APPENDIX C: SAMPLE MUNICIPAL STORMWATER MANAGEMENT PLAN

This chapter contains a sample municipal stormwater management plan (MSWMP). It was prepared to assist municipalities in developing these plans, which are required by the 1999 Stormwater Phase II Permitting Regulations and the Stormwater Management Rules. The plan must contain all of the required elements outlined in the Stormwater Management rules at N.J.A.C. 7:8 - 4.2. The plan should also include additional recommended elements to enable municipalities to better manage the impact of stormwater on the receiving waters of the State from new and existing development.

Take note that the plan used in this chapter was developed as an example, and the information used for the township in the example is not based on an actual municipality. However, some of the information may be actual data taken from reports previously furnished by one or more municipalities. Every municipality shall include municipality-specific data and other relative information for use in its own MSWMP.

Table of Contents

Introduction

Every plan should include an introduction to explain why the plan was initially prepared, an explanation of updates, and a summary of the contents of the plan. Sample language is provided below, and throughout this chapter, as blue shaded text. Italicized text is used to denote specific information that is intended to be replaced by the municipality preparing the document.

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for *the* {*insert name of municipality*} *("the* {*insert shortened municipal name*}*")* to address stormwater-related impacts. The original MSWMP for this town was created on {*insert date*}, revised on {*insert date*} and now is being revised again in response to the updated Stormwater Management rules adopted on January 20, 2026, and in accordance with the requirement to review and update the MSWMP every 10 years. This updated plan contains all of the required elements described in the Stormwater Management rules at N.J.A.C. 7:8, as updated and amended through January 20, 2026. This plan addresses groundwater recharge, stormwater quantity and stormwater quality impacts by incorporating green infrastructure (GI) to meet the design and performance standards for projects that meet the definition of major development provided at N.J.A.C. 7:8-1.2 {*or as otherwise defined by the municipality, if a more stringent definition is used*.} These standards are intended to minimize the adverse impacts of stormwater runoff on water quality and water quantity, as well as the loss of groundwater recharge, which provides baseflow in receiving waterbodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities. The plan also incorporates the required climate resiliency strategies.

A "build-out" analysis has been included in this plan based upon existing zoning and land available for development. The plan also addresses the review and update of existing ordinances, the municipal Master Plan and other planning documents to allow for project designs that include low impact development techniques. The final component of this plan is a mitigation strategy for when a variance or exemption of the design and performance standards is sought. As part of the mitigation strategy section, specific stormwater management measures are identified to lessen the impact of existing development.

MSWMP Goals

Although each municipal plan may have additional goals, pursuant to N.J.A.C. 7:8-4.2(c)1, listed below are the minimum set of goals that shall be included in all municipal stormwater management plans. Sample language regarding the goals of the MSWMP is noted below.

In accordance with N.J.A.C. 7:8-2.2, the goals of the MSWMP are to:

1. Reduce flood damage, including damage to life and property,
2. Minimize, to the extent practical, any increase in stormwater runoff from any new development,
3. Reduce soil erosion from any development or construction project,

4. Assure the adequacy of existing and proposed culverts and bridges and other in-stream structures,
5. Maintain groundwater recharge,
6. Prevent, to the greatest extent feasible, an increase in pollution from stormwater runoff,
7. Maintain the integrity of stream channels for their biological functions, as well as for drainage,
8. Minimize pollutants in stormwater runoff from new and existing development to restore, enhance and maintain the chemical, physical and biological integrity of the waters of the State, to protect public health, to safeguard fish and aquatic life and scenic and ecological values and to enhance the domestic, municipal, recreational, industrial and other uses of water, and
9. Protect public safety through the proper design and operation of stormwater basins.

To achieve these goals, the MSWMP outlines specific stormwater design and performance standards using green infrastructure (GI) for major developments. Additionally, the plan proposes stormwater management controls to address impacts from existing development, including the incorporation of a climate change resilience strategy providing an evaluation of the impact of climate change on stormwater management. The required evaluation also considers the impacts created by sea level rise, increased flooding frequency and extent and increased rainfall depth and intensity, identifies areas and infrastructure vulnerable to flooding and/or sea level rise, and indicates which measures, such as green infrastructure, that will be implemented to reduce the impacts and maintain the capacity of stormwater conveyance systems. Furthermore, preventative and corrective maintenance strategies are included in the plan to ensure long-term effectiveness of stormwater management facilities. The MSWMP also outlines safety standards for stormwater infrastructure to be implemented to protect public safety.

MSWMP Approval Process

A municipality shall amend the Municipal Stormwater Management Plan (MSWMP) to reflect the latest amendments to the Stormwater Control Ordinance (SCO). MSWMPs are subject to review by county planning agencies to determine whether they meet the standards required by the Stormwater Management rules. A copy of the proposed plan must also be sent to the Department of Environmental Protection via email to stormwatermanagementrules@dep.nj.gov. The county must approve, conditionally approve or disapprove the plan in writing within 60 calendar days. Generally, the plan becomes effective upon approval by the county; however, in the case of conditional approvals, the plan becomes effective after the municipality meets the conditions of approval. It is expected that amendments to ordinances or MSWMPs will also require corresponding changes to municipal Master Plans, Land Use Ordinances and Zoning Ordinances as necessary. Sample language is provided below.

On {*insert date*}, {*insert name of municipality*} submitted this plan for approval to {*insert Name of*} County planning agency for review to determine compliance with meeting the standards required by the Stormwater Management rules at N.J.A.C. 7:8. A copy of the

proposed plan was also sent to the Department of Environmental Protection. Following review by the County, if any conditional approvals are deemed necessary, {*insert name of municipality*} will address the issues and issue a revised plan with any necessary updates or changes. If the County does not issue an approval, disapproval or conditional approval within 60 calendar days, the plan shall be deemed approved. {*insert name of municipality*} will attach any verification of approval as an addendum to this plan following the 60-calendar day review period.

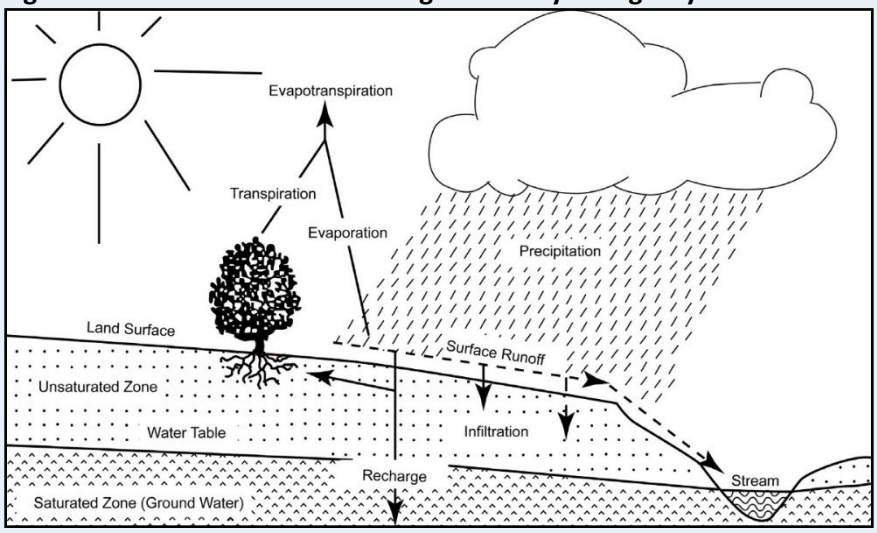
MSWMP Components

Stormwater Discussion

A brief description of the hydrologic cycle and how development affects the cycle is recommended and may be useful to the reader. Sample language is provided below.

Land development can dramatically alter the hydrologic cycle (See Figure C - 1 below) of a site and, ultimately, an entire watershed. Prior to development, native vegetation can either directly intercept precipitation or draw that portion that has infiltrated into the ground and return it to the atmosphere through evapotranspiration. Development can remove this beneficial vegetation and replace it with lawn or impervious cover (such as roadways and paved parking lots), reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. Impervious areas that are connected to each other through gutters, channels and storm sewers can transport runoff more quickly than natural areas. This shortening of the transport or travel time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher than natural conditions. These increases may cause new flooding problems, aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration which, in turn, reduces stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuations between normal and storm flow rates, which can increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can destroy habitat from which some species cannot adapt.

Figure C – 1: Groundwater Recharge in the Hydrologic Cycle



Source: New Jersey Geological Survey Report GSR-32

In addition to increases in runoff peaks and volumes and loss of groundwater recharge, land development often results in the accumulation of pollutants on the land surface that runoff can mobilize and transport to streams. New impervious surfaces and cleared areas created by development can accumulate a variety of pollutants from the atmosphere, including fertilizers, animal waste and leakage and wear from vehicles. Pollutants can include, but are not limited to, metals, suspended solids, hydrocarbons, pathogens and nutrients.

Furthermore, land development can adversely affect water quality and stream biota in more subtle ways beyond increased pollutant loading. For example, stormwater falling on impervious surfaces or stored in wet ponds can become heated and raise the temperature of the downstream waterway, thereby adversely affecting cold water fish species such as trout. Development can remove trees along stream banks that normally provide shading and stabilization of the stream bank.

Background Information

The MSWMP shall include background information on the municipality to help the reader understand its characteristics – size in square miles, population, population changes, waterways and the health of these waterways. For example, the MSWMP would state whether the municipality is a rural community that is rapidly becoming developed or is an older, established community where land use is fairly stable. The MSWMP would indicate the health of the waterways in the municipality, as described below in the Surface Water Quality Assessment subsection. Areas of recurrent stormwater/coastal flooding shall also be identified. Much of this information can also be found in the municipality's Watershed Improvement Plan (WIP) prepared pursuant to the Tier A MS4 permit, which is available on the municipality's stormwater webpage. For more information on the WIP requirements, see https://dep.nj.gov/njpdes-stormwater/municipal-stormwater-regulation-program/watershed-improvement-plan-resource-page/. Maps are to be provided to help the reader visualize the municipality and its physical features. In the sample language below, real data for Hillsborough Township is provided as an example so that the mapping and municipal characteristics could be presented along with information as to where to obtain this data.

However, note that all of the attributes for Hillsborough Township are not reflected in the data presented below. Due to the sample nature of this plan, this section does not present a comprehensive background of the municipality and its stormwater-related issues. Note the physical size of the figures published in this chapter is not meant to limit the size used in the actual MSWMP. Figures provided in the MSWMP shall be of sufficient size to properly show the necessary information.

The MSWMP shall include maps showing water bodies based on Soil Surveys published by the U.S. Department of Agriculture, the U.S. Geological Survey Topographic Map, 7.5 minute quadrangle series or other sources of information depicting water bodies in similar or greater detail. Sample language is provided below with accompanying figures provided on the next page:

{*insert name of municipality*} encompasses a *{insert area}* square mile area in *{insert County name}* County, New Jersey. In recent years, {*insert name of municipality*} has been under significant development pressure. The population of the {*insert name of municipality*} has {*select* increased *or* decreased*, as applicable*} from {*insert a series of population data and the corresponding years to demonstrate the increase or decrease*}. This population increase has resulted in considerable demand for new development; changes in the landscape have most likely increased stormwater runoff volumes and pollutant loads to the waterways of the municipality. Figure C - 2 illustrates the waterways in {*insert name of municipality*}. Figure C - 3 depicts the municipal boundary on the USGS quadrangle maps.

Figure C - 2: The Waterways of {*insert name of municipality*}

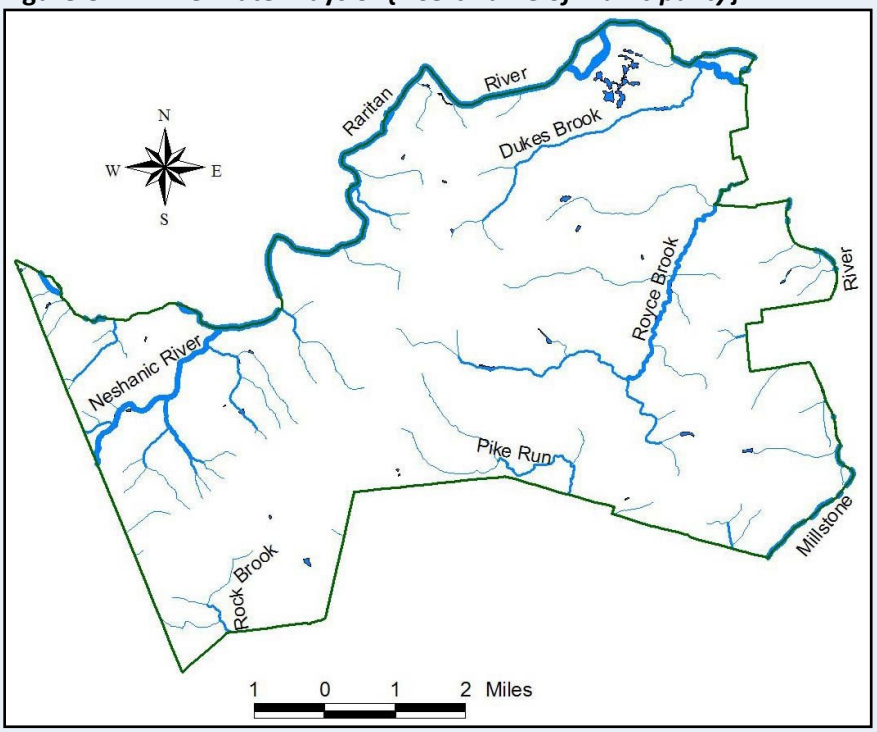
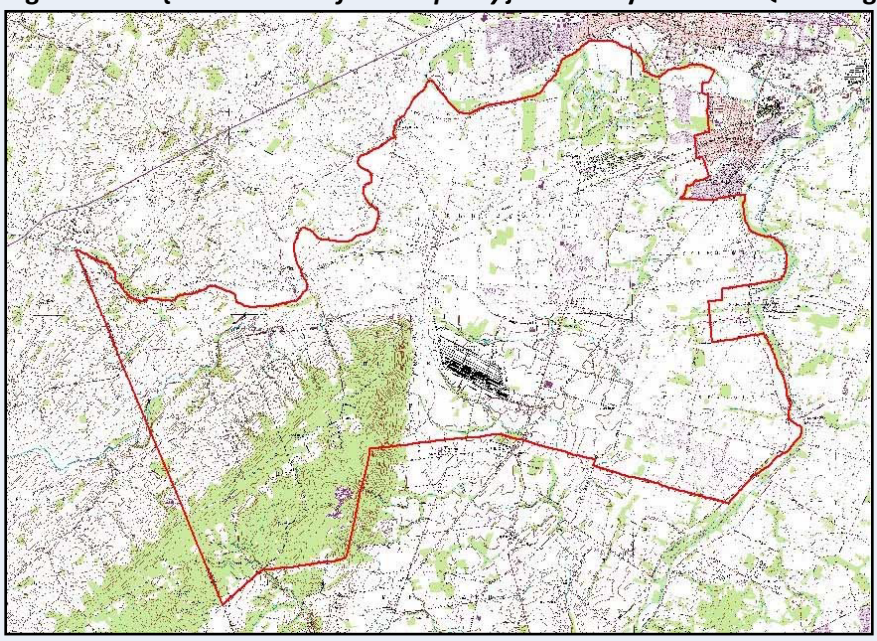


Figure C - 3: {*insert name of municipality*} Boundary on USGS Quadrangles



Population Statistics

It is recommended that the MSWMP include a discussion about the population statistics. Population statistics are available online from the New Jersey Department of Labor at: https://www.njlm.org/384/2020-Census-Information.

Mapping Requirements

Mapping, using Geographic Information System (GIS) software, is an essential component of the MSWMP. The NJ Bureau of Geographic Information has developed an application to access NJDEP GIS data online at https://dep.nj.gov/gis/nj-geoweb/. Click the Launch NJ-GeoWeb button to get started. The required elements include water bodies – which are to be based on Soil Surveys published by the U.S. Department of Agriculture, the U.S.G.S. Topographic Maps, 7.5 quadrangle series, or similar sources of information – and groundwater recharge areas and well head protection areas, as stated in N.J.A.C. 7:8- 4.2(c)2 and 3.

Stormwater Runoff Quantity Impacts

The municipality should list specific areas that are affected by stormwater runoff quantity problems and the extent. For example, for a 20-year storm event occurring in 2018, specific areas that reached particular elevations should be listed with a description of the effects to each area.

Sample language is provided below.

- **Stormwater Runoff Quantity Impacts**

{*insert name of municipality*} has exhibited water quantity problems including flooding, stream bank erosion, and diminished base flow in its streams. Many of the culverts associated with road crossings in the Township are undersized. During severe storm events, these undersized culverts do not have adequate capacity, thereby causing a backwater effect and flooding upstream.

These culverts were designed for much different hydrologic conditions (i.e., less impervious area) than those that presently exist in {*insert name of municipality*}. As the imperviousness increased in {*insert name of municipality*}, the peak flow rates and volumes of stream flows also increased. This increased amount of water resulted in stream bank erosion, which resulted in unstable areas at roadway/bridge crossings and degraded stream habitats.

Stormwater Management Design and Performance Standards

MSWMPs must describe how the plan incorporates the design and performance standards in N.J.A.C. 7:8-5 and any alternative design and performance standards that were adopted as a part of a regional stormwater management plan or water quality management plan. The design and performance standards incorporated into the municipality's SCO shall be at least as stringent as those in the Stormwater Management rules at N.J.A.C. 7:8. . This section should clearly state that the municipality will adopt all of the following:

1. Ordinances consistent with the design and performance standards at N.J.A.C. 7:8-5,
2. Ordinances to address maintenance consistent with N.J.A.C. 7:8-5.8 and
3. Ordinances to address safety consistent with N.J.A.C. 7:8-6.

The MSWMP must also indicate steps the municipality will take to ensure compliance with these standards.

Maintenance of Stormwater Management Measure Requirements

The MSWMP shall describe how the municipality will ensure that adequate long-term operation, as well as preventative and corrective maintenance that includes replacement, is performed on its stormwater management measures. Each of the BMPs covered in *Chapters 9, 10* and *11* of the BMP Manual include a maintenance section pertaining to the maintenance criteria specific to each type of BMP, and *Chapter 8* provides additional information pertaining to the general maintenance requirements for all BMPs. In the event the maintenance manual is no longer available or outdated, the municipality should require the responsible parties to reconstruct and update the maintenance manual using the information in the BMP Manual.

Safety Standards Compliance Requirements

The MSWMP shall describe how the municipality will ensure compliance with the Safety Standards for Stormwater Management Basins at N.J.A.C. 7:8-6.

Municipal stormwater management plans must describe how the plan incorporates the design and performance standards in N.J.A.C. 7:8-5 or alternative design and performance standards that were adopted as a part of a regional stormwater management plan or water quality management plan. The design and performance standards should be incorporated into the municipality's stormwater control ordinance to be consistent with this requirement. The full and simplified versions of a sample stormwater control ordinance are provided in *Appendix D: Model Stormwater Control Ordinance for Municipalities* to assist in the incorporation of these design and performance standards into municipal plans. The simplified version cites subchapter and section numbers the Stormwater Management rules, instead of the full text, to reduce or eliminate the need for the municipalities to revise their ordinance when the Stormwater Management rules are amended. A municipality has to comply with the applicable laws and procedures for the passage and adoption of ordinance pursuant to this simplified version.

This section should clearly state that the municipality will adopt ordinances consistent with the design and performance standards at N.J.A.C. 7:8-5, ordinances to address maintenance consistent with N.J.A.C. 7:8-5.8, and ordinances to address safety consistent with N.J.A.C. 7:8-6. It should also indicate steps the municipality will take to ensure compliance with these standards. The Township shall adopt the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies. The design and performance standards include the language for maintenance of stormwater management measures consistent with the stormwater management rules at N.J.A.C. 7:8-5.8 Maintenance Requirements, and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The ordinances will be submitted to the county for review and approval within {*12 months of the effective date of the Stormwater Management Rules*.}

The simplest method to address the need to incorporate all three of the ordinances noted above is to use the language from the Stormwater Management rules and the model SCO. However, the municipality may adjust these standards, as long as the adopted standards are at least as stringent as the State standards. For example, certain municipalities have designated specific entities that are required to assume maintenance responsibilities of identified stormwater facilities. In some cases, the municipality may choose to assume these responsibilities. Sample language is provided below.

> {*insert name of municipality*} will adopt the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving waterbodies. The design and performance standards will be met by incorporating green infrastructure in accordance with N.J.A.C. 7:8-5.3. The design and performance standards include the language for maintenance of stormwater management measures consistent with the Stormwater Management rules at N.J.A.C. 7:8-5.8 Maintenance Requirements and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The amended MSWMP and SCO will be submitted to the County for review and approval in accordance with N.J.A.C. 7:8-4.3(c).

As part of the application process for a major development, {*insert name of municipality*} will review stormwater plans and reports for the major development project to ensure compliance with the {*insert possessive for of the name of the municipality*}'s Stormwater Control Ordinance (SCO), the stormwater technical requirements of the Residential Site Improvement Standards (RSIS) which cite the stormwater regulation N.J.A.C 7:8 and the technical requirements of the New Jersey Stormwater Best Management Practices Manual (BMP Manual).

{*insert name of municipality*} will review the compliance for all stormwater BMPs in accordance with the BMP Manual or review any alternate BMP design pursuant to the {*insert possessive for the name of the municipality*}'s SCO. Any BMP alternative rate or alternate method of calculating the BMPs approval rate will be provided to the Department.

During construction, {*insert name of the municipality*} inspectors will observe the construction of the project to ensure that the stormwater management measures are constructed and function as designed.

Once constructed, {*insert name of municipality*} will ensure the responsible party performs the maintenance tasks listed in the maintenance manual, retain logs of the maintenance performed and ensure that the responsible party re-evaluates the effectiveness of the maintenance plan at least yearly.

The SCO may include fees and registration requirements to enforce adequate maintenance of stormwater management measures. The State rules also allow municipalities to require performance and maintenance bonds in accordance with their authority under the Municipal Land Use Law at N.J.S.A. 40:55D-53.

Soil Conservation District Coordination Requirements

The MSWMP shall include descriptive information on how the MSWMP will be coordinated with the Soil Conservation District and any other stormwater management plans, including any adopted RSWMPs. During construction, Township inspectors will observe the construction of the project to ensure that the stormwater management measures are constructed and function as designed. Sample is provided below.

The Township's Stormwater Management Ordinance requires all new development and redevelopment plans to comply with New Jersey's Soil Erosion and Sediment Control Standards. During construction, Township inspectors will observe on-site soil erosion and sediment control measures and report any inconsistencies to the local Soil Conservation District. During construction, {*insert name of the municipality*} inspectors will observe the construction of the project to ensure that the stormwater management measures are constructed and function as designed.

Green Infrastructure Requirements

On March 2, 2020, the Department adopted amendments to the Stormwater Management rules, N.J.A.C. 7:8. Among other things, these amendments replaced the requirement that major developments incorporate nonstructural stormwater management strategies with the requirement that green infrastructure BMPs identified in Table 5-1 at N.J.A.C. 7:8-5.2(f), and/or an alternative stormwater management measure approved in accordance with N.J.A.C. 7:9-5.2(g), be used to meet these same standards. **The requirements to use green infrastructure must be included in the MSWMP along with amendments and updates to the stormwater control ordinance(s), pursuant to N.J.A.C. 7:8-4.2(c).** Sample language is provided below.

> Pursuant to the SCO, green infrastructure BMPs designed in accordance with the BMP Manual shall be utilized on all major development projects to meet groundwater recharge, stormwater runoff quality and stormwater runoff quantity design and performance standards. Use of an alternative green infrastructure BMP can be approved by the municipality, subject to the requirements for alternative stormwater management measures at N.J.A.C. 7:8-5.2(g). As noted above, any alternative BMP will also be submitted to the Department.

The municipality must revise land use and zoning ordinances to prescribe how green infrastructure will be implemented. Additional information for using green infrastructure stormwater management measures and incorporating ordinances are provided in the individual subchapters of *Chapter 9: Green Infrastructure Practices* and *Chapter 10: Green Infrastructure Practices with a Waiver or Variance*, *Chapter 3: Regional and Municipal Stormwater Management Plans* and *Appendix B: Municipal Regulations Checklist*. Sample language is provided below.

> {*insert name of municipality*} has reviewed the Master Plan and ordinances and found the latest amendments to the chapter "Design and Performance Standards" include green infrastructure standards. Attached to this plan is the {*insert possessive form of the name of municipality*}'s stormwater control ordinance (SCO) that includes green infrastructure standards to be used for major development projects. {*insert name of municipality*} will review, inspect and enforce the implementation of major development projects ensuring the use of green infrastructure in accordance with the {*insert possessive form of the name of municipality*}'s SCO and the Stormwater Management rules at N.J.A.C. 7:8.

When submitting the plan and ordinances to the County for review, along with a copy to the Department, all revised ordinances, master plans and maps must be attached, along with an adoption schedule.

Additional discussion on using green infrastructure (GI) is presented in the guidance document titled "Meeting the Green Infrastructure Requirement (N.J.A.C. 7:8-5.3)" and *Chapters 9* and *10* of the NJ Stormwater Best Management Manual available at https://dep.nj.gov/stormwater/bmp-manual/.

Nonstructural Stormwater Management Strategies

Stormwater management plans shall include stormwater management measures, including green infrastructure and nonstructural strategies to meet the stormwater management goals. A stormwater management plan and any implementing ordinances shall be coordinated with any applicable Regional

Stormwater Management Plan. In both Regional and Municipal Stormwater Management Plans developed pursuant to N.J.A.C. 7:8-3 and 4, "nonstructural stormwater management strategies" may include one or more of the practices listed at N.J.A.C. 7:8-2.4(g), and are noted below. These strategies, as published in the rule, include approaches such as maximizing protection of natural drainage features and minimization of land disturbance, including clearing and grading, which are important principles to guide a stormwater planning effort.

As part of the 2020 Stormwater Rule amendments, although using green infrastructure to meet performance standards is required in place of using nonstructural strategies to the "maximum extent practicable," the nine nonstructural strategies listed below should be included in the MSWMP to guide the municipality's stormwater management planning effort.

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

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

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

4. Minimize the decrease in the "time of concentration" from pre-construction to post-construction. "Time of concentration" is defined as the time it takes for runoff to travel from the hydraulically most distant point of the drainage area to the point of interest within a watershed,

5. Minimize land disturbance, including clearing and grading,

6. Minimize soil compaction,

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

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

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

    - □ Development design features that help to prevent accumulation of trash and debris in drainage systems,
    - □ Development design features that help to prevent discharge of trash and debris from drainage systems,
    - □ Development design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments, and
    - □ When establishing vegetation after land disturbance, 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.

An additional discussion on the nonstructural is strategies is presented in *Chapter 2: Low Impact*

Development Techniques.

An example of the changes identified in the ordinances is given below. Take note this is not an exhaustive list of every ordinance that should be evaluated to include the nine nonstructural strategies; rather, it presents some examples. Since many municipal codes are similar throughout the State, the recommendations provided here may prove useful in modifying individual municipal codes. When submitting the plan and ordinances to the county for review and a copy to the Department, all revised ordinances, Master Plans and maps must be attached, along with an adoption schedule.

In accordance with the 2026 NJPACT Rule amendments to N.J.A.C. 7:8, {*insert name of municipality*} has reviewed the Master Plan and ordinances and has provided a list of the sections in {*insert name of municipality*} land use and zoning ordinances that are to be modified to incorporate nonstructural stormwater management strategies. As published in N.J.A.C. 7:8-2.4(g), the nine nonstructural stormwater strategies are as follow:

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

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

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

4. Minimize the decrease in the "time of concentration" from pre-construction to post-construction. "Time of concentration" is defined as the time it takes for runoff to travel from the hydraulically most distant point of the drainage area to the point of interest within a watershed,

5. Minimize land disturbance, including clearing and grading,

6. Minimize soil compaction,

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

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

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

    - □ Development design features that help to prevent accumulation of trash and debris in drainage systems,
    - □ Development design features that help to prevent discharge of trash and debris from drainage systems,
    - □ Development design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments, and

- □ When establishing vegetation after land disturbance, 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.

Below are the {*insert name of municipality*} ordinances identified for revision. Once the ordinance texts are completed, they will be submitted to the County review agency for review and approval within {*insert timeframe*}. A copy will be sent to the Department of Environmental Protection at the time of submission.

Chapter 77 of the {*insert name of municipality*} Code, entitled "Stormwater Regulations," was reviewed with regard to incorporating nonstructural stormwater management strategies. Nonstructural stormwater management strategies were removed from Article VI of this Chapter, entitled "Design and Performance Standards," to comply with the Stormwater Management rules at N.J.A.C. 7:8. The following nonstructural strategies are recommended:

Section 77-1: Buffers requires that buffer areas shall be created along all lot and street lines separating residential uses from arterial and collector streets, separating a nonresidential use from either a residential use or residential zoning district line and along all street lines where loading and storage areas can be seen from the street. The ordinance has been amended to also require the use of native vegetation, which requires less fertilization and watering than non-native species, be used for these buffer areas. An additional amendment was included requiring buffer areas to be used for stormwater management by disconnecting impervious surfaces and treating runoff from these impervious surfaces. This section requires development projects to include the preservation of natural wood tracts and limits land disturbance for new construction.

Section 77-2: Cluster Development provides for a cluster development option to preserve land for public and agricultural purposes, to prevent development on environmentally sensitive areas and to aid in reducing the cost of providing streets, utilities and services in residential developments. This cluster option is an excellent tool for reducing impervious roads and driveways. The option allows for smaller lots with smaller front and side yard setbacks than traditional development options. It also minimizes the disturbance of large tracts of land, which is a key nonstructural stormwater management strategy. The cluster option is being amended to require that {*insert percentage here}* of the total tract be preserved as common open space for residential area. The cluster option also requires that 25 percent of the green or common area be landscaped with trees and/or shrubs. This language was amended to promote the use of native vegetation, which requires less fertilization and watering than non-native ornamental plants. The cluster option requires public sidewalks to be installed along all streets, and these sidewalks can be constructed using pervious concrete where feasible. The cluster option also requires paths in open space to be mulched or stone to decrease the impervious area.

Section 77-3: Curbs and Gutters requires that concrete curb and gutter, concrete curb, or Belgian block curb shall be installed along every street within and fronting on a development. This section was amended to allow for curb cuts or flush curbs with

curb stops to allow vegetated swales to be used for stormwater conveyance and to allow the disconnection of impervious areas.

Section 77-4: Drainage, Watercourses and Flood Hazard Areas requires that all streets be provided with inlets and pipes where the same are necessary for proper drainage. This section was amended to encourage the use of natural vegetated swales in lieu of inlets and pipes to control the stormwater runoff along streets.

Section 77-5: Driveways and Accessways describes the procedure for construction of any new driveway or accessway to any street. This section was amended to allow the use of pervious paving materials for construction of driveway or accessway to any street to encourage minimizing stormwater runoff and promote groundwater recharge.

Section 77-6: Natural Features requires that natural features, such as trees, brooks, swamps, hilltops and views, be preserved whenever possible and that care be taken to preserve selected trees to enhance soil stability and landscaped treatment of the area. This section was amended to expand "trees" to refer to forested areas, in order to ensure that leaf litter and other beneficial aspects of the forest are maintained in addition to the trees.

Section 77-7: Nonconforming Uses, Structures or Lots now requires a variance for existing single family homes proposing additions that exceed the maximum percent impervious. The homeowner must mitigate the impact of the additional impervious surfaces unless the stormwater management plan for the development provided for these increases in impervious surfaces. This mitigation effort must address stormwater runoff water quality, quantity, and groundwater recharge as described in Chapter {*insert municipal code citation*}. A detailed description of how to develop a mitigation plan is present in {*insert name of municipality*} Code at {*insert municipal code citation*}.

Section 77-8: Off-site and Off-tract Improvements describes essential off-site and off-tract improvements. This section was amended to require that any off-site and off-tract stormwater management and drainage improvements must conform to the "Design and Performance Standards" described in this plan and provided in Chapter {*insert municipal code citation*} of the {*insert name of municipality*} Code.

Section 77-9: Off-street Parking and Loading details off-street parking and loading requirements. All parking lots with more than {*insert number*} spaces and all loading areas are required to have concrete or Belgian block curbing around the perimeter of the parking and loading areas. This section also requires that concrete or Belgian block curbing be installed around all landscaped areas within the parking lot or loading areas. This section was amended to allow for flush curb with curb stop or curbing with curb cuts to encourage developers to allow for the discharge of impervious areas into landscaped areas for stormwater management. Also, language was added to allow for use of natural vegetated swales for the water quality design storm, with overflow for larger storm events into storm sewers. This section also provides guidance on minimum parking space requirements. These requirements are based on the number of dwelling units and/or gross floor area. The section allows a

developer to demonstrate that fewer spaces would be required, provided area is set aside for additional spaces if necessary. This section was amended to allow pervious paving to be used in areas to provide overflow parking, vertical parking structures, smaller parking stalls and shared parking.

Sections 77-10: Performance Standards provides pollution source control. This ordinance section was added to prohibit materials or wastes from being deposited upon a lot in such form or manner that they can be transferred off the lot, directly or indirectly, by natural forces such as precipitation, evaporation or wind. It also requires that all materials and wastes that might create a pollutant or a hazard be enclosed in appropriate containers.

Section 77-11: Shade Trees requires a minimum of three shade trees per lot to be planted in the front yard. In addition to Section 77-73, {*insert name of municipality*} has a Tree Preservation Ordinance (Sections 77-160 to 77-165) that restricts and otherwise controls the removal of mature trees throughout {*insert name of municipality*}. This ordinance recognizes that the preservation of mature trees and forested areas is a key strategy in the management of environmental resources, particularly watershed management, air quality and ambient heating and cooling. These sections set out a "critical footprint area" that extends {*insert distance in feet here*} feet beyond the driveway and building footprint where clearing of trees cannot occur. This complies with minimizing land disturbance, which is a nonstructural stormwater management strategy. These sections were amended to require the identification of forested areas and that {*insert percentage here*} of forested areas be protected from disturbance.

Section 77-12: Sidewalks describe sidewalk requirements for {*insert name of municipality*}. Although sidewalks are not required along all streets, {*insert name of municipality*} can require them in areas where the probable volume of pedestrian traffic, the development's location in relation to other populated areas and high vehicular traffic, pedestrian access to bus stops, schools, parks and other public places, and the general type of improvement intended indicate the advisability of providing a pedestrian way. Sidewalks are to be a minimum of {*insert width in feet*} feet wide and constructed of concrete, using pervious concrete where feasible. This section was amended to require developers to design sidewalks to discharge stormwater to neighboring lawns where feasible to disconnect these impervious surfaces or use permeable paving materials where appropriate.

Section 77-13: Soil Erosion and Sediment Control addresses soil erosion and sediment control by referencing Chapter {*insert citation*}, {*insert possessive form of the name of municipality*}'s Soil Erosion and Sediment Control Ordinance. This revised ordinance requires developers to comply with the New Jersey Soil Erosion and Sediment Control Standards and outlines some general design principles, including, but not limited to, whenever possible, retain and protect natural vegetation, minimize and retain water runoff to facilitate groundwater recharge and install diversions, sediment basins and similar required structures prior to any on-site grading or disturbance.

Section 77-14: Stormwater Runoff addresses stormwater runoff by referencing Chapter {*insert citation*}, of the {*insert possessive form of the name of municipality*}'s

Stormwater Control Ordinance, which was updated to include all requirements outlined in N.J.A.C. 7:8-5. These changes were presented earlier in this document.

Section 77-15: Streets describes the requirements for streets in {*insert name of municipality*}. {*insert name of municipality*} has several street classifications, ranging from "Arterial," which has a minimum right-of-way of 80 feet, to "Secondary Local," which has a minimum right-of-way of 50 feet. Street paving widths are a function of the number of units served, whether a street is curbed, whether on-street parking is permitted, whether the interior streets serve lots of two acres or larger and whether on-site topographical constraints allow design flexibility. Depending on these factors, paving width for secondary local streets has a range from {*insert range of pavement width*} feet. This section was amended to encourage developers to limit on-street parking to allow for narrower paved widths. This section also required that cul-de-sacs have a minimum radius of {*insert radius*} feet. Language was added to this section to reduce the minimum radius of cul-de-sac designs. Cul-de-sacs with landscaped islands have a minimum radius of {*insert radius here*}, cul-de-sacs with flush curbs have a minimum radius of {*insert radius*} feet, with a {*insert width*} foot wide reinforced shoulder to accommodate larger equipment and emergency vehicles.

Section 77-16: Impervious Coverage Several changes were made to {insert municipal code citation} of the {*insert name of municipality*} Code entitled "Zoning Districts and Standards." {*insert name of municipality*} has 11 types of residential districts. Each district has a maximum percent impervious surface allocation, ranging from 5 percent for the MZ District, which has a minimum lot size of five acres for detached single-family homes, to 40 percent for the AM and RCA Districts, which have a minimum lot size of 7,000 square feet for cluster single-family homes. {*insert name of municipality*} has 12 types of non-residential districts. Each of these districts has a maximum percent impervious surface allocation, ranging from 30 percent for the HOO District to 60 percent for the I-1 District. Although each zone has a maximum allowable percent impervious surface, {*insert name of municipality*} Code was amended to remind developers that satisfying the percent impervious requirements does not relieve them of responsibility for complying with the Design and Performance Standards for Stormwater Management Measures contained in Chapter {*insert citation*}. If a developer is given a variance to exceed the maximum allowable percent imperviousness, the developer must mitigate the impact of the additional impervious surfaces. This mitigation effort must address stormwater runoff quality, quantity, and groundwater recharge as described in Chapter {*insert citation*}. A detailed description of how to develop a mitigation plan is included in this MSWMP.

Section 77-17: Pet Waste All pet owners and keepers are required to immediately and properly dispose of their pet's solid waste deposited on any property, public or private, not owned or possessed by that person. Any owner or keeper who requires the use of a disability assistance animal for disabilities such as vision or hearing loss, or other physical disabilities, shall be exempt from the provisions of this section while such animal is being used for that purpose. This exemption is not applicable to pets that are exclusively emotional support animals.

Section 77-18: Wildlife Feeding Control No person shall feed, in any public park or on any other property owned or operated by {*insert name of municipality*}, any wildlife.

Exemptions include unconfined wildlife at environmental education centers and feral cats as part of an approved Trap-Neuter-Release program.

Section 77-19: Litter Control It shall be unlawful for any person to throw, drop, discard or otherwise place any litter of any nature upon public or private property other than in a litter receptacle. Whenever any litter is thrown or discarded or allowed to fall from a vehicle or boat in violation of this ordinance, the operator or owner, or both, of the motor vehicle or boat shall also be deemed to have violated this ordinance.

Section 77-20: Improper Waste Disposal Control The spilling, dumping, or disposal of materials other than stormwater that causes the discharge of pollutants to the municipal separate storm sewer system operated by {*insert name of municipality*} is prohibited.

Section 77-21: Yard Waste A. No person shall sweep, rake, blow, or otherwise place yard waste into the street unless it is for a scheduled collection. B. For non-containerized (loose) yard waste collection: Placement of loose yard waste must be at least 10 feet away from any storm drain inlet and no sooner than 7 days prior to a scheduled and announced collection. C. For containerized yard waste collection: Yard waste shall be placed in an appropriate container at the curb or along the street for collection. Placement of such yard waste on the street at any other time or in any other manner is a violation of this ordinance. If such placement of yard waste occurs, the person responsible for placement of the yard waste shall be in violation of this ordinance and must remove the yard waste immediately.

Section 77-22: Privately-Owned Salt Storage A. Temporary outdoor storage of de-icing materials in accordance with the requirements below is allowed between October 15th and April 15th:

1. Loose materials shall be placed on a flat, impervious surface in a manner that prevents stormwater run-through;
2. Loose materials shall be placed at least 50 feet from surface water bodies, storm drain inlets, ditches and/or other stormwater conveyance channels;
3. Loose materials shall be maintained in a cone-shaped storage pile. If loading or unloading activities alter the cone-shape during daily activities, tracked materials shall be swept back into the storage pile, and the storage pile shall be reshaped into a cone after use;
4. Loose materials shall be covered as follows:
   a. The cover shall be waterproof, impermeable, and flexible;
   b. The cover shall extend to the base of the pile(s);
   c. The cover shall be free from holes or tears;
   d. The cover shall be secured and weighed down around the perimeter to prevent removal by wind; and
   e. Weight shall be placed on the cover(s) in such a way that minimizes the potential of exposure as materials shift and runoff flows down to the base of the pile.
      (1) Sandbags lashed together with rope or cable and placed uniformly over the flexible cover, or poly-cord nets provide a suitable method. Items that can potentially hold water (e.g., old tires) shall not be used;
5. Containers must be sealed when not in use; and
6. The site shall be free of all de-icing materials between April 16th and October 14th.

B. De-icing materials should be stored in a permanent structure if a suitable storage structure is available. For storage of loose de-icing materials in a permanent structure, such storage may be permanent, and thus not restricted to October 15 April 15.

C. {*Municipality may add optional language here requiring that all such temporary and/or permanent structures must also comply with all other local ordinances, including building and zoning regulations.*}

D. The property owner, or owner of the de-icing materials if different, shall designate a person(s) responsible for operations at the site where these materials are stored outdoors, and who shall document that weekly inspections are conducted to ensure that the conditions of this ordinance are met. Inspection records shall be kept on site and made available to the municipality upon request. Residents who operate businesses from their homes that utilize de-icing materials are required to perform weekly inspections.
Exceptions: Residents may store de-icing materials outside in a solid-walled, closed container that prevents precipitation from entering and exiting the container, and which prevents the deicing materials from leaking or spilling out. Under these circumstances, weekly inspections are not necessary, but repair or replacement of damaged or inadequate containers shall occur within 2 weeks. If containerized (in bags or buckets) de-icing materials are stored within a permanent structure, they are not subject to the storage and inspection requirements in Section III above. Piles of de-icing materials are not exempt, even if stored in a permanent structure. This ordinance does not apply to facilities where the stormwater discharges from de-icing material storage activities are regulated under another NJPDES permit.

Section 77-23: Tree Removal A. Any person who removes one or more street tree(s) with a DBH of 2.5" or more, unless exempt under Section IV, shall be subject to the requirements of the Tree Replacement Requirements Table below.

B. Any person, who removes one or more tree(s), as defined as Tree removal, with a DBH of 6" or more per acre, unless otherwise detailed under Section IV, shall be subject to the requirements of the Tree Replacement Requirements Table. The species type and diversity of replacement trees shall be in accordance with Appendix A {*insert municipality provided tree list as Appendix A of this ordinance*}. {*The municipality shall provide a list of approved trees that are acceptable to be planted as replacement trees, or at a minimum develop a list of trees that shall not be used as replacement trees. This list will be included as "Appendix A." It is permissible for a municipality to include a procedure for approval of a tree not on the approved list. The list shall also contain approved planting times/seasons and proper planting standard procedures or a reference to available literature containing this information.*} Replacement tree(s) shall:
1. Be replaced in kind with a tree that has an equal or greater DBH than tree removed or meet the Tree Replacement Criteria in the table below;
2. Be planted within twelve (12) months of the date of removal of the original tree(s) or at an alternative date specified by the municipality;
3. Be monitored by the applicant for a period of two (2) years to ensure their survival

and shall be replaced as needed within twelve (12) months; and
4. Shall not be planted in temporary containers or pots, as these do not count towards tree replacement requirements.

C. Replacement Alternatives:
1. If the municipality determines that some or all required replacement trees cannot be planted on the property where the tree removal activity occurred, then the applicant shall do one of the following:
a. Plant replacement trees in a separate area(s) approved by the municipality.
b. Pay a fee of {*amount to be set by municipality*} per tree removed. This fee shall be placed into a fund dedicated to tree planting and continued maintenance of the trees.
D. Exceptions: All persons shall comply with the tree replacement standard outlined above, except in the cases detailed below. Proper justification shall be provided, in writing, to the municipality by all persons claiming an exemption {*the municipality shall define what "proper justification" is such as photos or statements from NJ licensed tree expert as per NJ Statue 45:15C-11 or arborist*}:
1. Residents who remove less than four (4) trees per acre that fall into category 1, 2, or 3 of the Tree Replacement Requirements Table within a five-year period. {T*he number of trees removed is a rolling count across a five-year period. For example, if 3 trees from category 1 are removed in July 2023, the "count" resets to zero in July 2028. However, if 1 tree from category 1 is removed in July 2023 and another in July of 2025, the first tree will come off the count in July 2028 and the second in July 2030.*}
2. Tree farms in active operation, nurseries, fruit orchards, and garden centers;
3. Properties used for the practice of silviculture under an approved forest stewardship or woodland management plan that is active and on file with the municipality;
4. Any trees removed as part of a municipal or state decommissioning plan. This exemption only includes trees planted as part of the construction and predetermined to be removed in the decommissioning plan.
5. Any trees removed pursuant to a New Jersey Department of Environmental Protection (NJDEP) or U.S. Environmental Protection Agency (EPA) approved environmental clean-up, or NJDEP approved habitat enhancement plan;
6. Approved game management practices, as recommended by the State of New Jersey Department of Environmental Protection, Division of Fish, Game and Wildlife; and
7. Hazard trees may be removed with no fee or replacement requirement.

Tree Replacement Requirements Table:

Category	Tree Removed (DBH)	Tree Replacement Criteria (See Appendix A)	Application Fee *{Municipality may choose to include and determine appropriate fees.}*
1	DBH of 2.5" (for street trees) or 6" (for non-street trees) to 12.99"	Replant 1 tree with a minimum tree caliper of 1.5" for each tree removed	*TBD by town*
2	DBH of 13" to 22.99"	Replant 2 trees with minimum tree calipers of 1.5" for each tree removed	*TBD by town*
3	DBH of 23" to 32.99"	Replant 3 trees with minimum tree calipers of 1.5" for each tree removed	*TBD by town*
4	DBH of 33" or greater	Replant 4 trees with minimum tree calipers of 1.5" for each tree removed	*TBD by town*

Municipal Stream Corridor Protection Plan

Stream corridors, i.e., a vegetated zone or "buffer" along a stream, help filter pollutants carried in runoff, reduce erosion and maintain stream integrity, shade the stream, reduce temperature fluctuations caused by runoff and provide wildlife habitat. They are therefore of great value and can be a determinant of stream quality. Natural stream corridors protect homes and property from flood damage by providing a range of economic, ecological, and social benefits. Maintaining a stream corridor is instrumental in maintaining a healthy riparian ecosystem. Protecting a stream corridor saves resources, money and time, and such efforts are generally better at maintaining ecologic diversity than a restored stream corridor. However, even restoration of impaired waters provides the benefits mentioned above.

An MSWMP may require a stream corridor protection plan, which would include information on methods of evaluation, restoration and how to improve streams and stream corridors. Such a plan would define where a buffer would exist, e.g., for streams where a discernible bank exists, the buffer would extend a set distance – often 200 - 300 feet – from the edge of the bank and for streams where there is no discernible bank, the buffer would extend from the centerline of said stream. The resulting plan serves to protect the stream from inappropriate development and maintain its value as a natural resource.

The first step to plan creation is an inventory, or assessment, of the streams and associated habitats. The inventory first identifies the existing conditions, for which one may consult the Department's Integrated Water Quality Report and established TMDL information, perform field observations and review available GIS data. Secondly, the inventory diagnoses the sources of the issues. This evaluation would then be

included in a report of compiled data and include analyses of the functional value of the stream corridor, resulting in a disposition of the primary factors affecting the water resource and the rationale behind ordinances and other measures to be implemented, which are then incorporated into the stream corridor protection plan. The inventory shall incorporate the assessment and other information from the most currently available municipal WIP. More information on the required municipal WIP, plus the Department's tools and GIS layers are available at https://dep.nj.gov/njpdes-stormwater/municipal-stormwater-regulation-program/watershed-improvement-plan-resource-page/.

The functional value assessment methodology (FVAM) may be used to collect data and establish the functional value of an existing area, and it focuses on five core functional values of streams and riparian areas: channel integrity, habitat, water quality, temperature moderation and public use. These values are often interrelated. For example, healthy riparian plant communities provide water quality protection and temperature moderation, whereas impaired habitat and water quality can inhibit the public use. The FVAM consists of two phases: a desk-top, GIS-based exercise followed by field investigations. Guidance on the functional value assessment methodology, which is a tool for collecting and analyzing stream corridor date, is provided by the New Jersey Highlands Water Protection and Planning Council and may be found online at:

https://www.nj.gov/njhighlands/resources/lakes/Highlands_Council_Stream_Corridor_Guidance_Part_I_FVAM.pdf.

The municipality may also wish to consult the relevant materials provided by other nongovernmental environmental agencies serving areas beyond the highlands. One such resource is the Center for Watershed Protection's Unified Stream Assessment which provides information to systematically evaluate conditions, through the development of eight impact assessments and a single overall reach level assessment, and then identify restoration opportunities with a stream corridor. For more information, see the Resources tab on the Center for Watershed Protection website.

Some of the items in the aforementioned assessments are also geographic features of a municipal storm sewer system, or "MS4," that may be located in the data used to meet the mapping requirements for the Tier A MS4 permit, under Part IV.G.1, and for which assistance may be found online at https://dep.nj.gov/njpdes-stormwater/municipal-stormwater-regulation-program/msrp_map_aid/. In addition, the New Jersey Watershed Evaluation Tool (NJ-WET) provides the GIS layers of the MS4 infrastructures, including culverts, green infrastructure, inlets, manufactured treatment devices, outfalls and stormwater management basins that are reported from the MS4 permittees. The NJ-WET Tool is available on the Watershed Improvement Plan webpage at: https://dep.nj.gov/njpdes-stormwater/municipal-stormwater-regulation-program/watershed-improvement-plan-resource-page/. Other guidance is available through the link to the NJ Environmental Digital Library at https://njedl.rutgers.edu/.

Once the inventory is completed, the development of a stream corridor protection plan begins with defining what is to be protected and naming the streams to be protected. The streams to be protected shall be included as a layer on the municipality's required GIS mapping. Depicting the drainage areas connected to each stream as an additional layer is also required as per the 2023 Tier A MS4 permit. The next step would be to identify the buffer assigned to each stream, but as this is site specific, there may be a need to assign different widths of buffers to parts of a given stream to reflect the sensitivity and resource value of the stream, its bank and the adjacent area, using information from the assessment. It is recommended to include the buffers as a layer on the GIS mapping.

Next, the stream corridor protection plan should include a decision-making process that ranks and prioritizes areas of concern for restoration. The plan should consider the creation of strategies to be implemented or techniques that can be used to offset disturbance and enhance a site, including revegetation plans and other mitigation, and then provide a series of project recommendations that include efforts to build consensus within the community. Additionally, a rubric should be developed by which actions proposed in the development or redevelopment of a property impacted by the stream corridor protection plan can be gauged for their effectiveness in maintaining the integrity of the stream corridor. There should be no net loss in functionality of the stream corridor as a result of the project. Take note that some of this work may have already been completed in compliance with the Tier A MS4 permit, under the Watershed Improvement Plan found in Part IV.H.

Take note that stream corridors are dynamic systems that evolve over time. For example, portions of the stream bed may erode in one area, but there will be a corresponding deposition of the eroded materials elsewhere. However, human-made structures, bank armoring, confinements, such as bridge abutments, and the influx of additional runoff from development can introduce disequilibrium and result in a loss in functional value. The stream corridor protection plan should therefore also include planning for future changes to the stream location and also reflect changes brought about by climate change. Guidance for the development of the stream corridor protection plan may be found online at:

https://www.nj.gov/njhighlands/resources/lakes/Highlands_Council_Stream_Corridor_Guidance_Part_II.pdf,

which includes a list of technical literature resources and other references.

The final step to implementing the plan is the adoption of a stream corridor protection ordinance by the municipality. This ordinance should reflect the definitions from the plan, the listing of the streams and their respective buffer(s). The ordinance should also establish what uses are to be allowed in or adjacent to the buffers, including maintenance activities, existing agriculture – including any livestock crossings, existing structures, road and bridges, and recreation. The ordinance should also reflect future steps to be

taken as the stream corridor evolves. The ordinance should also include enforcement procedures and penalties section and standard severability clauses.

Climate Change Resiliency Plan Requirements

On February 4, 2021, Governor Murphy signed Senate Bill No. 2607 which required the integration of climate vulnerability assessments into future municipal master plan updates. Pursuant to N.J.A.C. 7:8-4.2(c)15, which was adopted on January 20, 2026, the municipality is required to create and implement a climate resilience strategy. The required municipal climate resilience strategies shall follow the three steps enumerated below pertaining to stormwater management:

1. Evaluate the impact of climate change on stormwater management, including a consideration of impacts created by sea level rise, increased flooding frequency and extent, and increased rainfall depth and intensity,

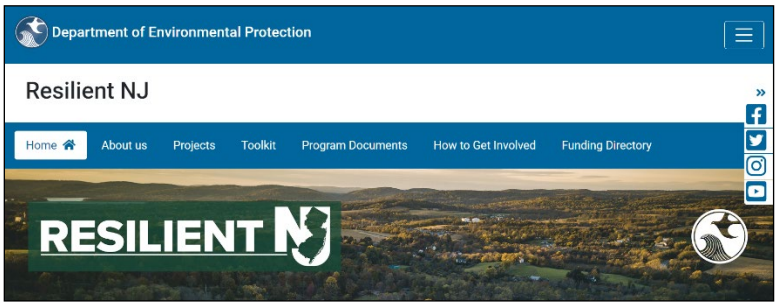
2. Identify areas and infrastructure vulnerable to flooding and/or sea level rise, and

3. Indicate which measures, such as green infrastructure, that will be implemented to reduce the impacts to the management of stormwater runoff in the municipality and maintain the capacity of stormwater conveyance systems and best management practices (BMPs) owned and operated by the municipality.

The municipal climate resilience strategy should enhance the municipality's ability to respond better and more efficiently to adverse situations resulting from climate change, and not simply allow the municipality to revert to what was considered normal prior to the event.

The information provided on the Resilient NJ website is meant for the local resilience planning over the social, environmental, or economic impacts, but it may be helpful in the creation of the climate change resilience strategies pertaining to the management of stormwater runoff. The website is found at https://www.nj.gov/dep/bcrp/resilientnj/. The toolkit provided for the aforementioned vulnerability assessments that can also be applied to the climate resilience strategies. To access the toolkit, start by navigating to the toolbar and select the Toolkit, which can be directly accessed at:

https://experience.arcgis.com/experience/9daab51c2f5542969d50437522e012c4.



In addition to redirecting the user to a designated page corresponding to the topic identified in the tab title, each of the tabs contains pull-down menus. It is recommended the user start with the overview tab. By working through the tabs, from left to right, the municipality can develop the climate resilience

strategies, which will incorporate capability and capacity building actions, identifying ways to reduce risk, and an evaluation of each strategy. One useful feature is the Resilience Library, which has many links to technical reports, planning legislation and requirements, template worksheets, training, sample meeting and communications - related guidance.

The process of climate resilience strategy development is itemized below. Sample language follows at the end of the discussion of the three requirements.

Step 1: Evaluation of the Impacts of Climate Change

The first step to developing a climate change resilience strategy for a given municipality is to evaluate the climate change impacts that actually affect that municipality. This can be accomplished by using two (2) different web applications to physically see the different impacts for a given area.

- The first web application is the New Jersey Extreme Precipitation Projection Tool: https://njprojectedprecipitationchanges.com/. This site provides an interactive tool for users to identify regional and local estimates of projected changes in extreme rainfall amounts (measured in inches) within a 24-hour duration for various return periods between current estimates and a future time period under either of two future emission scenarios.

- The second web application is NJ Geo-Web, which provides users access to NJDEP GIS data. Users can view, query and analyze the Department's GIS data with related environmental information, at: https://njdep.maps.arcgis.com/apps/webappviewer/index.html?id=02251e521d97454aabadfd8cf168e44d. There are multiple layers that can be added and viewed to evaluate the climate change impacts for a given municipality. These layers, and how to add them, are described below:

    - The **Federal Emergency Management Agency (FEMA) National Flood Hazard** layer, at: https://hazards.fema.gov/arcgis/rest/services/FIRMette/NFHLREST_FIRMette/MapServer, shows the effective regulatory flood insurance rate maps (FIRMs) that are used for engineering design and flood insurance purposes.

    - The **NJ Inland Design Flood Elevation** layer shows the required design flood elevation for inland areas in New Jersey. It is the FEMA 1% base flood elevation (BFE) plus 3 feet to account for climate change in fluvial areas. This layer can be added with the following URL: https://services1.arcgis.com/ze0XBzU1FXj94DJq/arcgis/rest/services/NJ_FEMA_FP3_4_9_2024/FeatureServer.

    - The **Tidal Climate Adjusted Flood Elevation (CAFE)** shows the required design flood elevation for coastal areas in New Jersey. It is the FEMA coastal special flood hazard area plus 5 feet to account for climate change in tidal areas. This layer can be added directly through NJ GeoWeb under the "Water" tab.

    - The **LULC Urban 2015 with Future Flooding** layer is a combination of the 1% and 0.2% flood hazard areas from the FEMA National Flood Hazard Layer and the CAFE layer clipped to only show urban areas. This layer compliments the above layers and can be added directly through NJ GeoWeb under the "Land" tab.

    - The **Height Above Nearest Drainage (HAND) Average Flood Event** layer shows an approximation of flood inundation from the nearest water stream based on historical data. This layer compliments the above layers and can be added with the following URL:

https://tiles.arcgis.com/tiles/ze0XBzU1FXj94DJq/arcgis/rest/services/HAND_Average_Flood_Event/MapServer.

- The **Sea Level Rise of 2, 3 and 5 Feet** layer shows potential flooding inundation of 2, 3 and 5 feet above Mean Higher High Water (MHHW) for tidally influenced areas. This layer can be added directly through NJ GeoWeb under the "Water" tab.

- The **Sea, Lake and Overland Surges (SLOSH) Hurricane Storm Surge** layer estimates storm surge heights resulting from historical, hypothetical or predicted hurricanes and is found at this URL: https://services1.arcgis.com/ze0XBzU1FXj94DJq/arcgis/rest/services/SLOSH_Hurricane_Storm_Surge/FeatureServer. This layer compliments the above-listed layers.

It is important to understand whether a municipality is inland or coastal in terms of impacts because a municipality does not need to be located directly along the Atlantic Ocean to experience coastal impacts. Many municipalities along the Passaic River, Raritan River and Mullica River, for example, experience storm surge because they are tidally influenced, and coastal/tidally areas have more climate change impacts of which to be more aware. With this in mind, the following table summarizes which layers may best be suited to inland versus coastal communities.

GIS Layer	Inland	Coastal
Federal Emergency Management Agency (FEMA) National Flood Hazard Layer	✓	✓
NJ Inland Design Flood Elevation	✓	
Tidal Climate Adjusted Flood Elevation (CAFE)		✓
LULC Urban 2015 with Future Flooding	✓	
Height Above Nearest Drainage (HAND) Average Flood Event	✓	✓
Sea Level Rise of 2, 3 and 5 Feet		✓
Sea, Lake and Overland Surges (SLOSH) Hurricane Storm Surge		✓

It is important to note that all available internal and local resources shall also be used to accurately evaluate climate change impacts to the fullest extent possible. In order to become the basis for the second requirement of N.J.A.C. 7:8-4.2(c)15, the end product for this requirement is a comprehensive set of GIS layers reflecting climate change impacts created by sea level rise, increased flooding frequency and extent, increased rainfall depth and increased intensity.

Step 2: Identify Areas and Infrastructure Vulnerable to Flooding and/or Sea Level Rise

The next step to developing a climate resilience strategy is an identification of areas and infrastructure sensitive to the climate change impacts identified in Step 1. By infrastructure, the focus is specifically on stormwater management facilities such as, but not limited to, inlets, catch basins, stormwater conveyances, cisterns, dry wells, grass swales, green roofs, manufactured treatment devices (MTDs), pervious paving systems, bioretention basins, infiltration basins, sand filters, filter strips, constructed wetlands, wet ponds, blue roofs and detention basins.

This can be accomplished by again using NJ GeoWeb to plot the locations of stormwater management facilities within the municipality and see where they overlap with the seven (7) layers from step one. As discussed above, this mapping information is also required in the MS4s permit and should be available through the New Jersey Watershed Evaluation Tool (NJ-WET) which provides the GIS layers of the MS4 infrastructures, including culverts, green infrastructure, inlets, manufactured treatment devices, outfalls and stormwater management basins that are reported from the MS4 permittees. The NJ-WET Tool is available on the Watershed Improvement Plan webpage at: https://dep.nj.gov/njpdes-stormwater/municipal-stormwater-regulation-program/watershed-improvement-plan-resource-page/. The MS4 infrastructure layers shown in the NJ-WET Tool are also available in the Utility layer of NJ GeoWeb. For collaboration of the MS4 infrastructure layers with the seven layers mentioned above, the steps involved using NJ GeoWeb are described below:

- **NJ GeoWeb**: From the "Utilities" tab, turn on Culverts, Green Infrastructure, Inlets, Manufactured Treatment Devices, Outfalls, Stormwater Management Basins and Subsurface Infiltration/Detention System (SIDS).
- **New Jersey Hydrologic Modeling Database**: This layer is a collection of stormwater basins from major developments.
    - The data is available at: https://hydro.rutgers.edu/public_data/.
    - Select the appropriate county and municipality and click "Download Basin Records."
    - Open the CVS file and change the column name "Project_Latitude" (column N) to "Latitude" and "Project_Longitude" (Column O) to "Longitude."
    - Add the file to NJ GeoWeb by clicking "Browse."

It is important to note that all available internal and local resources should also be used to accurately identify stormwater management facilities to the fullest extent possible. Additional GIS resources can also be used to overlap and manipulate the layers from Steps 1 and 2 because the compatibility of the additional GIS resources may need to be checked before being incorporated into NJ GeoWeb.

After plotting the locations of stormwater management facilities, a vulnerability assessment matrix should be completed to determine the risk level for each identified area and facility. After a risk level is determined for each facility for each climate impact (increased temperature, sea level rise, precipitation, ocean acidification and drought/water supply), the spreadsheet will automatically calculate the overall vulnerability for that facility. The vulnerability assessment matrix can be found here:

https://www.nj.gov/dep/bcrp/resilientnj/docs/vulnerability-assessment-matrix-template.xlsx.

The matrix with its itemized vulnerability ratings will help prioritize potential issues for municipalities and lead to the development of a set of actions the municipality can implement to address climate change impacts, and this subject is discussed further in Step 3 below.

Step 3: Measures to be Implemented to Reduce Impacts

The last step to developing a climate change resilience strategy for a given municipality is to implement measures that reduce the impacts found in Steps 1 and 2 and maintain the capacity of the stormwater conveyance systems. This can be accomplished by using structural and non-structural techniques, such as green infrastructure (GI), and local ordinances. The benefits provided by GI BMPs are included in the document entitled "Meeting the Green Infrastructure Requirement," which is found online at https://dep.nj.gov/wp-content/uploads/stormwater/meeting-the-gi-requirement-fact-sheet-2.pdf.

A municipality may also implement other stormwater management strategies, such as retrofitting existing stormwater infrastructure to accommodate the increase in precipitation depth and reduce local flooding. Below are a few options a municipality may consider including in its battery of measures to be incorporated into its climate change resilience strategy.

- Where the points of discharge are already, or will become, submerged due to climate change, the municipality may consider if tide gates will be required to prevent the intrusion of floodwaters into the system and how those points of discharge will function when submerged.
- The municipality may also consider whether the increased depths of precipitation will exceed the capacity of any stormwater pump stations and pipe collection systems and will such items require an increase their capacity.
- The municipality may also consider whether the increases in precipitation or sea level rise will impact an existing BMP, whether privately or publicly owned, resulting in localized flooding, and therefore require modification of the BMP.
- In anticipation of increased flooding, whether due to increased depths of precipitation or sea level rise, the municipal climate resilience strategy shall include the evaluation of locations and design of additional infrastructure to infiltrate stormwater runoff to reduce surface flows into conveyance systems.

A municipality should also review its ordinances, such as, but not limited to, the Zoning Ordinance, Stormwater Control Ordinance (SCO), and Land Use Ordinance to determine if modifications are needed to address climate change impacts. It is important to note that a municipality's SCO can be stricter than the model SCO available from the Department to account for the municipality's specific climate resilience strategy. For example, a municipality may implement a tree planting or open space requirement to offset increases in impervious cover.

NJDEP has also prepared three (3) matrices complete with example resilience strategies and individual action sheets for how to achieve them.

- For an example of a list of GI and nature-based solutions and how each measure addresses climate change effects and impacts, refer to:

  https://www.nj.gov/dep/bcrp/resilientnj/docs/green-infrastructure-and-nature-based-solutions-matrix.pdf.

- For a list of building and infrastructure projects strategies, refer to:

  https://www.nj.gov/dep/bcrp/resilientnj/docs/building-and-infrastructure-projects-matrix.pdf .

- For a list of local planning and regulations strategies, refer to:

  https://www.nj.gov/dep/bcrp/resilientnj/docs/local-planning-and-regulations-matrix.pdf.

Sample language for Steps 1 through 3 is provided below.

The climate change impacts for {*insert name of municipality*} were evaluated using the NJ GeoWeb web application to physically see the different types of impacts. There are seven (7) different layers that can be added and viewed to evaluate the climate change impacts, but because {*insert name of municipality*} is an inland community, only four (4) of the layers applied. These layers are the Federal Emergency Management Agency (FEMA) National Flood Hazard, NJ Inland Design Flood Elevation, Land Use/Land Cover (LULC) Urban 2015 with Future Flooding and Height Above Nearest Drainage (HAND) Average Flood Event layers. Figures 1 through 3 below show the progressive increase of potential flooding in affected areas as the above layers are, respectively, added. Locally maintained maps of frequently flooded areas were also reviewed as a part of this analysis. Together, these figures and maps summarize the progressive increase in flooding due to climate change impacts that will affect {*insert name of municipality*}. These are the impacts and areas that will need to be mitigated and monitored.

Figure 1: Township of Hillsborough, NJ with NJ Inland Design Flood Elevation

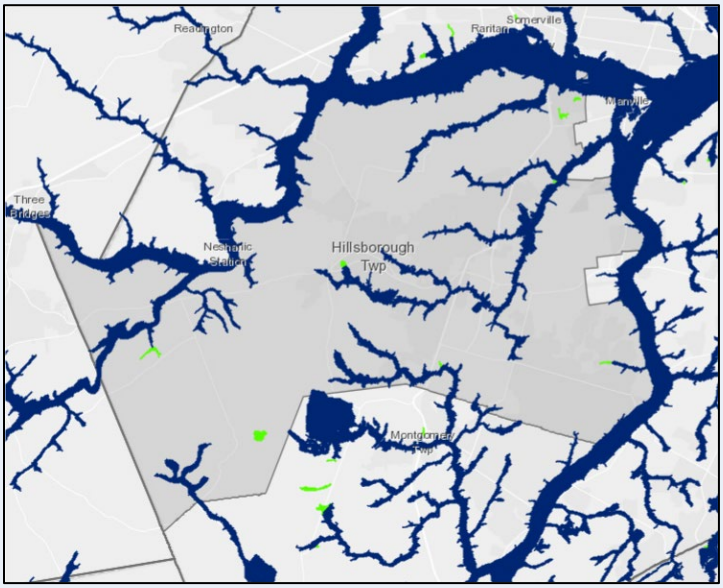


Figure 2: Township of Hillsborough, NJ plus LULC Urban 2015 with Future Flooding

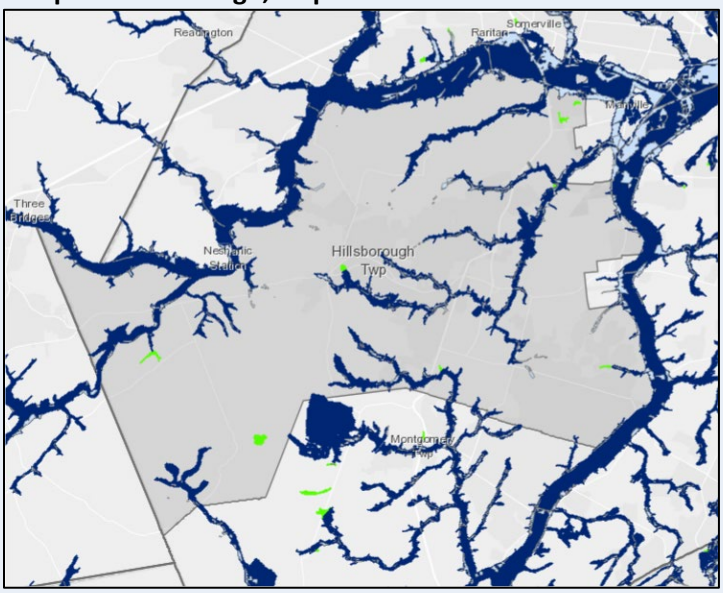
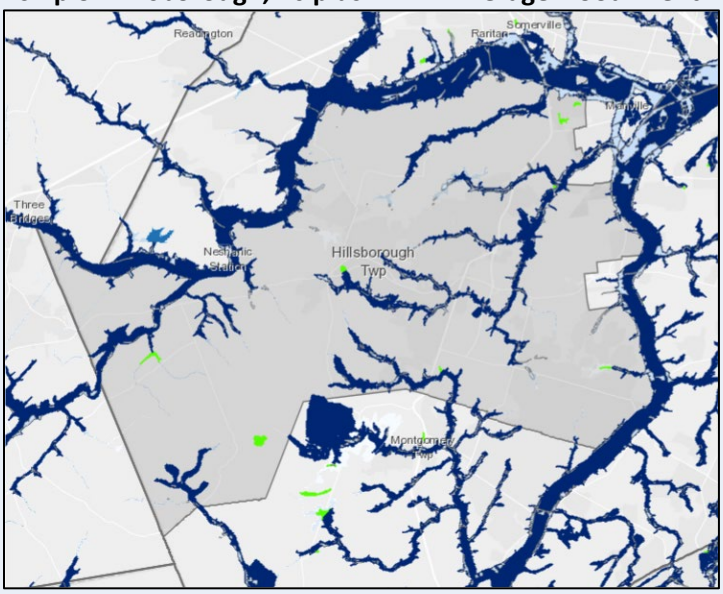


Figure 3: Township of Hillsborough, NJ plus HAND Average Flood Event



Similar to the climate change impacts, the stormwater management facilities within {insert name of municipality} were identified using the NJ-WET Tool and NJ GeoWeb application. These layers are not exhaustive and the location of some of these layers are at the center of the project site, aerial imagery, site visits, local documents and additional GIS resources were also used to help accurately locate these facilities. After locating all of the stormwater management facilities, a vulnerability assessment matrix was completed, detailing the climate change impacts and risk levels that overlap each one. The spreadsheet automatically calculated the overall vulnerability for each facility, and these are the areas and stormwater management facilities that will need to be prioritized for mitigation and monitoring.

Figure 4: Climate Change Impacts Overlapped with Stormwater Management Facilities

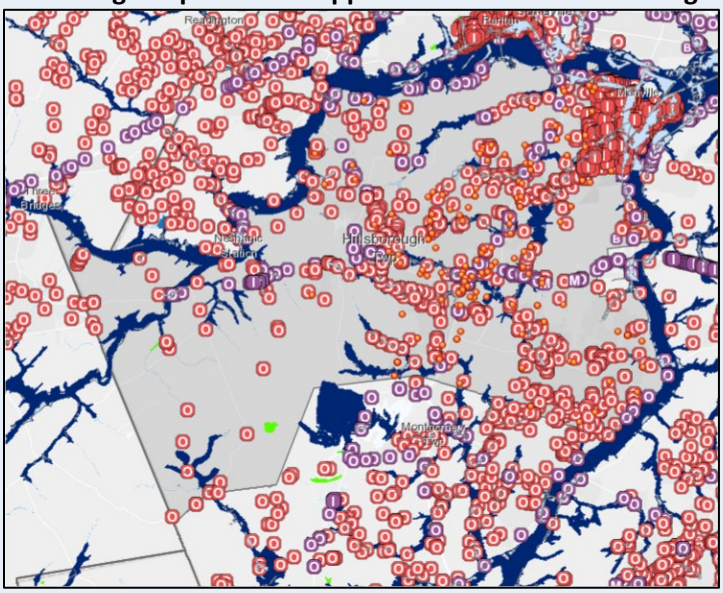


Figure 5: Vulnerability Assessment Matrix

		Climate Impact					
Asset Name	Asset Category	Increased Temp	Sea level rise	Precipitation	Ocean Acidification	Drought/Water Supply	Description of Impacts
Outfall 101	Stormwater Management Infrastructure	1	1	5	1	1	Outfall will be inundated during the 100-year storm
Outfall 102	Stormwater Management Infrastructure	1	1	5	1	1	Outfall will be inundated during the 100-year storm

Based on the results of the vulnerability matrix, it was determined that multiple stormwater outfalls not previously inundated by the 100-year storm will now be inundated. To avoid potential damage, contamination and flooding, {insert name of municipality} proposes to install and maintain a combination of stormwater pumps and backflow preventers at the most critical locations. These critical locations were determined based on where frequently flooded areas intersect critical infrastructure, such as main ingress and egress routes, emergency response services, food and water supply, medical care, communications and energy infrastructure, and hazardous materials facilities. This was done with the goal of being able to maintain continuous operation of critical business and government functions during an emergency.

The above example provides sample language for a small portion of the municipality, but this analysis needs to be completed for the entire municipality and all of its stormwater management infrastructure to ensure resilience in the face of climate change.

Plan Consistency

The MSWMP must be coordinated with the appropriate Soil Conservation District and any other stormwater management plan, such as an adopted regional stormwater management plan. A short paragraph, like the example below, is sufficient to comply with this requirement provided there is no RSWMP within the municipality. Sample language is provided below.

{*insert name of municipality*} is not currently within a Regional Stormwater Management Planning Area; therefore the requirement for the MSWMP to be consistent with any regional stormwater management plan (RSWMPs) is not applicable at this time. If any

RSWMPs are developed in the future, this plan will be updated to become consistent with the RSWMPs.

The MSWMP is consistent with the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21. {*insert name of municipality*} will use the most current update of the RSIS in the stormwater management review of major development projects in residential areas. This plan will be updated to be consistent with any future updates to the RSIS.

The {*insert possessive form of the name of municipality*}'s SCO requires all new development and redevelopment plans to comply with the New Jersey Soil Erosion and Sediment Control Standards. During construction, {*insert name of municipality*} inspectors will observe on-site soil erosion and sediment control measures and report any inconsistencies to the local Soil Conservation District.

Community Basin

A municipality that includes an area served by a combined sewer system (CSS) or a separate storm sewer system that is hydraulically connected to a combined sewer system may establish community basins that one or more developments could utilize to meet the development's water quantity requirements. The MSWMP shall include a demonstration, through hydrologic and hydraulic analysis, that the community basin(s) would alleviate existing or prevent potential flood damage or combined sewer overflow (CSO). See NJ BMP Manual *Chapter 3* and N.J.A.C. 7:8-4.2 (c) for more information regarding community basin requirements. Sample language is included below.

{*insert name of municipality*} is not within an area served by a combined sewer system (CSS) or a separate storm sewer system that is hydraulically connected to a CSS. Therefore, {*insert name of municipality*} has not established a community basin or basins to be used towards meeting water quantity requirements for any developments.

Sample language for a Township using a community basin appears below.

{*insert name of municipality*} is within an area served by a combined sewer system (CSS) or a separate storm sewer system that is hydraulically connected to a CSS. Therefore, {*insert name of municipality*} has established a community basin or basins to be used towards meeting water quantity requirements for any developments. {*insert area location map*}

In accordance with N.J.A.C. 7:8-4.2(c)14, {*insert name of municipality*} has designed a {s*pecify basin* (*community basin definition limits the available best management practices (BMPs) to infiltration basins, sand filters designed to infiltrate, standard constructed wetlands or wet ponds*)} community basin constructed in accordance with the New Jersey Stormwater BMP Manual, located at {*insert name and address of the basin*}. The basin is designed to address flooding and reduce or eliminate CSO discharges to the {*insert name of waterbody*}. The {*insert type, e.g., infiltration*} community basin also addresses stormwater from the {*identify specific lots*} in which the community basin will result in a net positive for the surrounding developments by reducing the land required to be dedicated for stormwater management, reducing the costs to the community, and

improving water quality through reduced CSOs. {*insert map to include lots and location of community basin*}

The {*insert type*} community basin provides stormwater runoff quantity control for the contributory sites in a manner that helps alleviate potential flood damage or CSO. In accordance with N.J.A.C. 7:8-4.(c)14.i, each contributory site to the community basin is presently served by a combined sewer system or a separate storm sewer system that is hydraulically connected to the combined sewer system. In accordance with N.J.A.C. 7:8-4.(c)14.iii and iv, the conveyance from each contributory site to the community basin has been designed to convey the 100-year design storm without overflow and the community basin has been designed to provide sufficient quantity control to address all of the stormwater draining into it. {i*nsert plans and drawings of basin(s) and all applicable detail drawings or plans*}

In accordance with N.J.A.C. 7:8-4.2(c)14ii, in addition to the community basin being used to meet the stormwater runoff quantity control standards at N.J.A.C. 7:8- 5.6, stormwater runoff quality, groundwater recharge and green infrastructure standards at N.J.A.C. 7:8-5.3, 5.4, and 5.5, as applicable, are designed to be met on each contributory site before leaving the site. {*Include all stormwater hydraulic and hydrologic analysis that demonstrates the applicable design and performance standards at N.J.A.C. 7:8-5 are being met, either as an attachment or link.*}

{*insert name of municipality*} shall maintain the basin and has adopted ordinances to regulate the use of the basin for ensuring the intended function to alleviate or prevent flood damage or CSOs into the future. {*Attach a maintenance plan and adopted maintenance ordinances*.}

{*insert name of municipality*} also adopted ordinances {*ordinance number*} to regulate the conditions and limitations of the inflow contributing to the community basin pursuant to N.J.A.C. 7:8-4.2(c)14vi.

All community basin plans will be submitted to the county for approval. Furthermore, the Long-Term Control Plans for addressing CSOs were submitted to the Department for review and approval. Since community basins are intended to be used to help address CSO, {*insert name of municipality*} will notify the Department of the use of a community basin both in the municipal stormwater management plan and as an update to the CSO Long-Term Control Plan, which the Department will review and approve before implementation.

Land Use/Build-Out Analysis

In compliance with N.J.A.C. 7:8-4.2(c)10, if a municipality can document that it has a combined total of less than one square mile of vacant or agricultural lands, the municipality has the option to not complete the following build-out analysis, which is required in subchapter 4.2(c)8 and 9 of the Stormwater Management rules. Otherwise, a build-out analysis must be conducted assuming full development under existing zoning for **each** HUC14 drainage area in the municipality. To satisfy the minimum requirements, the result of the build-out analysis WILL BE acreage of impervious surfaces, by HUC14, and associated

nonpoint loadings attributed to the build-out of the municipality. Although not required by the regulations, a quantitative analysis of the impact of build-out can be calculated, including population and number of school-age children, housing units and housing density, traffic, tax revenues, demands on schools, water supply, sewage, electrical production and police force. Additional information on the build-out is provided in *Chapter 3*.

There are four steps to preparing a build-out analysis that satisfies the requirements for the MSWMP:

1. Determine the total land area within each of the HUC14s of the municipality.

2. Determine the area of constrained lands within each HUC14 of the municipality.

3. Determine the land available for development by simply subtracting the constrained lands from the total land area for each HUC14. In essence, the land available for development is the agricultural, forest and/or barren lands available within each HUC14. Existing residential, commercial and industrial areas that are also eligible for redevelopment under updated zoning and should be considered as land eligible for development in the build-out analysis.

4. For each HUC14, complete a build-out analysis by using the municipal zoning map and applicable ordinances to determine the acreage of new development. Once the build-out acreage of each land use is determined for each HUC14, nonpoint source loadings can be determined for the build-out scenario. Shown below are examples of build-out analyses for two HUC14s located in the municipality.

Sample language is provided below. The figures and tables mentioned may be found on Pages 36 through 39.

> A detailed land use analysis for {insert name of municipality} was conducted. Figure C - 6 illustrates the existing land use in {*insert name of municipality*} based on 2015 GIS information from NJDEP. Figure C - 7 illustrates the HUC14s within {*insert name of municipality*}. The {*insert name of municipality*} zoning map is shown in Figure C - 8. Figure C - 9 illustrates the constrained lands within {*insert name of municipality*}. (Note: For this sample plan, not every constrained land was mapped.) The build-out calculations for impervious cover are shown in Table B - 1. As expected, when developing agricultural and forest lands, the build-out of these two HUC14s will result in a significant increase in impervious surfaces.
>
> Table C - 2 presents the pollutant loading coefficients by land cover. The pollutant loads at full build-out are presented in Table C - 3.

Figure C - 6: {*insert name of municipality*} Existing Land Use

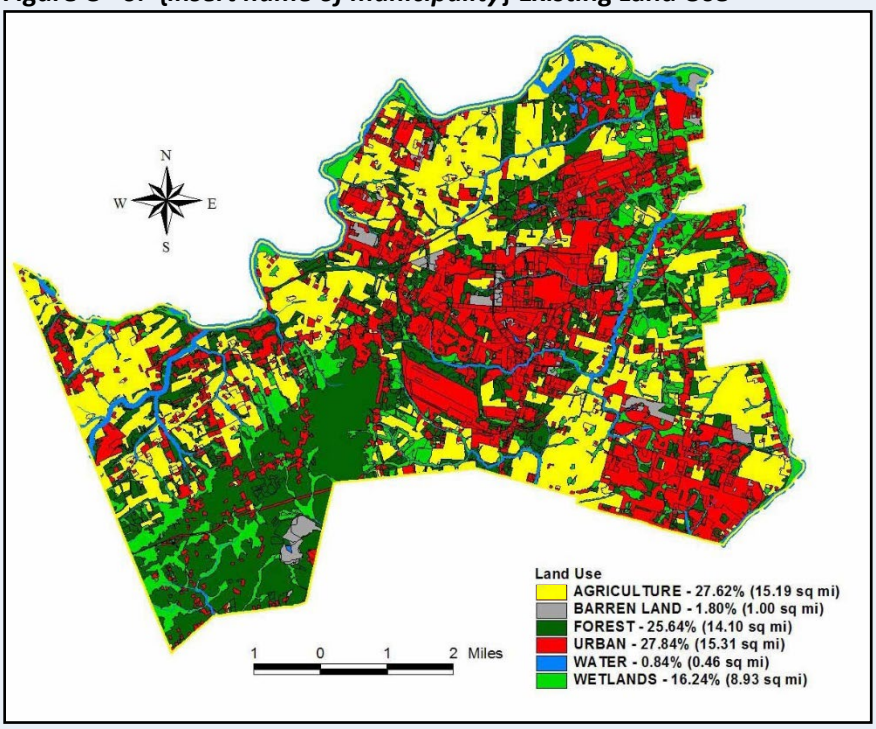


Figure C - 7: Hydrologic Units (HUC14s) within {*insert name of municipality*}

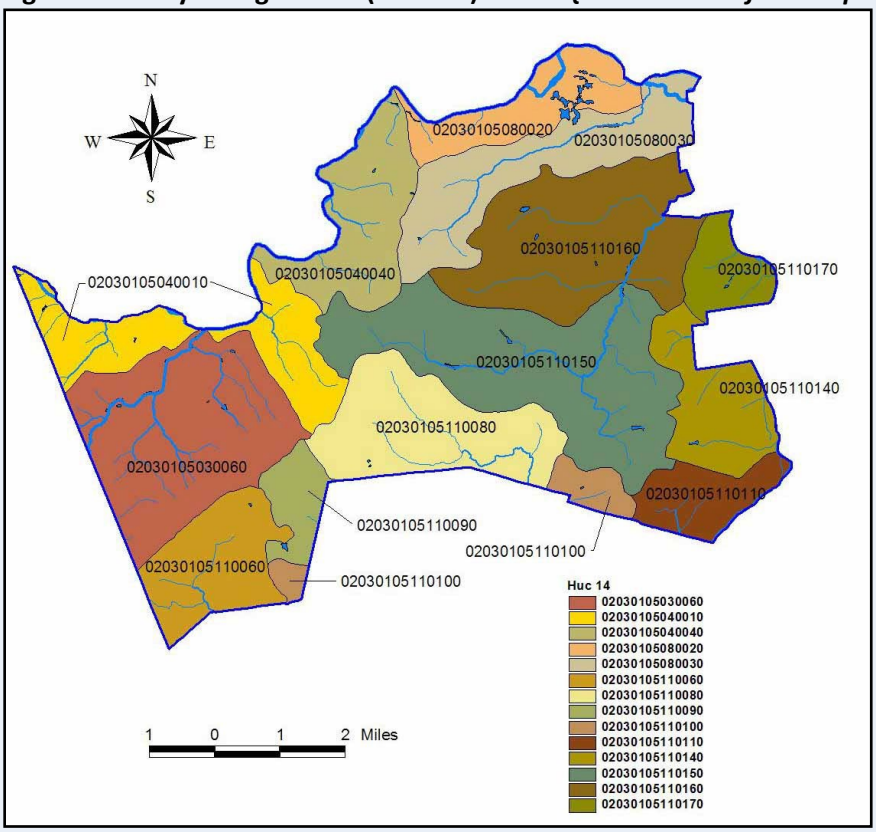


Figure C - 8: Zoning Districts within {*insert name of municipality*}

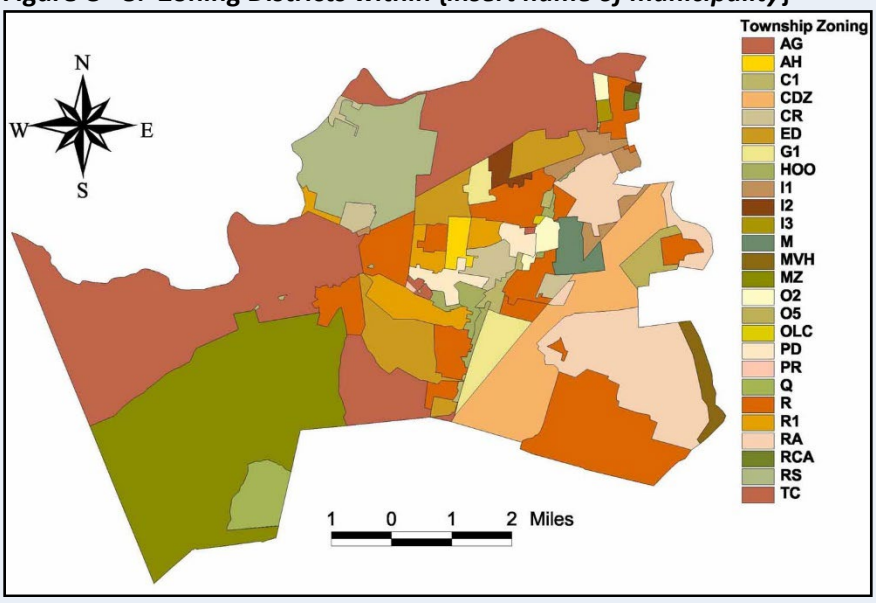


Figure C - 9: Wetlands and Water Land Uses within {*insert name of municipality*} – Constrained Land

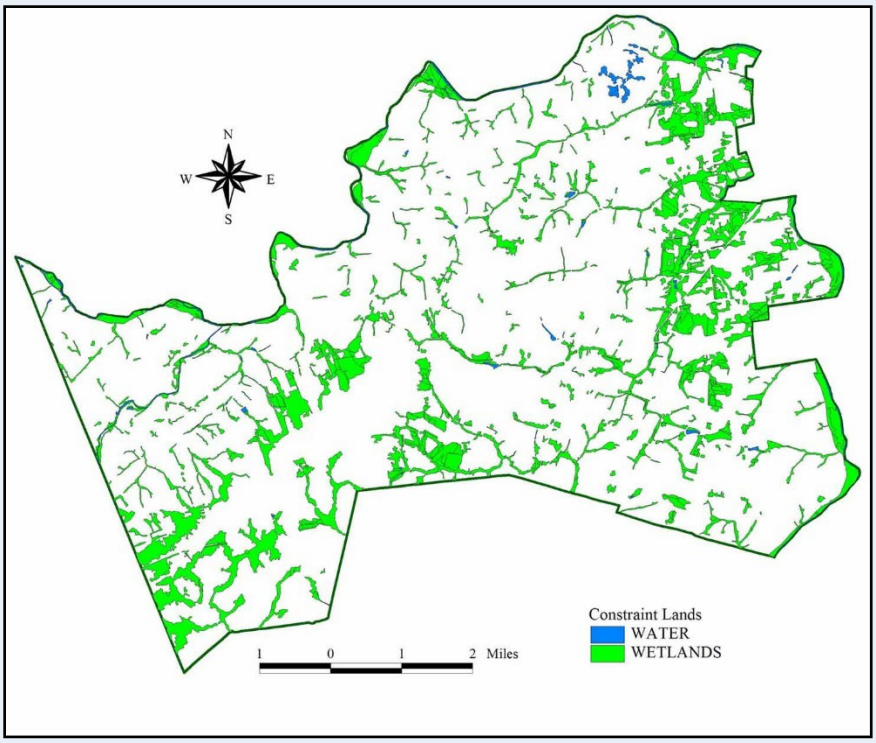


Table C - 1: Sample Build-Out Calculations for Two HUC14s

HUC14 and Zone	Total Area (acres)	Existing Impervious (%)	Existing Impervious (acres)	Wetlands/ Water Area (acres)	Developable Area (acres)	Allowable Impervious (%)	Build-Out Impervious (acres)
02030105110060							
Mountain (MZ)	2,009.84	1.08%	21.68	485.84	1,524.00	5%	76.20
Quarry (Q)	765.52	0.02%	0.18	32.46	733.06	5%	36.65
TOTALS	**2,775.36**	**0.8%**	**21.86**	**518.30**	**2,257.06**	**5%**	**112.85**
020301050040010							
Agriculture (AG)	2,206.32	2.94%	64.92	327.38	1,878.94	5%	93.95
Neighborhood Shopping Center District (C1)	402.70	1.85%	7.47	7.05	395.65	65%	257.17
Mountain (MZ)	663.23	2.88%	19.12	134.88	528.35	5%	26.42
TOTALS	**3,272.25**	**2.8%**	**91.51**	**469.31**	**2,802.94**	**13%**	**377.54**

Note: The Mountain, Quarry and Agricultural Zoning District allow for rural residential development on five acre lots with a maximum percent impervious of 5 percent.

Table C - 2: Pollutant Loads by Land Cover

Land Cover	Total Phosphorus Load (lbs/acre/year)	Total Nitrogen Load (lbs/acre/year)	Total Suspended Solids Load (lbs/acre/yr)
High, Medium Density Residential	1.4	15	140
Low Density, Rural Residential	0.6	5	100
Commercial	2.1	22	200
Industrial	1.5	16	200
Urban, Mixed Urban, Other Urban	1.0	10	120
Agricultural	1.3	10	300
Forest, Water, Wetlands	0.1	3	40
Barren Land/Transitional Area	0.5	5	60

Source: NJDEP Stormwater BMP Manual 2004.

Table C - 3: Nonpoint Source Loads at Build-Out for Two Example HUC14s

HUC14 and Zone	Build-Out Zoning	Develop-able Area (acres)	TP (lbs/acre/	TP (lbs/yr)	TN (lbs/acre/	TN (lbs/yr)	TSS (lbs/acre/	TSS (lbs/yr)
02030105110060								
Mountain (MZ)	Rural Residential	1,524	0.60	963	5	7,685	100	153,267
Quarry (Q)	Rural Residential	733	0.60	443	5	3,666	100	73,313
TOTALS		**2,257**		**1,406**		**11,351**		**226,580**
020301050040010								
Agriculture (AG)	Rural Residential	1,879	0.60	1,160	5	9,589	100	190,491
Neighborhood Shopping Center District (C1)	Commercial	396	2.10	832	22	8,727	200	79,429
Mountain (MZ)	Rural Residential	528	0.60	331	5	2,699	100	53,600
TOTALS		**2,803**		**2,323**		**21,015**		**323,520**

It is important to note that, although the pollutant loads for agricultural lands are higher than those for low density residential for the parameters in Table B - 2, converting agricultural lands to residential typically results in an increase in pollutant loads for metals and petroleum hydrocarbons. It is recommended that each municipality calculate build-out pollutant loads for each type of land use. Also, total suspended solids loads due to stormwater runoff may decrease due to the conversion of agricultural lands to low density residential; however, in this case, the percentage of impervious surfaces increases dramatically. If, due to the increase of impervious surfaces, increases in stormwater runoff flows are not managed properly, these high flows will increase streambank erosion, thereby increasing sediment loads to the receiving waters.

There are a number of resources available for assistance with preparing the build-out analysis, including the Association of New Jersey Environmental Commissions (ANJEC), various watershed associations within the State, Rutgers University's Center for Remote Sensing and Spatial Analysis and the Nonpoint Education of Municipal Officials (NEMO). The mapping and querying ability of GIS software such as ESRI's ArcView is essential for preparing a build-out analysis in a cost-effective manner.

Mitigation Plans

In accordance with N.J.A.C. 7:8-4.2(c)11, a mitigation plan is required if a municipality wishes to be able to grant a variance or exemption from any of the design and performance standards of an MSWMP and its Stormwater Control Ordinance (SCO). The mitigation plan requirements should offer a hierarchy of options that clearly offset the effects on groundwater recharge, stormwater quantity control, and/or stormwater quality control that was created by granting the variance or exemption. The mitigation plan shall identify what measures are necessary, potential mitigation projects, and/or other criteria to evaluate mitigation projects that can be used to offset the deficit created by granting a variance in accordance with N.J.A.C. 7:8-4.6. The mitigation plan requirements are as follows.

1. The municipal mitigation plan will require the applicant demonstrate that it is technically impracticable to meet any one or more of the design and performance standards on-site, where the determination that meeting a design and performance standard is technically impractical is strictly limited to only engineering, environmental, or safety reasons.

2. The municipal mitigation plan will require the applicant demonstrates that the proposed design, for which the variance is sought, achieves the maximum possible compliance with the design and performance standards on-site.

3. The municipal mitigation plan shall include a list of projects that may be selected for implementation as well as allow the applicant to propose an alternate mitigation project as long as the project meets the criteria in the municipal mitigation plan.

4. The municipal mitigation plan shall indicate the mitigation project must be implemented in the same HUC 14 as the area of the major development for which the variance is sought.

5. The municipal mitigation plan shall indicate the mitigation project shall be approved no later than preliminary or final site plan approval of the major development.

6. The municipal mitigation plan shall indicate the mitigation project must be constructed prior to, or concurrently with, the major development for which the variance is sought.

7. The municipal mitigation plan shall indicate the mitigation project shall comply with the green infrastructure (GI) standards at N.J.A.C. 7:8-5.3.

8. The municipal mitigation plan shall also include the provisions specified in N.J.A.C. 7:8 – 4.6.(a)3.vi should the variance requested be from the requirement to use GI.

9. The municipal mitigation plan shall also include the provisions specified in N.J.A.C. 7:8 – 4.6.(a)3.vii should the variance requested be from the groundwater recharge standards at N.J.A.C. 7:8-5.4.

10. The municipal mitigation plan shall also include the provisions specified in N.J.A.C. 7:8 – 4.6.(a)3.viii should the variance requested be from the stormwater runoff quality standards at N.J.A.C. 7:8-5.5.

11. The municipal mitigation plan shall also include the provisions specified in N.J.A.C. 7:8 – 4.6.(a)3.ix should the variance requested be from the stormwater runoff quantity standards at N.J.A.C. 7:8-5.6.

12. The municipal mitigation plan shall indicate the applicant or the entity assuming maintenance responsibility for the associated major development shall be responsible for preventive and corrective maintenance (including replacement) of the mitigation project and shall be identified as such in the maintenance plan established in accordance with N.J.A.C. 7:8-5.8, and shall also indicate the responsibility is non-transferable, in accordance with N.J.A.C. 7:8 – 4.6.(a)3.x.

13. The municipal mitigation plan shall indicate the municipality's approval of a variance shall apply to an individual drainage area and design and performance standard and shall not apply to an entire site or project, unless an applicant provides the required analysis for each drainage area within the site and each design and performance standard.

14. The municipal mitigation plan should indicate the timeframe for submittal of the approved variance to the designated recipients listed in N.J.A.C. 7:8 – 4.6.(b).

The following sample language is provided for the list of mitigation projects generated by the municipality or the criteria for the applicant's mitigation plan.

> In addition to project(s) proposed by the applicant, under the condition that the project meets the criteria in the municipal mitigation plan, the applicant can select one of the following projects listed to compensate for the deficit from the performance standards resulting from the proposed project. More detailed information on the projects can be obtained from the Township Engineer. Listed below are specific projects that can be used to address the mitigation requirement.
>
> **Green Infrastructure:**
>
> - Retrofit the Middle School site with small-scale bioretention basins, i.e., rain gardens, to treat runoff generated by the parking lot to provide the removal of 80 percent of total suspended solids from the parking lot runoff and an additional 65,000 cf of additional average annual groundwater recharge.
> - Replace the existing section of deteriorated overflow parking at the Municipal Soccer Complex with a pervious paving system to provide the removal of 80 percent of total suspended solids for the Water Quality Design Storm and provide 150,000 cf of additional average annual groundwater recharge.
>
> **Water Quality/Groundwater Recharge:**
>
> - Retrofit the existing stormwater management facility at Elementary School No. 1 as a small-scale bioretention basin to provide the removal of 80 percent of total suspended solids from the parking lot runoff.
> - Retrofit the existing parking area at the Municipal Complex to enhance water quality, quantity control and groundwater recharge. Due to site constraints, a subsurface infiltration basin is necessary and the number of parking spaces cannot be reduced. Note that any required pretreatment to remove 80 percent of total suspended solids must also adhere to these limitations.
>
> **Stormwater Runoff Quantity Control:**
>
> - Install small-scale infiltration basins or sand filters designed as on-line systems in the open space in the Manor Development to reduce the peak flow from the upstream development on the receiving stream by 20 cfs, 35 cfs, and 100 cfs for the 2, 10, and 100-year storms respectively.

Additional Measures

The MSWMP shall incorporate any additional measures specified in a TMDL(s) approved or established by the EPA, unless otherwise required pursuant to N.J.A.C. 7:14A-25.6(e). The municipality shall update its SWMP when the municipality receives the Department's written notice, and implements the requirements into its SCO.