested permeability rate of between one inch and 20 inches per hour.

SURFACE WATER — Any waters of the state which are not groundwater.

THE TOWNSHIP OF MONROE — The Planning Board, Zoning Board of Adjustment or other board, agency or official of the Township of Monroe with authority to approve or disapprove subdivisions, site plans, construction permits, building permits or other applications for development approval. For the purposes of reviewing development applications and ensuring compliance with the requirements of this section, the Township of Monroe may designate the municipal engineer or other qualified designee to act on behalf of the Township of Monroe.

TIDAL FLOOD HAZARD AREA — A flood hazard area which may be influenced by stormwater runoff from inland areas, but which is primarily caused by the Atlantic Ocean.

TIME OF CONCENTRATION — 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 — The insoluble solid matter suspended in water and stormwater that is separable by laboratory filtration in accordance with the procedure contained in the Standard Methods for the Examination of Water and Wastewater prepared and published jointly by the American Public Health Association, American Water Works Association and the Water Pollution Control Federation. The term "TSS" shall have the same meaning as "total suspended solids."

URBAN REDEVELOPMENT AREA — Previously developed portions of areas:

- (1) Delineated on the State Plan Policy Map (SPPM) as the Metropolitan Planning Area (PA1), Designated Centers, Cores or Nodes;
- (2) Designated as CAFRA Centers, Cores or Nodes;
- (3) Designated as Urban Enterprise Zones; and
- (4) Designated as Urban Coordinating Council Empowerment Neighborhoods.

WATERS OF THE STATE — The ocean and its estuaries, all springs, streams and bodies of surface water and groundwater, whether natural or artificial, within the boundaries of New Jersey or subject to its jurisdiction.

WATER TABLE — The upper surface of a zone of saturation.

WELL — A bored, drilled or driven shaft, or a dug hole, which extends below the seasonally high water table and which has a depth which is greater than its largest surface dimension.

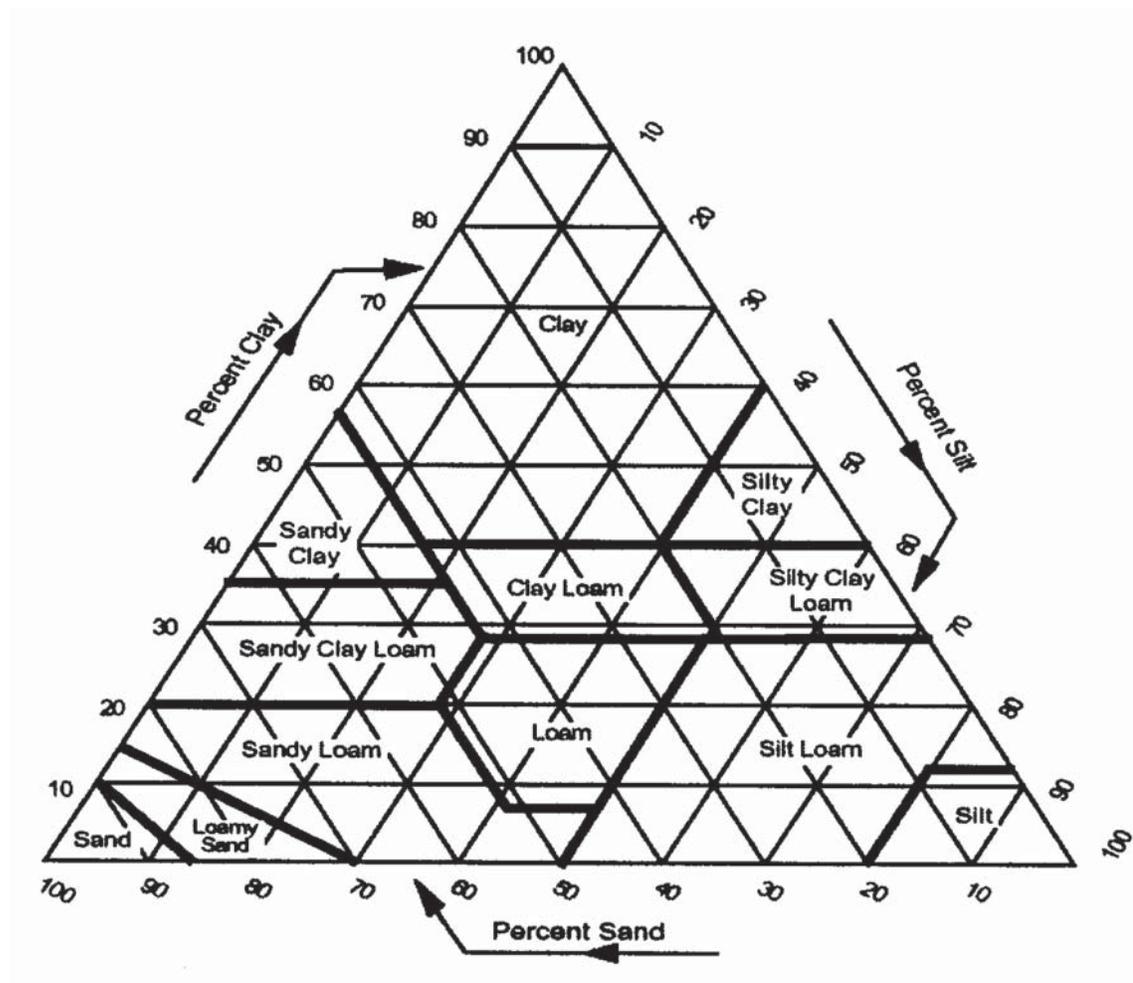
WETLANDS — Those lands which are inundated or saturated by water at a magnitude, duration and frequency sufficient to support the growth of hydrophytes. Wetlands include lands with poorly drained or very poorly drained soils as designated by the National Cooperative Soils Survey of the Soil Conservation Service of the United States Department of Agriculture. Wetlands include coastal wetlands and inland wetlands, including submerged lands. The New Jersey Pinelands Commission Manual for Identifying and Delineating Pinelands Area Wetlands: A Pinelands Supplement to the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, dated January, 1991, as amended, may be utilized in delineating the extent of wetlands based on the definitions of wetlands and wetlands soils contained in this subsection, N.J.A.C. 7:50 2.11, 6.4 and 6.5. The term "wetland" shall have the same meaning as "wetlands."

WET POND — A stormwater facility constructed through filling and/or excavation that provides both permanent and temporary storage of stormwater runoff. It has an outlet structure that creates a permanent pool and detains and attenuates runoff inflows and promotes the settling of pollutants. A stormwater retention basin can also be designed as a multistage facility that also provides extended detention for enhanced stormwater quality design storm treatment and runoff storage and attenuation for stormwater quantity management. The term "stormwater retention basin" shall have the same meaning as "wet pond."

- H. Penalties. Any person who erects, constructs, alters, repairs, converts, maintains, or uses any building, structure or land in violation of this section shall be subject to the following penalties: Any violation of any of the requirements of this section herein shall be subject to a fine not to exceed \$1,000 and/or 30 days in jail and up to 90 days of community service. Each violation shall constitute a separate offense under this section.

- I. When effective. This section shall take effect immediately upon the following:
- (1) Certification by the Pinelands Commission in accordance with N.J.A.C. 7:50 Subchapter 3; and
  - (2) Approval by the county review agency in accordance with N.J.S.A. 40:55D-97.
- J. Severability. If the provisions of any section, subsection, paragraph, subdivision, or clause of this section shall be judged invalid by a court of competent jurisdiction, such order of judgment shall not affect or invalidate the remainder of any section, subsection, paragraph, subdivision or clause of this section.
- K. Appendices.
- (1) Methods for calculating groundwater recharge.
    - (a) The New Jersey Geological Survey Report GSR-32: A Method for Evaluating Ground-Water Recharge Areas in New Jersey. Available at <http://www.njgeology.org/geodata/dgs99-2.htm>.
    - (b) The New Jersey Groundwater Recharge Spreadsheet (NJGRS). Available in the New Jersey BMP Manual, Chapter 6, at [http://www.njstormwater.org/bmp\\_manual2.htm](http://www.njstormwater.org/bmp_manual2.htm).
  - (2) NJDEP nonstructural strategies point system. The New Jersey Stormwater Management Rules at N.J.A.C. 7:8-5.2(a), and Subsection D(1) of this section, require nonstructural stormwater management strategies to be incorporated into the site design of a major development. A total of nine strategies are to be used to the maximum extent practical to meet the groundwater recharge, stormwater quality and stormwater quantity requirements of the Rules prior to utilizing structural stormwater management measures. The New Jersey Nonstructural Stormwater Management Strategies Point System (NSPS) provides a tool to assist planners, designers and regulators in determining that the strategies have been used to the maximum extent practical at a major development as required by the Rules. Refer online to <http://www.njstormwater.org> for information on the NSPS.
  - (3) Soils.

(a) USDA Soil Textural Triangle.



Source: US Department of Agriculture.

(b) Definitions. For the purposes of this Subsection K(3), the following terms shall have the meanings herein ascribed to them.

A-HORIZON — The uppermost mineral horizon in a normal soil profile. The upper part of the A-horizon is characterized by maximum accumulation of finely divided, dark-colored organic residues, known as "humus," which are intimately mixed with the mineral particles of the soil.

ARTESIAN ZONE OF SATURATION — A zone of saturation which exists immediately below a hydraulically restrictive horizon, and which has an upper surface which

is at a pressure greater than atmospheric, either seasonally or throughout the year.

**CHROMA** — The relative purity or strength of a color, a quantity which decreases with increasing grayness. Chroma is one of the three variables of soil color as defined in the Munsell system of classification.

**CLAY** — A particle size category consisting of mineral particles which are smaller than 0.002 millimeter in equivalent spherical diameter. Also, a soil textural class having more than 40% clay, less than 45% sand, and less than 40% silt, as shown in Subsection K(3)(a) (USDA Soil Textural Triangle).

**CLAY LOAM** — A soil textural class having 27% to 40% clay and 20% to 45% sand, as shown in Subsection K(3)(a) (USDA Soil Textural Triangle).

**COARSE FRAGMENT** — A rock fragment contained within the soil which is greater than two millimeters in equivalent spherical diameter or which is retained on a two-millimeter sieve.

**COUNTY SOIL SURVEY REPORT** — A report prepared by the US Department of Agriculture, Natural Resources Conservation Service, which includes maps showing the distribution of soil mapping units throughout a particular county together with narrative descriptions of the soil series shown and other information relating to the uses and properties of the various soil series.

**DIRECT SUPERVISION** — Control over and direction of work carried out by others with full knowledge of and responsibility for such work.

**EQUIVALENT SPHERICAL DIAMETER OF A PARTICLE** — The diameter of a sphere which has a volume equal to the volume of the particle.

**EXCESSIVELY COARSE HORIZON** — A horizon of limited thickness within the soil profile which provides inadequate removal of pollutants from stormwater due to a high coarse fragment content, excessively coarse texture and/or excessively rapid permeability.

**EXCESSIVELY COARSE SUBSTRATUM** — A substratum below the soil profile which extends beyond the depth of soil profile pits and borings and which provides inadequate removal of pollutants from stormwater due

to a high coarse fragment content, excessively coarse texture and/or excessively rapid permeability.

**EXTREMELY FIRM CONSISTENCE** — A type of soil material whose moist aggregated mass crushes only under very strong pressure; cannot be crushed between the thumb and forefinger; and shall be broken apart bit by bit.

**FIRM CONSISTENCE** — A type of soil material whose moist aggregated mass crushes under moderate pressure between the thumb and forefinger but resistance is distinctly noticeable.

**HARD CONSISTENCE** — A type of soil material whose dry aggregated mass is moderately resistant to pressure; can be broken in the hands without difficulty but is barely breakable between the thumb and forefinger.

**HUE** — The dominant spectral color, one of the three variables of soil color defined within the Munsell system of classification.

**HYDRAULICALLY RESTRICTIVE HORIZON** — A horizon within the soil profile which slows or prevents the downward or lateral movement of water and which is underlain by permeable soil horizons or substrata. Any soil horizon which has a saturated permeability less than one inch per hour is hydraulically restrictive.

**HYDRAULICALLY RESTRICTIVE SUBSTRATUM** — A substratum below the soil profile which slows or prevents the downward or lateral movement of water and which extends beyond the depth of profile pits or borings or to a massive substratum. A substratum which has a saturated permeability less than one inch per hour is hydraulically restrictive.

**LOAMY SAND** — A soil textural class, as shown in Subsection K(3)(a) (USDA Soil Textural Triangle), that has a maximum of 85% to 90% sand with a percentage of silt plus 1.5 times the percentage of clay not in excess of 15; or a minimum of 70% to 85% sand with a percentage of silt plus 1.5 times the percentage of clay not in excess of 30.

**LOWER PLASTIC LIMIT** — The moisture content corresponding to the transition between the plastic and semi-solid states of soil consistency. This corresponds to

the lowest soil moisture content at which the soil can be molded in the fingers to form a rod or wire, 1/8 inch in thickness, without crumbling.

**MOTTLING** — A color pattern observed in soil consisting of blotches or spots of contrasting color. The term "mottle" refers to an individual blotch or spot. The terms "color variegation," "iron depletion" and "iron concentration" are equivalent to the term "mottling." Mottling due to redoximorphic reactions is an indication of seasonal or periodic and recurrent saturation.

**MUNSELL SYSTEM** — A system of classifying soil color consisting of an alphanumeric designation for hue, value and chroma, such as "7.5 YR 6/2," together with a descriptive color name, such as "strong brown."

**O-HORIZON** — A surface horizon, occurring above the A-horizon in some soils, which is composed primarily of undecomposed or partially decomposed plant remains which have not been incorporated into the mineral soil.

**PERCHED ZONE OF SATURATION** — A zone of saturation which occurs immediately above a hydraulically restrictive horizon and which is underlain by permeable horizons or substrata which are not permanently or seasonally saturated.

**PIEZOMETER** — A device consisting of a length of metal or plastic pipe, open at the bottom or perforated within a specified interval, and used for the determination of depth to water, permeability or hydraulic head within a specific soil horizon or substratum.

**PLATY STRUCTURE** — Characterized by a soil aggregate which has one axis distinctly shorter than the other two and is oriented with the short axis vertical.

**REGIONAL ZONE OF SATURATION** — A zone of saturation which extends vertically without interruption below the depth of soil borings and profile pits.

**SANDY CLAY** — A soil textural class having 35% or more of clay and 45% or more of sand, as shown in Subsection K(3)(a) (USDA Soil Textural Triangle).

**SANDY LOAM** — A soil textural class, as shown in Subsection K(3)(a) (USDA Soil Textural Triangle), that has a maximum of 20% clay, and the percentage of silt plus twice the percentage of clay exceeds 30, and

contains 52% or more sand; or less than 7% clay, less than 50% silt, and between 43% and 52% sand.

**SILT** — A particle size category consisting of mineral particles which are between 0.002 and 0.05 millimeter in equivalent spherical diameter. It also means a soil textural class having 80% or more of silt and 12% or less of clay, as shown in Subsection K(3)(a) (USDA Soil Textural Triangle).

**SILT LOAM** — A soil textural class having 50% or more of silt and 12% to 27% of clay; or 50% to 80% of silt and less than 12% of clay, as shown in Subsection K(3)(a) (USDA Soil Textural Triangle).

**SILTY CLAY** — A soil textural class having 40% or more of clay and 40% or more of silt, as shown in Subsection K(3)(a) (USDA Soil Textural Triangle).

**SILTY CLAY LOAM** — A soil textural class having 27% to 40% of clay and less than 20% of sand, as shown in Subsection K(3)(a) (USDA Soil Textural Triangle).

**SOIL AGGREGATE** — A naturally occurring unit of soil structure consisting of particles of sand, silt, clay, organic matter, and coarse fragments held together by the natural cohesion of the soil.

**SOIL COLOR** — The soil color name and Munsell color designation determined by comparison of the moist soil with color chips contained in a Munsell soil color book.

**SOIL CONSISTENCE** — The resistance of a soil aggregate or clod to being crushed between the fingers or broken by the hands. Terms for describing soil consistence described are in N.J.A.C. 7:9A-5.3(h).

**SOIL HORIZON** — A layer within a soil profile differing from layers of soil above and below it in one or more of the soil morphological characteristics, including color, texture, coarse fragment content, structure, consistence and mottling.

**SOIL LOG** — A description of the soil profile which includes the depth, thickness, color, texture, coarse fragment content, mottling, structure and consistence of each soil horizon or substratum.

**SOIL MAPPING UNIT** — An area outlined on a map in a County Soil Survey Report and marked with a letter

symbol designating a soil phase, a complex of two or more soil phases, or some other descriptive term where no soil type has been identified.

**SOIL PHASE** — A specific type of soil which is mapped by the Natural Resources Conservation Service and which belongs to a soil series described within the County Soil Survey Report.

**SOIL PROFILE** — A vertical cross-section of undisturbed soil showing the characteristic horizontal layers or horizons of the soil which have formed as a result of the combined effects of parent material, topography, climate, biological activity and time.

**SOIL SERIES** — A grouping of soil types possessing a specific range of soil profile characteristics which are described within the County Soil Survey Report. Each soil series may consist of several soil phases which may differ in slope, texture of the surface horizon or stoniness.

**SOIL STRUCTURAL CLASS** — One of the shape classes of soil structure described in N.J.A.C. 7:9A-5.3(g).

**SOIL STRUCTURE** — The naturally occurring arrangement, within a soil horizon, of sand, silt and clay particles, coarse fragments and organic matter, which are held together in clusters or aggregates of similar shape and size.

**SOIL TEST PIT** — An excavation made for the purpose of exposing a soil profile which is to be described.

**SOIL TEXTURAL CLASS** — One of the classes of soil texture defined within the USDA system of classification (Soil Survey Manual, Agricultural Handbook No. 18, USDA Soil Conservation Service 1962).

**SOIL TEXTURE** — The relative proportions of sand, silt and clay in that portion of the soil which passes through a sieve with two-millimeter openings.

**STATIC WATER LEVEL** — The depth below the ground surface or the elevation with respect to some reference level, of the water level observed within a soil profile pit or boring, or within a piezometer, after this level has stabilized or become relatively constant with the passage of time.

**SUBSTRATUM** — A layer of soil or rock material present below the soil profile and extending beyond the depth of soil borings or profile pits.

**UNSUITABLE SOIL** — All soil other than suitable soil.

**USDA SYSTEM OF CLASSIFICATION** — The system of classifying soil texture used by the United States Department of Agriculture which defines 12 soil textural classes based upon the weight percentages of sand, silt and clay in that portion of the soil which passes through a sieve with two-millimeter openings. The soil textural classes are shown graphically on the USDA Soil Textural Triangle, as shown in Subsection K(3)(a).

**VALUE** — The relative lightness or intensity of a color, one of the three variables of soil color defined within the Munsell system of classification.

**VERY FIRM CONSISTENCE** — Characterized by a moist soil which crushes under strong pressure; barely crushable between thumb and forefinger.

**VERY HARD CONSISTENCE** — Characterized by a dry soil which is resistant to pressure; can be broken in the hands only with difficulty; not breakable between the thumb and forefinger.

**ZONE OF SATURATION** — A layer within or below the soil profile which is saturated with groundwater either seasonally or throughout the year. This includes both regional and perched zones.

- (c) Methods for assessing soil suitability for infiltration stormwater management BMPs. The results of a subsurface investigation shall serve as the basis for the site selection and design of stormwater infiltration BMPs. The subsurface investigation shall include, but not be limited to, a series of soil test pits and soil permeability tests conducted in accordance with the following:

[1] All soil test pits and soil permeability results shall be performed under the direct supervision of a professional engineer. All soil logs and permeability test data shall be accompanied by a certification by a professional engineer. The results and location (horizontal and vertical) of all soil test pits and soil permeability tests, both passing and failing, shall be reported to the Township of Monroe.

- [2] During all subsurface investigations and soil test procedures, adequate safety measures shall be taken to prohibit unauthorized access to the excavations at all times. It is the responsibility of persons performing or witnessing subsurface investigations and soil permeability tests to comply with all applicable federal, state and local laws and regulations governing occupational safety.
- [3] A minimum of two soil test pits shall be excavated within the footprint of any proposed infiltration BMP to determine the suitability and distribution of soil types present at the site. Placement of the test pits shall be within 20 feet of the basin perimeter, located along the longest axis bisecting the BMP. For BMPs larger than 10,000 square feet in area, a minimum of one-additional soil test pit shall be conducted within each additional area of 10,000 square feet. The additional test pit(s) shall be placed approximately equidistant to other test pits, so as to provide adequate characterization of the subsurface material. In all cases, where soil and/or groundwater properties vary significantly, additional test pits shall be excavated in order to accurately characterize the subsurface conditions below the proposed infiltration BMP. Soil test pits shall extend to a minimum depth of eight feet below the lowest elevation of the basin bottom or to a depth that is at least two times the maximum potential water depth in the proposed infiltration BMP, whichever is greater.
- [4] A soil test pit log shall be prepared for each soil test pit. The test pit log shall, at a minimum, provide the elevation of the existing ground surface, the depth and thickness (in inches) of each soil horizon or substratum, the dominant matrix or background and mottle colors using the Munsell system of classification for hue, value and chroma, the appropriate textural class as shown on the USDA textural triangle, the volume percentage of coarse fragments (larger than two millimeters in diameter), the abundance, size, and contrast of mottles, the soil structure, soil consistence, and soil moisture condition, using standard USDA classification terminology for each of these soil properties. Soil test

pit logs shall identify the presence of any soil horizon, substratum or other feature that exhibits an in-place permeability rate less than one inch per hour.

- [5] Each soil test pit log shall report the depth to seasonally high water level, either perched or regional, and the static water level based upon the presence of soil mottles or other redoximorphic features, and observed seepage or saturation. Where redoximorphic features, including soil mottles resulting from soil saturation, are present, they shall be interpreted to represent the depth to the seasonal high water table unless soil saturation or seepage is observed at a higher level. When the determination of the seasonally high water table shall be made in ground previously disturbed by excavation, direct observation of the static water table during the months of January through April shall be the only method permitted.
- [6] Any soil horizon or substratum which exists immediately below a perched zone of saturation shall be deemed by rule to exhibit unacceptable permeability (less than one inch per hour). The perched zone of saturation may be observed directly, inferred based upon soil morphology, or confirmed by performance of a hydraulic head test as defined at N.J.A.C. 7:9A-5.9.
- [7] Stormwater infiltration BMPs shall not be installed in soils that exhibit artesian groundwater conditions. A permeability test shall be conducted in all soils that immediately underlie a perched zone of saturation. Any zone of saturation which is present below a soil horizon which exhibits an in-place permeability of less than 0.2 inch per hour shall be considered an artesian zone of saturation unless a minimum one-foot-thick zone of unsaturated soil, free of mottling or other redoximorphic features and possessing a chroma of four or higher, exists immediately below the unsuitable soil.
- [8] A minimum of one permeability test shall be performed at each soil test pit location. The soil permeability rate shall be determined using test methodology as prescribed in N.J.A.C. 7:9A-6.2 (Tube

Permeameter Test), 6.5 (Pit Bailing Test) or 6.6 (Piezometer Test). When the tube permeameter test is used, a minimum of two replicate samples shall be taken and tested. Alternative permeability test procedures may be accepted by the approving authority, provided the test procedure attains saturation of surrounding soils, accounts for hydraulic head effects on infiltration rates, provides a permeability rate with units expressed in inches per hour and is accompanied by a published source reference. Examples of suitable sources include hydrogeology, geotechnical or engineering text and design manuals, proceedings of American Society for Testing and Materials (ASTM) symposia, or peer-review journals. Neither a Soil Permeability Class Rating Test, as described in N.J.A.C. 7:9A-6.3, nor a Percolation Test, as described in N.J.A.C. 7:9A-6.4, is an acceptable test for establishing permeability values for the purpose of complying with this section.

- [9] Soil permeability tests shall be conducted on the most hydraulically restrictive horizon or substratum to be left in place below the basin as follows. Where no soil replacement is proposed, the permeability tests shall be conducted on the most hydraulically restrictive horizon or substratum within four feet of the lowest elevation of the basin bottom or to a depth equal to two times the maximum potential water depth within the basin, whichever is greater. Where soil replacement is proposed, the permeability tests shall be conducted within the soil immediately below the depth of proposed soil replacement or within the most hydraulically restrictive horizon or substratum to a depth equal to two times the maximum potential water depth within the basin, whichever is greater. Permeability tests may be performed on the most hydraulically restrictive soil horizons or substrata at depths greater than those identified above based upon the discretion of the design or testing engineer. The tested infiltration rate should then be divided by two to establish the soil's design permeability rate. Such division will provide a 100% safety factor to the tested rate.

- [10] The minimum acceptable tested permeability rate of any soil horizon or substratum shall be one inch per hour. Soil materials that exhibit tested permeability rates slower than one inch per hour shall be considered unsuitable for stormwater infiltration. The maximum reportable tested permeability rate of any soil horizon or substratum shall be no greater than 20 inches per hour regardless of the rate attained in the test procedure.
- [11] After all construction activities have been completed on the development site and the finished grade has been established in the infiltration BMP, a minimum of one permeability test shall be conducted within the most hydraulically restrictive soil horizon or substratum below the as-built BMP to ensure the performance of the infiltration BMP is as designed. Hand tools and manual permeability test procedures shall be used for the purpose of confirming BMP performance. In addition, the infiltration BMP shall be flooded with water sufficient to demonstrate the performance of the BMP. Test results shall be certified to the municipal engineer.
- [12] A groundwater mounding analysis shall be provided for each stormwater infiltration BMP. The groundwater mounding analysis shall calculate the maximum height of the groundwater mound based upon the volume of the maximum design storm. The professional engineer conducting the analysis shall provide the municipal engineer with the methodology and supporting documentation for the mounding analysis used and shall certify to the Township of Monroe, based upon the analysis, that the groundwater mound will not cause stormwater or groundwater to breakout to the land surface or cause adverse impact to adjacent surface water bodies, wetlands or subsurface structures, including but not limited to basements and septic systems. If there is more than one infiltration BMP proposed, the model shall indicate if and how the mounds will interact. The mounding analysis shall be calculated using the most restrictive soil horizon that will remain in place within the explored aquifer thickness unless alternative analyses are authorized by the municipal engineer.

The mounding analysis shall be accompanied by a cross section of the infiltration BMP and surrounding topography and the mound analysis shall extend out to the point(s) at which the mound intersects with the preexisting maximum water table elevation.

[13] The applicant shall demonstrate that stormwater infiltration BMPs meet the seventy-two-hour drain time requirement established in Subsection E(2)(a) of this section.

(4) Pretreatment measures for infiltration BMPs. By reducing incoming velocities and capturing coarser sediments, pretreatment can extend the functional life and increase the pollutant removal capability of infiltration measures. Therefore, the installation of pretreatment measures is recommended for all development sites. Pretreatment measures may include, but are not limited to, the following:

- (a) Vegetative filter strips;
- (b) Bioretention systems. Used in conjunction with a bioretention system, the infiltration basin takes the place of the standard underdrain;
- (c) Sand filters;
- (d) Grassed swales; and
- (e) Detention basins.

(5) Collection and conveyance.

- (a) Bicycle-safe inlet grates. Site development plans that incorporate site design features that help to prevent discharge of trash and debris from drainage systems shall comply with the following standard to control passage of solid and floatable materials through storm drain inlets. For purposes of this subsection, "solid and floatable materials" means sediment, debris, trash, and other floating, suspended, or settleable solids.

[1] Acceptable grates.

- [a] Design engineers shall use either of the following grates whenever they use a grate in pavement or another ground surface to collect stormwater from that surface into a storm drain or surface water body under that grate:

- [i] The New Jersey Department of Transportation (NJDOT) bicycle-safe grate, which is described in Chapter 2.4 of the NJDOT Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines (April 1996); or
  - [ii] A different grate, if each individual clear space in that grate has an area of no more than seven square inches, or is no greater than 0.5 inch across the smallest dimension.
- [b] Examples of grates subject to this standard include grates in grate inlets, the grate portion (non-curb-opening portion) of combination inlets, grates on storm sewer manholes, ditch grates, trench grates, and grates of spacer bars in slotted drains. Examples of ground surfaces include surfaces of roads (including bridges), driveways, parking areas, bikeways, plazas, sidewalks, lawns, fields, open channels, and stormwater basin floors.
- [2] Whenever design engineers use a curb-opening inlet, the clear space in that curb opening (or each individual clear space, if the curb opening has two or more clear spaces) shall have an area of no more than seven square inches, or be no greater than two inches across the smallest dimension.
- [3] This standard does not apply:
- [a] Where the review agency determines that this standard would cause inadequate hydraulic performance that could not practicably be overcome by using additional or larger storm drain inlets that meet these standards;
  - [b] Where flows from the water quality design storm as specified in Subsection C are conveyed through any device (e.g., end-of-pipe netting facility, manufactured treatment device, or a catch basin hood) that is designed, at a minimum, to prevent delivery of all solid and floatable materials that could not pass through one of the following:

- [i] A rectangular space 4 5/8 inches long and 1.5 inches wide (this option does not apply for outfall netting facilities); or
  - [ii] A bar screen having a bar spacing of 0.5 inch.
  - [c] Where flows are conveyed through a trash rack that has parallel bars with one-inch spacing between the bars, to the elevation of the water quality design storm as specified in Subsection C of this section; or
  - [d] Where the NJDEP determines, pursuant to the New Jersey Register of Historic Places Rules at N.J.A.C. 7:4-7.2(c), that action to meet this standard is an undertaking that constitutes an encroachment or will damage or destroy the New Jersey Register listed historic property.
- (b) Catch basins. Catch basins are storm drain inlets with or without sumps. Catch basins may provide pretreatment for other stormwater BMPs by capturing large sediments. The sediment and pollutant removal efficiency of catch basins depends on the size of the sump and the performance of routine maintenance to retain the available sediment storage space in the sump. Where catch basins with sumps are proposed, the minimum two-foot separation between the bottom of the sump and seasonally high water table shall be provided.
- (c) Open or perforated conveyance piping. Where adequate separation to the seasonal high water table exists, stormwater from the development site may be conveyed to a stormwater basin via a system of perforated pipes. These pipes may be made of PVC or corrugated metal and are available with perforations of varying size and spacing. Perforated pipe specifications shall be certified by a professional engineer. A professional engineer shall certify that perforated conveyance piping will not act to intercept the seasonal high water table and convey groundwater to the stormwater basin. All open or perforated stormwater conveyance systems shall be installed with a minimum separation of two feet from the seasonal high water table.

L. Additional sources for technical guidance.

- (1) NJDEP technical guidance sources.
  - (a) New Jersey BMP Manual: available from the Division of Watershed Management, New Jersey Department of Environmental Protection, P.O. Box 418, Trenton, New Jersey 08625; or online at <http://www.njstormwater.org>.
  - (b) NJDEP Stormwater Management Facilities Maintenance Manual: available from the Division of Watershed Management, New Jersey Department of Environmental Protection, P.O. Box 418, Trenton, New Jersey 08625; or online at <http://njedl.rutgers.edu/ftp/PDFs/1188.pdf>.
- (2) Additional guidance sources.
  - (a) New Jersey Pinelands Commission, P.O. Box 7, 15 Springfield Road, New Lisbon, New Jersey 08064; phone: 609-894-7300; website: <http://www.state.nj.us/pinelands>.
  - (b) State Soil Conservation Committee Standards for Soil Erosion and Sediment Control in New Jersey: available from all State Soil Conservation Districts (including Gloucester Soil Conservation District, 14 Park Place, Sewell, NJ 08080; phone: 856-589-5250; fax: 856-256-0488).
  - (c) Gloucester Soil Conservation District.
  - (d) New Jersey Department of Transportation, P.O. Box 600, Trenton, NJ 08625-0600; phone: 609-530-3536; website: <http://www.state.nj.us/transportation>.