City of Northfield

Municipal Stormwater Management Plan

March 2020

Prepared by

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Project No. NF13-46

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Introduction

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for the City of Northfield ("the Municipality") to address stormwater-related impacts. This plan is prepared using the Sample Municipal Stormwater Management Plan included in Appendix C of the New Jersey Stormwater Best Management Practices Manual, dated February 2004, as a template. The creation of this plan is required by N.J.A.C. 7:14A-25 Municipal Stormwater Regulations. This plan contains all of the required elements described in N.J.A.C. 7:8 Stormwater Management Rules. The plan addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating stormwater design and performance standards for new major development, defined as projects that disturb one or more acre of land. These standards are intended to minimize the adverse impact of stormwater runoff on water quality and water quantity and the loss of groundwater recharge that provides baseflow in receiving water bodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities.

A "build-out" analysis has 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 section of the stormwater plan, specific stormwater management measures are identified to lessen the impact of existing development.

Goals

The goals of this MSWMP are to:

- reduce flood damage, including damage to life and property;
- minimize, to the extent practical, any increase in stormwater runoff from any new development;
- reduce soil erosion from any development or construction project;
- assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
- maintain groundwater recharge;
- prevent, to the greatest extent feasible, an increase in nonpoint pollution;
- maintain the integrity of stream channels for their biological functions, as well as for drainage;
- minimize pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water; and
- protect public safety through the proper design and operation of stormwater basins.

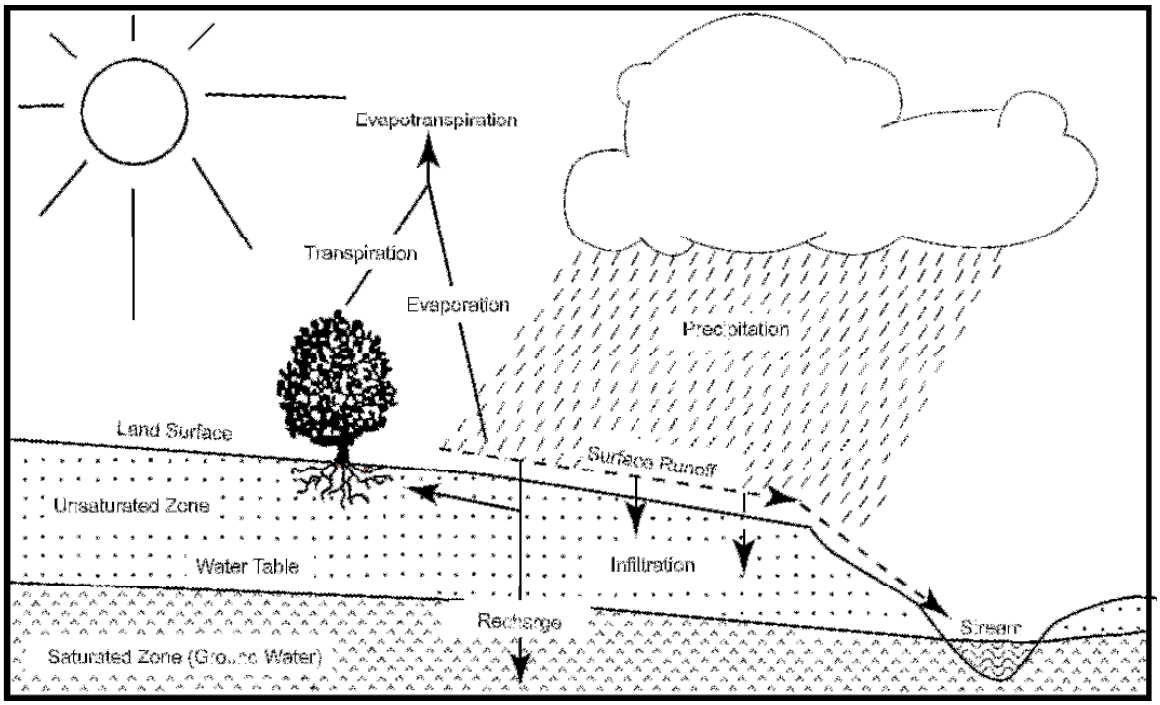
To achieve these goals, this plan outlines specific stormwater design and performance standards for new development. Additionally, the plan proposes stormwater management controls to address impacts from existing development. Preventative and corrective maintenance strategies are included in the plan to ensure long-term effectiveness of stormwater management facilities. The plan also outlines safety standards for stormwater infrastructure to be implemented to protect public safety.

Stormwater Discussion

Land development can dramatically alter the hydrologic cycle (See Figure C-1) of a site and, ultimately, an entire watershed. Prior to development, native vegetation can either directly intercept precipitation or draw that portion that has infiltrated into the ground and return it to the atmosphere through evapotranspiration. Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. Impervious areas that are connected to each other through gutters, channels, and storm sewers can transport runoff more quickly than natural areas. This shortening of the transport or travel time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher than natural conditions. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel.

Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration which, in turn, reduces stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuations between normal and storm flow rates, which can increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can destroy habitat from which some species cannot adapt.

Figure C-1: Groundwater Recharge in the Hydrologic Cycle



Source: New Jersey Geological Survey Report GSR-32.

In addition to increases in runoff peaks, volumes, and loss of groundwater recharge, land development often results in the accumulation of pollutants on the land surface that runoff can mobilize and transport to streams. New impervious surfaces and cleared areas created by development can accumulate a variety of pollutants from the atmosphere, fertilizers, animal wastes, and leakage and wear from vehicles. Pollutants can include metals, suspended solids, hydrocarbons, pathogens, and nutrients.

In addition to increased pollutant loading, land development can adversely affect water quality and stream biota in more subtle ways. For example, stormwater falling on impervious surfaces or stored in detention or retention basins can become heated and raise the temperature of the downstream waterway, adversely affecting cold water fish species such as trout. Development can remove trees along stream banks that normally provide shading, stabilization, and leaf litter that falls into streams and becomes food for the aquatic community.

Background

City of Northfield encompasses 3.44 square mile area and is located in the lower eastern portion of Atlantic County, in New Jersey. The entire Municipality is located within the CAFRA Planning Areas. Figure C-2 shows the CAFRA Planning Area map. The population of the Municipality has decreased slightly from 8,625 in 2010, to 8,212 in 2018 as shown in the United Stated Census Bureau data.

Figure C-3 illustrates the waterways in the Municipality. Figure C-4 depicts the Municipality boundary on the USGS quadrangle maps.

The City of Northfield is a municipality of a primarily Urban nature. The development within the municipality is limited by the lack of available large undeveloped parcel of land. Substantial growth in The City of Northfield is not expected. There are, however, limited areas within the municipality for residential and some modest commercial development. Intense development in the Municipality is not foreseeable due to the existing zoning and lack of undeveloped areas. The existing zoning is shown on Figure C-9. Additionally, as shown on Figure C-10, “City of Northfield Wetlands and Water Bodies – Constrained Land”, it is evident that vast portions of the City of Northfield un-developed parcel of land are impacted by wetlands and associated wetlands buffers as mandated by the New Jersey Department of Environmental Protection.

As a result of the aforementioned issues, the rate of development in the City of Northfield is very slow and the projected build out development in the Municipality is not as great as might otherwise be expected given its geographic location.

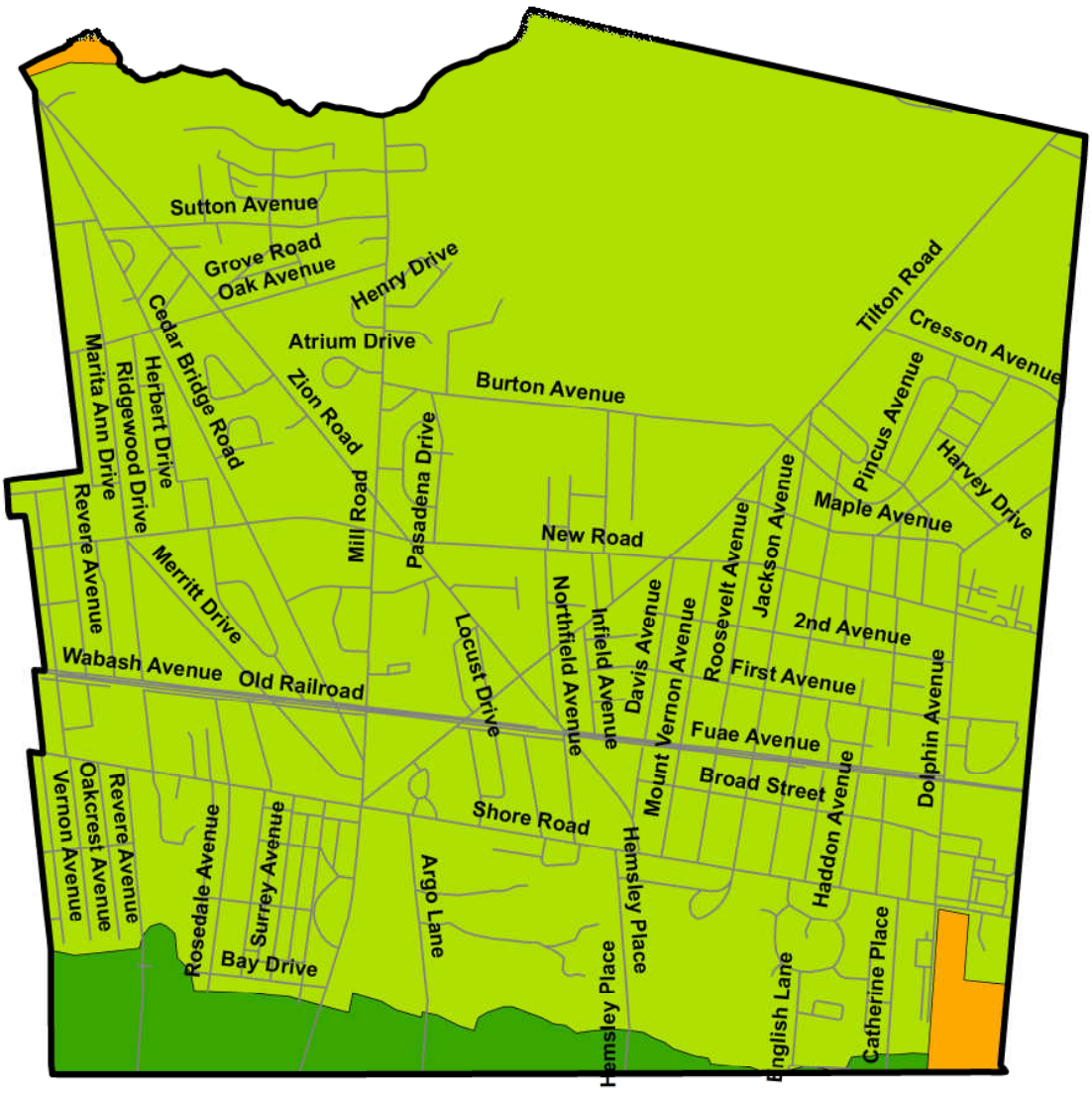
The New Jersey Department of Environmental Protection (NJDEP) has established an Ambient Biomonitoring Network (AMNET) to document the health of the state’s waterways. There are over 800 AMNET sites throughout the state of New Jersey. These sites are sampled for benthic macroinvertebrates by NJDEP on a five-year cycle. Streams are classified as non-impaired, moderately impaired, or severely impaired based on the AMNET data. The data is used to generate a New Jersey Impairment Score (NJIS), which is based on a number of biometrics related to benthic macroinvertebrate community dynamics.

A TMDL is the amount of a pollutant that can be accepted by a waterbody without causing an exceedance of water quality standards or interfering with the ability to use a waterbody for one or more of its designated uses. The allowable load is allocated to the various sources of the pollutant, such as

stormwater and wastewater discharges, which require an NJPDES permit to discharge, and nonpoint source, which includes stormwater runoff from agricultural areas and residential areas, along with a margin of safety. Provisions may also be made for future sources in the form of reserve capacity. An implementation plan is developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include improved stormwater treatment plants, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems, and other BMPs.

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

Figure C-2
City of Northfield



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0 385 770 1,540
Feet
1 inch = 1,500 feet

Map - CAFRA Planning Areas

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

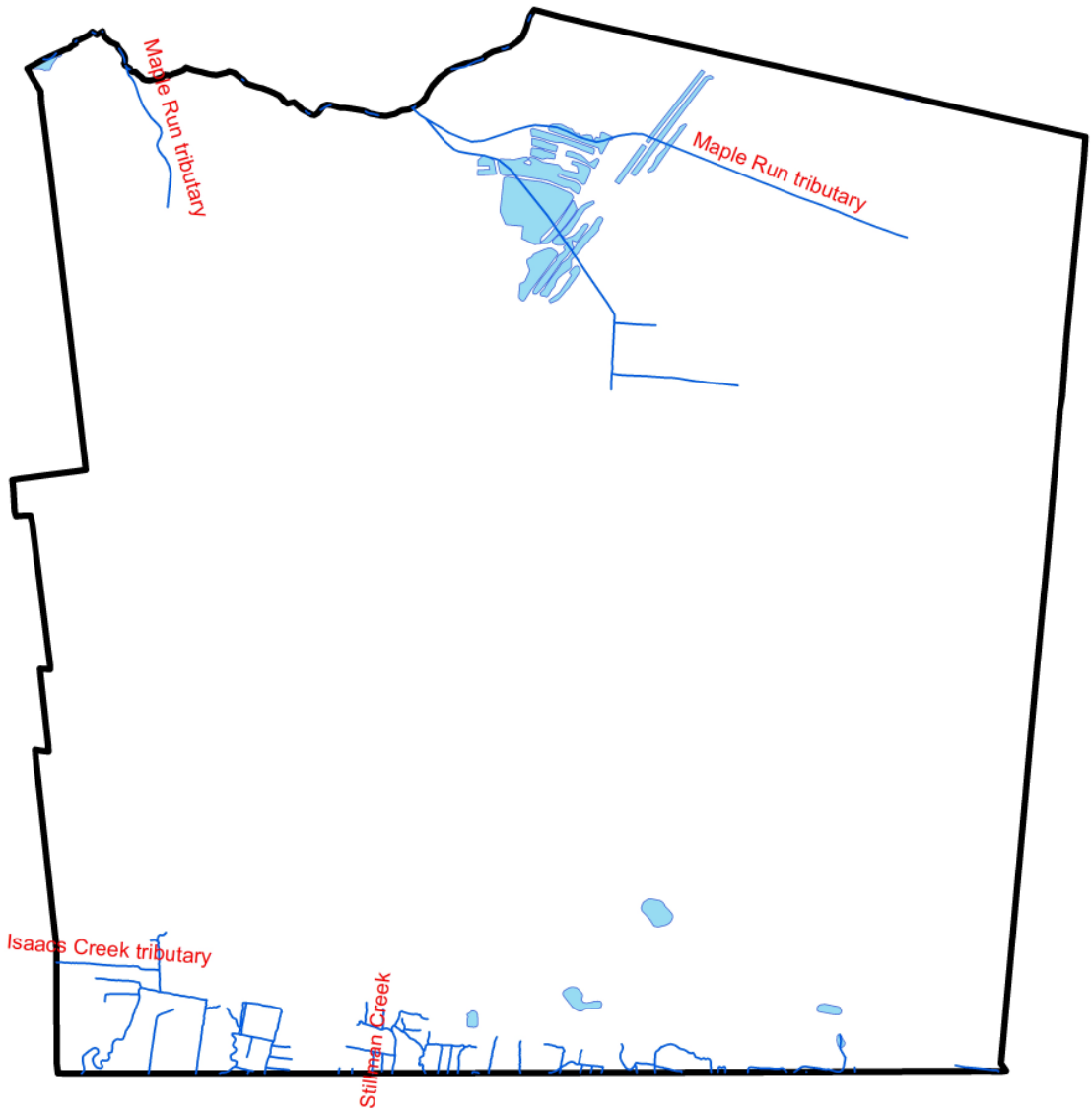
Legend

- City Boundary
- Streets

CAFRA Planning Areas

- COASTAL ENVIRONMENTALLY SENSITIVE PLANNING AREA
- COASTAL METROPOLITAN
- COASTAL PARK

Figure C-3
City of Northfield



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Map - Waterways

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Legend

- Streams
- City Boundary
- Lakes

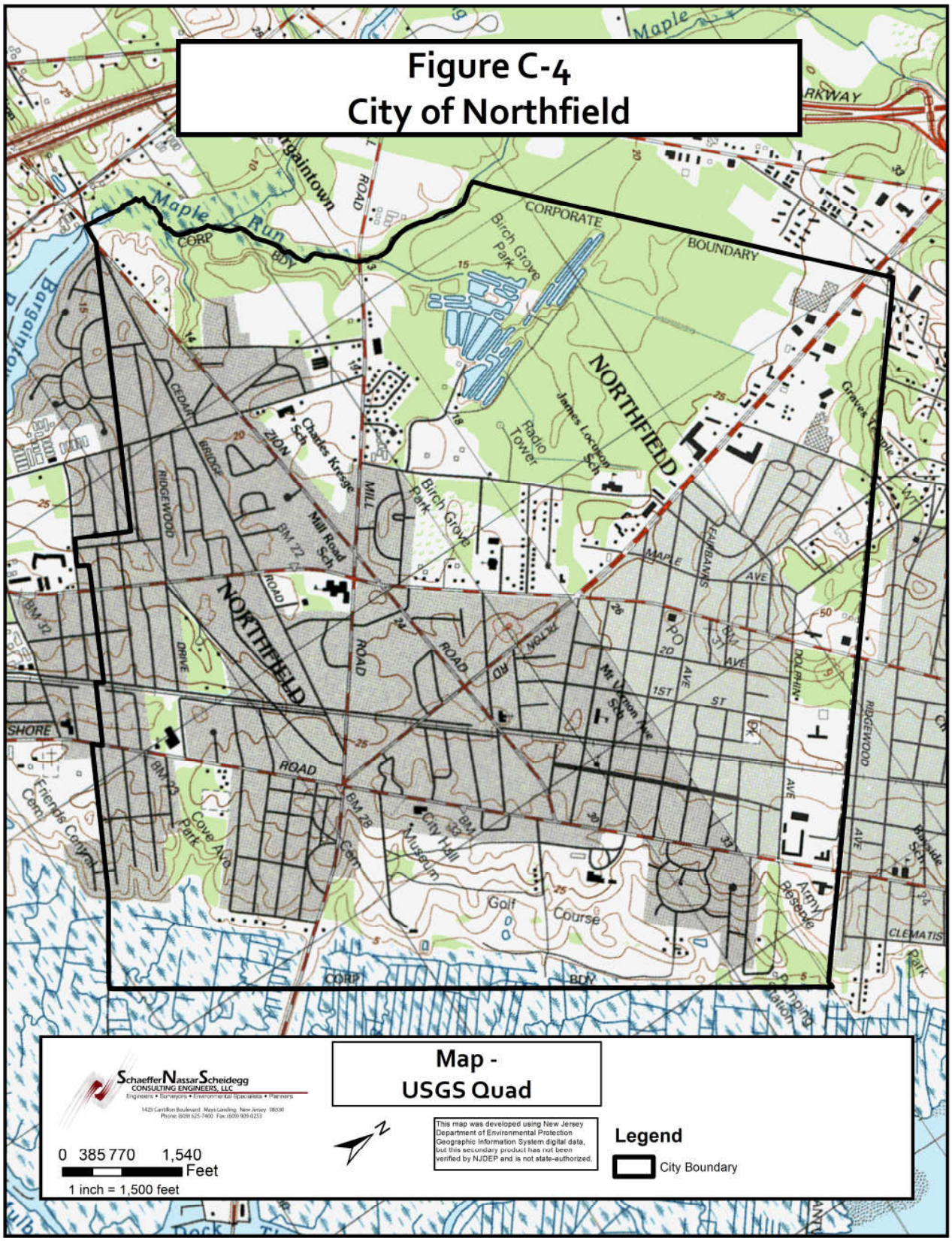
Figure C-4
City of Northfield
Map -
USGS Quad
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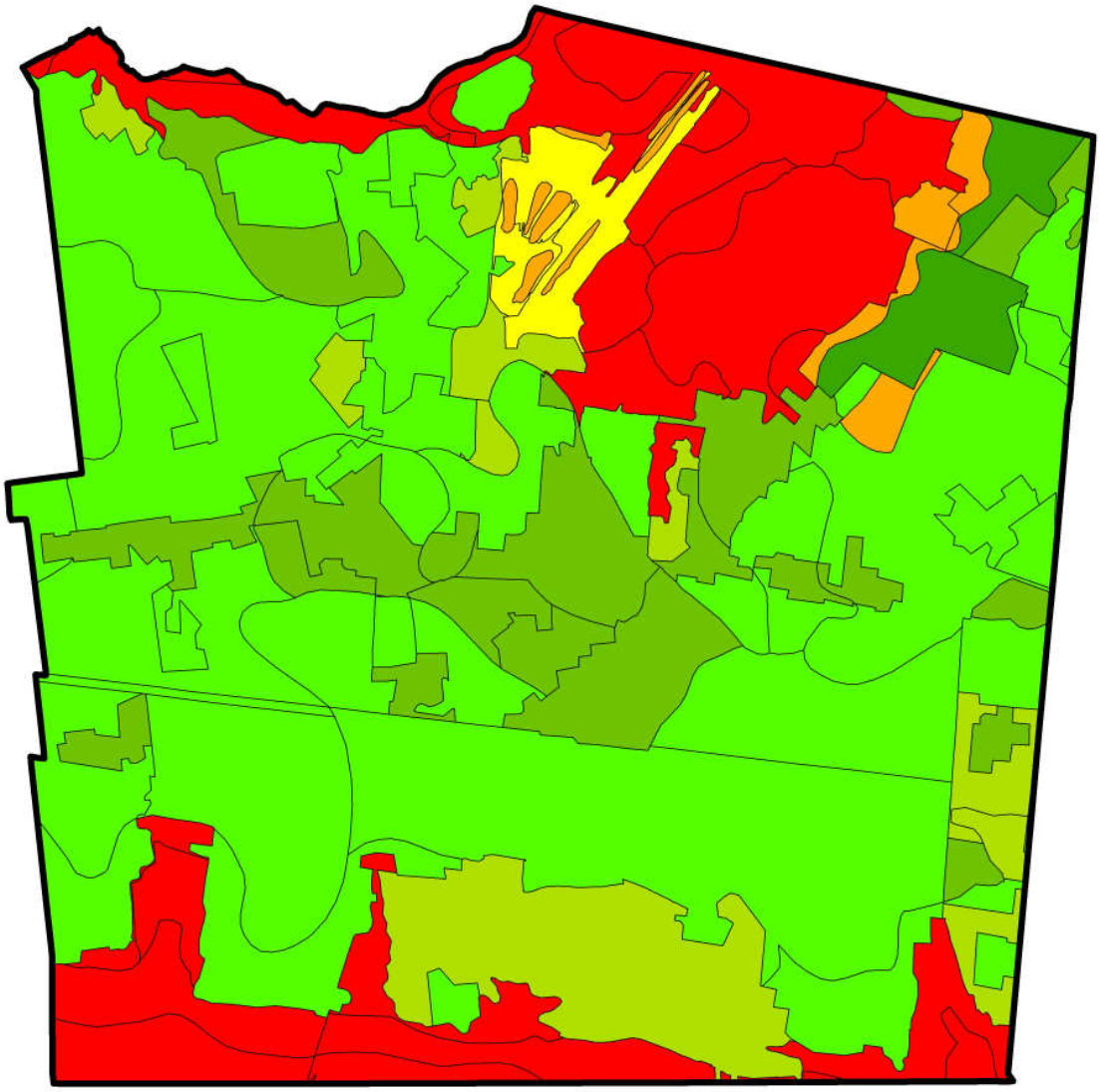
Legend
City Boundary
CORPORATE BOUNDARY
NORTHFIELD
Maple Run
Birch Grove Park
Mill Road Sch
Charles Krege Sch
James Locurto Sch
Mt Union Ave Sch
Bonside Sch
Cove Ave Park
City Hall
Museum
Golf Course
Friends Cem
Army Reserve
Pumping Station
Maple Ave
Fairbanks Ave
Dolphin Ave
Ridgewood Ave
Cedar Bridge Road
Mill Road
Shore Road
Clematis Park

Given the urban nature of The City of Northfield, substantial portions of the municipality are not suitable for groundwater recharge. A map of the groundwater recharge area is shown on Figure C-5. This map indicates that groundwater recharge over most of the municipality is in the 1 to 7 inches per year range.

Wellhead protection areas are also required as part of the MSWMP and are shown in Figure C-6.

Figure C-5
City of Northfield



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Map - Groundwater Recharge Areas

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Legend

- City Boundary

Groundwater Reacharge Areas

- 0 in/yr
- 1 to 7 in/yr
- 11 to 15 in/yr
- 8 to 10 in/yr
- Hydric Soils
- Areas of no Recharge
- Wetlands

0 385 770 1,540 Feet

1 inch = 1,500 feet


Figure C-6
City of Northfield
Map - Wellhead Protection Areas
Legend
City Boundary
TIER
Tier 1 (2 years)
Tier 2 (5 years)
Tier 3 (12 years)
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Design and Performance Standards

The Municipality has amended its Land Use Ordinances to incorporate the Design and Performance Standards for Stormwater Management measures as presented in N.J.A.C. 7:8-5, to minimize adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving waterbodies.

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 Ordinance Amendments will be adopted by the municipality within 12 months from the date that this Municipal Stormwater Management Plan was adopted by the City Planning Board and then will be submitted to the County review agency along with this Municipal Stormwater Management Plan, for approval.

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

Plan Consistency

The Municipality is not within a Regional Stormwater Management Planning Area and no TMDLs have been developed for waters within the Municipality; therefore this plan does not need to be consistent with any regional stormwater management plans (RSWMPs) nor any TMDLs. If any RSWMPs or TMDLs are developed in the future, this Municipal Stormwater Management Plan will be updated to be consistent.

The Municipal Stormwater Management Plan is consistent with the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21. The municipality will utilize the most current update of the RSIS in the stormwater management review of residential areas. This Municipal Stormwater Management Plan will be updated to be consistent with any future updates to the RSIS.

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

Nonstructural Stormwater Management Strategies

The NJDEP's new Stormwater Management Rules include the specific provisions that must be addressed in a MSWMP (N.J.A.C. 7:8-4.2(c)). One requirement is that the MSWMP include an evaluation of the extent to which the Municipal's entire master plan (including the land use element), official map, and development regulations (including zoning ordinances) implement the principles of the Stormwater Management Rules relating to nonstructural stormwater management strategies (N.J.A.C. 7:8-5.3(b)).

Certain low impact stormwater management strategies, or low impact development (LID) techniques, seek to reduce and/or prevent adverse runoff impacts through both nonstructural and structural approaches that attempt to preserve or closely mimic the natural hydrologic response to precipitation. LID techniques control stormwater runoff and pollutants closer to the source and provide measures that can significantly reduce the impact of development on stormwater runoff.

LIDs include the use of both nonstructural and structural stormwater management techniques, which are subsets of stormwater Best Management Practices (BMPs). LID-BMPs first attempt to minimize quantitative and qualitative changes to the hydrology, through nonstructural practices, and then, if necessary, employ structural LID techniques. LID-BMPs thus emphasize nonstructural stormwater management measures, maximizing their use prior to the use of structural LID-BMPs and standards BMPs.

Nonstructural LID-BMPs reduce stormwater runoff through techniques such as minimizing site disturbance, preserving important site hydrologic features, reducing and disconnecting impervious cover, flattening slopes, utilizing native vegetation, minimizing turf grass lawns, and maintaining natural drainage features and characteristics. Structural BMPs are considered LIDs if they are implemented close to the runoff's source; because of this, they are typically smaller in size than standard (non-LID0 structural BMPs. Structural LID-BMPs include various types of basins, filters, surfaces, and devices located on individual lots in a residential development or throughout a commercial, industrial, or institutional development.

The NJDEP believes that effective, state-wide use of such practices can best be achieved through modifications to municipal master plans and land use ordinances to include LID goals and to provide for the use of specific LID-BMPs. The Stormwater Management Rules require municipalities to review their master plans and ordinances in order to incorporate LID techniques to the maximum extent practicable.

The NJDEP Stormwater Management Rules (N.J.A.C. 7:8) require in Section 5.2(s) that Major Development (disturbing one acre or more or increasing impervious surface by ¼ acre) incorporate nonstructural stormwater management strategies "to the maximum extent practicable." Nonstructural LID-BMPs are to be given preference over structural BMPs. Where it is not possible to fully comply with the Stormwater Management Rules through nonstructural LIDs, structural LID-BMPs are to be used in conjunction with standard BMPs to meet the Rules' requirements.

The NJDEP Stormwater Management Rule requires the maximum practical use of the following nine nonstructural strategies (LID-BMPs) for major development and redevelopment.

1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.
2. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.
3. Maximize the protection of natural drainage features and vegetation.
4. Minimize the decrease in the pre-construction of "time of concentration."
5. Minimize land disturbance including clearing and grading.
6. Minimize soil compaction.
7. Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.
8. Provide vegetated open-channel conveyance systems that discharge into and through stable vegetated areas.
9. Provide preventative source controls.

N.J.A.C. 7:8-5 further requires that an applicant seeking approval for major development or redevelopment specifically identify which and how these nine nonstructural strategies are incorporated or provide an engineering, environmental, or safety reason for their non-incorporation.

In addition to these nonstructural LID-BMPs, structural stormwater management measures can be LID-BMPs. These structural BMPs become LID-BMPs by storing, infiltrating, and/or treating runoff close to the source of stormwater. Unlike standard structural BMPs that are located along a site's drainage system, structural LID-BMPs are normally dispersed throughout a development and more closely mimic the hydrology. LID-BMPs are typically standard structural MPs, but their location, closer to the runoff source, allows them to be smaller in size. Standard structural BMPs that can be implemented at a LID scale include: drywells, infiltration systems, bioretention basins, and both surface and subsurface detention basins; downsized, to address stormwater close to its source as LIDs.

There are a number of structural stormwater BMPs that may be used to address the groundwater recharge and stormwater quality and quantity requirements of the NJDEP Stormwater Management Rules in N.J.A.C. 7:8. The structural BMPs include the following techniques (see also *New Jersey Stormwater Best Management Practices Manual*, February 2004, which includes the planning, design, construction, and maintenance guidelines for these structural BMPs):

1. Bioretention Systems
2. Constructed Stormwater Wetlands
3. Dry Wells
4. Extended Detention basins
5. Infiltration Basins
6. Manufactured Treatment Devices
7. Pervious Paving Systems
8. Rooftop Vegetated Cover
9. Sand Filters
10. Vegetative Filters
11. Wet Ponds

Other BMPs that possess similar levels of effectiveness, efficiency, and endurance may also be utilized, provided that such levels can be demonstrated.

The City of Northfield has reviewed the Master Plan and local land use ordinances and incorporated structural stormwater management strategies (LID and standard structural stormwater BMPs) to the extent practicable and in accordance with sound planning, science, engineering and construction principles, as they apply to the Municipality and its unique environment.

The City of Northfield has reviewed the master plan and ordinances, and has modified sections in the Municipal land use and zoning ordinances to incorporate nonstructural stormwater management strategies.

Land Use/Build-Out Analysis

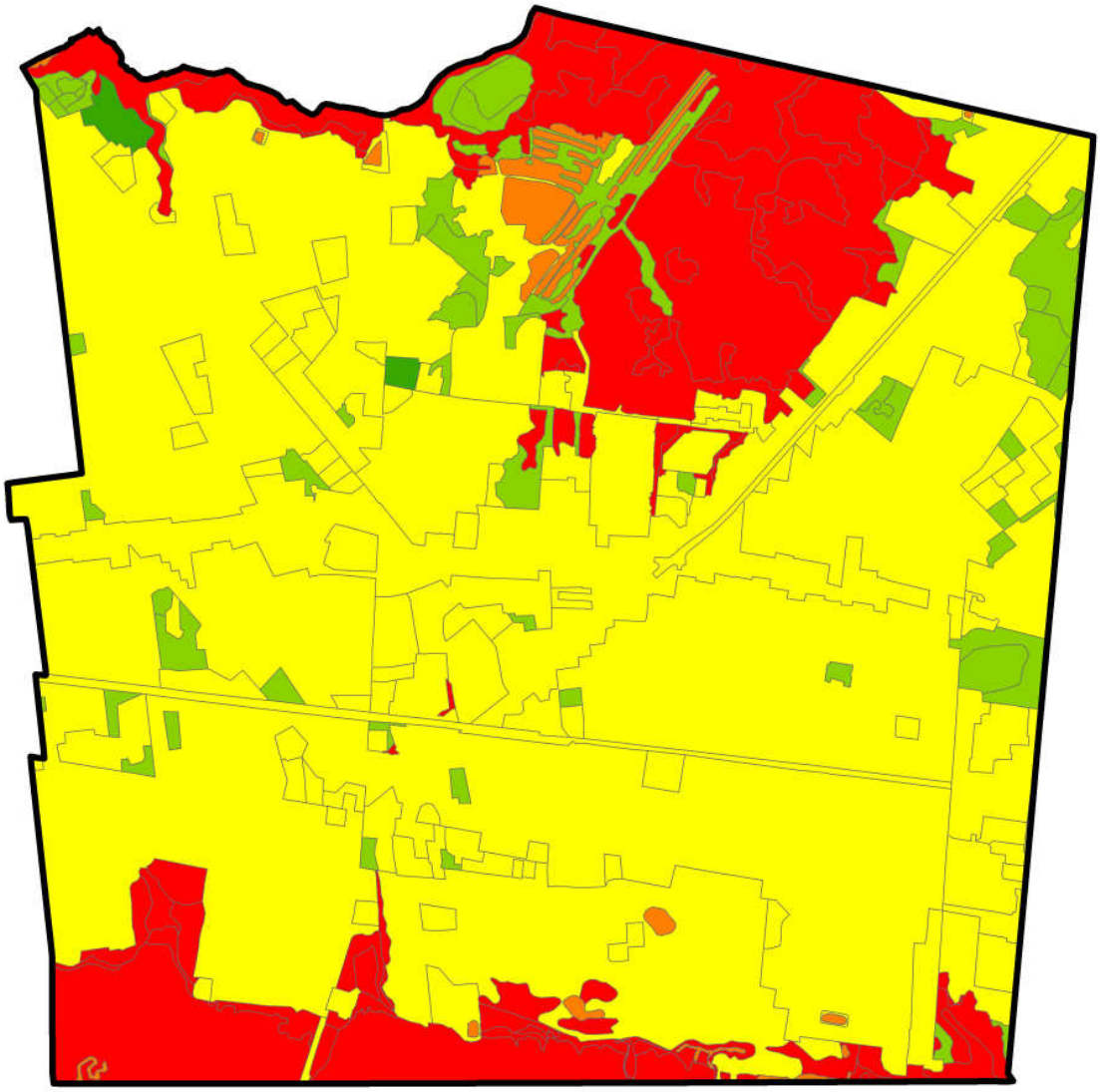
Build-out calculations have been prepared for the City of Northfield, based upon the methodology described within the NJDEP's sample Municipal Stormwater Management Plan as included within Appendix C of the New Jersey Stormwater Best Management Practices Manual. The four steps undertaken to prepare this build-out analysis are as follows:

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 are also eligible for redevelopment and should be considered as land available for development.*
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.*

A detailed land use analysis for the Municipality was conducted. Figure C-7 illustrates the existing land use in the Municipality based on 2015 GIS information from NJDEP. Figure C-8 illustrates the HUC14s within the City. The City zoning map is shown in Figure C-9. Figure C-10 illustrates the constrained lands within the City. Figure C-11 is a composite of the HUC14s with municipal zoning.

Table C-1 presents the NJDEP pollutant loading coefficients by land cover. The pollutant loads at full build-out are presented in Table C-2.

Figure C-7
City of Northfield



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Map - Land Use / Land Cover

0 385 770 1,540
Feet
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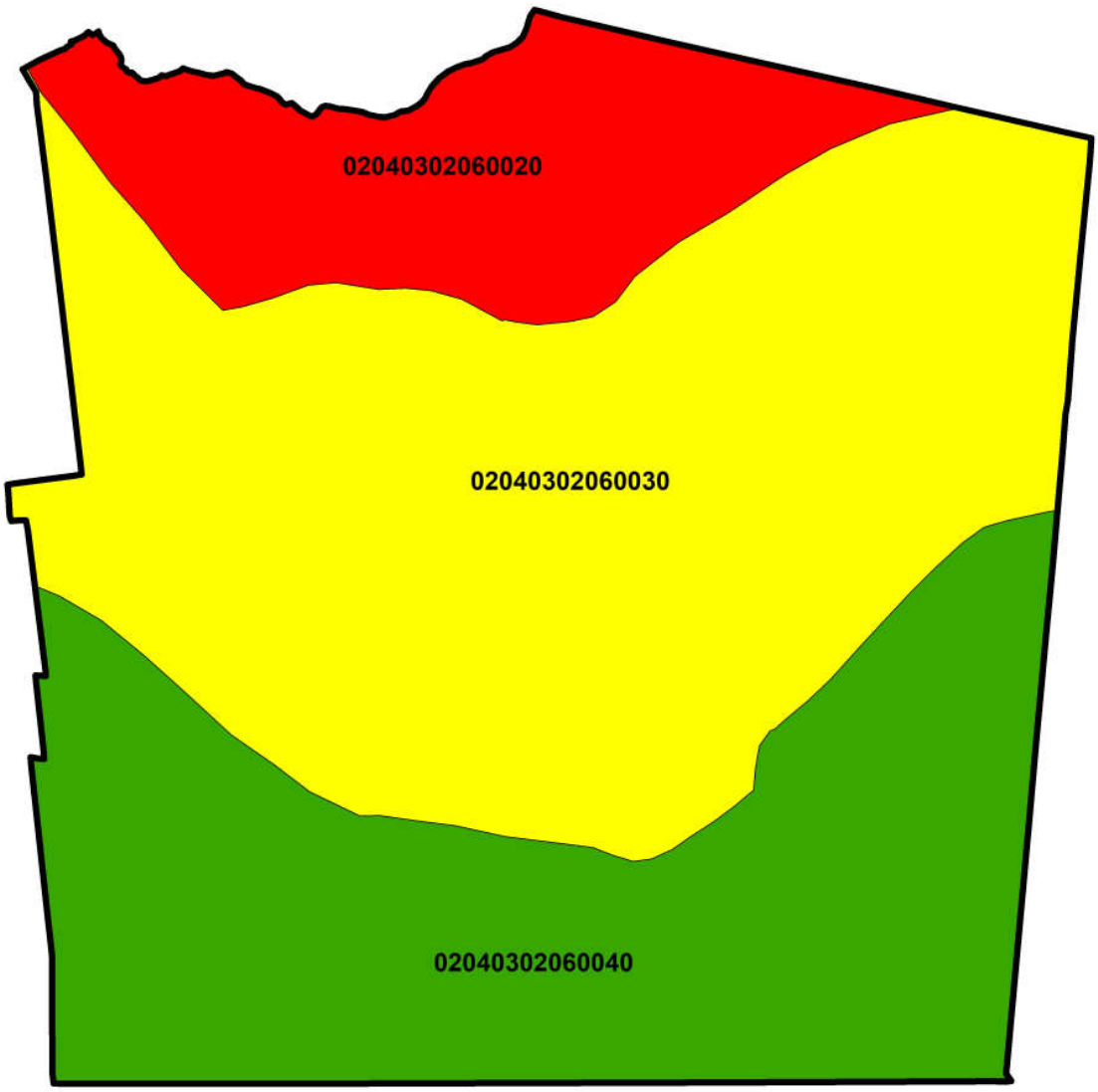
Legend

City Boundary

2015 Land Use / Land Cover

- AGRICULTURE
- FOREST
- URBAN
- WATER
- WETLANDS

Figure C-8
City of Northfield



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Map - Hydrologic Units (HUC 14)

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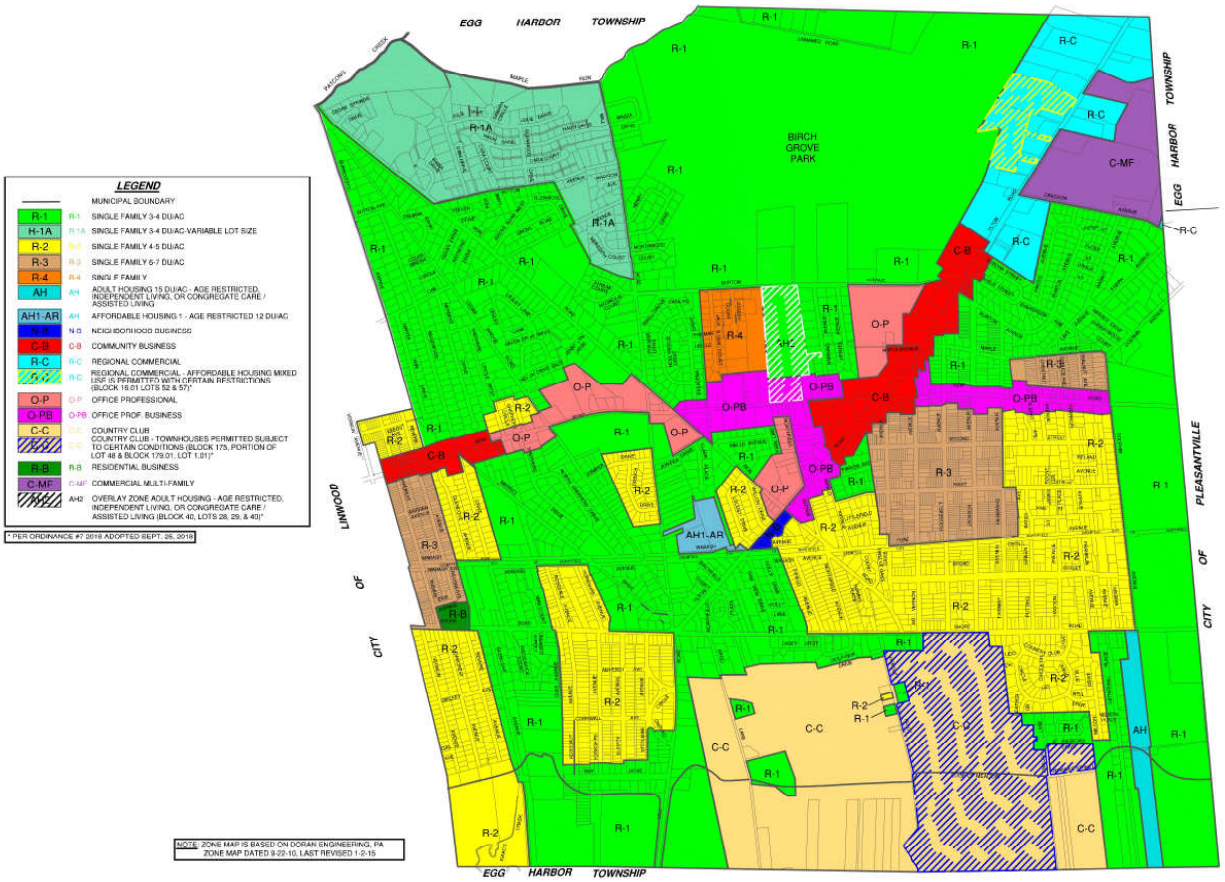
Legend
- City Boundary

HUC14
- 02040302060020
- 02040302060030
- 02040302060040

Figure C-9
City of Northfield



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Map - Zoning

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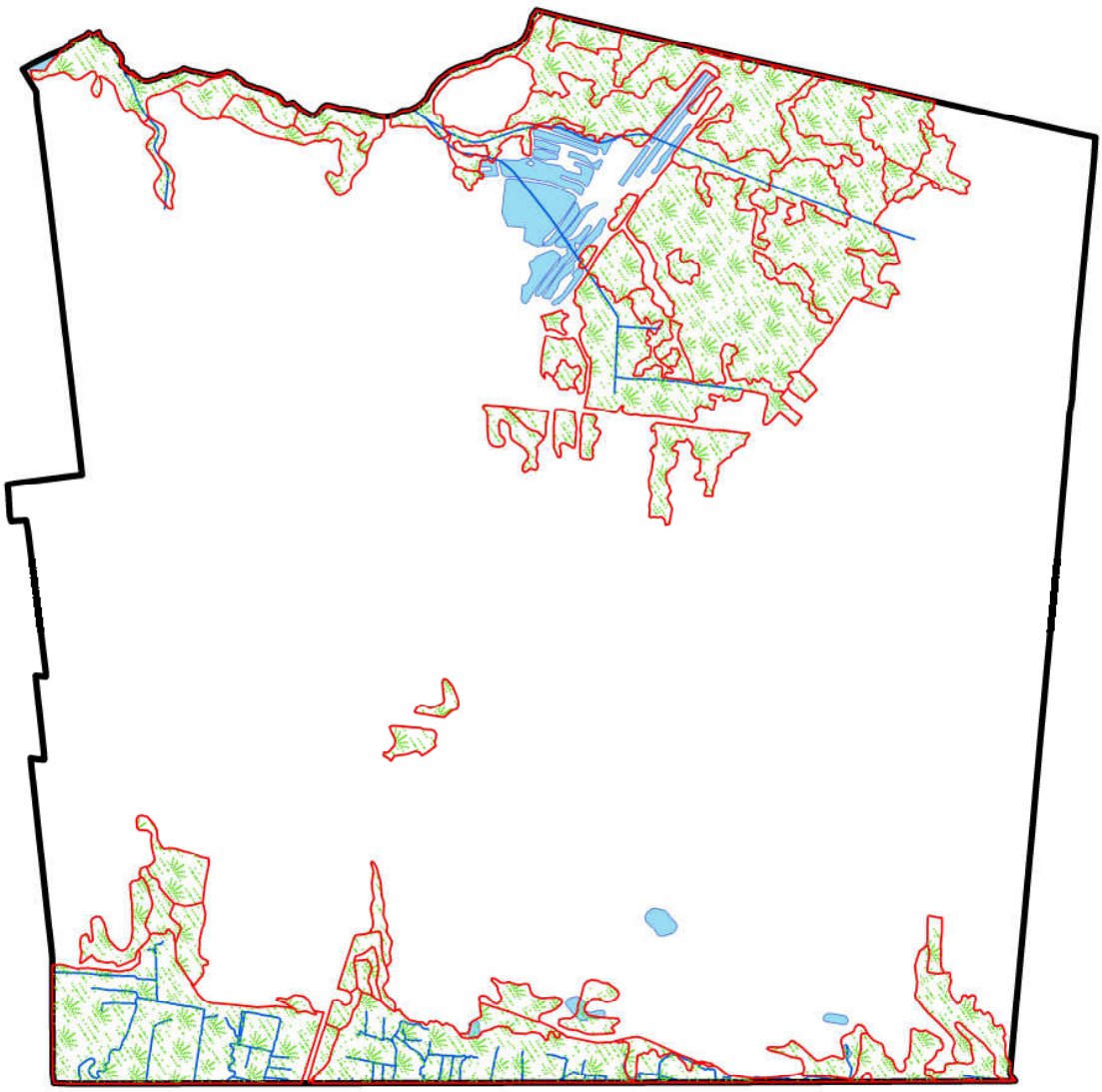
Figure C-10
City of Northfield



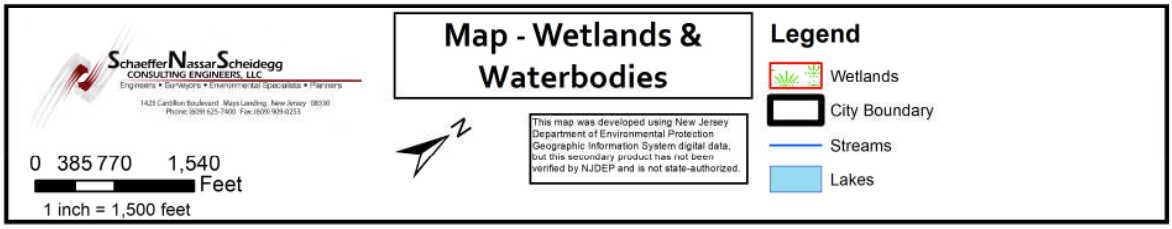
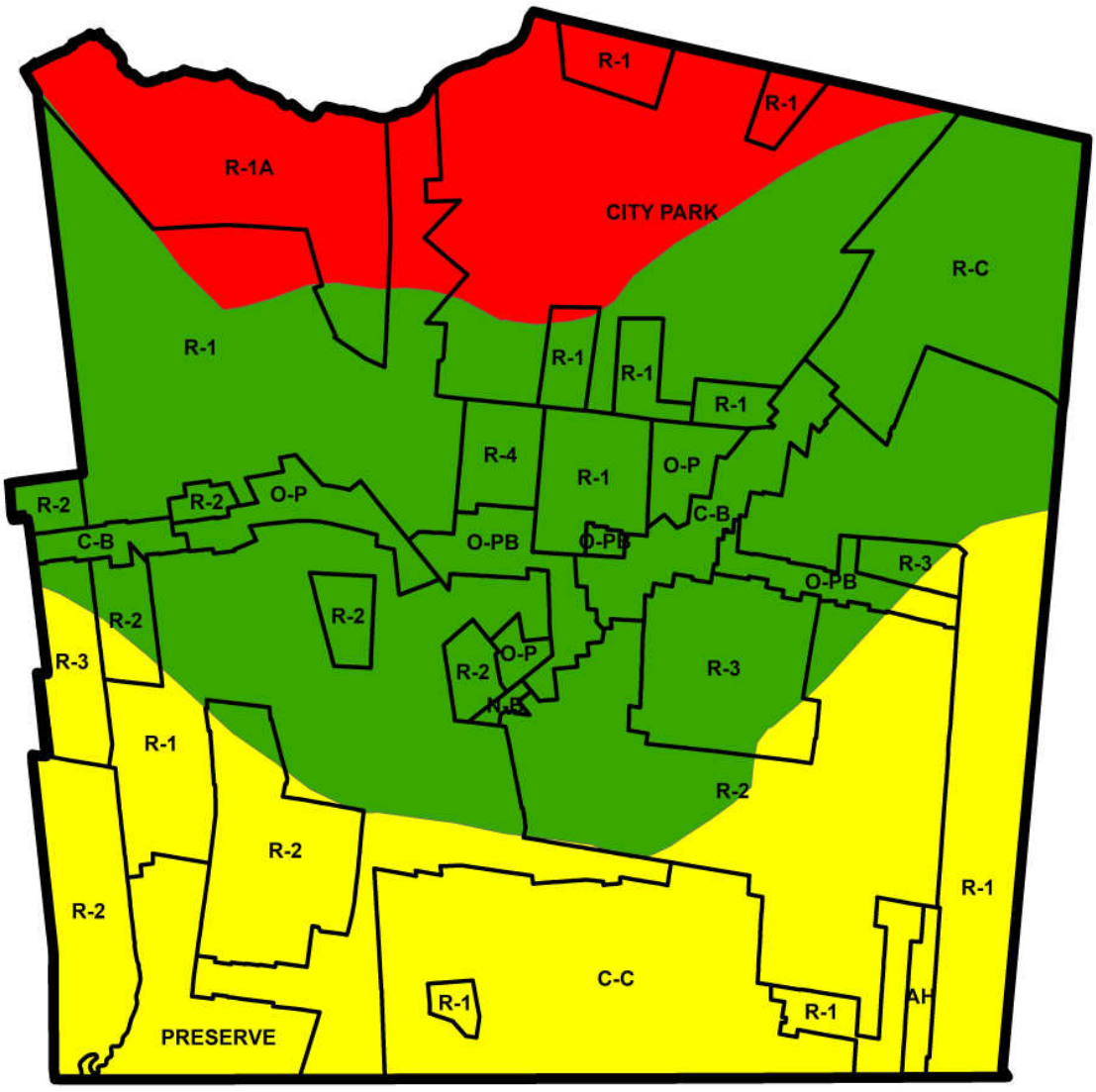


Figure C-11
City of Northfield



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Map - Hydrologic Units (HUC 14) & Zoning

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Legend

- City Boundary
- AtlCoMunicipalZoning2009 selection

Sub Watershed Name

- GEH Bay/Lakes Bay/Skull Bay/Peck Bay
- Maple Run/Mill Br(Zion Rd to Cardiff rd)
- Patcong Creek (Somers Ave to Zion Rd)

Table C-1: 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
Barrenland/Transitional Area	0.5	5	60

Source: NJDEP Stormwater BMP Manual 2004.

Table C-2: Pollutant Loads at Build-out

WMA	HUC 14 Sub-Watershed		Area (Acres)			Total Pollutant Load (Lbs/Year)		
	No.	**Name**	**Total**	**Constrained**	**Developable**	**P**	**N**	**TSS**
Great Egg Harbor	02040302060020	Maple Run / Mill Branch (Zion Rd. to Cardiff Rd.)	339.23	220.91	118.32	70.99	591.60	11,832
	02040302060030	Patcong Creek (Somers Ave. to Zion Rd.)	1,110.63	231.30	879.33	527.60	4,396.65	87,933
	02040302060040	Patcong Creek / Great Egg Harbor Bay	757.67	185.07	572.60	343.56	2,863.00	57,260
	Total		**2,207.53**	**637.28**	**1,570.25**	**942.15**	**7,851.25**	**157,025**

P = Total Phosphorus Load (lbs/acre/yr)
N = Total Nitrogen Load (lbs/acre/yr)
TSS = Total Suspended Solids Load (lbs/acre/yr)

Mitigation Plans

The “design and performance standards” section of this plan addresses stormwater management measures applicable to major development projects in the City of Northfield. In some instances, however, site specific conditions may prevent strict compliance with these standards. In accordance with N.J.A.C. 7:8-4.2(c)11, such projects may be granted a variance or exemption from these standards by the Township Planning/Zoning Board, if a mitigation plan is approved by the Board and mitigation plan implementation is a condition of the major development project approval.

To the extent possible, a mitigation plan should offset the impacts on groundwater recharge, stormwater quantity control, and/or stormwater quality control that would be created by granting the variance or exemption to the development project. In addition, to the extent possible, the proposed mitigation project(s) should be located within the same HUC14 sub-drainage basin(s) as the major development project, and if not, within the same Watershed Management Area (See Figure C-8). For projects in the Pinelands areas, any offsite mitigation must occur within the Pinelands area and within the same drainage area as the parcel proposed for development.

A mitigation plan may include more than one mitigation project, in order to achieve the objectives of location and/or impact offsets. The City of Northfield Stormwater Coordinator, Public Works Director, and Municipal Engineer will develop and maintain a list of mitigation projects that can be implemented in order to comply with the mitigation plan provisions of this Municipal Stormwater Management Plan. Included as part of the list of projects will be quantitative estimates of the offsets to groundwater recharge, stormwater quantity control, and/or stormwater quality control for each of the mitigation projects.

The mitigation plan must include a detailed plan and schedule for implementation of the mitigation project. Implementation maybe accomplished as a part of the major development project, or the Municipality may accept funding for the project at the discretion of the Municipality. If the Municipality chooses to accept funding in lieu of implementation, such funding shall include any costs that must be incurred by the Municipality in implementing the mitigation project, including design, permitting, land and/or easement acquisition, construction, and provisions for the long-term operation and maintenance of the mitigation project.

The mitigation plan must include provisions for ensuring the long-term operation and maintenance of the mitigation project, by clearly identifying the party responsible for the operation and maintenance of each mitigation project. If the Municipality accepts a mitigation plan that designates the Municipality as the responsible party for mitigation project operation and maintenance, provisions for funding the associated costs by the developer shall be included in the mitigation plan.

If implementation of a mitigation plan is a condition of approval for a major development project by the City Zoning Board or Planning Board, such approval shall also include the requirement that the develop execute a funding agreement with the Municipality for mitigation plan implementation, as a further condition of approval. The funding agreement, in form acceptable to the Municipality, shall provide for funding by the developer of all costs to implement the plan that will be incurred by the Municipality, including the cost of long-term operation and maintenance of any mitigation projects in accordance with this plan and Chapters 8 and 9 of the NJDEP Stormwater BMP Manual.

The following is a listing of potential mitigation projects within the City of Northfield.

Water Quality

- Periodically clean stormwater collection system.
- Inspect stormwater Inlets and manholes
- Modifications to the existing stormwater collection system to eliminate ponding along local roads.

The municipality may allow a developer to provide funding or partial funding to the municipality for an environmental enhancement project that has been identified in a Municipal Stormwater Management Plan, or towards the development of a Regional Stormwater Management Plan. The funding must be equal to or greater than the cost to implement the mitigation outlined above, including costs associated with purchasing the property or easement for mitigation, and the cost associated with the long-term maintenance requirements of the mitigation measure. The City of Northfield must expend any contributions collected within 5 years of their receipt.