



ENVIRONMENTAL RESOURCE INVENTORY

FOR

**FRANKLIN TOWNSHIP
SOMERSET COUNTY, NEW
JERSEY**

**Prepared by:
Franklin Township
Environmental Commission**

May 2019

**Adopted by the Planning Board as an element of the
Township Master Plan: August 7, 2019**



Acknowledgements

This Environmental Resource Inventory (ERI) is an update of the Township ERI prepared for the Township Environmental Commission by Amy S. Greene Environmental Consultants, Inc. in 2008. The 2008 ERI was funded by the Township of Franklin and through a Smart Growth Planning Grant from the Association of New Jersey Environmental Commissions (ANJEC). The Township Environmental Commission has prepared this updated ERI with the assistance of staff of the Township's Department of Planning & Zoning and the Township's GIS staff.

The Environmental Commission wishes to acknowledge the work done by Amy S. Greene Environmental Consultants, Inc. on the 2008 ERI and the funding provided by ANJEC which made the production of that document possible. This ERI retains the general format, explanatory text and much of the information presented in that document. However, various data and maps have been updated. The extent of updating required the production of a new ERI.

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1.0 INTRODUCTION

1.1 General Information

Franklin Township is a particularly diverse community with a wide representation of races and cultures. As with its human population, Franklin is diverse in land use, historic and natural resources. The Township's land uses range from dense residential development to expansive agricultural areas and forest. It contains a variety of quality forests and grassland vegetation communities, forested and emergent wetlands and geology with characteristics of both the Piedmont and Inner Coastal Plain Provinces.

Franklin Township is located within southeastern Somerset County in Central New Jersey (Section 11, Location Map Figure 1). The Township is approximately 30,000 acres or 46.8 sq. mi. and partially bounded by the Millstone River to the west, and the Raritan River to the north. Approximately 0.1 sq. mi. or 0.15% of the municipality is mapped as surface water. Municipalities that border Franklin Township to the west include Montgomery Township, Rocky Hill Borough, Hillsborough Township, Millstone Borough, Princeton Township and Manville Borough. Bridgewater Township, Piscataway Township and South Bound Brook Borough border the Township to the north; and, New Brunswick City and North and South Brunswick Townships (all Middlesex County) border the Township to the east.

Franklin Township is comprised of multiple historical communities, unincorporated enclaves and census designated areas. These communities include Blackwells Mills, East Millstone, Franklin Park, Griggstown, portions of Kingston, Middlebush, Weston and Zarephath. The Township also includes Somerset, which comprises the majority of the municipal population.

According to US Census data, the population of Franklin had grown from 19,858 (NJDOH) in 1960 to 42,780 in 1990, representing a 46.4% growth rate. At the time of the US Census (2000), there were 50,903 people living in Franklin Township. The Township population increased by about another 11,400 persons between 2000 and 2010 to 62,300 according to the 2010 Census. The Township's 2014 population was estimated at 65,900. The rapid growth of Franklin Township since the 1960s is reflected in the heavy residential development of the municipality over that time period. In 2010, the population density was approximately 1,350 people per sq. mi. (up from 1,088 in 2000).

1.2 Conservation in Franklin

To help meet the pressures on natural resources from a growing population, Franklin Township has implemented a number of conservation measures in the form of municipal ordinances, projects and municipal plans. Through its municipal planners, commissions and committees including Open Space, Historic Preservation and Environmental Commissions, Franklin Township has been progressive in protecting its natural and cultural resources. The Township has actively pursued the preservation of farmland and open space through the purchase of lands and development rights. To date, approximately 34 percent of the Township has been preserved as open space. The municipality has partnered with various organizations including the Stony Brook Millstone Watershed Association to aid in the identification of critical water resource areas and to receive guidance for their protection (SBMWA, 2005). Franklin has partnered with the NJ Audubon Society in the creation and management of the Negri-Nepote and Griggstown

Grassland Preserves which serve as valuable wildlife habitat resources within the municipality. The Township has conducted a water quality study with guidance from the New Jersey Department of Environmental Protection (NJDEP) and developed a detailed priority forest study in 1986. These conservation initiatives are reflected in the 2006 Master Plan, which sets specific conservation goals for the Township under its Conservation Plan Element.

The Conservation Plan Element of the Franklin Township Master Plan (March, 2006) was created with the intention of developing a pathway for the best preservation or conservation of the municipality's natural resources. Resources specifically identified include energy, open space, water supply and quality, forests, soils, wetlands, and threatened and endangered species habitat. Specific goals and objectives stated in the Conservation Plan Element include the following:

Goal: To conserve open space, rural character, scenic vistas, sensitive environmental areas and farmland.

Objectives:

- Identify and protect resources by continued use of the Open Space Trust Fund and non-contiguous parcel clustering
- Maintain open space and link to other open spaces and community resources
- Maintain clustering as a design technique which preserves open space and protects environmentally sensitive areas
- Limit the extension of utilities to currently approved service areas, unless otherwise indicated in the Master Plan
- Promote retention of wildlife and species diversity by conserving continuous tracts of differing vegetative types
- Maintain design standards to protect the Township's historic and rural character, particularly in villages and among scenic corridors
- Continue to support the Right to Farm Ordinance
- Strongly enforce limits on impervious coverage and encourage innovative water quality enhancement techniques in site design

Goal: Protect water quality in Township streams, the Millstone and Raritan Rivers, and the Delaware and Raritan Canal.

More recently, the Township's Open Space and Recreation Plan (OSRP), adopted in December 2013, outlined a Preservation Action Plan which includes the following key components:

- *Land Preservation Areas:* Provide structure, guidance and direction in the Township's land preservation efforts: Canal Preservation / Millstone Valley Area; Kingston / Griggstown Preserve; Village Greenbelts; Stream Greenways; Ten Mile Run Greenway; State / County Lands Preservation Area; Greenways/ Connectivity; and Scenic Corridor Planning Area.
- *Zoning Techniques:* The OSRP recommends that the Township continue to pursue zoning techniques that are compatible with open space and farmland preservation and the retention of agriculture and rural character.

- *Rural Density Zoning:* The OSRP identifies the following zoning districts as being most compatible with such objectives: Agricultural (A) Zone; Canal Preservation (CP) Zone; Rural Residential (RR-3) Zone; and Rural Residential (RR-5) Zone. The OSRP recommends that the Township maintain the rural density of those areas currently within the A, CP, RR-5 and RR-3 zoning districts.
- *Cluster Provisions:* The Township's development regulations have a number of clustering provisions (Lot Size Averaging, NRPC cluster option, NRPC R-40 Cluster Option, Agricultural Cluster Option) that have been very successful in preserving agriculture and open space while managing a significant amount of growth. In this way, development in the more rural areas of the Township have not simply consumed massive amounts of agricultural land but has actually led to the permanent preservation of open space. The OSRP recommends that the Township continue to encourage the use of cluster techniques when such techniques could serve to protect existing farmland, areas of scenic value and/or natural resource value. Further, it recommends that the Township re-evaluate the cluster provisions in order to: identify ways to either increase the likelihood of their use.
- *Infrastructure Considerations:* The OSRP notes that areas planned to remain less dense (i.e., those zones that permit less than 1 unit per acre) are not served by sewer. and recommend that the Township carefully restrict the expansion of the sewer service area into areas of the Township that are inappropriate and/or unsuitable for more intensive development. The same recommendation is made with respect to the expansion of public water service.
- *Implementation of the Farmland Preservation Plan:* The OSRP recommends that the Township continue to pursue implementation of the Farmland Preservation Plan as a key means of addressing the Township's open space preservation goals.

Franklin Township, with support from the Association for New Jersey Environmental Commissions (ANJEC), developed the Township's Environmental Resource Inventory (ERI) in 2008. This ERI retains the general format and much of the information presented in that document. However, various data and maps have been updated. The extent of updating required the production of a new ERI. The Township Environmental Commission prepared this updated ERI with the assistance of staff of the Township's Department of Planning & Zoning and the Township's GIS staff.

The purpose of the Franklin Township ERI is to identify and describe the diverse natural and cultural resources and environmental features within the Township. The ERI provides both visual depictions of natural resources, in the form of mapping information (Section 11, Figures), and text that describes these resources, their sensitivities and limitations for development and suggested measures for protection of sensitive resources. The text has been gathered from existing resources, reports and studies provided by County, State and Federal agencies, and non-government organizations.

Franklin Township's original ERI was created by the Environmental Commission in 1977 with the intent of providing a guide for Township planners by identifying a series of land use constraints (hydrological,

geological, soil and basic vegetation limitations) and cross referencing them with various land uses to create a systematic planning review process. The ERI did not provide significant detail on contemporary land use, land cover and wildlife resources, but was important as a starting point for the creation of Township ordinances.

The ERI should be periodically reviewed and updated with regard to changes in land use, the quality and quantity of environmental resources and local, State and Federal laws. Reviews of the ERI content are necessary to accurately document the progression of the municipality over time and to keep the ERI functioning as a legitimate tool for planning.

The ERI is designed to serve as a *general guideline* for determining Franklin's priority resources and their locations within the municipality. No fieldwork, within the Township or otherwise, was conducted specifically for this report. Although the ERI provides vital guidance for field activities, it is not a substitute for site specific surveys. Activities such as wetland delineations, wildlife studies and groundwater testing require *in situ* studies for conclusively determining the presence of various resources, impacts and other detailed site specific conditions. Once field data are collected and verified, they may be directly incorporated into the ERI in future revisions.

2.0 HISTORIC AND SCENIC RESOURCES

2.1 Early History

Evidence suggests that Paleo-Indians settled the Raritan Valley as early as 12,000 years ago. This is evidenced by the presence of clovis type points discovered just west of Franklin in neighboring Hillsborough Township. The "Lenape" or Delaware Indians were the indigenous people of Franklin Township when Europeans first settled the region. The Lenape Indians consisted of three major divisions: the Minsi in northern New Jersey, the Unami in central New Jersey and the Unalatchigo in southern New Jersey. The Raritan Indians of the Unami subtribe (translated as "People Down the River") occupied the region of the Raritan River including the Raritan Bay and Staten Island, and were present in the vicinity of Franklin Township. Indigenous sites of NJ are typically found within 300 feet of water and often situated in areas with well-drained soils, level topography, historic trails, and a decent vantage point. Prehistoric evidence of Lenape campsites would typically include pottery fragments, fireplace stones, and stone chips/unfinished tools or other evidence of tool making (Skinner and Schrabisch, 1913). Areas along the Raritan and Millstone Rivers would be the most likely to contain prehistoric and indigenous evidence in Franklin Township.

While it is important to note that major development of the region, including soil disturbance and impervious cover creation, reduces the probability of finding regional archaeological evidence, sites have historically been identified throughout the Raritan River Drainage. A study conducted by the NJ Geological Survey in 1913 revealed the presence of multiple campsites and artifacts (including two burial grounds) along the Green, Bound, and Ambrose Brooks, across the Raritan River just north of Franklin. At the time, it was suspected that similar findings may occur along the Millstone and Raritan Rivers (Spier, 1915).

The first Europeans to settle the area that is now Franklin Township were Dutch settlers that traded with the local indigenous people of the area around 1650 and the oldest existing houses within the Township date from the 1720s. Franklin Township was initially formed in circa 1745 as Eastern Precinct. The Township was part of the State's initial 104 townships incorporated by the New Jersey Legislature on February 21, 1798. The Township was either named for founding father and patriot Benjamin Franklin or for his illegitimate son William Franklin, the Loyalist Governor of New Jersey (1763-1776). In 1998, the Township Council officially adopted the theory that the Township was named for Benjamin Franklin (www.franklintwpnj.org).

The Revolutionary War is central to Franklin Township history. For a time during the war, the British occupied Franklin and the British Generals Cornwallis and De Heister attempted to engage Washington within the vicinity of East Millstone and Middlebush. Washington remained outside of Franklin until the British withdrew (Meadows Foundation). The British destroyed a number of Middlebush homes during their retreat of the region. Franklin was the site of minor Revolutionary War conflicts, and raids were sometimes conducted from Kings Highway (Route 27 today).

In 1834, a twenty-two mile section of the Delaware and Raritan (D&R) Canal was built within Franklin, providing the Township with what is today one of its most significant historic features.

During the Civil War, the canal was a vital means of freight transportation between Philadelphia and New York and vital to the local economy. In 1854, the Pennsylvania Railroad Company opened the Millstone and New Brunswick Railroad, which provided passenger and freight service within Franklin. As railroads became the most dominant form of freight transportation during the later 19th century, the D&R Canal system of freight transport became functionally obsolete. The D&R Canal was closed as a transport system in 1933 and became part of the public water system. In 1975, the D&R Canal State Park was created.

2.2 Historic Resources

Franklin Township is replete with 18th and 19th century historic sites and structures. Fine examples of these resources include the Van Wickle House, located next to the D&R Canal (built in 1722 by Dutch Settlers) and the Rockingham Historic Site in Kingston, which contains the house occupied by George Washington for over two months in 1783 as he prepared his "Farewell Orders to the Armies of the United States". The wealth of historic resources of Franklin Township is reflected in the multiple listings on the State and National Registers of Historic Places. The following ten historic districts are located within Franklin:

The **Delaware and Raritan (D&R) Canal Historic District** includes the Canal bed and 100 yards to either side of the Canal center line and runs through six counties between the Delaware and Raritan Rivers. The D&R District contains multiple State and Nationally Registered Historic Places including the Van Wickle House. Historic districts specific to Franklin within the D&R Canal Historic District include Rocky Hill, Griggstown, parts of Six Mile Run, and East Millstone. It was listed on the National Register in 1973 and the State Register in 1972.

The **East Millstone Historic District** is located in the northwestern portion of Franklin Township along Amwell Road adjacent to the D&R Canal Historic District. It was listed on the State and National Registers in 1983. East Millstone is also a Township-designated historic district.

Listed on the State and National Registers in 1984, the **Griggstown Historic District** incorporates portions along the Millstone River in both Franklin and Montgomery Townships.

Kingston Village Historic District is located in three counties: Somerset, Mercer and Middlesex. The community was largely settled by the English who established the Kingston Presbyterian Church in 1723 and a school in 1776. General Washington was in Kingston when it was decided to travel north to winter quarters in Morristown rather than taking New Brunswick from the British, after the Battle of Princeton in 1777. Kingston Village was placed on the State Register of Historic Places in 1989, and the National Register in 1990. Kingston Village is also a Township-designated historic district.

Kingston Mills Historic District, adjacent to Kingston Village, contains the oldest four-arch stone bridge (1798) in either Mercer or Somerset Counties, which is located partially in Franklin Township. This Historic District was designated in 1986 on the State and National Registers of Historic Places.

King's Highway Historic District is located in Princeton, South Brunswick, Lawrence and Franklin Townships and is comprised of portions of Route 206 and NJ Route 27. The Kings Highway was a major route between New York and Philadelphia during the 18th century and played a significant role in military movements during the Revolutionary War. Listed on the National register in 1990, the Kingston Village Historic District is located in Somerset, Mercer and Middlesex Counties and incorporates portions of NJ Route 27.

Rocky Hill Historic District extends across the Millstone River into Franklin where the village originally stood. The district includes two houses from 1722 and 1786 and was listed on both the State and National Register in 1982.

Six Mile Run Historic District includes portions of the State Reservoir Area and includes two sections in the vicinity of South Middlebush and Suydam Roads, and Cortelyous and Jacques Lanes. The district was listed on the State and National Registers in 1995 and 1993 respectively.

Middlebush Village Historic District is adjacent to Six Mile Run Historic District. The Middlebush Historic District designation was recently under consideration for registration and review by the State Historic Preservation Office. It was listed on the State Register in February, 2007 and on the National Register in April, 2007. Middlebush Village is also a Township-designated historic district.

The **Franklin Park Historic District** is located on the border of Franklin and South Brunswick Townships. It includes two State and Nationally Registered Historic Places including the Abraham Voorhees House and the Six Mile Run Reformed Church. Franklin Park is a Township-designated historic district

Additional Individual Structures on the National Register in Franklin:

Rockingham Located at 84 Laurel Ave., Kingston, the house is a State Historic Site first constructed between 1702 and 1710, with additions in the 1760s by owner John Berrien, a farmer and NJ Supreme Court Judge. It is noted for being the temporary residence of George Washington in 1783 as he addressed the Continental Congress in Princeton and prepared his “Farewell Orders to the Armies of the United States.” Originally placed on the State and National Registers in 1970, the dates reflected in Table 1 below reflect the designation post relocation of the structure from its prior location on Route 518.

Tulipwood Located at 1165 Hamilton Street in Somerset, the house was constructed in 1892. The “Shingle Style” of this house is considered rare in Somerset County. The style is characterized by extensive use of shingles on the roof and house sides. **Six Mile Run Reformed Church** Located within the Franklin Park Historic District along Route 27, this structure was added to the State and National Registers in 2009.

Van Wickle House (The Meadows) The house is located on 1289 Easton Ave. Constructed in 1722 by Symen Van Wickle, the house is a classic example of “Dutch” style which is actually a combination of English, Dutch and Flemish styles. The house is maintained by the Meadows Foundation (see Section 2.3 below).

A complete list of the State and National Register of Historic Places within Franklin from the State Historic Preservation Office (SHPO) is included in Table 1 below (last updated 1/25/16). The listings in the table below itemize the buildings, structures, sites, objects, and districts listed on the New Jersey Register of Historic Places (SR) and the National Register of Historic Places (NR), Certifications of Eligibility (COE) and opinions of eligibility from the SHPO (SHPO Opinion). The properties and historic districts listed in the table meet the New Jersey and National Register criteria for significance in American history, archaeology, architecture, engineering or culture, and possess integrity of location, design, setting, materials, workmanship, feeling and association (see Section 2.3).

Table 1: State and National Registers of Historic Places within Franklin (2016)

Historic Resource	State ID #	Location	State Status + Date	National Register Date Reference #
Cornelius S. Conover Farm	3690	New Brunswick Rdve.	Opinion 4/4/02	
Delaware and Raritan Canal Historic District Extension	2503	Weston Canal Road	Opinion: 1/25/93	
Delaware and Raritan Canal Historic District	1600	Six Counties from Delaware to Raritan Rivers	SR: 11/30/72	NR: 5/11/73 73001105
East Millstone Historic District	2494	Amwell Road D&R Canal	SR: 2/3/83	NR: 3/17/1983 83001613

Historic Resource	State ID #	Location	State Status + Date	National Register Date Reference #
Hendrick Fisher House	4470	1960 Easton Ave.	COE 6/15/05	
Garretson House and Barn	2495	New Brunswick Road	Opinion 6/23/82	
Griggstown Historic District	2496	Canal Road	SR: 6/21/84	NR 6/21/84 84002798
Hageman Farm Complex	2497	South Middlebush Road	COE: 1/19/90	
Howe Farmstead	4626	538 Elizabeth Ave.	COE: 7/21/06	
Inch Lines Linear Multistate Historic District	1914	Multiple Municipalities	Opinion 8/31/93	
Kings Highway Historic District	353	US 206 NJ Rt. 27	SR: 10/23/00	NR: 12/21/00 00001493
Kingston Mill Historic District	1746	Millstone River; Princeton – Kingston Road; Herrontown Road; River Road	SR: 3/5/86	NR: 4/10/86 86000707
Kingston Village Historic District	2498	NJ Route 27, Laurel Avenue, Church Street; Heathcote Brook Road, Academy Street, etc.	Opinion: 12/20/88 SR: 11/20/89	NR: 1/11/90 89002163
Middlebush Village Historic District	4704	Amwell and South Middlebush Roads; Railroad Ave; Olcott and DeBow St.	SR: 2/7/07	NR: 4/25/2007 07000384
Charles B. Moore House	3350	4451 NJ Route 27	Opinion 9/3/86	
Rockingham	2499	Laurel Avenue	SR: 9/28/09	NR: 1/11/10 70000394
Rocky Hill Historic District	2580	Washington St.; Montgomery; Crescent and Princeton Aves.	SR: 1/14/82	NR: 7/8/82 82003304
Six Mile Run Historic District	2500	South Middlebush and Suydam Roads; Cortelyous and Jacques Lanes	SR: 7/14/93	NR: 10/25/95 95001191

Historic Resource	State ID #	Location	State Status + Date	National Register Date Reference #
Six Mile Run Reformed Church	3527	3071 NJ Route 27	Opinion 4/26/94 SR: 1/9/09	NR: 12/18/09 09001102
Six Mile Run Village Historic District	3528	Pleasant Plains Road and NJ Route 27	Opinion 4/26/94	
Percy Smith Farm Site (Site 19)	2501	Weston Canal Road	Opinion 6/23/82	
Somerset County Courthouse Archaeological Site	2502	Somerset County Courthouse	Opinion 4/26/94	
Stankovich Auto Body	4797	893 Somerset Street	Opinion: 9/18/2007	
Tulipwood	4226	1165 Hamilton St.	COE: 12/4/03 SR: 7/14/05	NR: 9/9/05 05000966
Symen Van Wickle House (The Meadows)	2504	1289 Easton Ave.	SR: 9/18/73	NR: 12/4/73 73001134
Voorhees Site	4845		Opinion: 9/9/08	

2.3 Historic Preservation

Historic Preservation is the identification, evaluation and protection of historic and archaeological resources. Historic properties are links to the past that provide a physical record of the events and people that shaped our history. Historic preservation includes saving historic properties, conserving natural landscapes and scenic views. In New Jersey the public commitment to implement historic preservation is defined by three distinct designation types: National Register of Historic Places, the New Jersey Register of Historic Places and designation by a municipality pursuant to the authority of the New Jersey Municipal Land Use Law.

The National Historic Preservation Act of 1966 established the National Register of Historic Places as the official list of historic resources worthy of preservation. The NJ Register of Historic Places Act of 1970 established the New Jersey Register of Historic Places as the state's official list of historic places. The New Jersey Register is modeled after the National Register and uses the same criteria for establishing eligibility. Listing of a property in the New Jersey Register of Historic Places provides recognition of a property's historic importance and assures protective review of public projects that might adversely affect the character of the historic property. However, listing on the National or State Register only affects public undertakings and does not prevent a private property owner from altering or even demolishing a listed property. The most effective protection of historic resources is designation and regulation at the municipal level.

Franklin Township has taken action to preserve its natural resources through municipal ordinances including the Historic District Overlay areas and the establishment of the Historic Preservation Advisory

Commission (Franklin Municipal Code, Chapter 112 Land Use, Section 200). The Historic Preservation Advisory Commission advises the Planning Board and Zoning Board of Adjustment on development applications which may impact historic resources in designated historic district overlay zones of East Millstone, Kingston, Franklin Park, Middlebush, and within 1000 feet of the D&R Canal. The Historic Preservation Plan Element of the Master Plan sets goals and objectives for the preservation and protection of historic resources in Franklin. These goals include the following:

- Promote the preservation and restoration of the Township's historic buildings, sites and districts
- Protect historic structures located in historic districts from insensitive encroachment and renovation and/or demolition
- Protect historic viewsheds

To achieve these goals, in 2011, Franklin adopted a complete overhaul of the Township's Historic Preservation Ordinance which increases protection of existing or newly designated historic sites or properties. The new ordinance meets the standards for Certified Local Government (CLG) designation. The CLG program offers municipalities the opportunity to participate more directly in state and federal historic preservation programs. Further, CLG status provides for local review of public projects, in lieu of review at the State level. As a CLG, the community is eligible to apply for Historic Preservation Fund (HPF) grants for a variety of local preservation activities. The Township is currently finalizing the CLG review process with the State and anticipates receiving CLG designation shortly.

The Township has adopted a Redevelopment Ordinance which has resulted in the preservation of the Franklin Inn (c. 1751) in East Millstone and the adjacent bridge tender's house as well as houses at the end of Georgetown Road that represent the original settlement of Rocky Hill.

The Meadows Foundation. The Meadows Foundation is a 501 (c) (3) non-profit organization formed in 1977 to promote understanding of Dutch and early American heritage through the preservation of historic sites, development of public programs and awareness for local culture and architecture, and support for environmental issues including open space and farmland preservation.

Much of the Meadows Foundation's efforts are focused on Franklin Township's historic resources, and the organization oversees several Township properties constructed between the early 18th century and the late 19th century. The "Meadows" is a reference to the Van Wickle House property, a (c.1722) structure managed by the organization. Other properties managed by the organization include the Hageman Farm (c.1810), the Van Liew-Suydam House (c. 1755), and the Wycoff-Garretson House (c. 1705-10). The Meadows Foundation may be reached at 1289 Easton Avenue, Somerset, NJ 08873 (732) 828-7418. [e-mail: info@themeadowsfoundation.org](mailto:info@themeadowsfoundation.org)

2.4 Scenic Resources

Township-Designated Scenic Corridors

In June 2003, the Township's Scenic Corridor Ordinance went into effect. Scenic corridors are defined as areas that are visible from scenic roadways that may exhibit one or more of the following features: panoramic vistas of natural or built environments; unique geologic or topographic features of natural or historic significance; extended, unobstructed viewsheds; mature woodlands, hedgerows, dense tree stands and substantial individual trees; fallow, open fields or active agricultural operations; and waterbodies or watercourses.

The following are Township-designated scenic corridors: Canal Road; Old Georgetown Road; Copper Mine Road; Butler Road; South Middlebush Road between Amwell and Suydam; Suydam Road; Jacque's Lane; Cortelyou Lane; Blackwell's Mills Road; Mettler's Road; Skillman's Lane; Weston Canal Road between Weston Road and Randolph Road; Weston Road between Weston Canal Road and Elizabeth Avenue; Grouser Road between Canal Road and Van Cleef Road; and King's Highway Historic District (southern portion of Route 27)

Millstone Valley Scenic Byway

Canal Road, Kingston-Rocky Hill Road and the adjoining causeways are a critical component of the Millstone Valley National Scenic Byway - one of only two such byways so-designated in the State of New Jersey. The National Scenic Byways Program is part of the U.S. Department of Transportation, Federal Highway Administration. The program was established to help recognize, preserve and enhance selected roads throughout the United States. Under the program, the U.S. Secretary of Transportation recognizes certain roads as National Scenic Byways or All-American Roads based on their archaeological, cultural, historic, natural, recreational, and scenic qualities. Valued not only for scenic reasons, the byway also provides opportunity for historical interpretation of the skirmishes between local militia and British troops that played a key role during the Revolutionary War.

Canal Road -- New Jersey Scenic Byway

Canal Road was designated a New Jersey Scenic Byway in 2001 as part of the Millstone Valley Byway - one of only seven such byways so-designated in the State. State scenic byways highlight transportation corridors that have outstanding scenic, natural, recreational, cultural, historic or archaeological significance. They represent the uniqueness and diversity of the state and together the byways tell stories about New Jersey's history, heritage, recreational opportunities and beauty.

3.0 CLIMATOLOGY

New Jersey experiences a significant variation in temperature between the summer and winter months and large daily and day-to-day fluctuations. In the winter, New Jersey's climate is influenced by the semi-permanent high pressure that forms over Canada and the northern Great Plains. Strong surges of cold air borne on prevailing winds from the northwest drag cold polar air masses to the southeast over the eastern United States. Storm centers often accompany these cold polar masses of air. In spring, the high pressure over Canada weakens and a Bermuda high develops over the Atlantic Ocean. The clockwise flow around this high

pressure system results in prevailing winds from the south and southwest, carrying moist tropical and maritime air from the Gulf of Mexico and the Caribbean. In autumn, the Bermuda high weakens and retreats to the south. During this transition period, New Jersey often experiences mild and tranquil weather as weak high pressure moves slowly southeast from Canada. The winter circulation pattern slowly becomes reestablished by December, ushering in our winter weather.

In spite of New Jersey’s small size (7,836 square miles), the Office of the State Climatologist identifies five distinct climate zones in the state: The Northern; Central; Pine Barrens; Southwest; and Coastal. The region’s geology, distance from the Atlantic Ocean, and prevailing atmospheric flow patterns produce distinct variations in the daily weather between each of these zones. Franklin Township is wholly located within the Central Climate Zone.

The Central Zone has a northeast to southwest orientation, running from New York Harbor and the Lower Hudson River to the great bend of the Delaware River in the vicinity of Trenton. The region is marked by higher levels of pollutants associated with industry and increased automobile traffic as compared to rural areas within the state. Concentrations of buildings and paved areas within these areas tend to retain heat, creating slightly warmer ambient temperatures than surrounding rural areas. Referred to as “heat islands,” these warm zones occur frequently within the urbanized parts of the Central Climate Zone.

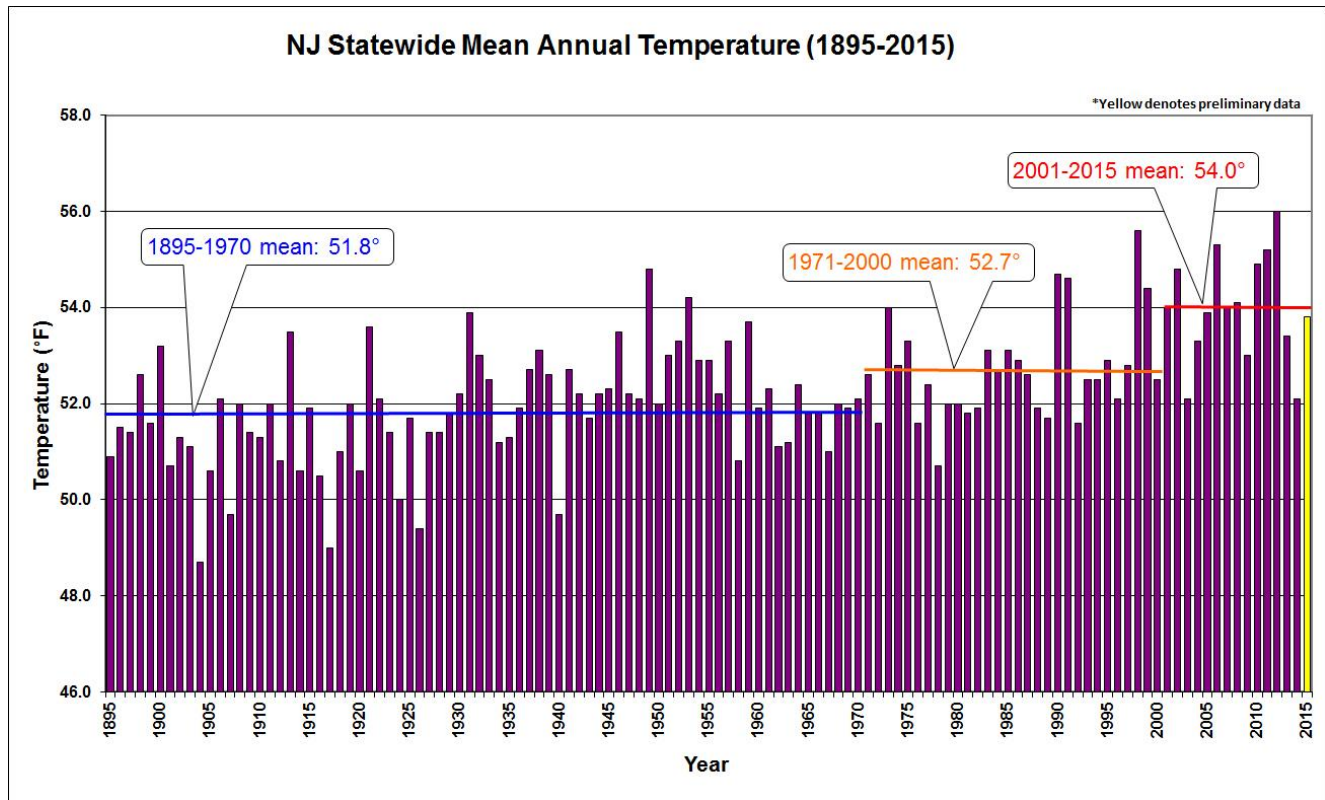
The northern edge of the Central Climate Zone often serves as a boundary between freezing precipitation and rain during the winter. The Central Zone tends to have 15-20 days above 90 degrees Fahrenheit in the summertime; generally half as many as in areas south of this zone.

The National Weather Service’s Cooperative Observer Program (COOP) provides weather and climate data through weather stations nationwide. The data provided in Table 2 represent mean climate data for approximately 120 years from a sampling station in New Brunswick.

Table 2: Mean Climate Data for New Brunswick 1893-2016

Condition	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. temp. degrees F	30.5	31.6	40.5	50.7	61.0	69.8	74.7	72.9	66.4	55.3	44.8	34.4	52.8
Max. temp degrees F	39.0	40.6	50.4	61.7	72.5	80.7	85.4	83.4	77.3	66.3	54.3	42.7	62.9
Min temp. degrees F	22.1	22.5	30.6	39.7	49.6	58.8	64.0	62.5	55.5	44.2	35.3	26.2	42.6
Precip. inches	3.43	2.99	3.79	3.74	3.95	3.89	4.83	4.69	3.5	3.50	3.45	3.72	45.89
Snow inches	7.3	8.3	4.2	0.9	0.0	0.0	0.0	0.0	0.0	0.1	0.6	4.9	25.8

The figure below illustrates the increase in mean annual temperature in New Jersey since 1895.



Source: http://climate.rutgers.edu/stateclim_v1/data/njihisttemp.html

Additional information from Office of the State Climatologist provide data from the Somerville Station and weather and climate trends throughout the state (http://climate.rutgers.edu/stateclim_v1/monthlydata/index.php?stn=286055&elem=avgt).

4.0 GEOLOGY

4.1 Physiography

Physiography is the relationship between a particular location and its underlying geology. New Jersey includes four major physiographic provinces, the Ridge and Valley, Highlands, Piedmont and the Atlantic Coastal Plain. Franklin Township is located entirely within New Jersey's Piedmont Province, also known as the Triassic Lowlands.

The Piedmont is a 1,600 square mile area occupying approximately 1/5th of New Jersey. It is situated in northern and central New Jersey between the Highlands and Coastal Plain Provinces. The Piedmont is generally characterized by gently rolling plains of elevations typically between 200 to 400 feet, separated by a series of erodable ridges (NJGS, 2003).

New Jersey portions of the Piedmont incorporate the counties of Essex, Hudson, Union, Hunterdon, and Somerset, most of Bergen, and parts of Mercer, Middlesex, Morris, and Passaic. It is predominantly comprised of mildly folded and faulted sedimentary rocks of Triassic and Jurassic age (240 to 140 million years old), and Jurassic age igneous rocks that comprise ridge areas within the formation.

Varying soil types have developed in the Piedmont as a result of glacial influences occurring at various periods over parts of the province. Vegetation communities within the region are more influenced by the specific hydrological regime than soil variation (Collins and Anderson, 1994).

4.2 Stratigraphy and Surficial Formations

The underlying bedrock geology of Franklin Township primarily consists of Triassic Age siltstones, shales, sandstones and conglomerates. These Triassic rock formations outcrop (are exposed at the land surface) throughout much of Franklin Township. Also included is a band of Jurassic Diabase along the southernmost portion of the Township. The underlying geology of the Township significantly influences the soils and subsequently the municipality's vegetation/ecological communities and agricultural productivity. The variable resistance to erosion of the formations within the Township results in varying elevations. The erosion resistant basalt rocks tend to be associated with slightly higher elevations and igneous rock outcrops in the southern portions of the Township (see Section 11, Figure 3).

The Triassic and Jurassic (Mesozoic) formations beneath Franklin Township are part of a massive geological formation referred to as the Newark Basin. The Basin was created during the breakup of the Pangea Supercontinent about 250 to 200 Million Years Ago (MYA). Covering about 3,000 square miles and extending for 137 miles through New Jersey, southern New York State and southeastern Pennsylvania, the Newark Basin is the largest of the exposed divisions of the Newark Supergroup and contains primarily siltstone and shales up to 11,000 feet thick on its western edge (USGS, 2003).

Olsen (1980) describes the Newark Supergroup as detrital fill found in elongated basins over 32,000 feet thick in some locations throughout eastern North America (from Maine to South Carolina). The formations include sedimentary rocks, primarily red clastic (formed from other rocks); and intrusive and extrusive diabases and basalt volcanic rocks. Some formations of the Newark Basin are noted for having plant, vertebrate and invertebrate fossils from a 35 million year period in the Early Mesozoic Era.

NJDEP geologic mapping identifies four geologic units outcropping in Franklin Township (see Section 11, Figure 3). The descriptions here are summarized from the NJDEP, NJ Geological Survey Descriptions and listed from uppermost to lowest:

Magothy Formation. The Magothy formation is the uppermost formation within Franklin Township. The formation outcrops in two small locations in the southern portion of the Township: in the Little Rocky Hill area along Route 27 and Old Road; and in the area of Coppermine and Old Georgetown Road (see Section 11, Figure 3). The Magothy formation consists of unconsolidated fine to coarse grained quartz sand, interbedded with thin-bedded clay or clay-silt. Locations within Franklin represent isolated pockets of this formation within the Piedmont Province. The Magothy formation outcrops extensively along the northern edge of the Inner Coastal Plain approximately three miles south of the southern tip of Franklin Township. This formation is associated with acid producing soils (see Section 5.7).

Jurassic Diabase. The Jurassic diabase is found in the southernmost portions of the Township from the vicinity of Rockingham eastward to Little Rocky Hill and northward to the vicinity of Sunset Hill Garden. The diabase is a fine grained dark gray to black igneous trap rock that forms from intrusive magma between sedimentary layers. Jurassic diabase is hard and more erosion resistant than the surrounding sedimentary formations. This weathering resistance results in slightly higher elevations where it is located within Franklin. Wells within Jurassic diabase aquifers tend to have poor yields (see Section 4.3).

Passaic Formation (Lower Jurassic Upper Triassic). The Passaic Formation is the dominant bedrock of Franklin Township and outcrops throughout the majority of the Township. The Passaic Formation consists of reddish brown thick to thin bedded shale, siltstone and very fine to coarse grained sandstone, and black, gray or greenish shales.

Passaic Formation Gray Bed. This portion of the Passaic formation primarily extends in very narrow bands in a southwest/northeast direction through the central and southern portion of the Township. It also extends through the northern portion of the Township in two separate patches. This formation is comprised of cycles 7 to 23 ft. finely laminated gray bed sequences consisting of shales, siltstone and mudstone.

4.3 Aquifers and Recharge Areas

An aquifer is a saturated permeable geologic unit that can transmit significant quantities of water under ordinary hydraulic gradients. The most common aquifers are those geologic formations that have relatively high hydraulic conductivity values, such as unconsolidated sands and gravels, permeable sedimentary rocks such as sandstone and limestone, and heavily fractured sedimentary, volcanic and crystalline rocks.

The groundwater that comprises an aquifer is derived from that part of precipitation that does not run off the surface of the land to streams or return to the atmosphere through evaporation and transpiration. Factors which determine the amount of water that infiltrates to the groundwater aquifer include the porosity and permeability of the surficial material, the slope of the land, the amount and kind of natural and artificial cover, and the intensity and amount of precipitation. The process of water infiltrating a groundwater aquifer is referred to as "recharge." Within Franklin Township, groundwater recharge generally ranges from 11 to 14 inches per year throughout much of the northern and southern portions of the Township. These areas are interspersed with recharge areas of 9 to 10 inches per year. Much of the agricultural areas of central Franklin contain recharge areas within this range. Some developed areas, particularly in the northern and eastern parts of the municipality, have 1 to 8 inches of groundwater recharge per year (see Section 11, Figure 5).

Aquifers are generally equated to the name of the geologic formation in which they exist, but in actuality do not necessarily correspond to the defined boundary of the mapped geologic formation. NJDEP mapping indicates that the primary bedrock aquifer associated with Franklin Township is the Brunswick aquifer. The Potomac-Raritan-Magothy (PRM) aquifer and the Jurassic Diabase aquifers are associated with their corresponding geological formations in the southern portion of the Township.

Various aquifers have different well yields depending on characteristics of the aquifers and may range from one to 3,000 gallons per minute (GPM) within the state of NJ. The NJ Geological Survey has assigned a well yield ranking system for the aquifers of the state based on the findings of high capacity wells. The

aquifers are ranked from A to E depending on gallons per minute yield. The ranks are as follows: E, less than 25 gpm; D, 25 to 100 gpm; C, greater than 100 gpm to 250 gpm; B, greater than 250 gpm to 500 gpm; and A, greater than 500 gpm. Each county's yield data were analyzed and ranked based upon this ranking system. The metadata for this ranking system is found at the NJDEP NJ Geology survey at www.state.nj.us/dep/njgs/geodata/dgs07-1/readme.htm. It is important to consider that the well yield data collected for this ranking system is from high capacity wells and does not represent all wells located within the aquifer. High capacity wells are often created after thorough hydrologic and geologic investigations and may be installed near surface waters that contribute to well-yields (Muhall and Demicco, 2004).

There are two main types of aquifers – confined and unconfined. Confined aquifers are situated such that less permeable formations (called aquitards) are located above and below the aquifer, confining the groundwater in the aquifer. The aquifers nearest the ground surface are generally unconfined aquifers. An actively pumped well in an unconfined aquifer can draw down the surface water table in the vicinity of the well when pumped, affecting nearby surface water bodies (Freeze and Cherry, 1979). Friable (broken) layers closest to the surface of the Brunswick aquifer are unconfined. The aquifer becomes more confined with depths below 50 feet, however leakage between the large blocky rock confining units may occur in these generally confined aquifer sections. Within the Magothy and Raritan formations, confined conditions exist in some deeper wells (typically 500-900 feet) (NJWSA, 2002) but are otherwise generally unconfined.

The rocks of Franklin's Piedmont formations, including shales, sandstones, siltstones, mudstones, and diabase sills transmit water between fractures from faults, joints or changes in the bedding planes (Muhall and Demicco, 2004). The amount of water storage and transmission through these rocks depends on the separation distance between fractures, which may range from several inches in some types of rocks to several feet in others (Muhall and Demicco, 2004).

Brunswick Aquifer

This aquifer derives its name from its association with the Brunswick Formation, currently known as the Passaic Formation (See Section 4.2). Aquifers within the Newark Basin exist within the weathered joint and fracture systems of shales within the upper 200 – 300 ft (USGS, 2005; Barksdale, 1943). Fracture areas are smaller and water availability lessens below 500 feet within the formation. Intergranular spaces within the aquifer and coarser grained sandstones also hold water (USGS, 2005). The shale and sandstone portions of the Brunswick Aquifer tend to be the most productive and contain wells known to yield up to 1500 gallons per minute (gpm) (Carswell and Rooney, 1976). Within Somerset County, the Brunswick Aquifer high capacity well yields range from 20 to 460 gpm with a mean of 188 gpm, giving it a "C" ranking. A USGS study of 709 domestic wells within Stony Brook, Beden Brook and Jacob's Creek drainage basins resulted in a median well yield of 15 gpm for Passaic Formation wells, exceptionally lower than the high capacity well yields (Muhall and Demicco, 2004).

Potomac –Raritan –Magothy (PRM) Aquifer

The PRM aquifer is a wedge-shaped formation consisting of Cretaceous age sediments deposited in alternating layers of clay, silt, sand, and gravel. The aquifer thickens throughout the outer coastal plain from a very thin layer near the outcrop to more than 4,100 feet beneath Cape May County (USEPA, 1988). The PRM aquifer system is divided into two subaquifers: The Farrington aquifer (mainly Raritan age) and

the Old Bridge aquifer (Magothy age). The small sections of the PRM within Franklin Township are associated with the Old Bridge Aquifer. This aquifer is directly associated with the outcropping of the Magothy formation in southern Franklin. Although having an extremely limited range within the Township, this aquifer is Franklin's most productive and is given an "A" ranking, indicating productivity of over 500 GPM on high capacity wells. Undeveloped areas associated with this aquifer are considered to be the most important water supply areas within the Township (SBMWA, 2005).

Jurassic Diabase

The dense, poorly fractured rocks of diabase do not easily store or transmit water. As a result the Jurassic diabase aquifers of Somerset County have low productivity and the high capacity wells are given an "E" ranking by NJDEP, indicating less than 25 GPM. A study of Hunterdon County diabase aquifers (Kasabach, 1966) found wells ranging from 0 to 55 gpm with a median yield of 5 gpm. USGS studies indicate that drilling beyond 125 feet within diabase does not result in increased well yield (Muhall and Demicco, 2004).

4.4 Potable Water Supply

Water systems are classified as community or noncommunity systems. Community water systems contain no less than 15 service connections used by year round residents, or regularly serve at least 25 year round residents. Examples include municipal systems and mobile home community systems.

The Franklin Township Department of Public Works supplies public community water to the majority of the Township residents. The remaining portion of municipal residences (>25%) utilize private individual wells. These residencies are primarily in the southern portion of the Township. According to the NJDEP Source Water Assessment Report, the Franklin Township Department of Public Works purchases all of the public community system water from four community water systems outside of the Township:

- *South Brunswick Water Department (PWSID # 12211004)* - Water from this system comes from three wells within the middle Potomac-Raritan–Magothy (PRM) Aquifer.
- *New Brunswick Water Department (PWSID # 1214001)* – Water is provided to this department through two surface water intakes – the Lawrence Brook and the Delaware and Raritan Canal.
- *North Brunswick Water Department (PWSID # 1215001)* – Water from this system is supplied through one surface water intake - Delaware and Raritan Canal.
- *New Jersey American Water Company* - Source water for the system comes from 129 regional wells and seven surface water intakes. Water sources for the Elizabethtown system include the Millstone River, Upper Potomac-Raritan–Magothy Aquifer; the Raritan River; deposits within igneous and metamorphic rocks, glacial sand and gravel; Delaware & Raritan Canal, Brunswick Aquifer and the Stockton Formation.

A noncommunity water system is a public water system used by individuals other than year round residents for at least sixty days of the year. Noncommunity water systems may serve transient or nontransient populations. If the water system serves the same 25+ people over a six month period during the year, the system is considered nontransient. Examples include schools, offices and factories. A transient noncommunity water system is a system that is active at least sixty days of the year, but does not serve the

same population during that time period. Rest stop areas, restaurants, and motels are examples of transient noncommunity systems. These systems may have their own noncommunity servicing wells. According to the NJDEP (noncommunity systems) there are currently 19 noncommunity systems within Franklin Township.

Franklin Township Noncommunity Systems

PWID	Water System Name	Water System Type	Primary Source of Water
NJ1808001	FRANKLIN TOWNSHIP DEPT OF PUBLIC WORKS	Community (C)	Purchased surface water
NJ1808318	THOMAS EDISON ENERGYSMART CHARTER SCHOOL	Nontransient noncommunity (NTNC)	Groundwater
NJ1808341	PILLAR OF FIRE	Nontransient noncommunity (NTNC)	Groundwater
NJ1808342	CEDAR HILL CLUB INC	Transient noncommunity (NC)	Groundwater
NJ1808343	CORNER CAFE AND GRILL	Transient noncommunity (NC)	Groundwater
NJ1808347	STEWARTS	Transient noncommunity (NC)	Groundwater
NJ1808349	OBRIENS TAVERN	Transient noncommunity (NC)	Groundwater
NJ1808353	BUNKER HILL GOLF COURSE	Transient noncommunity (NC)	Groundwater
NJ1808355	MIDDLEBUSH VILLAGE SHOPPING SQUARE	Transient noncommunity (NC)	Groundwater
NJ1808356	FRANKLIN MALL	Transient noncommunity (NC)	Groundwater
NJ1808357	LITTLE GEM ACADEMY	Nontransient noncommunity (NTNC)	Groundwater
NJ1808358	THOMAS EDISON ENERGYSMART CHARTER SCH	Nontransient noncommunity (NTNC)	Groundwater
NJ1808360	SO BOUND BROOK LITTLE LEAGUE	Transient noncommunity (NC)	Groundwater
NJ1808361	TABATCHNICK FINE FOODS	Nontransient noncommunity (NTNC)	Groundwater
NJ1808363	ARSHA BODHA CENTER	Transient noncommunity (NC)	Groundwater
NJ1808371	GRIGGSTOWN VOLUNTEER FIRE COMPANY	Transient noncommunity (NC)	Groundwater
NJ1808372	GRIGGSTOWN REFORMED CHURCH	Transient noncommunity (NC)	Groundwater
NJ1808373	PEDIATRIC & ADULT REHABILITATION CENTER	Transient noncommunity (NC)	Groundwater
NJ1808374	BUNKER HILL LUTHERAN CHURCH	Transient noncommunity (NC)	Groundwater

Each year, the Township Water Utility issues a Water Quality Report. The last five reports are provided on the Township website at <http://franklintwpnj.org/government/departments/water-utility>. The Water Quality Reports are an annual report to all water consumers on the quality of water provided by the Township of Franklin. The reports meet the Federal Safe Drinking Water Act requirements for Consumer Confidence Reports. The Water Quality Reports provide the Utility's customers with information on the sources of drinking water, the water system, applicable health information and the concentrations of detected contaminants with a comparison to water quality regulations.

Public water is provided in the more densely developed portions of the Township, as well as the areas developed with commercial and industrial uses. Generally, this corresponds to the following zoning districts: the commercial and industrial zones, mixed-use zones including the HBD and the redevelopment area, multi-family housing zones and the R-7, R-10, R-10A, R-10B, R-15, R-20 and R-40 single-family residential zones. Some notable exceptions to this include: the South Bound Brook area west of Elizabeth Avenue; the Willow Avenue area off of Easton Avenue; and some residential areas off of DeMott Lane including the Gates/ Ellison and Emerson Road areas. Homes in these areas are served by private wells. In addition, the following lower density residential zones (i.e., greater than 1 acre) are not served by public water: RR-3, RR-5, C-P and A single-family residential zones.

4.5 Aquifer Contamination

The chemical quality of ground water is a primary concern where it is used for public and domestic supply. The chemical properties are determined by the chemical properties of the precipitation; mineralogy of the substrate through which the water moves; and the length of time the water is in contact with the substrate. The chemical content can be altered by the introduction of contaminants into the environment. Pollutants may enter the environment from point or nonpoint sources. Point sources are usually discrete sources where concentrations may be elevated, such as leaking pipes, underground storage tanks and accidental spills. Nonpoint sources are usually lower concentrations spread out over larger areas, such as fertilizers and pesticides applied in agricultural areas, stormwater runoff from pavement and vehicle emissions that settle on the ground and infiltrate with precipitation.

Although associated primarily with the Inner Coastal Plain, the PRM aquifer is one of the sources of water for Franklin Township via the NJ American Water Company – Elizabethtown Division (See Section 4.4). The PRM Aquifer, which is part of the New Jersey Coastal Plain Aquifer System, has a fairly high potential for contamination through recharge (USEPA, 1988 (2)). A combination of factors including the high water table conditions, high permeability of the soil, and its low attenuation capability allow for the transport of contaminants from the land surface into the aquifers. Leaking septic systems, landfill leaching, chemical spills, leaks and illegal dumping, industrial waste lagoons, highway deicing agents and agricultural and lawn maintenance chemicals may all contribute to its contamination (USEPA, 1988 (2)). These contaminants may have immediate local impacts and long term impacts as the contamination travels deeper into the aquifers.

The 15 basin (Northwest New Jersey) aquifer system, which includes the Millstone River Basin, is considered to be highly vulnerable to contamination by the USEPA (1988). This determination aided in the basin's designation as a Sole Source Aquifer (see Section 4.9). The 15 basin Aquifer is associated with Ridge and Valley, Highlands and Piedmont Geology. Reasons cited for its vulnerability include thickness of the soils, the shallow depth to ground water, and the fractured nature of the bedrock. Potential sources of contamination cited by the USEPA include transportation routes, septic systems, highway, rural and urban runoff, commercial and industrial facilities, and agricultural practices (USEPA, 1988).

Contamination of groundwater may be the result of a surface spill of a liquid, from streams or lakes, or be the result of a buried solid which is dissolved into groundwater as the result of water percolation. Contamination may be less dense than water and float, as in the case of petroleum products, or may sink within the aquifer as many solvents do. Certain chemicals may mix with aquifer water and become solutions such as chlorides. Some chemicals that dissolve into the water may travel distances of thousands of feet from the original source in the form of a "plume." The introduction of certain biodegradable materials into an aquifer may result in changes to the chemical properties of the groundwater. These chemical changes may result in the freeing of previously bound naturally occurring metals into groundwater. The release of metals from chemical changes has been associated with aquifer portions located under landfills (NJDWSC, 2002).

The New Jersey Department of Environmental Protection produces a Source Water Assessment Report for all public water systems within the state. This report determines the susceptibility of a water system to various contaminants and does not reflect actual contaminants being consumed by customers of that water supply

system. Under this program the following parameters are considered: Pathogens including bacteria and viruses; nutrients including nitrogen and phosphorus; volatile organic compounds (VOCs) such as solvents, degreasers and gasoline components; pesticides; inorganics including asbestos, arsenic, lead and other metals; radionuclides including uranium and radium; radon; and disinfection byproduct precursors (DBP) that include solutions of organic matter and disinfecting agents such as chlorine.

Each contaminant is given a high (H), medium (M), or low (L) rating depending on the susceptibility of the particular well. Levels of susceptibility are determined by looking at various factors impacting the wells including the hydrologic conductivity of the soil, percentages of organic matter and clay in the soils, the proximity of agricultural land uses, the proximity and amount of urban landscape or impervious surfaces, and the proximity of streams and wetlands. Susceptibility ratings are listed in Table 3 for Franklin’s public community water systems. Totals of contamination potential for Franklin Township’s noncommunity systems are listed in Table 4. It is important to remember that these ratings reflect a well’s potential for contamination, and does not confirm actual contamination. Public water systems are required to monitor for regulated contaminants and must install treatment if any contaminants are detected at frequencies and concentrations above allowable levels (SWAP, 2004).

Additional details and information regarding source water protection data in Franklin Township may be obtained through the NJDEP at www.nj.gov/dep/swap.

Table 3: Contamination Potential Public Community Source Water for Franklin Township

Name	Pathogens			Nutrients			Pesticides			VOCs			Inorganics			Radio-nuclides			Radon			DBP			
	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	
SOURCES																									
SBT Wells 3		1	2	2	1			2	1	3				2	1	3				3			2	1	
NJAM Wells- 129	4	65	29	42	56			24	74	88		10	16	66	16	39	59		92	6	7	25	73		
NJAM Surface 7	7			7				7				7		7				7			7	7			
NeBWD Surface-2	2			1	1			2				2		2				2			2	2			
NoBWD Surface-1	1			1				1				1		1				1			1	1			
Total -142	14	66	31	53	58			8	28	75	91	10	10	26	68	17	42	59	10	92	9	17	37	74	

* Numbers refer to the number of individual sources. For example New Jersey American utilizes water from 129 individual wells and from seven surface water intakes.

Table 4: Contamination Potential Totals Noncommunity Water in Franklin Township

Name	Pathogens			Nutrients			Pesticides			VOCs			Inorganics			Radio-nuclides			Radon			DBP			
	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	
SOURCES																									
Total	1	3	19	0	22	1	0	22	1	5	0	18	6	17	0	19	4	0	23	0	0	0	23	0	

Contaminants

VOCs. Ninety-one wells within the Franklin Township public water systems were determined to have high susceptibility for volatile organic compounds or VOCs. Five noncommunity systems were determined to have high potential for VOC contamination. VOCs are the most common organic groundwater contaminants in New Jersey. VOC contaminants may be of point or nonpoint in origin and typically include solvents, degreasers, and additives of gasoline including MTBE (methyl tertiary-butyl ether). Gas stations, chemical plants, and other industries are typical sources of VOCs. In addition to being linked to adverse health problems, VOCs contribute to the development of ground level ozone (O₃). Ozone is a gas that forms when nitrogen oxides and VOCs react in the presence of sunlight and heat. VOC aquifer contamination is common in urban and industrialized areas within the state. VOC contamination within the PRM aquifer has resulted in nonpotable conditions within some sections (Nevooy, Undated). Sampling of sections of the Delaware and Raritan Canal have revealed the presence of MTBE (Gibbs, *et al.*, 1998). MTBE is a common VOC groundwater contaminant used as a fuel additive to increase oxygen content in gasoline. Leaky underground fuel tanks can result in MTBE contamination.

Nutrients. A high potential for nutrient contamination was found in all surface water intakes and 53 wells of Franklin Township Community Water Sources. Noncommunity sources were generally found to be at medium risk of nutrient contamination. Nutrient contamination is linked with high levels of nitrogen and phosphorus. High nutrient levels may be connected to fertilizers from agricultural areas or lawns, or may result from sewerage treatment effluent, leaky septic systems, livestock or excessive waterfowl (e.g. Canada goose) populations. Nutrients can have environmental and human health impacts by enhancing the growth of harmful pathogens such as *E. coli* bacteria or creating eutrophic conditions in open waters. Surface water supplies within Franklin Township were found to have a high potential for pathogen contamination.

Nutrient overloads and sedimentation, or the occurrence of fine particulate matter in water, may result in eutrophic conditions. Eutrophism is caused by an exponential population increase of photosynthetic organisms including algae, which in turn results in reduced oxygen levels in the water. Ultimately, this may result in inhospitable conditions for many fish and other aquatic wildlife. Residential development, golf courses or other sources of maintained lawn may contribute to excessive nitrogen or phosphorus through application of fertilizers for grass maintenance. Soil erosion from development and increases in impervious surfaces may result in increased sedimentation.

The high susceptibility ratings for nutrients in local surface water intakes are reflected in the Federal Water Pollution Control Act Section 303d listings, and in the surface water study conducted by the Township (see Section 6.3.3). Portions of the Millstone and Raritan Rivers near Franklin were found to not attain State Water Quality Standards for phosphorus (see Section 6.3). Furthermore, portions of the Raritan River near Franklin do not attain standards for total suspended solids (see Section 6.3).

Radiation. Unstable, radioactive components of certain elements naturally occurring or introduced into the soil are known as radionuclides. Common forms of radionuclides include alpha emitters, proton/proton emitters, radium 226/228 and radon. All of these forms of radiation have been linked to various forms of cancer. Radon is a naturally occurring gas that results from the breakdown of uranium in soil. Although radon is typically associated with, and most dangerous as, air contamination, it may also enter water. Ninety-two of the 129 NJ American Water Company - Elizabethtown Division wells were

found to have high susceptibility to radon contamination. Within Franklin Township, noncommunity sources of water generally have a high susceptibility for radiation contamination.

Preliminary water testing for radioactive elements involves measuring gross alpha activity. Alpha radiation is a product of radioactive decay, a process by which elements emit radiation to reach a more stable form. Alpha radiation is measured in units known as picocuries. NJDEP indicates that the geologic formations in NJ typically associated with the highest levels of uranium occur in the Highlands Province of NJ, which includes the northernmost tip of Somerset County.

Under current US Environmental Protection Agency laws, the lifetime risk associated with consuming water with the maximum allowable contaminant level for gross alpha activity is 1 in 10,000, or one additional fatal cancer for every 10,000 people consuming two liters of water per day for seventy years. Municipal water systems are required to test for and treat water above the mean contaminant level (MCL). The current MCL for dissolved radium (226 and 228) is 5pCi/L (picocuries per liter) (USEPA, 2002).

Additional information related to radionuclide contamination may be obtained at <http://www.state.nj.us/dep/rpp/radwater.htm>.

Inorganics. Inorganics include a variety of non-organic substances ranging from asbestos to heavy metals. Heavy metals are those metals ranging from copper (average atomic weight 63.546) and those above it in the periodic table. Industrial waste is a typical source of these metal contaminants. Certain metals including cobalt, manganese, molybdenum, vanadium, strontium, zinc, nickel, copper and iron are utilized by all living organisms in trace amounts. However, mercury (see above), cadmium, chromium, arsenic and lead are metals considered particularly dangerous to humans and wildlife in surface waters (Kennish, 1992). A wide range of health problems have been associated with heavy metals: Cadmium disrupts the body's ability to regulate zinc and copper (Kennish, 1992); chromium may cause respiratory and dermatological problems; and arsenic may cause digestive tract and cardiac harm. Arsenic has also been linked to cancer (Steve Spayd, NJ Geological Survey). Sixteen public community wells and all surface water supply sources for Franklin Township's water have been determined to have a high susceptibility to inorganics. This is consistent with surface water findings under the Section 303d list, which identifies portions of both the Millstone River and the Raritan River near Franklin as not attaining the standard for arsenic (see Section 6.3).

The 303d list also identifies mercury contamination in both the Millstone and Raritan Rivers. Mercury occurs naturally in the environment and also enters the environment from industrial pollution. Airborne mercury that descends into waterbodies can be transformed by microorganisms into the highly toxic methylmercury. This form of mercury may accumulate in high levels in fish and shellfish (fish-mercury). Human exposure to methylmercury via fish consumption may cause nervous system damage and, as a result, State and Federal health advisories against consumption of fish of particular species or within particular waterbodies are regularly issued. Methylmercury is particularly harmful to young children and unborn babies (USEPA). Naturally occurring arsenic has been determined to be above the state action level of 5 parts per billion (ppb) over two-thirds of Franklin Township.

Disinfection Byproduct Precursors (DBP). DBPs are byproducts resulting from the reaction between disinfectants and organic and inorganic compounds in water. Chlorine is the most common disinfectant

associated with DBPs. Chlorine is typically used in public water supplies as a means of controlling water-borne pathogens. Common chlorination byproduct chemicals include trihalomethanes (THMs), haloacetic acids, haloacetonitriles and chloral hydrate. Natural organic matter has been determined to be a primary organic component of DBPs (Stevens *et al.*, 1976). The USEPA has created some MCL standards for some DBPs.

DBPs may be naturally occurring or the result of septic system effluent coming in contact with surface water bodies or groundwater supplies. Water with higher concentrations of organic compounds is naturally more susceptible to DBP formation. Water quality and water treatment factors that are identified as potentially contributing to the development of certain DBPs (THM) include increased contact time, higher presence of carbon precursors in the water, higher temperature, higher pH, greater presence of free chlorine residuals, and higher concentrations of bromide.

Surface waters throughout NJ, including all those utilized by the community water systems of Franklin, are susceptible to DBP contamination.

Pesticides. Pesticides are a group of chemicals used to kill or control pests. Subcategories of pesticides include herbicides (plants), fungicides (fungi), rodenticides (rodents), algicides (algae), insecticides (insects and other arthropods), nematocides (nematode worms), and bactericides (bacteria and similar pathogens). They are typically distributed from non-point sources such as agricultural fields, golf courses, residential lawns, transportation rights-of-way, commercial and industrial sources and atmospheric deposition. A wide range of chemicals are used as pesticides including organochlorine; organophosphorus; carbamate insecticides; chlorophenoxy, acetanilide, and triazine herbicide acids; and some VOC fumigants. Variables that may impact pesticide contamination potential include organic content of soil (wells), surrounding land use, distance from the water source to agricultural operations and minimum distances to golf courses.

Various pesticides (including organophosphates and N-methyl carbamates) have been linked to nervous system function impacts, and triazines have been linked to developmental reproductive impacts in lab animals and tumor production (chloroacetanilides) (USEPA).

According to the NJDEP SWAP report, the surface water sources of Franklin Township are considered to have the highest potential for pesticide contamination. Well sources of Franklin Township water supplies generally have medium potential for pesticide contamination. Additional information on these and other forms of water contamination may be found at the EPA website www.epa.gov/ogwdw/hfacts.html, the NJDEP SWAP website at www.nj.gov/dep/swap/reports/sw_dbp.pdf and <http://www.nj.gov/cgi-bin/dep/swap/swapdata2.pl?psid=1808001>.

Other Contaminants

Other potential contaminants include:

- Pathogens: Disease-causing organisms such as bacteria, protozoa, and viruses. Sources of pathogens include both point (e.g., sewer system overflow) and nonpoint (livestock) activities.
- Disposal of medications that bypass the PWS treatment plants (e.g., hormones)
- Microbeads (facial scrubs, etc): recent reports have found micro plastic fragments that bypass the PWS treatment system and are in potable water.

4.6 Wellhead Protection

In order to protect New Jersey groundwater resources, the NJDEP has identified Wellhead Protection Areas (WHPAs) for public community water supply wells. The WHPA is the area from which a well draws its water within a specified timeframe. Once delineated, the WHPAs are typically considered priority areas to prevent and clean up groundwater contamination.

WHPAs consist of three tiers, each based on the time of travel (TOT) to the well. The outer boundaries of these tiers will have the following times of travel:

Tier 1 = two years (730 days) Tier 2 = five years (1,826 days)

Tier 3 = twelve years (4,383 days)

The portion of the zone of contribution designated as the WHPA is based upon the TOT of the groundwater to a pumping well. The TOT is particularly significant in that it is related to the amount of time it would take a flowing contaminant to reach the well from a given location. The TOT determination aids in prioritizing sources that pose an imminent threat to a well water source.

No public community wells are identified by NJDEP in Franklin Township, however there are multiple non-community wells throughout the municipality. The Tier 1, 2 and 3 WHPAs for the non-community water supply wells in Franklin are shown on the Wellhead Protection Area Figure 4 of Section 10. This figure also provides the locations of Known Contaminated Sites (KCS) within Franklin listed by the NJDEP.

Although there are no public community supply wells within Franklin, the 12 year tiers of neighboring public community supply wells in Manville Borough and Montgomery Township extend into Franklin. Land use planning may typically include an examination of the existing and proposed land uses in wellhead protection areas as certain land uses have a greater potential to contaminate groundwater than do others. The Stony-Brook Millstone Watershed Association has developed a document outlining major aspects of wellhead protection and the development of wellhead protection ordinances. The document is available online at: www.thewatershed.org/images/uploads/Wellhead_Ordinance_Implementation.pdf.

4.7 Sole-Source Aquifers

The Federal *Safe Drinking Water Act* contains provisions that allow for specific designation of areas that are dependent on groundwater as their sole or principal drinking water source. The technical requirements for designation as a sole source aquifer are that (1) more than 50% of the drinking water for the aquifer service area is supplied by the aquifer system and (2) that there are no economically feasible alternative drinking water sources.

When an area is designated as a sole source aquifer, the Federal environmental review process will ensure that Federal agencies will not commit funds toward projects which may contaminate these designated ground water supplies. The Piedmont related aquifers of Franklin Township are part of the Northwest New Jersey 15 Basin Sole Source Aquifer. The Potomac-Raritan-Magothy (PRM) aquifer, which supplies some of Franklin's water supply, is part of the Coastal Plain Sole Source Aquifer System.

4.8 Known Contaminated Sites

The NJDEP Site Remediation Program currently maintains a list of more than 12,000 New Jersey sites that are confirmed to be contaminated and are undergoing a remedial investigation or a cleanup or are awaiting assignment to a NJDEP case manager. According to the NJDEP, Franklin Township contains a total of 53 Known Contaminated Sites (Figure 4 in Section 11) as listed in Table 5.

Table 5: NJDEP Known Contaminated Sites in Franklin Township (2016)

Site ID	PI Number	PI Name	Address
189530	249045	110 BUTLER ROAD	110 BUTLER RD
572664	717367	1110 EASTON AVENUE	1110 EASTON AVE
24467	301364	1600 COTTONTAIL LANE INDUSTRIAL BUILDING	1600 COTTONTAIL LN
1709	532004	1760 EASTON AVENUE	1760 EASTON AVE
343187	424425	442 WHEELER PLACE	442 WHEELER PL
439414	568115	495 WESTON CANAL ROAD	495 WESTON CANAL RD
534620	671057	7 WEXFORD WAY	7 WEXFORD WAY
447782	562886	827 SOMERSET ST	827 SOMERSET ST
441345	562937	853 863 SOMERSET STREET	853 863 SOMERSET ST
522783	656820	A-1 CLEANERS	1165 RT 27
1700	11267	ACME TUBE INC	659 HOWARD AVE
1699	3104	AJIT FUEL LLC	1376 HAMILTON ST
13332	25886	ALBERT SANDERS/MURRAY SANDERS	27 SCHOOL HOUSE RD
57830	33529	BD OF FIRE COMMISSIONERS DISTRICT TWO	1037 CANAL RD
1649	G000004576	BOC GROUP INC	676 HOWARD AVE
13330	14287	CARDINAL HEALTH 406, LLC	100 SCHOOL HOUSE RD
27408	14287	CARDINAL HEALTH 406, LLC	19 SCHOOL HOUSE RD
59099	14287	CARDINAL HEALTH 406, LLC	14 SCHOOL HOUSE RD
1698	6368	DELTA	882 HAMILTON ST
13331	8744	DO-RITE CLEANERS	3175 LINCOLN HWY
21354	12591	EASTON GAS CORP NJ0101	1830 EASTON AVE
1716	520620	EASTON SHOPPING CENTER LLC	900 EASTON AVE
46071	520620	EASTON SHOPPING CENTER LLC	908 EASTON AVE
346365	520620	EASTON SHOPPING CENTER LLC	900 EASTON AVE
385392	520620	EASTON SHOPPING CENTER LLC	900 EASTON AVE
415375	520620	EASTON SHOPPING CENTER LLC	900 EASTON AVE
19807	712260	EMMETTS SINCLAIR	636 HAMILTON ST
1684	26009	EQUIPMENT ERECTORS INC	15 VERONICA AVE
477465	1611	FORMER GETTY SS# 56118	1213 RT 27
169605	222900	FRANKLIN TWP GROUNDWATER CONTAMINATION	CLOVER PL & CLAREMONT RD
1639	1726	GETTY 00654	669 SOMERSET ST

Site ID	PI Number	PI Name	Address
52625	19829	HERR FOODS INC - SOMERSET BRANCH	790 NEW BRUNSWICK RD
15708	G000005807	HIGGINS FARM AND DRUM SITE # 2	73 RT 518
43287	5163	H K TIRE CO	495 SOMERSET ST
1702	13960	JP AUTO CENTER	541 HAMILTON ST
224555	574038	LEEWOOD RENAISSANCE @ FRANKLIN CORP	IRVING ST
1726	G000003514	MATERIALS TECHNOLOGY	220 CHURCHILL AVE
14731	16092	MICRO STAMPING CORP	100 BELMONT DR
1676	10186	MIDDLEBUSH SERVICE CENTER	1873 AMWELL RD
66121	G000002443	MIDDLESEX QUALITY CONTAINER & DRUM CO	909 SOMERSET ST
42608	3194	MILLSTONE GARAGE	2371 AMWELL RD
1711	8662	PAYAL ENTERPRISE INC	650 FRANKLIN BLVD
46543	26984	PILLAR OF FIRE	10 CHAPEL DR
1634	22427	POLYONE CORP	789 NEW BRUNSWICK RD
1651	31631	RACEWAY FRANKLIN PARK	2893 RT 27
202641	288575	RUKH DEVELOPMENT	1714 EASTON AVE
68411	G000024865	SCHWARZ GARDENS GREEN HOUSE / CENTER	4355 RT 27
1638	14585	SICORA MOTORS INC	541 SOMERSET ST
1707	8678	SOHUM ENTERPRISES LLC	1101 EASTON AVE
124743	31915	SOMERSET GROVE II	290 DAVIDSON AVE
517118	649685	STEPHEN ANDROSKO	1076 CANAL RD
1705	15851	VINCENTS CLEANERS	847 HAMILTON ST
1631	26297	W A CLEARY CORP	955 1049 SOMERSET ST

Known Contaminated Sites are sites where contamination of soil and/or groundwater is confirmed at levels greater than the applicable cleanup criteria or standard. Remedial activities, which may be as simple as soil removal and replacement, or which are very complex may be underway. The sites may be handled under one or more State and/or Federal regulatory programs. A site may be active, or may be pending when the site has not yet been assigned to a specific remediation program, or may be closed with restrictions. The NJDEP may be contacted for detailed information on the nature, extent and severity of contamination at a specific site. All of the active sites are in a stage of remediation and have a particular State Bureau overseeing remediation. The Bureau assigned to the case depends on the nature of the contamination and/or the location of the site. In Franklin Township, the following State bureaus are involved with Known Contaminated Site mitigation: Bureau of Field Operations –Northern (BFO –N); Bureau of Case Management (BCM); Bureau of Operation, Maintenance and Monitoring (BOMM) Bureau of Northern Case Management (BNCM); Bureau of Southern Case Management (BSCM); Office of Wellfield Remediation (OWR); Initial Notice Section (INS).

For additional information regarding these sites, the type of remediation, or other general information about Known Contaminated Sites, visit NJDEP at: <http://www.state.nj.us/dep/srp/kcs-nj/loverview.htm>. Requests for specific contaminants may require a formal Open Public Records Act (OPRA) request.

4.9 USEPA Superfund Sites

The Superfund Program, established through the U.S. Environmental Protection Agency (USEPA) in 1980, was created to locate, investigate and clean up the nation's most contaminated sites. There are currently two superfund sites within Franklin Township: the Higgins Farm Site and the Higgins Disposal Service Site. These sites are National Priority List (NPL) sites (see below). Information for the Higgins Farm and Higgins Disposal sites is compiled from the USEPA Superfund Program Website at: www.epa.gov/superfund.

Within the USEPA Superfund System, sites may be listed as National Priority List Sites (NPL). NPL sites are those sites that are given priority due to their contamination level. As part of the NPL determination, the sites go through a screening called the Hazard Ranking System (HRS). The HRS uses criteria including the likelihood of a hazardous substance entering the environment; the toxicity and other characteristics of the contamination; and the frequency of people or sensitive targets potentially impacted by the waste. The site then undergoes a remedial investigation/feasibility study to determine prioritization by reviewing site conditions and the nature of contamination; determining the impact to human health and the environment; the treatability of the site; potential of success; and the cost of treatment technologies.

Sites are first proposed to the National Priorities List (NPL) in the *Federal Register*. EPA then accepts public comments on the sites, responds to the comments, and places the site on the NPL as long as it continues to meet the requirements for listing.

Higgins Farm Site. The Higgins Farm site (# NJD981490261) is located along Route 518 in Franklin Township. A well sample taken by the Township Health Department in 1985 indicated elevated levels of chlorobenzene, a volatile organic compound (VOC - see Section 4.5). Further investigation by NJDEP revealed a drum burial dump site approximately 40 yards from the well and contamination from VOCs, semi-VOCs and metals. In April 1987, the USEPA stabilized the site to prevent further groundwater release. Priority actions included the development of an alternate water supply and long-term groundwater remediation. Starting in 1990, an alternate water supply was approved for 26 homes within the vicinity of the site and residential wells were closed. Development of a new water main distribution system for the homes was completed in 1993. In 1992, long-term remediation was approved that included the creation of groundwater wells and an onsite treatment plant, and a long-term monitoring plan to determine the effectiveness of the implemented measures. All remediation action measures have been completed at the site.

Studies conducted onsite included an optimization study designed to determine how to improve the groundwater treatment plant operation. In addition, a groundwater monitoring study was conducted to evaluate the extent of the contaminated plume. An evaluation of potential off-site migration of contaminated groundwater will be conducted by the USEPA.

As part of a litigation settlement, the Township of Franklin accepted development rights from the family to prevent further development from occurring onsite.

Higgins Disposal Site. The Higgins Disposal site (NJD053102232) is a 37.6 acre site located on Laurel Avenue approximately 1500 feet west of the D&R Canal and Millstone River in Franklin Township.

The Higgins disposal site is located less than one mile from the Higgins Farm site but is categorized as a separate Superfund site. The site owner operated a waste disposal business from the 1950s to 1985 that included an unpermitted landfill, waste transfer station and trash compactor. The site groundwater and subsurface soil were found to be contaminated with both organic and inorganic compounds that were associated with the landfill and several additional burial areas.

The USEPA removed 765 tons of PCB contaminated soil in 1992. A drum burial area was discovered onsite in March of 1993 and the USEPA initiated a second removal action resulting in the removal of 12,000 tons of soil and 7000 containers (drums, laboratory glass, and plastic and metal containers). Final soil removal action was completed by the USEPA and the potentially responsible party (PRP) in June of 1999. The removal resulted in the excavation of 34,000 tons of contaminated material and 16,000 containers.

In 1997, a Record of Decision regarding groundwater remediation was signed. Remedial actions included connecting all residents down gradient of the site to a public water supply and the extraction of the site's contaminated groundwater. Initially, contaminated water was to be conveyed through a pipeline to a water treatment facility on the neighboring Higgins Farm site. There was significant public opposition to the proposed pipeline conveyance and a PRP sponsored focused feasibility study indicated that onsite treatment would be more cost-effective and practical than a pipeline transfer offsite. As a result of the public opposition and the feasibility study, the USEPA selected onsite methodologies for groundwater treatment in 2002. Construction of the onsite treatment systems began in August, 2005 and has been functional since February of 2006. Monitoring related to the site continues and in March of 2006, the USEPA started to investigate vapor intrusion of local residences to determine if VOCs from the Higgins Disposal site groundwater plume are impacting air within and around surrounding homes. As part of a litigation settlement between USEPA and the Higgins family, the Township of Franklin has accepted development rights from the family to prevent further development from occurring onsite

5.0 SOILS

5.1 Soil Types

Soils provide the basis for the potential land uses within the community. They determine the types of vegetation or crops that can be grown and influence the development activities and design of structures that can be constructed. Soils represent a non-renewable resource and must be appropriately managed. In addition to the cultural and aesthetic losses typically associated with the loss of farms to residential development, the loss of quality soil typically occurs. Residential and commercial development results in the conversion of soils from their historic agricultural or open space uses into permanent non-use. Considering significant soils in the planning process is vital to maintaining the rural elements of the Township and meeting objectives set forth in the Franklin Township Comprehensive Farmland Management Plan. This plan provides a framework for farmland preservation within the municipality and includes specific soil information on the targeted Farmland of the Township.

Soils are formed by forces of the environment acting on soil material deposited or accumulated by geologic processes. The characteristics of a soil at any given location are determined by the climate in which the soils material has accumulated and has existed since accumulation; the physical and mineralogical composition of the parent material; the relief or slope of the land which influences drainage, moisture content, aeration, susceptibility to erosion, and exposure to the sun and elements; the biological forces (plants and animals) acting upon the soil material; and the length of time the climate and biological forces have had to act on the soil. The parent material of Franklin's dominant soils consist of Jurassic age red shales, siltstones and sandstones typical of the Piedmont. The major soil series in Franklin generally range from well to moderately drained silt loams that vary from slightly acid to extremely acid depending on soil type and depth.

The Natural Resource Conservation Service (NRCS) has also prepared soil mapping from the Soil Survey Geographic (SSURGO) database that is available from NJDEP GIS data. SSURGO is mapped throughout the State of New Jersey. Mapping was prepared on a detailed scale that provides individual soil mapping units for Somerset County. The soil map (Soil Map, in Section 11) is based on the mapping provided by the NRCS. Franklin Township contains a relatively diverse range of soil types that include a total of 47 individual soil mapping units, excluding land cover marked as water, udorthents (poorly formed soils), quarry or Urban Land. These soil mapping units are components of a more generalized soil series characterization. Descriptions of the major soil series within Franklin are included in Section 5.4 of the ERI. The soil mapping units occur in 22 different soil series. The various units and their amounts within Franklin Township, as mapped by SSURGO, are listed in Table 6.

Table 6: Franklin Township Soil Mapping Units and their Characteristics

Label	Name	Acres	Hydric	Status	Depth to Bedrock	Drainage Class	Depth to Seasonal High Water Table (ft)
AbrA	Abbotstown silt loam, 0 to 2 % slopes	2.320		SI	40 to 60"	Somewhat poorly drained	0-2.5
AbrB	Abbotstown silt loam, 2 to 6% slopes	51.851		SI	40 to 60"	Somewhat poorly drained	0-2.5
BhnB	Birdsboro, silt loam, 2 to 6% slopes	1012.729		P	6 to 20+'	Well drained and moderately well drained	>6
BhnC	Birdsboro silt loam, 6 to 12% slopes	132.659		SI	6 to 20+'	Well drained and moderately well drained	>6
BoyAt	Bowmansville silt loam, 0 to 2% slopes	347.836	H	SI	6+'	Poorly drained and somewhat poorly drained	0-6+
BucB	Bucks silt loam, 2 to 6% slopes	52.983		P	40+''	Well drained	>6
BucC2	Bucks silt loam, 6 to 12% slopes	10.555		SI	40+''	Well drained	>6
CoxA	Croton silt loam, 0 to 2% slopes	338.106	H	SI	3.5 to 5'	Poorly drained	0-2.5
DunA	Dunellen sandy loam, 0 to 3% slopes	175.779		P	10+'	Well drained	>6
DunB	Dunellen sandy loam, 3 to 8% slopes	826.557		P	10+'	Well drained	>6

Label	Name	Acres	Hydric	Status	Depth to Bedrock	Drainage Class	Depth to Seasonal High Water Table (ft)
DunC	Dunellen sandy loam, 8 to 15% slopes	91.047		SI	10+'	Well drained	>6
DuxA	Dunellen moderately well-drained sandy loam, 0 to 2% slopes	255.857		P	10+'	Well drained	>6
EkbA	Elkton silt loam, 0 to 2% slopes	229.359	H	SI	60+''	Poorly drained	0-6+
KepA	Keyport silt loam, 0 to 2% slopes	357.581	HI	P	72+''	Moderately well drained	1.5-3.5
KepB	Keyport silt loam, 2 to 5% slopes	452.937	HI	P	72+''	Moderately well drained	1.5-3.5
KkoC	Klinesville channery loam, 6 to 12% slopes	2687.416			10 to 20''	Somewhat excessively drained	>6
KkoD	Klinesville channery loam, 12 to 18% slopes	340.473			10 to 20''	Somewhat excessively drained	>6
KkoE	Klinesville channery loam, 18 to 35% slopes	69.841			10 to 20''	Somewhat excessively drained	>6
KkuB	Klinesville-urban land complex, 0 to 6% slopes	3.705			10 to 20''	Somewhat excessively drained	>6
LbtA	Landsdowne silt loam, 0 to 2% slopes	829.393	HI	SI	40+''	Moderately well drained and somewhat poorly drained	1.0-3.0
LbtB	Landsdowne silt loam, 2 to 6% slopes	272.996		SI	40+''	Moderately well drained and somewhat poorly drained	1.0-3.0
LdmC	Lawrenceville silt loam, 6 to 12% slopes	11.097		SI	48+''	Moderately well drained	1.5-3.5
LemB	Lehigh silt loam, 2 to 6% slopes	466.915	HI	SI	40 to 60''	Moderately well drained and somewhat poorly drained	1.5-3.5
LemC	Lehigh silt loam, 6 to 12% slopes	191.768		SI	40 to 60''	Moderately well drained and somewhat poorly drained	1.5-3.5
MonB	Mount Lucas silt loam, 2 to 6% slopes	100.374	HI	P	48+''	Moderately well drained and somewhat poorly drained	0.5-3.5
MooC	Mount Lucas gravelly silt loam, 6 to 12% slopes	105.116	HI	SI	48+''	Moderately well drained and somewhat poorly drained	0.5-3.5
MopCb	Mount Lucas-Watchung silt loams, 6 to 12% slopes, very stony	471.596	H		48 - 60+''	Moderately well drained and somewhat poorly drained	0-6+
NehB	Neshaminy silt loam,	519.014		P	4 to 6+'	Well drained	>6

Label	Name	Acres	Hydric	Status	Depth to Bedrock	Drainage Class	Depth to Seasonal High Water Table (ft)
	2 to 6% slopes						
NehC	Neshaminy silt loam, 6 to 12% slopes	69.811		SI	4 to 6+'	Well drained	>6
NehEb	Neshaminy silt loam, 18 to 35% slopes, very stony	22.756			4 to 6+'	Well drained	>6
NemCb	Neshaminy–Mount Lucas silt loams, 6 to 12% slopes, very stony	329.060			4 to 6+'	Well drained	0.5-3.5
NemDb	Neshaminy –Mount Lucas silt loams, 12 to 18% slopes, very stony	47.161			4 to 6+'	Well drained	0.5-3.5
NotB	Norton loam , 2 to 6% slopes	576.587		P	3.5 to 10'	Well drained	>6
NotC	Norton loam , 6 to 12% slopes	9.128		SI	3.5 to 10'	Well drained	>6
PenA	Penn silt loam, 0 to 2% slopes	92.043		P	20 to 40"	Well drained	>6
PenB	Penn silt loam, 2 to 6% slopes	6691.732		P	20 to 40"	Well drained	>6
PenC	Penn silt loam, 6 to 12% slopes	667.134		SI	20 to 40"	Well drained	>6
PeoB	Penn channery silt loam, 2 to 6% slopes	1346.267		P	20 to 40"	Well drained	>6
PeoC	Penn channery silt loam, 6 to 12% slopes	1806.915		SI	20 to 40"	Well drained	>6
QukC	Quakertown silt loam, 6 to 12% slopes	12.478		SI	36 to 60"	Well drained	>6
QY	Quarry	381.591			N/A	N/A	
RarAr	Raritan Silt loam, 0 to 3% slopes , rarely flooded	205.306	HI	P	5 to 20'	Moderately well drained and somewhat poorly drained	>6
RehA	Reaville silt loam, 0 to 2% slopes	1,454.237	HI	SI	20 to 40"	Moderately well drained and somewhat poorly drained	1.0-6.0
RehB	Reaville silt loam, 2 to 6% slopes	942.464		SI	20 to 40"	Moderately well drained and somewhat poorly drained	1-6+
RemB	Reaville –urban land complex 0 to 6% slopes	0.467			20 to 40"	Moderately well drained and somewhat poorly drained	>6
RorAt	Rowland silt loam, 0 to 2% slopes, frequently flooded	2,537.460	HI	SI	40" to sand and gravel	Moderately well drained and somewhat poorly drained	>6
RoyB	Royce silt loam, 2 to 6% slopes	2,012.978		P	40 to 70"	Well drained	>6
UdbB	Udorthents, bedrock substratum, 0 to 8% slopes	0.343			N/A	N/A	
UR	Urban land	13.779			N/A	N/A	
WasA	Watchung silt loam, 0 to 2%	25.255	H		60+"	Poorly drained	0-6+

Label	Name	Acres	Hydric	Status	Depth to Bedrock	Drainage Class	Depth to Seasonal High Water Table (ft)
	slopes						
WATER		356.810			N/A		
TOTAL		30,009.65					

H - Hydric Soil HI - Hydric Inclusion SI - Soil of Statewide Importance P - Prime Farmland

5.2 Prime Farmland

The NRCS has identified soils based on their agricultural significance, or Land Capability Classification. The best quality soils are termed “Prime Farmlands” which are followed by “Soils of Statewide Importance.” Prime Farmlands include all those soils in Land Capability Class I and selected soils from Land Capability Class II. Prime Farmlands are lands that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops and are also available for these uses. It has the soils quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops when treated and managed according to acceptable farming methods. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding. Soils of Statewide Importance include those soils in Land Capability Class II and III that do not meet the criteria as Prime Farmlands, but nonetheless support agricultural production, with some limitations. These soils may be suited to certain crops or require special conservation practices to maintain their productivity. Table 6 identifies the soil-mapping units that are considered Prime Farmland or Soils of Statewide Importance as well as depth to bedrock.

Areas of Prime Farmland and Soils of Statewide Significance occur throughout Franklin and according to SSURGO soils mapping, occupy approximately 14,679 acres or nearly 49% of Franklin Township’s surface area. An additional 10,581 acres of soils within Franklin are considered of Statewide Importance. Penn series soils (approximately 8,037 acres of Prime Farmland) comprise most acres of the Prime Farmland Soils in Franklin. Other dominant Prime Farmland soils in the Township include the Royce (approximately 2,013 acres of Prime Farmland), Dunellen (approximately 1,288 acres of Prime Farmland), Birdsboro (approximately 1,013 acres of Prime Farmland), Keyport (approximately 811 acres of Prime Farmland), Norton (577 acres of Prime Farmland), Neshaminy (approximately 519 acres of Prime Farmland) and Raritan (205 acres of Prime Farmland).

5.3 Hydric Soils

Approximately 1,412 acres (4.7% of the land cover) of hydric soils are mapped in Franklin Township. An additional 6,509 acres (22% of the land cover) of soils within the Township are mapped as potentially having hydric inclusions. Hydric soils are the soils that typically characterize the soil substrate found in wetlands. They are soils that have low permeability, are poorly to very poorly drained and have a water table at or near the ground surface during the growing season; or are soils that are frequently ponded or flooded for a long duration or very long duration during the growing season. The major hydric soil series in Franklin Township identified by SSURGO mapping include the Mt Lucas-Watchung (approx. 472 acres), Bowmansville (approx. 348 acres) and Croton (approx. 338 acres).

Major soil units identified as containing hydric inclusions include Rowland silt loam, 0 to 2% slopes, frequently flooded (approx. 2,537 acres), Reaville silt loam, 0 to 2% slopes (approx. 1,454 acres), Landsdowne silt loam, 0 to 2% slopes (approx. 829 acres), and Keyport silt loams (approx. 0 to 2 and 2 to 5% slopes – approx. 811 acres).

5.4 Major Soil Series Descriptions

Franklin's major soil series are provided here with a brief description. Information is provided by the NRCS Official Soil Series Descriptions and the SSURGO Soils Database.

PENN SERIES

Penn soils are the most dominant soil series in Franklin by a considerable margin. This series comprises approximately 10,604 acres or 35% of Franklin Township's land cover. Soils of the Penn Series are moderately deep, well drained soils. Parent materials of these soils consist of weathered Triassic reddish shale, silt stone and fine-grained sandstone. Penn soils are found on fairly level to steep uplands. Slopes consisting of Penn soils range from 0 to 60%. Penn soils tend to be well drained, runoff is medium to very rapid and permeability is moderate to moderately rapid. Much of Penn soil is used for rotation cropland. Wooded areas tend to be mixed hardwood dominated by oak.

The A horizon is 0 to 8 inches and consists of dark reddish brown silt loam that is slightly acid. Many roots and porters may be found in this horizon. Rock fragment content ranges from 2 to 30%. The B horizon extends from 8 to 21 inches and ranges in color from reddish brown to weak red. The horizon ranges from slightly to moderately acid. Roots and pores are common in the upper three inches of the horizon. Rock content ranges from 5 to 50 % of the soil composition. The C horizon is 21 to 34 inches, weak to dusky red, and contains 30 to 90% shale and siltstone rock content. It ranges from slightly acid to strongly acid.

KLINESVILLE SERIES

The Klinesville series is the second most dominant soil series in Franklin Township, comprising approximately 3101 acres or 10% of Franklin's land cover. Soils of the Klinesville series are formed from red shale, siltstone, slate and finely grained sandstone. Klinesville series soils are somewhat excessively drained and occur on slopes ranging from 3 to 80%. Runoff is medium to very rapid and permeability is considered moderately rapid. Soil uses are commonly forest or pasture. Less sloping areas are used for growing hay or crop tilling. Common natural forest trees include black oak and chestnut oak.

The A horizon is 0 to 5 inches, dark reddish brown very channery silt loam, with few fine roots and with 50% shale fragments. This horizon tends to be very strongly acid. Rock fragments range from 15 to 75 % of the soil composition. The B horizon is 5 to 15 inches of reddish brown extremely channery silt loam with few fine roots and 60% shale fragments. This horizon is very strongly acid. Rock fragments range from 15 to 75% of the soil composition. The C horizon extends 15 to 19 inches and is weak red weathered fragments of shale with reddish brown silt coatings. This layer is massive with 90% shale fragments. The C horizon is strongly acid. This horizon sits above a limited R horizon at 19 inches and consisting of weak red fractured acid shale bedrock. Rock fragments range from 40 to 90% of the soil composition.

ROWLAND SERIES

Approximately 2537 acres or 8% of Franklin's land cover consists of Rowland Series soils. The Rowland series consists of very deep, moderately well and somewhat poorly drained soils. Rowland soils are formed on relatively narrow level floodplains in alluvial sediments of red and brown shale, sandstone and conglomerate. These soils are flooded by streams in precipitation events. Permeability is considered moderate to moderately slow above approximately 40 inches and rapid in the underlying sands and gravels. Soil uses are primarily pasture or cropland. Wooded areas are dominated by mixed hardwoods.

The A horizon is 0 to 10 inches of dark reddish brown silt loam and friable with many fine roots. It is moderately acid. The B horizon from 10 to 28 inches is reddish brown silt loam. The horizon is friable with many fine roots in the upper 16 inches and few medium roots in the lower portions. Light gray mottles occur in the lower portions. Upper portions are moderately acid while lower portions are strongly acid. The C horizon from 28 to 65 inches is weak red in color and silty clay loam to 44 inches and stratified sand and gravel from 44 to 65 inches. Gray and brown mottling occurs in the upper portions. The C horizon is moderately acid.

REAVILLE SERIES

Approximately 2397 acres or 8% of Franklin Township's land cover consists of the Reaville Series soils. The Reaville Series consists of moderately deep, well, and somewhat poorly drained soils formed in residuum of weathered Triassic red shales, siltstone and fine-grained sandstone. Reaville slopes range from 0 to 15 % and permeability is slow. Land use is typically cleared and cultivated. Hay grains and corn are typical crop uses. Reaville soil areas are also used for pasture. Native forests on this soil are oak dominated mixed hardwood. The A horizon extends from 0 to 9 inches and consists of reddish brown channery silt loam. The layer contains fine roots and up to 15% rock fragments up to 1 inch. This layer is slightly acid. The B horizon extends from 9 to 13 inches and is reddish brown channery silt loam with some yellowish red to reddish gray mottling. The layer contains 20 to 30% shale fragments and is slightly acid. The C horizon extends 15 to 25 inches and consists of dusky red very channery silt loam with reddish gray mottling. This layer contains 50% rock fragments of shale. The layer is slightly acid. The C horizon is underlain by an R layer that exists at 25 inches and consists of weak red shales and sandstone.

DUNELLEN SERIES

Approximately 1349 acres or 4.5% of Franklin's land cover consists of the Dunellen series soils. Dunellen soils are very deep, well-drained soils with slopes ranging from 0 to 35 % commonly found on glacial outwash plains and stream terraces. They formed in stratified materials where the underlying bedrock is red, soft shale or siltstone. In the solum, of the soil series, the permeability is moderately rapid to moderate and in the substratum the permeability is moderately rapid. The rock fragments within the Dunellen Series are mostly rounded pebbles composed of red shale, sandstone or siltstone, and may include basalt, granite, gneiss, quartzite and conglomerates. Given their locations, Dunellen soils are used mostly for community development. Remaining areas are idle on the urban fringe and some areas can be used for pasture, hay or general crops.

The A horizon of 0 to 8 inches is a brown sandy loam. It is a medium granular structure with fine roots throughout. Three percent of the composition of the horizon is rounded gravel. The A horizon is moderately acidic and rock fragments range from 0 to 15 % of the soil composition. The E horizon of 8 to 14 inches is a brown sandy loam with a subangular blocky structure. There can be found a few fine roots and tubular pores within the E horizon. The rounded gravel within the horizon contributes approximately 2% to the

composition. This horizon is moderately acidic. Rock fragments range from 0-30 percent in the lower part of the solum. The BE horizon of 14 to 20 inches and the Bt horizon of 20 to 32 inches are very similar in composition. Both sections of the horizon are reddish brown sandy loams with weak subangular blocky structures. Fine roots and tubular pores are consistent within both layers. They differ the most where the BE horizon consists of 3% rounded gravel and the Bt horizon has 5% rounded gravel. This horizon is strongly acidic. The C horizon is 2 layers, one layer being the C horizon (32 to 42 inches) and the other being the 2C horizon (42 to 70 inches). Both are reddish brown in color and consist of 10% rounded gravel. The C horizon is a massive sandy loam, whereas the 2C horizon is a single grained loamy sand. The entire horizon is moderately acidic. In the C horizon the rock fragments will range from 5 to 50 % of the composition, but average less than 35% and for the most part occur in thin lenses of gravel.

BIRDSBORO SERIES

Approximately 1145 acres or 4% of Franklin Township's land cover is mapped as Birdsboro Series soils. The Birdsboro Series consists of very deep, well drained to moderately well drained soils developed from old alluvial deposits of red sandstone, shale and siltstone. These soils are found on terraces and alluvial fans with slopes ranging from 0 to 15%. These soils are of moderate permeability. Most Birdsboro soils are cultivated or in pasture and about a quarter of the soil is in non-agricultural use. A small portion of the non-agricultural soil contains mixed hardwood forest.

The A horizon is 0 to 10 inches of dark or pale brown siltloam with about 2% gravel. It is slightly acid. The B horizon is 10 to 46 inches thick and comprised of reddish brown loam to 39 inches. The lower portion is brown sandy clay loam with yellowish or light brownish mottles. Gravel ranges from 2 to 5% of soil composition. Acidity ranges from very strongly to extremely acid. The C horizon extends from 46 to 70 inches. This horizon consists of reddish brown very gravelly clay loam. This layer contains 50% rounded gravel and is very strongly acid.

5.5 Steep Slopes

In general, development of slopes in excess of 10% increases the risk of erosion, stormwater runoff and flooding potential. The additional runoff results in sedimentation of down slope surface waters, which damages habitat and has the potential to damage property. The sloping land increases the rate of stormwater runoff, which reduces the rate of groundwater infiltration. This is exacerbated when vegetation is unnecessarily stripped from the slope. Chapter 112 Land Development of the Franklin Township Code sets standards for steep slope development: In areas with slopes of 12% to 25%, no more than 15% of these areas are allowed to be developed and/or regraded or stripped of vegetation and, for purposes of subdivision or the issuance of a building permit for a new dwelling, each lot must include a minimum of one contiguous acre of land with less than 15% slope on which all development shall occur. In areas with slopes of 25% or more, no development, regrading or stripping of vegetation is permitted.

NJDEP mapping indicates the presence of moderate slopes of 6 to 12% throughout Franklin Township. These areas are often associated with stream courses including Six Mile Run, Ten Mile Run and Simonson Brook, and multiple tributaries of the Millstone River, D&R Canal and the Raritan River (see Section 11, Figure 7). The largest areas of slopes ranging from 12 to 18% are associated with portions of Nine Mile Run, Six Mile Run, Steep Hill Brook, Middlebush Brook and Simonson Brook. Slopes in the range of 18 to 35% are primarily associated with Simonson Brook, Nine Mile Run, Six Mile Run, Ten Mile

Run, and Mile Run along the border with New Brunswick. Additional steep slopes are located within the vicinity of the quarry in southernmost Franklin.

5.6 Soil Erosion and Sediment Control

The NJDEP Soil Erosion and Sediment Control Act (N.J.S.A. 4-24-42 et seq.), requires that a Soil Erosion and Sediment Control Plan be prepared for any clearing or disturbance of 5000 square feet or more. The plan must be prepared in accordance with the Standards for Soil Erosion and Sediment Control in N.J.A.C 2:90. Soil disturbance of one acre or more during construction also requires a New Jersey Pollutant Discharge Elimination System (NJPDES) permit and a Request for Authorization (RFA) from NJDEP's Bureau of Nonpoint Pollution. These documents and information can be obtained through the County's Soil Conservation District. The SCD monitors compliance with the SESC plan during construction. Information about Soil Erosion and Sediment Control may be obtained from the Somerset County Soil Conservation District at 908-526-2701 <http://www.co.somerset.nj.us/division/soilconserve.html>. The Somerset SCD may be reached at 308 Milltown Road, Bridgewater, NJ 08807 or by email at SoilConsrv@co.somerset.nj.us

Soil Erosion and Sediment Control standards are also included in Franklin Township Code (Updated 10-15-07 – Supp. No. 4). Chapter 330 of the Code discusses soil erosion and sediment control standards to be followed with regard to stormwater management for construction sites, detention basins, etc. Chapter 206 of the Code considers soil erosion and sediment control with regard to the disposal, movement or removal of soil. Chapter 222 discusses soil erosion factors when the Township is considering tree removal permits, and Chapter 6 of the code discusses the necessity for approved Soil Erosion and Sediment Control plans when seeking land development approvals.

5.7 Acid Producing Soils

NJDEP defines acid producing soils as “Soils that contain geologic deposits of iron sulfide minerals (pyrite or marcasite) which, when exposed to oxygen from the air or from surface waters, oxidize to produce sulfuric acid. Acid producing soils, upon excavation, generally have a pH of 4.0 or lower. After exposure to oxygen, these soils generally have a pH of 3.0 or lower.”

The formations commonly associated with acid producing soils are typically confined to the Inner Coastal Plain formations south of Franklin Township. However the Magothy formation, a formation associated with acid producing soils does outcrop in small areas in the southernmost portions of Franklin Township (see Section 4.2).

Because of the ability of acid producing soils to impact water quality and alter natural communities, Soil Erosion and Sediment Control Standards specific to acid producing soils were developed by NJDEP. Under the newly released Flood Hazard Control Act Rules (N.J.A.C. 7:13), regulated water (Riparian Zone) buffers are required to be 150 feet along streams and open waters where acid producing soils will be exposed. Guidelines for the additional information on the location and handling of acid producing soils in the region may be obtained through the Somerset SCD (see Section 5.6).

6.0 WATER RESOURCES

6.1 Watershed Management Areas, Drainage Basins and Major Surface Water Features

A watershed is an area of land that drains into a body of water such as a stream, lake, river or bay. This includes surface water features and the surrounding land itself. Topographic features such as hills and slopes define the boundaries of watershed management areas. These watershed management areas are comprised of Drainage Basins; large watersheds that encompass multiple small watersheds. NJDEP manages watersheds by dividing the state into 20 large watershed management areas (WMAs). Franklin Township is located within two watershed management areas: Watershed Management Area 9, Lower Raritan South River and Lawrence Brook primarily in the northern third of the Township, and WMA 10, the Millstone Watershed (above Carnegie Lake) in the southern two-thirds of the Township. The border between the two WMAs is defined by the convergence of the Millstone and Raritan Rivers on the northern border of the Township and extends in a southeastern direction between the headwaters of the Raritan River tributaries to the north and east, and the Six Mile Run tributaries to the south and west (see Section 11, Figure 8).

Table 7: Watershed Management Areas of Franklin

WMA	WMA NAME	Acres within Franklin	Percentage of Twp.
09	Lower Raritan, South River, and Lawrence Brook	9,302.24	31.00%
10	Millstone	20,707.69	69.00%
TOTAL	TOTAL	30,009.93	100.00%

WMA 9

Watershed Management Area 9 consists of the mainstem of the Raritan River (extending from the confluence of the North and South Branches to the Raritan Bay), South River and Lawrence Brook. According to NJDEP there are 73 NJPDES permits and 29 Biological Monitoring Stations in the watershed. The drainage area is densely populated, with suburban development being the primary land use. Areas of commercial and industrial development are scattered throughout WMA 9. This watershed is characterized in part by heavy stream bank modification and construction.

The Raritan River, the defining surface water of WMA 9, runs along Franklin from the vicinity of Zarephath, near Bound Brook, and eastward to Mile Run at the Middlesex County border. Major tributaries of the Raritan River within Franklin include Randolph Brook and Mile Run. The primary land use along the Raritan River in northern Franklin is suburban.

Randolph Brook begins in the vicinity of Zarephath and flows northward to the Raritan River. Land use near the headwaters include wetlands and agriculture, however the river is otherwise predominantly suburban.

Mile Run begins east of Vorhees in Middlesex County and flows north, dividing portions of Franklin from New Brunswick City before converging within the Raritan River. The land use surrounding the Mile Run is almost entirely suburban.

WMA 10

The entire Millstone Watershed incorporates the 38-mile Millstone River and its tributaries. The watershed drains approximately 184,320 acres within the Piedmont Plateau and Inner Coastal Plain physiographic provinces in central New Jersey. Areas within the watershed are generally defined as being upstream or downstream from Carnegie Lake, the Millstone River's largest impoundment. Within Franklin, the Millstone watershed is below (downstream from) Carnegie Lake, which terminates just south of the Township near Kingston. The Millstone River generally flows in a northwesterly direction from Millstone Township in Monmouth County, forming the southern border of Middlesex County before turning more northerly near Princeton Junction, and flowing north, defining the western border of Franklin Township and converging with the Raritan River near Zarephath. Major tributaries of the Millstone River within Franklin include Six Mile Run, Ten Mile Run and Simonson Brook. Each of these waterways contains multiple small tributaries within the Township.

Six Mile Run's headwaters begin east of Franklin Township in North Brunswick and flow generally westward, through the center of Franklin before converging with the Millstone River near Blackwells Mills. Major tributaries of Six Mile Run within Franklin include Nine Mile Run and Cross Brook to the south, and Middlebush and Steep Hill Brooks to the north. Six Mile Run and most of its associated tributaries are all Freshwater 2 Non-trout, Category 1 (FW2-NT C1). Waters including portions of Nine Mile Run south of Claremont (see Section 6.2). Most of the Six Mile Run's associated land cover includes State Protected Land that comprises Six Mile Run Reserve (see Section 9.4). Land use consists primarily of forest and agricultural areas.

The Ten Mile Run begins in Franklin, south of Rt. 518 and flows eastward to South Brunswick and then northward back into Franklin, before converging with the Millstone River halfway between Griggstown to the south and Blackwells Mills to the north. Surface waters associated with Ten Mile Run and its tributaries are classified as Freshwater Non-trout Category 2 (FW2- NT C2). Land use surrounding the Ten Mile Run consists of a mix of agricultural, forest and residential uses.

The Simonson Brook headwaters begin near Ridings Road in Franklin Township. The stream flows northward before turning westward at Sunset Hill Garden and converging with the Millstone River near Griggstown. Surface waters associated with Simonson Brook and its tributaries are classified as Freshwater Non-trout Category 2 (FW2-NT C2). Land use surrounding the Simonson Brook consists of a mix of agricultural, forest and residential uses.

Within each WMA, there are multiple watersheds and subwatersheds. The US Geological Survey has mapped and identified watersheds using a hierarchical numbering system. Each watershed or "hydrologic unit" is identified by a unique hydrologic unit code (HUC) consisting of up to 14 digits, for the smallest mapped (sub) watersheds. There are 150 HUC-11 watersheds in New Jersey ranging in size from 0.1 to 143 square miles, with an average size of 51.9 square miles. There are 921 HUC 14 subwatersheds in New Jersey, ranging in size from 0.1 to 42 square miles, with an average size of 8.5 square miles.

Franklin Township contains 12 HUC 14 subwatersheds within three HUC 11 watersheds (see Section 11, Figure 8). These watersheds and subwatersheds, and their corresponding percentages within the Township are listed in Tables 8 and 9.

Table 8: HUC 11 Watersheds in Franklin

HUC 11	Watershed	Acres within Franklin	Percentage of Twp.
02030105110	Millstone River (below/incl Carnegie Lk)	20,707.69	69.00%
02030105120	Raritan R Lower (Lawrence to Millstone)	9,266.99	30.88%
02030105130	Lawrence Brook	35.25	0.12%
TOTAL	TOTAL	30,009.93	100.00%

Table 9: Franklin Township HUC 14 Subwatersheds

HUC 14	Subwatershed	Acres within Franklin	Percentage of Twp.
<i>Within HUC 11 Millstone River (below/incl Carnegie Lk)</i>			
02030105110010	Heathcote Brook	981.37	3.27%
02030105110030	Millstone R (Beden Bk to Heathcote Bk)	2,367.073	7.89%
02030105110110	Millstone R (BlackwellsMills to BedenBk)	5,604.660	18.68%
02030105110120	Sixmile Run (above Middlebush Rd)	4,202.58	14.00%
02030105110130	Sixmile Run (below Middlebush Rd)	3,472.29	11.57%
02030105110140	Millstone R(AmwellRd to BlackwellsMills)	981.87	3.27%
02030105110170	Millstone River (below Amwell Rd)	3,098.17	10.32%
<i>Within HUC 11 Raritan R Lower (Lawrence to Millstone)</i>			
02030105120140	Raritan R Lwr (I-287 PiscatwayMillstone)	3,348.63	11.16%
02030105120150	Mile Run	1,321.56	4.40%
02030105120160	Raritan R Lwr (Mile Run to I-287 Pisctwy)	4,596.80	15.32%
02030105120170	Raritan R Lwr (Lawrence Bk to Mile Run)	0.01	0.00%
<i>Within HUC 11 Lawrence Brook</i>			
02030105130030	Oakeys Brook	35.25	0.12%
TOTAL	TOTAL	30,009.93	100.00%

6.2 Surface Water Quality Classification

In New Jersey, it is the policy of the State to restore, maintain, and enhance the chemical, physical, and biological integrity of its waters, to protect the public health, to safeguard aquatic biota, protect scenic and ecological values and to enhance the domestic, municipal, recreational, industrial, agricultural and other reasonable uses of the State's waters. Water quality is evaluated with respect to Surface Water Quality Standards (SWQS) and water quality concerns occur when SWQS are not met or are threatened. New Jersey's Surface Water Quality standards (NJAC 7:9B, et seq.) establish the water quality goals and policies underlying the management of the State's water quality.

All of the surface water bodies that are located in Franklin Township are classified as freshwater non-trout (FW2-NT). Non-Trout waters are not associated with trout production or trout maintenance and are generally unsuitable for trout because of their physical, chemical, or biological attributes. These waters may be suitable for a wide variety of other fish species.

The designated use for FW2-NT waters are identified as:

- Maintenance, migration and propagation of the natural and established biota;
- Primary and secondary contact recreation;
- Industrial and agricultural water supply;
- Public potable water supply after conventional filtration, treatment and disinfection; and,
- Any other reasonable uses.

Category 1 and 2 waters

In addition to the standard water quality classifications, waters are also classified as either Category 1 or Category 2 waters. Category 1 waters are those waters designated for additional protection due to their "color, clarity, scenic setting other aesthetic value, exceptional ecological significance, recreational significance, water supply significance or fisheries resources." All other waters are considered Category 2 waters. Under the NJ Stormwater Management Rules (N.J.A.C. 7:8) Category 1 waters are afforded a designated special waters resource protection area (SWRPA). The SWRPAs are those areas within 300 feet of the top of each bank of C1 waters. In addition, the 300-foot width SWRPA is required adjacent to those waters that drain to C1 waters within the limits of the associated subwatershed (HUC-14). This buffer may be reduced to 150 feet for disturbed areas such as yards, lawns and agricultural areas. The SWRPA is intended as a buffer between development and these special waters in order to further protect water quality. The 300-foot width buffer is based on an NJDEP review of existing scientific literature. Existing development within the SWRPA is not regulated. Consequently, maintenance of existing features, such as tree pruning, cultivation and mowing are also not regulated. However, new construction or expansion of existing facilities that would disturb up to one acre of land or create one-quarter acre of new impervious surfaces is considered major development and would be regulated under the NJDEP Stormwater Management Rules (N.J.A.C. 7:8). Furthermore all C1 waters and upstream waters within the same HUC 14 are subject to a 300 foot regulated Riparian Zone in which vegetation removal is regulated under the Flood Hazard Control Act Rules (N.J.A.C. 7:7-13). Most of the Six Mile Run and its tributaries including portions of Nine Mile Run are listed as C1 waters. Remaining waters within Franklin Township are listed as C2 waters (see Section 11, Figure 9).

See Section 6.4.1 which describes recent changes to the Township's Stream Corridor Protection Ordinance which makes lands within 300-foot C-1 waters and their tributaries subject to the ordinance (including prohibiting any additional disturbance to undisturbed areas with 300 feet of these streams).

6.3 Surface Water Quality

The surface water quality for rivers and creeks has been evaluated in New Jersey using various methods, in particular, the NJDEP uses a protocol termed Ambient Biological Monitoring Network (AMNET) for rapidly assessing water quality (see Section 6.3.2). In addition, under the Federal Clean Water Act Section 303 (d) States are required to list the status of their streams. The 303(d) list is generated using the AMNET and other stream monitoring data such as that generated by the NJDEP Clean Lakes Program, NJDEP Shellfish Monitoring Program, Fish Tissue Monitoring and NJDEP/USGS chemical and physical water quality monitoring. In addition to these studies, the Municipality of Franklin has, through its Environmental Commission, collected data on its stream quality (see Section 6.3.4) through a water sampling program.

6.3.1 Nonpoint Source Pollution

The major source of stream pollution in Franklin is the result of nonpoint sources. These sources of pollution are somewhat difficult to identify since they do not discharge directly from a pipe, or a "point source." The most common nonpoint pollutants include solid waste/floatables; sediment; nutrients; pesticides; metals, road salts; petroleum hydrocarbons and pathogens. These nonpoint sources may be transferred into receiving waters via stormwater that runs off of developed, impervious surfaces and from agricultural areas that are subject to erosion (see Section 6.4.2, Stormwater).

In addition to increased runoff, developed areas also accumulate pollutants on the land surface from atmospheric deposition. These pollutants are mobilized and transported to streams during storm events. Stormwater that runs off of pavement or is stored in detention basins is also often heated, which raises the temperature of the receiving waters. The consequences of nonpoint source pollution result in significant stream and habitat degradation.

6.3.2 AMNET Monitoring (Aquatic Invertebrate Populations)

In order to determine the health of the streams that comprise the watersheds, the NJDEP performs monitoring of benthic macroinvertebrate populations using the Environmental Protection Agency's Rapid Bioassessment Protocols – Level II procedure. Using this method, aquatic communities are examined for pollution tolerant and intolerant life forms and the results are used to compute a New Jersey Impairment Score and Biological Condition. Biological condition of a stream sample is based on 100 organism samples taken at the AMNET site. The benthic macroinvertebrate samples examined include representatives of various taxonomic families of insects and insect larvae, mollusks such as mussels, clams and snails, and crustaceans such as crayfish. Ratings of the stream condition are based on the level of pollution tolerance of the families collected, the ratio of pollution tolerant to pollution intolerant families, and the biodiversity of the system (percentage of single species dominance). The program is termed the Ambient Biological Monitoring Network (AMNET). In New Jersey, over 800 locations are sampled on a five-year rotating schedule. Biological impairment of

streams may be caused by several major factors including nonpoint source pollution, point source pollution and/or a lack of stream corridor (riparian) buffers.

Moderately Impaired communities are characterized by reduced richness of EPT taxa (Ephemeroptera- mayflies, Plecoptera –stoneflies, and Trichoptera -caddisflies); reduced community balance and reduced number of pollution intolerant taxa. Severely Impaired communities are benthic communities that are drastically different from those in less impaired situations including a few dominant pollution tolerant macroinvertebrate taxa (NJDEP 2004 Ambient Stream Metadata). Pollution tolerant groups include worms (Oligochaeta), midges (Simuliidae), leeches (Hirudinia), and various snails (Gastropoda).

A total of 7 AMNET biological monitoring stations are located in Franklin Township. An additional 10 stations from the vicinity of the Township are also included in Table 10. Table 10 shows the most recent round of sampling (round 4) and provides a comparison to the previous round of sampling.

Table 10: Biological Condition of Streams Impacting Franklin Township (Updated 2012)

Stream Name	Location	AMNET Station	Round 3 Rating	Round 4 Rating	Change in Rating	Location Notes
Raritan R	Bridgewater	AN0377	Fair	Good	+	abv Millstone R conf
Cuckels Bk	Bridgewater	AN0415	Fair	Poor	-	Rt 28
Middle Bk	Bridgewater	AN0420	Fair	Fair	/	Talmage Ave
Raritan R	Piscataway	AN0428	Fair	Good	+	Fieldville Dam
Green Bk	Bound Brook	AN0426	Poor	Fair	+	Main St
Royce Bk	Manville	AN0413	Poor	Poor	/	Rt 533
Millstone R	Franklin	AN0414	Fair	Fair	/	abv Raritan R conf
Raritan R Trib	Franklin	AN0427	Fair	Poor	-	Rt 527
Mile Run	Franklin	AN0429	Poor	Poor	/	Rt 527
Pike Run	Montgomery	AN0405	Fair	Fair	/	Rt 533
Millstone R	Hillsborough	AN0410	Fair	Fair	/	Blackwells Mills
Simonson Bk	Franklin	AN0406	Fair	Fair	/	Canal Rd
Ten Mile Run	Franklin	AN0407	Good	Fair	-	Canal Rd
Six Mile Run	Franklin	AN0408	Poor	Poor	/	Rt 27
Six Mile Run	Franklin	AN0409	Fair	Good	+	Canal Rd
Heathcote Bk	S. Brunswick	AN0396	Fair	Good	+	Academy St
Millstone R	Princeton	AN0397	Poor	Poor	/	off Rt 27

Source: <http://www.state.nj.us/dep/wms/bfbm/download/rarRnd4.pdf>

- + indicates positive change in rating
- indicates negative change in rating
- / indicates no change in rating

6.3.3 Federal Clean Water Act Section 303 (d)

Under the Federal *Clean Water Act* Section 303(d), each state is required to list impaired waterbodies. New Jersey uses chemical and biological stream monitoring to determine these impaired waters. Waterbodies cannot be removed from the 303(d) list until the water quality standards are met.

The 303(d) list is divided into **sublists** or **categories** depending on the condition of the waterbody. The categories defined by NJDEP are as follows:

Sublist 1: There is sufficient data to assess all applicable designated uses for the waterbody and the assessment indicates full attainment for all designated uses.

Sublist 2: Waterbodies are placed on this sublist when an assessment for an individual designated use is complete and results for that assessment indicates full attainment but other designated uses are unassessed, assessed as non-attain or have an approved TMDL. When all designated uses are assessed as full attain, these waterbodies will be moved to Sublist 1.

Sublist 3: Waterbodies are placed on this sublist when the designated use assessment indicated insufficient or no data to assess the designated use.

Sublist 4: The waterbody is impaired or threatened for one or more designated uses. There are three subcategories:

Sublist 4A. Waterbodies are placed on this sublist when the designated use is non-attain due to pollutants and a TMDL (Total Maximum Daily Load) has been adopted in the New Jersey Register and approved by the USEPA.

Sublist 4B. Waterbodies are placed on this sublist when the designated use is non-attain due to pollutants and other enforceable pollution control requirements are reasonably expected to result in the conformance with the applicable SWQs in the near future.

Sublist 4C. Waterbodies are placed on this sublist when the designated use is non-attain and the impairment is not caused by a pollutant.

Sublist 5: Designated use assessment is complete and results for the assessment indicate non-attain.

To view the full Integrated Water Quality and Monitoring Assessment Report, visit the NJDEP http://www.nj.gov/dep/wms/bears/docs/2014_draft_integrated_report_with_appendices.pdf The Clean Water Act requires that each Sublist 5 (non-attaining for pollutants) waterbody is given a priority ranking of high (H), medium (M) or low (L) with the goal of lowering TMDL. The prioritization process takes into account various environmental, social and political factors. Evaluated criteria include source and parameters of impairment; additional data needs; TMDL complexity and nature; waterbody use and cultural or historic importance; efficiency concerns; watershed management activities; sensitive species concerns; and public interest. Table 11 provides the most recent available (2015) data for water body conditions for Sublist 5 The complete integrated list (Table 12) includes all sublists and various categories of water use.

Table 11: 2015 (Sublist 5) Impaired Waterbodies 303(d) List for the Vicinity of Franklin Township with Priority Ranking

WMA	Assessment Unit ID	Assessment Unit Name	Parameter	Rank
09	02030105080030-01	Raritan R. Lwr. (Millstone to Rt. 206)	pH	M
09	02030105080030-01	Raritan R. Lwr. (Millstone to Rt. 206)	Phosphorus	H
09	02030105080030-01	Raritan R. Lwr. (Millstone to Rt. 206)	Temperature	M
09	02030105080030-01	Raritan R. Lwr. (Millstone to Rt. 206)	Total suspended solids	H
09	02030105080030-01	Raritan R. Lwr. (Millstone to Rt. 206)	Turbidity	M
09	02030105120140-01	Raritan R Lwr. (1-287 Piscataway-Millstone)	Arsenic	L
09	02030105120140-01	Raritan R Lwr. (1-287 Piscataway-Millstone)	Benzene	L
09	02030105120140-01	Raritan R Lwr. (1-287 Piscataway-Millstone)	pH	M
09	02030105120140-01	Raritan R Lwr. (1-287 Piscataway-Millstone)	Phosphorus	M
09	02030105120140-01	Raritan R Lwr. (1-287 Piscataway-Millstone)	Total suspended solids	H
09	02030105120160-01	Raritan R. Lwr. (Mile Run to 287 Pisctwy)	Arsenic	L
09	02030105120160-01	Raritan R. Lwr. (Mile Run to 287 Pisctwy)	Benzene	L
09	02030105120160-01	Raritan R. Lwr. (Mile Run to 287 Pisctwy)	PCBs	L
09	02030105120160-01	Raritan R. Lwr. (Mile Run to 287 Pisctwy)	pH	M
09	02030105120160-01	Raritan R. Lwr. (Mile Run to 287 Pisctwy)	Phosphorus	M
09	02030105120160-01	Raritan R. Lwr. (Mile Run to 287 Pisctwy)	Temperature	M
09	02030105120160-01	Raritan R. Lwr. (Mile Run to 287 Pisctwy)	Total suspended solids	M
09	02030105120150-01	Mile Run	Pollutant Unknown	L
09	02030105120150-01	Mile Run	E. coli	M
10	02030105110170-01	Millstone River (below Amwell Road)	Phosphorus	M
10	02030105110170-01	Millstone River (below Amwell Road)	pH	M
10	02030105110030-01	Millstone R. (Beden Bk. To Heathcote Bk.)	Arsenic	L
10	02030105110030-01	Millstone R. (Beden Bk. To Heathcote Bk.)	Oxygen, Dissolved	M
10	02030105110030-01	Millstone R. (Beden Bk. To Heathcote Bk.)	E. coli	M
10	02030105110030-01	Millstone R. (Beden Bk. To Heathcote Bk.)	pH	M
10	02030105110030-01	Millstone R. (Beden Bk. To Heathcote Bk.)	Phosphorus	M
10	02030105110030-01	Millstone R. (Beden Bk. To Heathcote Bk.)	Temperature	M
10	02030105110120-01	Six Mile Run (above South Middlebush Rd.)	Phosphorus	M
10	02030105110120-01	Six Mile Run (above South Middlebush Rd.)	E. coli	M
10	02030105110130-01	Six Mile Run (below South Middlebush Rd.)	Phosphorus	M
10	02030105110140-01	Millstone R. (Amwell Rd to Blackwells Mills)	Arsenic	L
10	02030105110140-01	Millstone R. (Amwell Rd to Blackwells Mills)	Phosphorus	M
10	02030105110170-01	Millstone River (below Amwell Road)	Phosphorus	M
10	02030105110170-01	Millstone River (below Amwell Road)	pH	M

Table 12: 2015 Franklin Township 303d Integrated List for Impaired Waters

WMA	Assessment Unit ID	Assessment Unit Name	Aquatic Life (General)	Aquatic Life (Trout)	Recreation	Water Supply	Fish Consumption
09	02030105120140-01	Raritan R Lwr (1287 Piscataway – Millstone)	Not Supporting	N/A	Not Supporting	Not Supporting	Not Supporting
09	02030105120160-01	Raritan R Lwr (Mile run to 1 287 Piscataway)	Not Supporting	N/A	Not Supporting	Not Supporting	Not Supporting
09	02030105120150-01	Mile Run	Not Supporting	Sublist 3	Not Supporting	Insufficient Data	Insufficient Data
10	02030105110110-01	Millstone R.		N/A		Not	

WMA	Assessment Unit ID	Assessment Unit Name	Aquatic Life (General)	Aquatic Life (Trout)	Recreation	Water Supply	Fish Consumption
		(Blackwells Mills to Beden Bk.)	Not Supporting		Fully Supporting	Supporting	Not Supporting
10	02030105110120-01	Six Mile Run (above South Middlebush Rd.)	Not Supporting	N/A	Not Supporting	Insufficient Data	Insufficient Data
10	02030105110130-01	Six Mile Run (below South Middlebush Rd.)	Not Supporting	N/A	Insufficient Data	Fully Supporting	Insufficient Data
10	02030105110140-01	Millstone R (Amwell Rd to Blackwells Mills)	Not Supporting	N/A	Fully Supporting	Not Supporting	Not Supporting
10	02030105110170-01	Millstone River (below Amwell Road)	Not Supporting	N/A	Fully Supporting	Not Supporting	Not Supporting

6.3.4 Community Water Monitoring

Volunteer Monitoring and Watershed Watch Network

The NJDEP Volunteer Monitoring Program and the Watershed Watch Network are programs of the Office of Outreach and Education in the Division of Watershed Management. The NJDEP Watershed Watch Network is an umbrella program for all volunteer monitoring activities in New Jersey. Volunteers choose the level of commitment they would like to make based on the purpose of their monitoring and proposed uses of the data. The program is designed to provide quality assurance for data submitted to NJDEP, and to help data collectors build upon existing programs. For additional information about volunteer monitoring, contact the Volunteer Monitoring Coordinator, at 609-633-9241.

Franklin Township Stream Survey

Between September 2003 and August 2004 the Franklin Township Environmental Commission collected water samples from streams from 27 locations in streams across Franklin Township as part of a partnership with the NJDEP. Values were taken for nitrogen including nitrates and nitrites; phosphorus; total suspended solids (TSS); pH; conductivity; turbidity; dissolved oxygen and temperature. Results indicate that samples exceeded the State Water Quality Standard (SWQS) for phosphorus at 21 stations; total suspended solids at six stations; and turbidity at nine stations. Appendix B contains the Environmental Commission Map illustrating the locations of these test stations by the referenced site number. Table 13 includes the results of the study, including values exceeding standards. Table 14 provides the results of fecal coliform testing conducted by the Franklin Township Environmental Commission.

Table 13: Stream Survey for Franklin Twp. Sept 28-29, 2003

Site #	Location	Nitrate + Nitrite	Nitrate mg/L	Nitrite Mg/L	Phos Mg/L	T S S	pH	Conductivity mS/cm	Turbidity NTU	Dissolved O2 Mg/L	Temp C
1	Meadows Bk.	1.4	1.4	<0.01	0.12	<4	7.12	0.271	5	6.99	20.1
2	Mile Run	2.7	2.7	<0.01	0.14	13	7.04	0.289	0	7.66	19.7
3	Seely's Bk	2.2	2.2	<0.01	0.10	<4	7.23	0.251	4	8.18	19.7
4	Cedar Grove Bk.	1.1	1.1	<0.01	0.15	32	6.83	0.19	70	7.5	19.9

Site #	Location	Nitrate + Nitrite	Nitrate mg/L	Nitrite Mg/L	Phos Mg/L	T S S	pH	Conductivity mS/cm	Turbidity NTU	Dissolved O2 Mg/L	Temp C
5	Raritan Bk.	1.0	1.0	<0.01	0.15	20	N/A	N/A	N/A	N/A	N/A
6	Randolph Bk	0.7	0.7	<0.01	0.2	58	7.06	0.174	131	7.93	20.2
7	Sim's Bk.	1.1	1.1	0.012	0.53	520	6.6	0.104	999	7.5	20.1
8	Spooky Bk.	0.72	0.72	0.017	0.16	21	6.5	0.13	70	6.8	20.7
9	Miller Farm Bk	2.2	2.2	<0.01	0.22	405	7.02	0.137	29	7.55	18.6
10	N of Blackwells Mills	2	2	0.049	0.25	17	6.87	0.193	26	7.3	19.7
11	Six Mile Run Canal rd.	1.5	1.5	<0.01	0.3	18	7.06	0.17	40	7.6	19.7
12	Cross Bk	0.81	0.81	<0.01	0.14	8	6.91	0.126	214	7.84	19.0
13	Middlebush Bk.	2.6	2.6	<0.01	0.21	54	6.56	0.22	146	7.5	19.1
14	Steep Hill Bk.	2.7	2.7	<0.01	0.16	17	6.92	0.213	33	8.13	19.4
15	Simonson's Bk	0.82	0.82	<0.01	0.17	32	6.5	0.11	152	9.17	19.6
16	"Spencer Brook"	0.33	0.33	<0.01	0.072	<4	6.88	0.86	13	8.0	19.0
17	"Three Brooks"	0.73	0.73	<0.01	0.15	12	6.7	0.116	34	8.15	19.6
18	"Knowlton Bk"	0.66	0.66	<0.01	0.083	12	6.9	0.096	25	7.8	19.8
19	Dirty Brook	<0.10	<0.10	<0.01	0.14	54	7.07	0.1	120	8.3	20.6
20	"Flemer Brook"	0.13	0.13	<0.01	0.059	4	7.0	0.123	0	8.55	19.8
21	Nine Mile Run Route 27	0.88	0.88	<0.01	0.11	19	6.79	0.185	18	6.1	19.8
22	Ten Mile Run Route 27	1.4	1.4	<0.01	0.15	4	6.3	0.19	18	6.1	19.8
23	Griggstown Quail Farm Bk.	7.4	7.4	0.036	0.33	56	6.62	0.288	93	7.62	20.9
24	Nine Mile Run at Six Mile Run	0.95	0.95	<0.01	0.14	11	7	0.126	20	8.2	20.1
25	Clyde Bk.	0.8	0.8	<0.01	0.12	11	6.84	0.121	18	8.44	19.8
26	Six Mile Run at Clyde Bk.	0.66	0.66	<0.01	0.11	11	6.9	0.138	11	8.2	20.7
27	Ten Mile Run Canal Rd.	1.1	1.1	<0.01	0.18	26	6.15	0.111	55	8.15	20

Printed from the Franklin Township Master Plan Conservation Element, 2006 Bold = values that exceed SWQS
 Bold/underlined = values that are extreme
 N/A-not available

Table 14: Franklin Township Stream Survey 2003-04, Fecal Coliform Counts/100ml

Site #	Site Name	Coliforms/100ml		
		9/03	4/04	8/04
4	Cedar Grove Bk.			2160
5	Raritan Bk.	720		2440
6	Randolph Bk			3900
7	Sim's Bk.			>4000 (est. 24000)
8	Spooky Bk.			440
9	Miller Farm Bk			420

Site #	Site Name	Coliforms/100ml		
		9/03	4/04	8/04
10	N of Blackwells Mills			420
11	Six Mile Run at Canal rd.	+	150	1760
13A	Middlebush Bk, East Branch	+	4300	4000 (est.12,000)
13B	Middlebush Bk, West Branch	+	2300	4000 (est. 5600)
14	Steep Hill Bk.		400	480
15	Simonson's Bk		4000	2320
17	"Three Brooks"		<1000	1420
18	"Knowlton Bk"		400	3800
21	Franklin Pk. Bk at Route 27		3,000	2540
22	Ten Mile Run Route 27			2400
23	Griggstown Quail Farm Bk.	+	9000	3780
24	Nine Mile Run at Six Mile Run		(<100)	960
25	Clyde Bk.		3000	640
26	Six Mile Run at Clyde Bk.			2120
27	Ten Mile Run Canal Rd.		900	1500
28	Lisa's Bk, Near Bunker Hill Rd.		15,000	>4000 (est.12000)
29	Lakeview Ranch			480

Printed from the Franklin Township Master Plan Conservation Element, 2006 + = Levels too numerous to be recorded
Bold = values that exceed SWQS

As indicated by the 2015 303d list provided by NJDEP, the Franklin Township Stream Survey revealed high levels of phosphorus throughout Franklin's streams. Six streams were found to have twice the SWQS for phosphorus. Furthermore, coliform tests indicate high levels of pathogens in all tested streams. High phosphorus and coliform levels are an indication that animal or human waste from agriculture, leaky septic systems or other sources may be contaminating Franklin Township's surface waters.

Other pollutants and tested values including nitrogen, pH, temperature, dissolved oxygen, and petroleum (tested at several sites) were found to be at acceptable levels. As a result of the findings of the Stream Sampling Study, the Environmental Commission recommended the following:

- Further testing in collaboration with Rutgers University to determine the potential sources of fecal coliform.
- Sims' Zarephath Brook was determined to have extremely high phosphorus, coliform and turbidity levels. Some of this pollution may have been associated with the construction of the Canal Walk Senior Village. As a result, the Commission recommended that developers be required to monitor streams for turbidity and take additional protective measures to mitigate for excessive levels of TSS.

- The Sampling Study indicates avian fecal pollution from Griggstown Quail Farm may be contributing to excessive levels of pollutants and coliform. The Environmental Commission requested approval for the Griggstown Quail Farm to be connected into the municipal sewer system. This property has since been added to the Sewer Service Area and the connection has since been made.
- Coordination and support from the NJDEP and New Jersey Water Supply Authority on approaches to reduce stream pollution including riparian protection through support grants.
- Planning that involves careful consideration of impervious surface increases.

6.3.5 Point Source Pollution

Point source pollution comes from a defined “point” in the landscape such as an industrial or stormwater discharge pipe. Point source discharges to surface and ground water are regulated by the NJDEP under the New Jersey Pollution Discharge Elimination System (NJPDES). Much of this program was created in 1972 by the Federal Clean Water Act. To accomplish the goals of the program, permits are issued that limit the mass and/or concentration of pollutants, which may be discharged into the ground or surface water. These types of permits often require monitoring and include maintenance and best management practices to ensure that they are functioning properly. The types of permitted facilities range from campgrounds, schools and shopping centers to large industrial and municipal wastewater facilities. In Franklin, there are currently 36 NJPDES permits currently on file with the NJDEP on the Active Permit List, most of which are stormwater discharges (Table 15).

Table 15: NJDEP Active Permit (NJPDES) List for Franklin Township (2016)

NJDES ID	Facility Name	Location	Description	Last Activity
NJG0188000	WALGREENS PHARMACY	RT 27	Construction Activity Stormwater (GP)	Stormwater Discharge General Permit Authorization New
NJ0032051	KINGSTON QUARRY	LAUREL AVE	Stormwater	Stormwater Discharge Renewal Permit Action
NJ0081205	KINGSTON QUARRY – SANITARY	LAUREL AVE	Discharge to Groundwater	Ground Water Renewal Permit Action
NJ0102008	KINGSTON QUARRY	LAUREL AVE	Discharge to Groundwater	Ground Water Renewal Permit Action
NJG0160946	HIGGINS DISPOSAL SUPERFUND SITE	LAUREL AVE	General Remediation Clean-up (GP)	Surface Water GPA Renewal
NJG0167533	HIGGINS FARM SUPERFUND SITE	RT 518	General Remediation Clean-up (GP)	Surface Water GPA Renewal
NJG0184659	WALGREENS EASTERN CO INC	RT 27	Sanitary Subsurface Disposal (GP)	Ground Water General Permit Authorization New
NJG0071650	DELTA SERVICE STATION	HAMILTON ST	General Permit GW Petro Prod Cleanup	Surface Water GPA Renewal
NJG0107484	APGAR BROS MOTOR TRANSPORTATION	APGAR DR	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization Renewal
NJG0119865	ROTOR CLIP COMPANY INC	DAVIDSON AVE	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization Renewal
NJG0122441	FF PHILLIPS INC	SOMERSET ST	Concrete Products	Stormwater Discharge

NJDES ID	Facility Name	Location	Description	Last Activity
	SOMERSET FACILITY		Manufacturing (GP)	General Permit Authorization Renewal
NJG0131776	OFS FITEL LLC	SCHOOLHOUSE RD	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization Renewal
NJG0140490	SOMERSET RECYCLING AND AUTO WRECKERS	SOMERSET ST	Scrap Metal Processing/Auto Recycling (GP)	Stormwater Discharge General Permit Authorization Renewal
NJG0156396	FRANKLIN PARK	COMMERCE DR	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization Renewal
NJG0163171	ROBERT KERR ASSOC	SCHOOL AVE	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization Renewal
NJG0163872	TABATCHNICK FINE FOODS INC	HAMILTON ST	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization Renewal
NJG0168131	ELECTRIC FORKLIFT REPAIR CORP	SOMERSET ST	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization Renewal
NJG0172553	MAHASEN KHALIL DMD	RT 27	Dental Facilities Onsite Wastewater Treatment Systems (GP)	Ground Water General Permit Authorization New
NJG0173061	JOSHUA C PAYNE DMD	CEDAR GRV LN	Dental Facilities Onsite Wastewater Treatment Systems (GP)	Ground Water General Permit Authorization New
NJG0178021	PARKSIDE FAMILY HOUSING	PARKSIDE STREET AND MARK STREET	Construction Activity Stormwater (GP)	Stormwater Discharge General Permit Authorization New
NJG0179337	800 COTTONTAIL LLC	COTTONTAIL LN	Construction Activity Stormwater (GP)	Stormwater Discharge General Permit Authorization New
NJG0181081	PIM BRANDS LLC	PIERCE ST	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization New
NJG0188107	LEEWOOD RENAISSANCE AT FRANKLIN	MATILDA AVENUE	Construction Activity Stormwater (GP)	Stormwater Discharge General Permit Authorization New
NJG0189278	STERLING POINTE MODEL HOMES LOTS 4 & 5	2 SCHINDLER COURT	Construction Activity Stormwater (GP)	Stormwater Discharge General Permit Authorization New
NJG0191779	STERLING POINTE - K. HOVNANIAN	SCHINLDER CT & SPANGENBERG LN	Construction Activity Stormwater (GP)	Stormwater Discharge General Permit Authorization New
NJG0119881	RUST-OLEUM CORP	BELMONT DR	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization Renewal
NJG0164372	CARTERET DIE CASTING CORP	VERONICA AVE	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization Renewal
NJG0189219	PROPOSED TURF FIELD	WESTON CANAL ROAD	Construction Activity Stormwater (GP)	Stormwater Discharge General Permit Authorization New
NJ0035190	NORTH BRUNSWICK TWP-WTP	CANAL RD	Industrial Wastewater	Surface Water Major Mod Permit Action

NJDES ID	Facility Name	Location	Description	Last Activity
NJ0075078	NORTH BRUNSWICK TWP-WTP	CANAL RD	Discharge to Groundwater	Ground Water Renewal Permit Action
NJG0120022	AMBANI REALTY INC	NEW BRUNSWICK RD	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization Renewal
NJG0121983	MICROSTAMPING CORP	BELMONT DR	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization Renewal
NJG0125385	L'OREAL USA INC	COMMERCE DR	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization Renewal
NJG0147869	FRANKLIN TWP	DE MOTT LN	Tier A Municipal Stormwater General Permit	Stormwater Discharge General Permit Authorization Renewal
NJG0119962	MATERIALS TECHNOLOGY INC	CHURCHILL AVE	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization Renewal
NJG0148113	BUDD VAN LINES	SCHOOLHOUSE RD	Basic Industrial Stormwater GP - NJ0088315 (5G2)	Stormwater Discharge General Permit Authorization Renewal

Source: NJDEP Active Permit List

NJDEP Regulated Sites

Currently there are approximately 1,801 sites in Franklin Township that are regulated by NJDEP. In addition to active Known Contaminated Sites, NJDEP regulated sites include those that have been determined to not be contaminated, receive inspections, have discharge permits or have completed remediation and have received letters from NJDEP determining that “No Further Action” (NFA) is needed. The dataminer site contains an archive of inspections, enforcement actions and violations on file for each of these sites. To review the full list of regulated sites, visit the NJDEP dataminer site at http://datamine2.state.nj.us/dep/DEP_OPRA/index2.html.

6.4 Surface Water Quality Protection

6.4.1 Riparian Corridors

Riparian corridors are natural areas along river systems that typically connect larger patches of habitat and provide the stream or river with a buffer to disturbance. The riparian corridors in which streams and rivers are located serve many functions in protecting these sensitive resources. They are complex ecosystems that provide food and shade and are effective in removing excess nutrients and sediment from surface runoff and shallow groundwater. Streamside vegetation also buffers the impacts of some pesticides and provides dissolved and particulate organic food needed to maintain high biological productivity and diversity. Streamside forests improve water quality and biological diversity by filtering out sediments and suspended solids; transforming excess nitrogen and phosphorus; storing nutrients for extended periods; and providing energy to the stream in the form of dissolved carbon compounds and particulate organic detritus (dead plant matter). This detritus forms the basis for the aquatic food chain. In New Jersey, deforestation associated with agriculture and urban and residential development has drastically reduced the extent of stream corridor protected by forest.

The width of the preserved buffer along stream corridors can vary, depending on soil permeability and slopes. Areas with flatter slopes and with soils having a greater proportion of sand would not require a buffer as wide as areas with steeper slopes and soils containing less sand. Effective riparian corridors should typically be 100 feet or wider (Welsch, 1991). A 300 foot width Riparian Zone has been adopted by the NJDEP under the Flood Hazard Area Control Act Rules to protect all Category 1 (C1) waters in New Jersey. In addition to providing water quality protection, a 300-foot width buffer will provide significantly greater benefits to aquatic biota and other wildlife than would a narrower corridor.

Under the November, 2007 NJDEP *Flood Hazard Area Control Act* rules (N.J.A.C. 7:13), the NJDEP regulates development (vegetation removal) within the vicinity of stream corridors and within floodplains. Under the revised regulation, the protection of vegetation or Riparian Zone extends for a distance of 50, 150 or 300 feet from the top of bank along streams depending on several factors. A corridor of 50 foot width may provide some limited stream corridor functions, such as shade and bank stabilization, but will provide less in the way of filtering sediment or pollutants or the uptake of nutrients.

Further protection for these resources can be provided by enacting local ordinances that complement or provide more stringent requirements than those enforced by NJDEP. The Franklin Township Municipal Code Chapter 112, Article XXIX sets development standards for stream corridor protection. Protections include: a 300 foot buffer for the Millstone River, Raritan River, D&R Canal and C-1 streams and their upstream tributaries within the same HUC-14 watershed; 150-foot buffers for delineated streams, and a 50 foot buffer for additional state open waters. This ordinance was recently overhauled. In particular the ordinance was revised to specifically prohibit disturbance within previously undisturbed land within these buffer areas (while modifications to previously disturbed land such as areas with existing parking lot and buildings and existing residential backyards, would be exempt). The new ordinance also: eliminated the “loophole” whereby streams with wetlands were essentially exempt from the ordinance; and, updated the categories of stream corridor components including specifically including land surrounding C-1 waters and their tributaries as being subject to the ordinance. The new ordinance better addresses the public interest of stream corridor protection by prohibiting disturbance to undisturbed natural lands located along stream corridors since the preservation of such undisturbed lands are particularly critical to protect property from flooding, to reduce land development impacts on stream water quality and flows, and to provide recreation and wildlife migration corridors. The ordinance regulates development by protecting stream corridors from the type and intensity of development which would be destructive to their special environmental importance, harmful to the health and welfare of the general public, and harmful to properties downstream.

The Stony Brook Millstone Watershed Association (2003) indicated that by 1995 12% of the riparian areas of the Millstone Watershed, which includes two-thirds of Franklin, had been converted to agricultural land use. An additional 16% of the riparian area has been converted to suburban or residential land use. Riparian areas originally comprised 35% of the Millstone Watershed, by 1995 this number had dropped to 25%. Within Franklin, considerable areas of riparian zone had been lost to development. Approximately 1439 acres of riparian habitat within Franklin had been lost to development before 1986. The largest areas lost to development before 1986 include the areas near Trap Rock Quarry in southern Franklin, riparian areas of an unnamed tributary near Metlars Lane, near the Borough of Manville, and along the Raritan River in the northern border of Franklin. An additional 1355 acres of riparian habitat had been lost to agriculture before 1986. Between 1986 and 1995, an additional 263 acres of riparian habitat had been lost to

development in Franklin Township. Riparian losses during this time have been spread throughout the municipality, however losses are more concentrated in northern Franklin Township. A small area of approximately 8 acres has been lost to agricultural land use between 1986 and 1995. Remaining riparian areas constitute approximately 3919 acres in Franklin. The greatest contiguous riparian habitat exists within the D&R Canal State Park (between the Millstone River and the D&R Canal) throughout much of Franklin's western border. Other significant patches of riparian habitat exist near the headwaters of Carter's Brook, sections of the Six Mile Run, sections of Simonson Brook, and along the tributaries of northern Franklin Township, east of Randolph Brook.

Restoration of stream buffers on agricultural lands is supported by various programs administered by the New Jersey Division of the USDA Natural Resource Conservation Service . The NRCS provides technical assistance through various programs, primarily the Conservation Technical Assistance Program (CTA). The CTA typically results in the development of a Conservation Plan for a farm that directs the landowner to available programs, such as the Farm Bill Program. A number of Farm Bill programs provide for conservation practices such as the Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program (WHIP), Wetland Reserve Program (WRP), Conservation Reserve Program (CRP), Farm and Ranch Land Protection Program (FRPP) and the Grassland Reserve Program (GRP). These programs offer cost sharing opportunities for implementing conservation practices. The CRP is especially applicable to riparian buffer conservation. This program compensates farmland owners for the loss of land being converted to protect stream corridors and also provides funding to perform the actual restoration of the buffers.

Franklin Township has utilized NRCS grants for the creation of the Negri-Nepote and Griggstown Grassland Preserves, however use of these agricultural grants may be somewhat limited in Franklin Township because much of the agricultural land within the municipality is State-owned.

6.4.2 Stormwater Management

Increases in development and impervious surfaces results in increases of stormwater runoff quantity and velocity. The increase in quantity causes downstream areas to peak faster and higher than under natural or predevelopment conditions. This results in downstream flooding and erosion problems. A drastic example of this condition occurred along the Millstone River (particularly near Zarephath) following Hurricane Floyd in 1999. Sedimentation disrupts the naturally occurring substrate in a stream bottom and may literally smother benthic (bottom dwelling) invertebrate communities. When water runs quickly over the land surface or is directed via a pipe to a stream, the opportunity for the water to infiltrate and recharge groundwater is lost. Groundwater supplies the stream base flow for many streams. Reduced stream base flows can negatively impact the hydrology of adjacent wetlands. The reduced base flow and increased peak flows cause streams to erode at a faster than normal rate which introduces excess sediment. The increased sedimentation fills channels and causes streams to broaden and become increasingly shallow. Sediment is the most common and easily recognized of the nonpoint source pollutants.

As a result of the water quality and quantity issues associated with stormwater, New Jersey adopted two sets of rules in 2005 that affect stormwater management. The first set of rules are the Phase II New Jersey Pollutant Discharge Elimination System (NJPDES) Stormwater Regulation Program Rule (N.J.A.C.

7:14A-1 *et seq.*). These rules address pollutants associated with existing stormwater runoff, as required under the Federal Clean Water Act. These rules govern the issuance of permits to certain public entities, including municipalities, which own or operate small municipal storm sewer systems (MS4s). The permit program establishes the Statewide Basic Requirements that must be implemented to reduce nonpoint source pollutant loads from these sources. The Statewide requirements include measures such as: the adoption of ordinances (litter control, pet waste, wildlife feeding, proper waste disposal, etc.), the development of a municipal stormwater management plan and implementing ordinances; requiring certain maintenance activities (such as street sweeping and catch basin cleaning); implementing solids and floatables controls, locating discharge points and stenciling catch basins, and a public education component.

The second set of rules are the Stormwater Management Rules (N.J.A.C. 7:8-1 *et seq.*), which apply to stormwater systems associated with new (proposed) development. The design and performance standards established in these rules have replaced the stormwater management rules that apply to residential development under the Residential Site Improvement Standards (RSIS), and include residential subdivisions, site plan and building permit approvals. For non-residential development, the Stormwater Management Rules will not be applied at a local level until a municipal ordinance is passed adopting the standards. However, if the non-residential development requires one of the Land Use Regulation Program permits listed at N.J.A.C. 7:8- 1.6(c), the new rules will be applied under that review.

The Stormwater Management Rules apply to new development that will ultimately result in the disturbance of one or more acres of land, or in an increase in impervious surface by one-quarter of an acre or more (*i.e.*, “major development”). The Stormwater Management Rules for major development require standards for quantity and quality control including groundwater recharge, runoff quantity controls (such as detention basins), runoff quality controls (such as total suspended solids (TSS) removal devices, and buffers around C-1 waters. Details of the performance standards can be found in Subchapter 5 of the Stormwater Management Rules.

6.5 Floodplains and the Flood Hazard Area Control Act Rules

6.5.1 Flood Hazard Area Control Act Rules –Definitions

Activities in floodplains (Flood Hazard Areas) are regulated by the NJDEP under the *NJ Flood Hazard Area Control Act* (N.J.S.A. 58:16A-50 *et seq.*).

A Flood Hazard Area is defined in N.J.A.C. 7:13-1.2 as the land and space above that land, which lies below the Flood Hazard Area Design Flood. The area of the Flood Hazard Area Design Flood is determined by a discharge 25% larger than the discharge resulting from a 100-year storm in order to account for the effects of future development in the watershed (NJDEP Flood Control). The Flood Hazard Area includes both the floodway and flood fringe. The floodway is the channel and inner portions of the floodplain adjoining the channel which are reasonably required to carry and discharge the regulatory flood.

The floodway is subject to high velocity flows during flooding events. The flood fringe is the portion of the flood plain contiguous with the floodway. The flood fringe experiences flooding, but is inundated to a

lesser degree than the floodway. Delineated Flood Hazard Areas have been established and officially adopted by the State of New Jersey for certain watercourses. Flood profiles, mapping and corresponding computer models for delineated watercourses may be obtained from the NJDEP.

The Flood Insurance Program, administered by the US Flood Emergency Management Agency (FEMA) has also prepared mapping and classifies floodplain areas in a manner similar to the State of New Jersey. Within the FHA rules (N.J.A.C. 7:13-3), NJDEP has established methodologies and circumstances for using FEMA floodplain mapping for determining the Flood Hazard Area for FHA applications. The FEMA Floodplains Map provided in Section 11 depicts the approximate extent of floodplains throughout Franklin Township. This mapping was derived from digital coverage provided by FEMA.

6.5.2 Flood Hazard Area Control Act Rules

Certain types of development activities within the Flood Hazard Area (the floodway and flood fringe) and Riparian Zone (see below) must be authorized by a Flood Hazard Area Permit issued by NJDEP in accordance with the *NJ Flood Hazard Area Control Act* (FHACA) rules. The Flood Hazard Area Rules (N.J.A.C. 7:13) were reissued on November 5, 2007. Similar to the NJDEP Wetlands Permit Structure, Flood Hazard Area General Permits have been created for various activities within the Flood Hazard Area. If an activity does not fall under one of the designated General Permits, the activity may require the application of a Flood Hazard Individual Permit, depending on the nature and location of the proposed activity within the Flood Hazard Area. It is important to note that flood hazard area individual permits are generally not as costly as Freshwater Wetlands Individual Permits. The application process may also require NJDEP verification of the lines of the Flood Hazard Area or Floodway, which would need to be shown on a plan signed and sealed by a professional engineer.

Additional activities are covered under various Permit-by-Rules identified within FHACA rules (N.J.A.C 7:13-7). Permit-by-rules have been created for a variety of reconstruction or regular maintenance activities within a flood hazard area. Permit-by-rule activities do not require a flood hazard area permit application, however certain permit-by-rules do require a minimum 14 day notification to NJDEP prior to the start of activities.

6.5.3 Flooding Within Franklin

Flooding in Franklin Township is caused by a number of sources. The Millstone River, Raritan River, Six Mile Run and the Delaware & Raritan Canal can leave their banks during heavy rain storms. Smaller streams prone to flooding include Ten Mile Run, Nine Mile Run, Carter's Brook, Simonson Brook, Cedar Grove Brook, Seeley's Brook, and Randolph Brook (See Section 11, Figure 10).

Flooding within Franklin Township, particularly along the Millstone River has been a concern of the municipality, particularly in recent years. In September of 1999, Hurricane Floyd was a particularly devastating event resulting in the inundation of Zarephath and Millstone Borough and along Easton Avenue resulting in \$13,551,207 in damages. The flood event of 1999 severely damaged multiple structures and an existing levee in Zarephath. Hurricane Irene and Tropical Storm Lee caused flooding, power outages and property damage. Other exceptionally large storms took place in April 2007 and March 2010. The March 2010 storm occurred after soils had already been saturated and as a result, hundreds of trees toppled over. While not as dramatic, localized flooding also takes place throughout the Township during heavy rain events.

The most common damages from flood events within the Millstone Watershed involve damage to roads and bridges, the next most common reported flood damages are to residences. Flooding within Franklin has in part resulted from stormwater run-off from communities upstream of Franklin. As a result of the Hurricane Floyd event, the NRCS prepared a PL83-566 Watershed Plan Development Project which resulted in the Millstone River Watershed Flood Damage and Mitigation Analysis Report in December 2004.

A Flood Mitigation Plan was created in February 2004 as a partnership with USDA and Franklin Township. Goals of the Mitigation Plan included protecting life and human health, identifying and mitigating flood hazards, reducing and preventing flood losses to new and existing structures, protect natural floodplain buffers, and improving ratings of and awareness of flood insurance. Within this plan, structural and nonstructural prevention measures were evaluated for their effectiveness in reducing future floods. Concepts considered included setbacks, buffer zones, minimum natural areas for properties, landscaping, tree protection and minimizing impervious areas. Other measures considered included reverse 911 warning and purchase of repetitive loss (two or more claims) structures (Franklin/NRCS 2004). Many flood prone structures in Franklin Township are owned by the State of New Jersey (as part of Delaware and Raritan Canal State Park). The State does not appropriate money for flood mitigation for its own property and, as a result, mitigation measures for State-owned property is limited.

Franklin Township joined the National Flood Insurance Program (NFIP) in 1973, and is currently an active member of the NFIP. Flood Insurance Rate Maps have been in effect for the community since May 15, 1980. Franklin Township is proactive in floodplain management with ordinances exceeding requirements. For instance, Franklin Township adopted a Flood Damage Prevention Ordinance on September 18, 2007 and adopted a Stormwater Management Ordinance on May 23, 2006 that was updated in 2013 to include minor developments (over 1,000 s.f. additional impervious or 2,500 s.f. of disturbance). Further, the Township has a stream corridor protection ordinance that exceeds state requirements and is in the process of updating that ordinance further.

Franklin Township has completed Community Assistance Visits (CAV), with the most recent visit completed in 2014. Franklin Township has identified personnel to manage and uphold Franklin Township's compliance with the NFIP. The staff completes numerous tasks in order for Franklin Township to be in compliance of NFIP standards including: assistance with NFIP issues; public education on flooding issues; engineering plan reviews; building permit reviews and inspections; site construction inspections; stormwater management facility inspections and maintenance; and submissions to FEMA required per the CRS program.

There are 235 NFIP policies enforced within Franklin Township. Of the 235 insurance policies, 24 are within the Special Flood Hazard Area (SFHA). Repetitive loss insurance claims have been reported in several areas within Franklin Township, including in the vicinity of the Raritan River, the Millstone River and Six Mile Run. There have been 6 repetitive loss properties and 1 severe repetitive loss property within Franklin Township.

Franklin Township conducts numerous educational and/or outreach activities related to the NFIP. Activities include availability of education material in the Franklin Township Public Library and the Engineering Department, articles in the Franklin Times (a newsletter mailed several times a year to all

residents and businesses), handouts distributed in the municipal building and at Township events and assistance to the public with flood zone determinations. Due to the Township's community outreach and information programs, its efforts to preserve flood-prone areas as open space, its flood mitigation procedures, and other similar efforts, the Township was able to enter FEMA's Community Rating System (CRS) program in 2010 with a class ranking of seven. The Township has been able to maintain this ranking to date. Communication with residents is done via the following methods: reverse 911, Township website, Nixel system, and Township cable TV channel.

Identified actions to further strengthen the program include: promotion of open space uses within the flood plain; establishment of low-density development zones near special flood hazard areas; continual inspections of private stormwater facilities and maintenance of public facilities; and annual status reports of flood mitigation activities to the Township Council and the public.

7.0 WETLANDS

7.1 Definition and Identifying Factors

The NJDEP regulates activities in wetlands and their adjacent transition areas under the *New Jersey Freshwater Wetlands Protection Act* (NJSA 13:9A-1 et seq.), which defines a wetland as:

“An area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation.”

In simple terms, a wetland is an area with a specific hydrologic regime that supports the growth of plants adapted to living in saturated soil conditions. Wetlands serve many important functions. They minimize flooding by absorbing water during storm events and releasing it slowly over time. They improve water quality by filtering sediments and adsorbing nutrients and pollutants and reducing them to their elemental forms. Wetlands provide habitat for many species of wildlife including Federal and State-listed endangered and/or threatened species.

In order to accurately define and delineate wetlands, a methodology was developed by the Federal Interagency Committee for Wetland Delineation (FICWD) and is presented in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (FICWD 1989). NJDEP has adopted this manual as the technical basis for identifying and delineating freshwater wetlands in New Jersey. The location and extent of wetlands is established using a three-parameter approach: 1) dominance of hydrophytic vegetation, 2) presence of hydric soils, and 3) evidence of long-term wetland hydrology.

7.2 Wetland Locations

The general distribution of freshwater wetlands in Franklin Township is depicted on the Wetlands Map (Section 11, Figure 11). The mapped wetlands are based on photo interpretations of color infrared aerial photos that were integrated with other sources (i.e. hydric soils, USGS flood prone areas and 1906 atlas

sheet geology) based on coincident features. The extent of wetlands as depicted are intended to be used as a general planning tool. The specific location, extent and resource value classification of wetlands is subject to case-by-case detailed field delineations, surveys and analysis. The presence, absence, extent and resource value classification of wetlands are subject to verification by the NJDEP Land Use Regulation Program through the Letter of Interpretation (LOI) application process.

While Franklin Township may not adopt ordinances specifically regulating activities in wetlands and wetland transition areas, the Township may adopt an ordinance requiring that an applicant for subdivision, site plan or building permit approval obtain a LOI from NJDEP establishing the limit of wetlands and wetlands transition areas on a property.

The most dominant wetland community within Franklin Township is the palustrine deciduous forested wetland. These wetlands occur primarily along stream corridors of the Six Mile Run and its tributaries and throughout much of the D&R Canal State Park along the municipal western border. In addition, NJDEP mapping identifies a large contiguous forested wetland between Kingston and Little Rocky Hill in southern Franklin. Fragmented forested wetlands are scattered throughout northern Franklin Township. Herbaceous wetlands within the Township are generally mapped as small parcels adjacent to or mixed within the riparian forested wetlands (see Section 11, Figure 11).

7.3 Wetland Resource Value Classification

The Freshwater Wetlands Protection Act classifies wetlands according to resource value. Each wetland resource value classification has a corresponding transition area, or upland buffer, that must be maintained between the wetland and adjacent development to protect the integrity and viability of the wetland ecosystem. There are three different resource value classifications; exceptional, ordinary and intermediate as described below:

- *Exceptional resource value wetlands* are the highest quality wetlands and require a 150-foot transition area. Exceptional resource value wetlands are those that drain to FW-1 waters, FW-2 trout production waters or their tributaries, or are present or documented habitat for threatened or endangered species.
- *Intermediate resource value wetlands* include all freshwater wetlands not defined as exceptional or ordinary and require a 50-foot transition area.
- *Ordinary resource value wetlands* are typically viewed as the lowest quality wetlands and do not require a transition area. Ordinary resource value wetlands do not exhibit the characteristics of exceptional resource value wetlands and include isolated wetlands that are surrounded by development by more than 50% and are less than 5,000 square feet in size. These wetlands include drainage ditches, swales, or detention basins.

NJDEP has the final authority to determine the resource value classification of wetlands. This is established when the NJDEP issues an LOI for a site. An LOI is obtained by submitting an application to the NJDEP Land Use Regulation Program in accordance with the requirements found at N.J.A.C. 7:7A-3.

All of the surface waters within Franklin Township are classified as Freshwater 2 – Non Trout by NJDEP. There are no Freshwater 1 (FW-1) waters within Franklin Township. Considered Outstanding Natural Resource Waters, Freshwater 1 waters are designed to be kept in a natural state and not subject to any wastewater discharges or increases in runoff. FW-1 waters should not be confused with Category 1 (C1) classification, which is a separate anti-degradation category and does not influence wetland transition area determinations (see Section 6.2, Water Quality Classification).

NJDEP Landscape Mapping of endangered and threatened wetland species within the town indicates the presence of wood turtle habitat along Simonson Brook and the Millstone River. The presence of these wetland-dependent State-threatened species will affect the resource value of wetlands associated with these stream courses. Most wetlands within the NJDEP Landscape Mapping that are designated wood turtle habitat would likely receive a 150 foot standard transition area buffer. Red-shouldered hawk (*Buteo lineatus*), a State-Threatened (Endangered breeding) forested wetlands breeder, has also been identified in Franklin Township in the vicinity of the Clyde Brook headwaters. Subsequently, NJDEP has listed associated wetlands within this vicinity as exceptional resource value. It appears that the majority of the remaining wetlands in Franklin would be likely to be classified as intermediate resource value wetlands and would have an associated 50-foot width wetland transition area (buffer). The documentation of additional threatened or endangered species or individuals in Franklin may change the potential resource value of wetlands within the Township. The resource value, or width of the transition area, is established by the NJDEP on a case-by-case basis when an LOI application is submitted for NJDEP review and verification.

7.4 Wetland Communities

According to 2002 Land Use data, Franklin’s NJDEP mapped wetland includes a total of 5,236.08 acres of the Township’s total land. The wetland communities are classified following a system identified by Cowardin (1979), which separates wetlands into one of five basic ecological systems: Marine, Estuarine, Riverine, Palustrine, and Lacustrine. Franklin’s wetlands are considered Palustrine. The types and approximate percentages of Palustrine wetlands within Franklin Township are included in Table 16.

Table 16: NJDEP Distribution of Wetland Communities in Franklin Township (2002)

Wetland Type (NJDEP Classification)	Acres	% of Total Acreage
wetland rights-of-way	73	1.40
cemetery on wetland	1	0.02
managed wetland in maintained lawn greenspace	122	2.33
managed wetland in built-up maintained rec area	17	0.32
agricultural wetlands (modified)	463	8.84
former agricultural wetland	751	1.44
deciduous wooded wetlands	3,768	71.96
coniferous wooded wetlands	17	0.32
deciduous scrub/shrub wetlands	77	1.47
coniferous scrub/shrub wetlands	62	1.19
mixed scrub/shrub wetlands (deciduous dom.)	102	1.94
mixed scrub/shrub wetlands (coniferous dom.)	113	2.16

Wetland Type (NJDEP Classification)	Acres	% of Total Acreage
herbaceous wetlands	198	3.79
phragmites dominate interior wetlands	3	0.07
mixed wooded wetlands (deciduous dom.)	32	0.61
mixed wooded wetlands (coniferous dom.)	25	0.48
disturbed wetlands (modified)	87	1.67
Total	5,236	100.00

Palustrine wetlands include all non-tidal wetlands dominated by trees, shrubs and persistent emergent vegetation. These wetlands are usually bordered by uplands and shoreward of lakes and river channels and typically include all wetlands termed marsh, bogs, swamps, and fens. Palustrine wetlands may include small, shallow intermittent or permanent ponds, such as vernal pools (see Section 11, Figure 11).

Sources of hydrology for Franklin's wetlands include surface water runoff, in the form of overland flow or flooding from adjacent open waters; or groundwater discharge to the wetland. Water tables are usually highest in the late winter and into early spring. During this period, water may pond or flood the wetlands for variable periods. In May or June the water table usually begins to drop. Water tables reach their lowest levels in September or October. Fluctuations relate mainly to rainfall patterns, temperatures, and rates of evapotranspiration. Franklin's wetlands listed in Table 16 can be categorized into the major groups listed below.

7.4.1 Palustrine Deciduous Forested Wetlands

Deciduous forested wetlands are the most abundant type of wetland in both New Jersey and Franklin Township. Palustrine deciduous forested wetlands comprise approximately 3767 acres of the Township's mapped wetlands. Additional areas of "mixed" deciduous dominant wetland have been identified in Franklin Township. Mixed areas indicate the presence of some coniferous species, typically Eastern red cedar (*Juniperus virginiana*) in the Piedmont of New Jersey.

These forested wetlands include swamps and floodplains of rivers and streams. Forested wetlands help to filter and purify water by absorbing and filtering pollutants and sediments. They also stabilize stream flows by temporarily storing floodwater and mitigating the effects of drought. Forested wetlands are particularly important for flood storage along the Raritan and Millstone Rivers. Forested wetlands include vegetation that is greater than 6 meters tall and may have a variety of water regimes ranging from permanently inundated to intermittently flooded. Dominant wetland forest vegetation of Piedmont wetlands, such as those found in Franklin, include red maple (*Acer rubrum*), American elm (*Ulmus americana*), black willow (*Salix nigra*), swamp white oak (*Quercus bicolor*), pin oak (*Quercus palustris*), sweet gum (*Liquidambar styraciflua*), box elder (*Acer negundo*), black gum (*Nyssa sylvatica*), river birch (*Betula nigra*), sycamore (*Platanus occidentalis*) and shadbush (*Amelanchier canadensis*) (Collins and Anderson, 1994).

Common understory shrubs in these wetlands include spicebush (*Lindera benzoin*), silky dogwood (*Cornus amomum*), smooth alder (*Alnus serrulata*), common elder (*Sambucus canadensis*), highbush blueberry (*Vaccinium corymbosum*), southern arrowwood, (*Viburnum*

dentatum), buttonbush (*Cephalanthus occidentalis*), witch hazel (*Hamamelis virginiana*) and swamp azalea (*Rhododendron viscosum*). Vine species may include poison ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), riverbank wild grape (*Vitis riparia*), and Japanese honeysuckle (*Lonicera japonica*) (Collins and Anderson, 1994).

Numerous herbaceous understory species may be observed in these communities. Some of the more representative species include skunk cabbage (*Symplocarpus foetidus*), jack-in-the-pulpit (*Arisaema triphyllum*), marsh marigold (*Casltha palustris*), spring beauty (*Claytonia virginica*), trout lily (*Erythronium americanum*), tussock sedge (*Carex stricta*), cinnamon fern (*Osmunda cinnamomea*), marsh fern (*Thelypteris palustris*), sensitive fern (*Onoclea sensibilis*), clearweed (*Pilea pumila*), wood nettle (*Laportea canadensis*), and blueflag (*Iris versicolor*) (Collins and Anderson, 1994).

7.4.2 Scrub/Shrub Wetlands

Within Franklin Township, about 77 acres are currently mapped as deciduous scrub/shrub wetland, with an additional 214 acres mapped as “mixed” wetlands, indicating a coniferous component. A small portion (approximately 16 acres) of coniferous dominant scrub/shrub wetland is also mapped within the Township. Scrub/shrub wetlands include vegetation that is less than 6 meters tall and includes true shrubs or young trees, often representing a stage of succession following disturbances such as fire, logging or other human activities. Shrub wetlands may also be a component of marsh wetlands otherwise dominated by herbaceous species. Shrub wetlands include a variety of water regimes ranging from permanently inundated to intermittently flooded. Common shrub species within the Piedmont may include buttonbush (*Cephalanthus occidentalis*), silky dogwood (*Cornus amomum*), smooth alder (*Alnus serrulata*), common elder (*Sambucus canadensis*), swamp rose (*Rosa palustris*), and meadowsweet (*Spiraea tomentosa*). The dominant coniferous species in the shrub wetlands of Franklin would likely be Eastern red cedar.

7.4.3 Palustrine Emergent (Herbaceous) Wetlands

Palustrine emergent wetlands are freshwater marshes dominated by persistent and non-persistent grasses, rushes sedges, forbs and other herbaceous or grass like plants. Within Franklin, NJDEP maps show approximately 198 acres of palustrine emergent wetlands dominated by herbaceous species. However herbaceous wetlands may be a component within other mapped wetland communities within Franklin including forested or modified agricultural wetlands.

Common plants in emergent or herbaceous wetlands will include broad leaved cattail (*Typha latifolia*), narrow leaved cattail (*Typha angustifolia*), common reed (*Phragmites australis*), tussock sedge (*Carex stricta*), great bulrush (*Scirpus validus*), common rush (*Juncus effusus*), swamp loosestrife (*Decodon verticillatus*), pickerelweed (*Pontederia cordata*), woolgrass (*Scirpus cyperinus*), tick-seed sunflower (*Bidens* spp.), blue flag (*Iris versicolor*), sweetflag (*Acorus calamus*), rice cutgrass (*Leersia oryzoides*), bur-reeds (*Sparganium* spp.), arrow arum (*Peltandra virginica*), pickerelweed (*Pontederia cordata*), purple loosestrife (*Lythrum salicaria*), Arrow-leaved tearthumb (*Polygonum sagittatum*), water pepper (*Polygonum hydropiper*), and manna-grass (*Glyceria striata*) (Collins and Anderson, 1994).

Also included in this category would be approximately 3 acres of interior *Phragmites* wetland. *Phragmites*, or common reed, is an aggressive (non-native) plant that under certain conditions will dominate open freshwater and estuarine wetland systems and form a monoculture that results in a drop of overall species diversity.

7.4.4 Modified Wetlands

Modified wetlands are those wetlands that have been altered by human activities such as agriculture, and are usually altered by ditching, diking, filling or the installation of subsurface drainage. Within Franklin, these wetlands include agricultural modified wetlands (approximately 463 acres) and other areas simply mapped as disturbed (approximately 87 acres). Areas mapped as “cemetery on wetland” and “managed wetlands” or “maintained lawn greenspaces” also fall into the general modified wetland category. Some modified wetlands may have some components of herbaceous wetlands or may be lawns dominated by maintained cool season grasses. Close inspection of soils and vegetation of heavily modified wetlands may reveal the presence of historic wetlands including redox (wetland) soils and small amounts of hydrophytic vegetation. Such modified wetland will often revert back to the natural hydrophytic plant community if previously installed drainage features are abandoned. These areas can also be actively converted back to wetland with minimal effort, by plugging ditches and drains or removing dikes. Reversion of modified wetlands may be part of a habitat enhancement or wetland mitigation program (see Section 7.4.6, Wetland Mitigation).

7.4.5 Vernal Pools

Vernal pools are ephemeral wetlands that fill annually in the winter and early spring from precipitation runoff or rising groundwater tables. They may be located within a forested, scrub/shrub or emergent wetland. Most years they dry out during the summer and late fall, losing water through evapotranspiration or as the groundwater table drops. This wet/dry cycle and the low water oxygen levels prevent the establishment and breeding of fish, yet provide a unique temporary habitat for many species. The time of year that the pool fills and dries out will influence the community of animals that utilizes the pool. Numerous amphibians and invertebrates have evolved life cycles adapted to the exploitation of vernal pools. Some species are completely dependent on these pools (obligate Species) while others may use vernal pools, other wetlands, or open waters (facultative Species) for reproduction. Vernal pools are also indispensable for biodiversity, with local populations often entirely dependent on a single pool. Vernal pools also provide an important source of water for a variety of other wildlife. Vernal pools are a unique wildlife resource that have long been ignored or overlooked. They have been filled, drained, and used as road drainage detention ponds. Adjacent areas have been cleared and groundwater wells have lowered water tables. Fertilizers and pesticides have degraded water quality.

Vernal pools are a very valuable natural resource, and although often isolated from adjacent wetlands, are worthy of protection, along with adjacent upland buffers. Amphibian inhabitants of vernal pools may utilize adjacent forested habitat of up to 1,000 feet or more from the breeding pool.

NJDEP uses four basic criteria to determine if a wetland is a certified vernal pool. A wetland certified by the State as a vernal pool must be: 1) a confined basin/depression lacking a

permanent outlet, 2) harboring documented obligate or facultative vernal habitat species (as identified in N.J.A.C. 7:7A, Appendix 1), 3) maintaining water for at least two continuous months between March & September of a normal rainfall year, 4) free of fish populations or dries up at some time during a normal rainfall year.

The Rutgers Center for Remote Sensing and Spatial Analysis (CRSSA) provides mapping of potential and confirmed vernal pools throughout the State. CRSSA mapping identifies potential vernal pools clustered throughout the forested wetlands of D&R Canal State Park within Franklin Township. Additional clusters of potential vernal pools are identified by CRSSA near the Clyde Brook Tributary of Six Mile Run, near Carter's Brook headwaters in southern Franklin, and along the Raritan River near the northern border of Franklin. All of Franklin Township's vernal pools are identified as "not surveyed" and are strictly identified by aerial photography. No official field investigation has confirmed their status or existence on the ground. The vernal pool habitats of Franklin will require field investigation at the appropriate time of year to determine if they will qualify as "certified" vernal pools.

Vernal habitats are sometimes relatively small (<.5acre) and may appear as nothing more than an ordinary wooded depression during certain times of the year. Consequently field evaluations for vernal habitat/species within the Township at the appropriate time of year would be required to fully determine the extent of vernal habitat and species. It is important to note that active vernal pools have been unofficially confirmed in Franklin Township (see below) and the small size of some vernal pool habitats may result in some potential pools in Franklin unmapped by CRSSA. In addition, vernal pools may be intentionally created, as in the case of the habitat enhancement project at the Negri-Nepote grasslands.

Within Franklin, certain obligate vernal pool amphibian species may be targeted during surveys for adults, eggs and larvae. These obligate species must use vernal pools to successfully breed. Wood frogs (*Rana sylvatica*) and the spotted salamander (*Ambystoma maculatum*) would be the most likely obligate vernal species in Franklin and would utilize the pools in the early spring (March-April). Wood frogs have been identified in the Bunker Hill Environmental Education Center forests and would likely be breeding in many other large forest tracts of the municipality.

Another obligate species mapped within Somerset County is the marbled salamander (*Ambystoma opacum*). The female marbled salamander utilizes the vernal pools in the fall where she lays eggs and guards them as the pool fills. Species such as spring peepers (*Pseudacris crucifer*), northern gray treefrogs (*Hyla concolor*), green frogs (*Rana clamitans*), southern leopard frogs (*Rana utricularia*), pickerel frogs (*Rana palustris*), bullfrogs (*Rana catesbiana*) and the Fowler's toad (*Bufo woodhousii*) are among the numerous facultative amphibian species potentially using these habitats at some point in the year in Franklin. All of these species should be considered in any survey of Franklin's vernal pools.

Currently, under the NJDEP *Freshwater Wetlands Protection Act* rules (N.J.A.C. 7:7A), vernal pools and adjacent wetland transition areas are protected from disturbance by prohibition of issuance of most general permits for activities in these vernal habitats [N.J.A.C. 7:7A-4.3(b)16]. However, as of the date of this document, General Permit #6 currently allows the filling of up to one acre of non-tributary or isolated wetlands, (which may be vernal pools) that do not provide documented habitat for State-listed threatened or endangered species. The NJDEP has discretionary authority, however, to require an Individual Permit for a proposed disturbance to an isolated wetland considered a vernal pool.

Individuals that have identified a vernal pool or potential vernal habitat may register the pool at the NJDEP sponsored website listed below. The website, sponsored by the Center for Remote Sensing and Spatial Analysis (CRSSA) at Rutgers University, provides general information about vernal pools and contains a database and mapping of vernal pool locations throughout the state: <http://www.dbrssa.rutgers.edu/ims/vernal/viewer.htm>.

7.4.6 Wetland Mitigation

Wetlands such as the modified agricultural wetlands mentioned in Section 7.4.4 may be converted to their original state as part of a mitigation project. Wetland mitigation is required for certain projects that impact open waters and wetlands in New Jersey. Mitigation is the development, preservation, enhancement or restoration of wetland required (often by NJDEP or US Army Corps of Engineers) as compensation for wetlands impacted or lost during permitted activities such as road development. Mitigation may provide opportunities for landowners to sell wetlands that are otherwise not developable and have less economic value, or sell adjacent uplands they wish not to sell for development. The New Jersey Department of Transportation and other organizations are often required to purchase sites for mitigation as part of their permitting processes.

For those required to do wetland mitigation, it can be performed onsite or offsite or through land donations, monetary contributions, or through the purchase of Wetland Mitigation Bank credits. A wetland mitigation bank is a pre-constructed wetland or an area of wetland/upland that has been preserved. Mitigation Banks are assigned to specific Watershed Management Areas to compensate for wetland losses within that WMA. Franklin Township falls within WMA 9 (Raritan River) and WMA 10 (Millstone River). One active bank, the Wycoff Mills Bank, currently serves WMAs 9 and 10. A second bank, Chimento, serves WMA 9 but is currently undergoing maintenance to meet performance standards and is therefore not able to sell credits.

More information on mitigation may be acquired through the Division of Land Use Regulation Mitigation Council webpage at www.nj.gov/dep/landuse/fww/mitigate/mcouncil.html. In addition, the NRCS can direct farmers and other landowners to programs and organizations involved with wetland mitigation/restoration.

7.4.7 Wetland Regulations

Since July 1, 1988 the NJDEP Bureau of Freshwater Wetlands has regulated all disturbances in freshwater wetlands under the NJ Freshwater Wetlands Protection Act Rules (NJAC 7:7A-1.1 et seq.). Since July 1, 1989, they have regulated “transition areas,” lands adjacent to wetlands. As per the freshwater wetlands regulations, municipalities cannot adopt local wetlands ordinances.

In March 1994 the NJDEP assumed the administration of the Federal 404 wetlands program for the majority of freshwater wetlands in the state. The USACOE retained jurisdiction over all tidal wetlands, certain interstate waters and wetlands and most freshwater wetlands within 1000 feet of tidal waters. The US Environmental Protection Agency, the National Marine Fisheries Service and the US Fish and

Wildlife Service retain some oversight over this program, reviewing permit applications for major discharges to wetlands and reviewing new Statewide General Permits and other changes to the rules for consistency with the Federal 404 program.

Between July 1, 1988 and July 1, 1989, only activities in wetlands and open waters themselves were regulated by NJDEP. Since July 1, 1989, buffer or transition areas adjacent to wetlands have also been regulated. Regulated activities in wetlands include draining, flooding, cutting of vegetation, excavation, filling, and erection of structures. Similar activities are regulated in wetland transition areas.

There are two types of permits than can be issued for wetlands disturbance 1) General Permits and 2) Individual Permits. General Permits may also be issued for activities in wetland transition areas. General Permits can be granted for certain minor activities in wetlands subject to certain conditions. There are General Permits for wetlands encroachments related to multiple activities including: utility lines; outfalls; road crossings; disturbance of isolated wetlands; disturbance of ditches or swales; surveying; soils sampling; house additions; trails and boardwalks; docks and piers; dredging of ponds; fish and wildlife management activities; clean up of hazardous waste; etc. For outfalls and road crossings, no more than 1/4 acre can be disturbed. For isolated wetlands, ditches and swales, no more than one acre can be disturbed. Additions to residential dwellings existing prior to July 1, 1988, are limited to less than 750 SF of fill with no effect to adjacent wetlands. If wetlands filling cannot be avoided, proposed activities should be limited to those activities authorized under the General Permit where at all possible.

Individual Permits are required for all other disturbances in wetlands not authorized under General Permits. These are very difficult to obtain. If the proposed activity is water dependent, and wetlands disturbance is minimized, a permit may be granted. For non-water dependent uses it must be proven that there is no other alternative location or design for the proposed project that would involve less or no wetlands disturbance. An alternative site to be considered can be on property owned by the applicant or on any property that could be obtained in the region. This requirement is very difficult to satisfy. Mitigation, or creation of wetlands from uplands, at a ratio of 2:1 would be a condition of an Individual Permit, but is currently not required for most General Permits.

Activities in wetland transition areas must be authorized under a Transition Area Waiver. Granting of a wetland permit is accompanied by a waiver to disturb the associated transition area. If activities are limited to within a transition area, they may be approved under a Transition Area Averaging Plan Waiver. Under such a plan the shape of a transition area may be adjusted as long as the total area of the standard transition area is not reduced and other minimum and maximum width requirements of the transition area are maintained. Selected activities within a transition area may be authorized under a Special Activities Waiver. These activities may include construction of road crossings or stormwater outfalls that would be authorized under a General Permit if they were conducted in wetlands. Where certain specific characteristics of slope and vegetative cover are present in the transition area and the development intensity is not high, a straight reduction of the transition area, without compensation, may be authorized under a waiver. Lastly, a Hardship Waiver may be granted under certain circumstances.

8.0 AIR QUALITY

8.1 Regional Air Quality - Criteria Pollutants

Existing ambient air quality data for Franklin Township were obtained from the Air Quality Report published by the NJDEP, Bureau of Air Monitoring. The data are the most recent data available. In New Jersey, there are continuous monitoring stations that monitor six specific air pollutants (criteria pollutants) which are used as indicators of air quality and for which Ambient Air Quality Standards (AAQS) have been established. These pollutants are listed as carbon monoxide, nitrogen oxides, ozone, sulfur dioxide, smoke, shade and fine particulates. In addition, a manual monitoring network has been established to measure inhalable particulates, ozone precursors, atmospheric deposition, lead and air toxics. Ambient air quality data are used as the baseline for evaluating the effect of the construction of new emission sources or of modifications to existing sources. New stationary sources of air contamination require permits from the NJDEP, Bureau of Air Quality, New Source Review.

The NJDEP Bureau of Air Quality provides Air Quality monitoring at various locations across the State. The Bureau divides the state up into nine Air Quality Index Regions. Franklin Township falls within Region 3, also called the Suburban Region. This region includes Morris, Somerset and Middlesex Counties. Air Quality stations within the vicinity of Franklin Township include two stations in New Brunswick, including one at Rutgers University, and one in Perth Amboy.

Particulate matter (most commonly sulfides and organic carbon), nitrogen dioxide, and ozone are monitored at the New Brunswick stations. Carbon monoxide, sulfur dioxide and particulate matter are monitored at the Perth Amboy station.

The results of air monitoring for pollutants measured at the stations were compared to the National Ambient Air Quality Standards. An index value was given for the level of Air Quality. The Index Level ranges from 0-300. Zero to 50 is considered good air quality; 51-100 is considered moderate air quality; 101-150 is considered unhealthy for sensitive groups (children, elderly and individuals with health conditions); 151-200 is considered unhealthy and 200-300 is considered very unhealthy. The index value (NAAQS) standard is equal to a value of 100. Any value above 100 is considered to be exceeding the National Air Quality Standard.

Below is a summary of the Air Quality Index Summary from 2005 through 2014 demonstrating a general trend towards more days reported as “good” within the Suburban Region:

- 2005: 264 “good”; 89 “moderate”; 12 “unhealthy for sensitive groups”; 0 “unhealthy” 0 “very unhealthy
- 2006: 276 “good”; 77 “moderate”; 11 “unhealthy for sensitive groups”; 1 “unhealthy” 0 “very unhealthy
- 2007: 290 “good”; 61 “moderate”; 14 “unhealthy for sensitive groups”; 0 “unhealthy” 0 “very unhealthy
- 2008: 291 “good”; 57 “moderate”; 17 “unhealthy for sensitive groups”; 0 “unhealthy” 0 “very unhealthy

- 2009: 327 “good”; 37 “moderate”; 1 “unhealthy for sensitive groups”; 0 “unhealthy” 0 “very unhealthy
- 2010: 286 “good”; 63 “moderate”; 16 “unhealthy for sensitive groups”; 0 “unhealthy” 0 “very unhealthy
- 2011: 305 “good”; 48 “moderate”; 12 “unhealthy for sensitive groups”; 0 “unhealthy” 0 “very unhealthy
- 2012: 305 “good”; 48 “moderate”; 12 “unhealthy for sensitive groups”; 0 “unhealthy” 0 “very unhealthy
- 2013: 315 “good”; 48 “moderate”; 2 “unhealthy for sensitive groups”; 0 “unhealthy” 0 “very unhealthy
- 2014: 295 “good”; 66 “moderate”; 4 “unhealthy for sensitive groups”; 0 “unhealthy” 0 “very unhealthy

In general, the air quality in New Jersey has improved significantly since the passage of the Clean Air Act in 1970. New Jersey is now in compliance with all National Ambient Air Quality (NAAQS) Standards for criteria pollutants, except for ozone. However, it is important to consider that localized air quality particularly in urbanized areas, may be impacted from sources such as diesel particulate matter from trucks and machinery.

Based on a review of the Air Quality Index data, air quality in the Suburban Region of the state is of intermediate quality compared to other portions of New Jersey. Data indicate that the air quality is poorer in more urbanized areas near New York City and Philadelphia, and better in the more rural portions of the state including the Northern Delaware Valley and the Southern Coastal region. The NJDEP Bureau of Air Monitoring Air Quality Reports can be reviewed at <http://www.njaqinow.net/>.

8.2 Regional Air Quality - Air Toxics

Air toxics are a large group of pollutants that are likely to be emitted into the atmosphere in large enough quantities to result in adverse health effects including lung and respiratory conditions, birth defects and cancer. Although there is no Federal air quality standard for these toxicants, Congress in 1990 directed the USEPA to begin addressing 200 of these substances by developing technology control standards. Benchmark levels have been established by the USEPA and other agencies. The carcinogen health benchmark is set at a level of pollutant that corresponds to a level of a one in a million risk increase of getting cancer if the person were to breathe that level of pollutant over their lifetime. The benchmark for non-carcinogens is set at the concentration where no health risks are expected (NJDEP Department of Air Monitoring 2004 Air Toxics Summary).

Since 2001, seventy of these toxicants have been tested for within Region 3 at the New Brunswick Air Monitoring Station under a manual monitoring network. These data are obtained through collected samples that are then analyzed in a laboratory. The data collected through manual sampling cannot be monitored in real time as criteria pollutants are. The most common air toxics are Volatile Organic Compounds (VOCs). VOCs are typically emitted from industrial sources including chemical plants, factories as well as motor vehicles and may be found in air, soil and water (see Section 4.5). In addition to being linked to adverse health problems, VOCs contribute to the development of ground level ozone (O₃). Ozone is a gas that

forms when nitrogen oxides and VOCs react in the presence of sunlight and heat. Ozone is the most common criteria pollutant exceeding standards in the State. In 2004, six VOCs were found at the New Brunswick station in mean concentrations above the accepted Health Benchmark. These compounds are listed in Table 17 in micrograms per cubic meter (ug/m3). In 2014, eleven VOCs were found at the New Brunswick station mean concentrations above the accepted Health Benchmark.

Table 17: Air Toxics Exceeding Benchmarks New Brunswick Lab Monitoring Station 2004 and 2014

Pollutant	NJDEP Benchmark ug/m3	2004 Mean Level ug/m3 at New Brunswick	2014 Mean Level ug/m3 at New Brunswick
Acetaldehyde	0.45	7.06	2.87
Acrylonitrile	0.018	Not exceeding	0.221
Benzene	0.13	0.95	0.54
1,3-Butadiene	0.033	Not exceeding	0.065
Carbon tetrachloride	0.067	0.52	0.63
Chloroform	0.043	Not exceeding	0.46
Chloromethane	0.56	1.18	1.17
1,2-Dibromoethane	0.0017	Not exceeding	0.004
1,2-Dichloroethane	0.038	Not exceeding	0.079
Formaldehyde	0.077	5.76	11.044
Methyl tert-Butyl Ether	3.8	4.00	Not exceeding
1,1,2,2-Tetrachloroethane	0.017	Not exceeding	0.043

Source: <http://www.njcinow.net/>

9.0 LAND USE

9.1 Land Use/ Cover Types

Land use cover types according to NJDEP for 2002 and 2012 digital GIS coverage are presented on the Land Use/Land Cover maps (Figures 12 and 13 of Section 11) on which the following land cover types are documented: Agricultural, Forest, Wetlands, Water, Recreational, Developed, and Barren Land. The approximate acreages of these land cover types are summarized in Table 18 and descriptions of the Land Cover are listed below (see Section 7.4 for Wetland Descriptions). The table also shows land cover changes (in acres and percent) between 1995 and 2012.

Table 18: Land Use/Land Cover Types 1995-2012

Land Cover Type	1995		2002		2012		Change 1995-2012	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Agriculture	7,243	24%	5,483	18%	4,936	16%	-2,307	-32%
Barren Land	363	1%	315	1%	515	2%	153	42%
Forest	6,033	20%	6,294	21%	5,911	20%	-122	-2%

Land Cover Type	1995		2002		2012		Change 1995-2012	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Recreational	898	3%	934	3%	938	3%	41	5%
Developed	9,505	32%	11,241	37%	12,344	41%	2,839	30%
Water	503	2%	506	2%	557	2%	54	11%
Wetlands	5,466	18%	5,236	17%	4,809	16%	-657	-12%

Evaluation of Table 18 and the Land Use/ Land Cover maps in Figures 12 and 13 reveal the following general trends:

- As of 2012, roughly 41% (about 12,300 acres) of the Township consists of developed land cover (i.e., residential, commercial and industrial land uses), with another 2% consisting of barren land (i.e., the quarry and sites under development). The remaining roughly 57% (about 17,000 acres) of the Township consists of agriculture, forest, recreation, water or wetlands.
- While more than roughly 4,900 acres remain in agricultural use in 2012, there was a roughly 2,300 acre loss of agricultural land cover between 1995 and 2012. Comparison of Figures 12 and 13 appears to reveal that a large proportion of this decrease occurred in the northwestern portion of the Township with the development of the age-restricted communities and that a portion of this decrease occurring in the Six Mile Run State Park (with a relatively large amount of land converting to forest in the intervening years).
- Corresponding largely with the loss of agricultural land cover is an increase in the developed land cover which increased by roughly 2,800 acres (30%) between 1995 and 2012.

While there has been additional development since 2012, such additional development would not significantly change the figures presented in Table 18. Nonetheless the following developments are noted:

- The Summerfields development in the northwesterly portion of the Township is shown on Figure 13 (2012) as a combination of developed, barren (under development) and agricultural. That development is nearing completion and the land cover (with the exception of the wetlands which remains) would be mapped as developed.
- The portion of the Avalon Somerset development at the corner of Easton/ Demott shown on Figure 13 (2012) as barren (as it was under construction at the time) would now be mapped as developed.

9.2 Land Use Descriptions

9.2.1 Developed Coverage

The developed category includes residential land cover and also includes other lands where the landscape has been altered substantially by human activities including: cemeteries, commercial, communications facilities, industrial areas, governmental facilities, schools, managed wetlands in maintained lawn greenspace, rights-of-way, services, storm water basins, or other built up lands. These lands may be covered by impervious surfaces and or associated patches of lawns, road infields, etc.

9.2.2 Barren Land Coverage

Barren Land refers to areas of land that have thin soil, sand or rocks and a lack of vegetative cover. Vegetation in these areas, if present, is widely spaced. Barren land areas may be naturally occurring such as beaches or rock faces; however, as in the case of Franklin, Barren land areas consist of the Trap Rock Quarry and lands in which site preparation for development has begun.

9.2.3 Forest Coverage

It is critical to note that the “forest” category in Table 18 only consists of large, upland (non-wetland) forest located outside of the “developed” land cover. It does not include additional forested areas which are included in the wetlands category of the Land Use/Land Coverage. Table 19 provides a detailed breakdown of Franklin’s wetland and upland forest types from the Land Use/Land Cover data. The dominant forest types of Franklin Township are described below. The total amount of forest cover identified in Table 19 is 10,688 acres (or roughly 36% of the Township) as of 2002. Commensurate with the roughly 7% decrease in forest and wetlands cover since 2002, it is reasonable to assume that this currently would total roughly 10,000 acres today (or about 33% of the Township).

The forest cover also does not include smaller forested areas contained within the “developed” land cover. Inclusion of such forested area would have increased the percent of forest cover slightly as well. This assumption is consistent with the recent tree cover analysis conducted by the Township’s Shade Tree Commission which estimated the Township tree canopy cover at 39% (see Section 9.2.5.2 for further discussion on the Shade Tree Commission’s assessment).

Table 19: NJDEP Forest Type Coverage in Franklin (2002) (Including Wetland Forest)

NJDEP Code	Primarily Upland/Wetland	Forest type	Acres	%
4110	Upland	deciduous forest (10-50% crown closure)	604.41	5.65
4120	Upland	deciduous forest (>50% crown closure)	2,620.28	24.52
4210	Upland	coniferous forest (10-50% crown closure)	39.35	0.37
4220	Upland	coniferous forest (>50% crown closure)	243.76	2.28
4230	Upland	Plantation	8.15	0.08
4311	Upland	mixed forest (>50% coniferous with 10- 50% crown closure)	75.55	0.71
4312	Upland	mixed forest (>50% coniferous with >50% crown closure)	268.33	2.51
4321	Upland	mixed forest (>50% deciduous with 10- 50% crown closure)	83.62	0.78
4322	Upland	mixed forest (>50% deciduous with >50% crown closure)	112.96	1.06
4410	Upland	old field (< 25% brush covered)	524.77	4.91
4420	Upland	deciduous brush/shrubland	130.11	1.22

NJDEP Code	Primarily Upland/Wetland	Forest type	Acres	%
4430	Upland	coniferous brush/shrubland	1,056.69	9.89
4440	Upland	mixed deciduous/coniferous brush/shrubland	526.20	4.92
6210	Wetland	deciduous wooded wetlands	3,767.89	35.25
6220	Wetland	coniferous wooded wetlands	16.96	0.16
6231	Wetland	deciduous scrub/shrub wetlands	76.86	0.72
6232	Wetland	coniferous scrub/shrub wetlands	62.19	0.58
6233	Wetland	mixed scrub/shrub wetlands (deciduous dom.)	101.64	0.95
6234	Wetland	mixed scrub/shrub wetlands (coniferous dom.)	113.09	1.06
6240	Wetland	herbaceous wetlands	198.19	1.85
6251	Wetland	mixed wooded wetlands (deciduous dom.)	31.76	0.30
6252	Wetland	mixed wooded wetlands (coniferous dom.)	25.39	0.24
Total		Total	10,688.15	100.00

Upland Deciduous Forest

Per Table 19, about 3,225 acres of land in Franklin were mapped as deciduous upland forest with varying crown closure. Per White and Worthen (1986), Franklin Township's forests may be generally described as mixed oak/hickory or mixed oak /tulip poplar (see Section 9.2.5.1 for additional forest information). The mature deciduous forests of Franklin are mixed oak forests co-dominated by red oak (*Quercus rubra*), white oak (*Quercus alba*) and black oak (*Quercus velutina*). Other dominant upland tree species identified within Franklin Woodlands Study (1986) include tulip poplar (*Liriodendron tulipifera*), chestnut oak (*Quercus prinus*), white ash (*Fraxinus americana*) red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*) and sweetgum (*Liquidambar styraciflua*). Other upland species may include mockernut hickory (*Carya tomentosa*) and shagbark hickory (*Carya ovata*), that may also be present in the canopy. Arrowwood (*Viburnum dentatum*), maple-leaf viburnum (*Viburnum acerifolium*), blackhaw viburnum (*Viburnum prunifolium*), spicebush (*Lindera benzoin*), sweet pepperbush (*Clethra alnifolia*), blueberry (*vaccinium corymbosum*), and lowbush blueberry (*Vaccinium vacillans*) are among the typical forest understory species expected in the upland forests of Franklin. White and Worthen (1986) noted that the northern and middle regions of Franklin Township were dominated by oaks, ash, red maple and hickories. Tulip, poplar and sweetgum were noted as dominant in some southern forests, but were absent in other areas. Riparian forests (including the Delaware and Raritan Canal state Park) were dominated by green ash, pin oak and silver maple. One of the best examples of mature upland (white oak dominated) deciduous forest in New Jersey is within the William J. Hutcheson Memorial Forest in Franklin (see Section 9.4).

Scrub/Shrub Forests

About 1,713 acres of land in Franklin Township are mapped as scrub/shrub forest uplands. Upland shrub forests mapped within the region would typically be represented by successional lots, old fields or other

previously disturbed areas. When vegetation is determined to be over 20 feet in height, it is mapped as forest by NJDEP Land Use Mapping. These forests may be old agricultural areas abandoned or left fallow for a period of time or portions of open canopy within a forest. Opportunistic ‘pioneer species’ initially colonize these areas. In old field communities, annual, biennial, and eventually perennial herbaceous plants are the pioneer species. Early succession herbaceous plants expected would include goldenrods (*Solidago* spp) (see Appendix B, Photos), ragweed (*Ambrosia artemisiifolia*), foxtails (*Setaria* spp.), wild carrot (*Daucus carota*), horseweed (*Conyza canadensis*), asters (*Aster* spp.), oxeye daisy (*Chrysanthemum leucanthemum*), wild garlic (*Allium vineale*), thistle (*Cirsium* spp), panic grasses (*Panicum* spp.) broomsedge (*Andropogon* spp) and many others (Collins and Anderson, 1994).

As time passes, woody species may begin to develop in these areas and become shrub dominated secondary growth forests depending on various factors such as deer herbivory, fire, etc. Species typically include gray birch (*Betula populifolia*), black cherry (*Prunus serotina*) and trembling aspen (*Populus grandidentata*). Eastern red cedar (*Juniperus virginiana*) is identified as one of the most common Piedmont successional trees. Other species may include sassafras (*Sassafras albidum*), black locust (*Robina pseudoacacia*), staghorn sumac (*Rhus typhina*), winged sumac (*Rhus coppalina*) and smooth sumac (*Rhus glabra*), dogwoods (*Cornus* spp.) and autumn olive (*Eleagnus umbellata*). Vines within the old field secondary growth communities include Japanese honeysuckle (*Lonicera japonica*), Virginia creeper (*Parthenocissus quinquefolia*) and poison ivy (*Toxicodendron radicans*). Dominant invasive species are found within shrub areas and successional old fields throughout Franklin Township. These species include multiflora rose (*Rosa multiflora*) and autumn olive (*Eleagnus umbellata*). As with many species considered invasive, both of these species are aggressive colonizers that thrive where land disturbance has occurred. Multiflora rose is a versatile species that may occur within successional old fields, forest breaks and edges, and along emergent and shrub wetland edges. Autumn olive occurs in successional old field uplands and forest edges. Invasive species such as these generally lower the wildlife diversity and quality of the habitat areas where they occur.

Coniferous Forest/ Coniferous Shrubland

Most coniferous forest under NJDEP mapping typically identifies pitch pine or pitch pine dominated mixed forest in the state. However in Franklin, successional areas dominated by Eastern red cedar (*Juniperis virginiana*) (see Appendix B, Photos) are more likely contributors to coniferous forest and shrub coverage. Planted stands of coniferous species such as Norway spruce (*Picea abes*) are identified under the separate category of “Plantation” and make up approximately eight acres of the mapped forest in Franklin. Coniferous stands may be of particular interest as they may be used as roosting areas for owl species in conjunction with farmlands or deciduous forest.

9.2.3.1 Franklin Township Forest Study (1986)

In 1986, Franklin Township developed a forest cover and composition study (White and Worthen) that mapped municipal woodlands, analyzed the composition of forests within Franklin, and prioritized their ecological importance. Study areas within Franklin were categorized into the northern, middle, southern and riparian areas. The data resulting from the study have been used by the Township as a tool in determining open space acquisition. The information below was incorporated from the woodlands study. Tables 20, 21 and 22 below document the preserved priority woodlands, candidates for preservation and recently developed tracts, respectively. Four tracts have been developed from the original woodlands

study. Most forests are oak dominated, with several other deciduous species being identified as dominant on certain tracts.

Sixty stand samples were taken for the study with 51 tree species identified in the forests. At the time of their study, White and Worthen identified 4,784 acres (16%) of Franklin’s land cover as forested. The study indicates that upland forest cover was less than 9% of the total, while southern and riparian regions represented 32% and 52% of the forest cover, respectively. Forested areas consisted of 213 individual stands with a median stand size of 8.2 acres and 90% of the forest stands as smaller than 49 acres.

The Forestry Study reviewed historic forest cover trends within Franklin. The earliest survey of Franklin Forests occurred in 1880. At this time 62 forest stands comprised 9% of Franklin’s total land cover. The median forest coverage was 6.2 ha. The largest Township forest in 1880 was west of Little Rocky Hill and covered approximately 752 acres. As the Industrial Revolution occurred and agriculture declined in the early 20th century, reforestation occurred in Franklin, resulting in 18% forest coverage by 1943. Reforestation growth ended with suburban expansion after 1943. Between 1943 and 1986, the authors identified a 481 acre, 21% decline in the forests of northern and middle Franklin, and a 7% decline in the forests of southern Franklin.

White and Worthen noted direct and indirect disturbances had resulted in canopy oak loss in 9% of the Township forests. Attributed disturbance included non-native gypsy moth defoliation, and various forms of air pollution. The most widespread disturbance noted was low density residential development, which was impacting forest understories and regeneration even when portions of the canopy were kept intact. White and Worthen also identified the increasing commercial and large residential development impacting forests north of Bennetts Lane.

Two-thirds of the forests in the study were identified as post agricultural succession forests. It was concluded that about 12% of Franklin’s forests were relatively undisturbed middle aged to mature forests.

Table 20: Preserved Priority Woodlands Tracts Franklin Township Woodlands Study -1986 (Protection Status Updated 2016)

Coord	Size (ha)	Dominant Species	Forest Name	Protection Status
Upland Forest				
27/21	38.7	White Oak	Hutcheson	Preserved
22/22	7.9	White Oak	Colonial park	Preserved
27/38	5	Black Oak	S.G. Smith School	Preserved
16/17	14	Red Oak	Scout Camp	Preserved
80/3	6.5	Red Oak	Rocky Hill	Preserved
38/22	23.9	Ash	Six Mile Run	Preserved
23/19	2.1	White Oak	Mettler’s East	Preserved
66/7	6.3	Chestnut Oak	Coppertop	Preserved
25/27	3.6	Black Oak	Millstone Branch	Preserved
63/5	163.4	White Oak	Copper Hill	Preserved
67/3	163.4	Beech	Old Georgetown	Preserved

Coord	Size (ha)	Dominant Species	Forest Name	Protection Status
54/15	19.1	Tulip Poplar	Sunset Hill	Preserved
27/26	3.3	Black Oak	Amwell	Preserved
59/18	190.4	Ash	Bunker Hill South	Preserved
48/16	24	Red Oak	Ten Mile Hilltop	Preserved
18/37	4.6	Ash	Quail Brook Hill	Preserved
23/25	5.2	Black Oak	Wilson	Preserved
54/20	14.8	Red Oak	Pheasant Farm	Preserved
23/18	1.9	White Oak	Mettler's West	Preserved
38/39	14.9	Red Oak	Skillman's	Preserved
19/42S	15.0	Ash	DeMott	Preserved
45/29	2.2	Red Oak	Cortelyous South	Preserved
36/36	4.6	Red Maple	Middlebush Brook	Preserved
48/21	1.8	Oaks	Suydam	Preserved
46/26	9.7	Ash	South Middlebush	Preserved
53/21	14.8	Red oak	Butler	Preserved
41/18	4.3	Ash	Jacques	Preserved
36/40	6.9	Red Maple	Bennetts	Partially preserved farmland
Riparian Forests				
49/8	47	Pin Oak	Griggstown	Preserved
41/17	26.4	Ash	Blackwells Mills	Preserved
4/37	13.5	Ash	Raritan	South Bound Brook/ State Park
32/16	32.6	Silver Maple	Millstone South	Preserved
64/1	9	Silver Maple	Oxbow	Preserved
20/16	4	Pin Oak	Millstone North	Preserved

Table 21: Forested Tract Candidates for Preservation Franklin Township Woodlands Study - 1986

Coord	Size (ha)	Dominant Species	Forest Name	Protection Status
56/9		Sugar Maple	Simonson's Brook	Preserved
59/10N		Tulip Poplar	Simonson's Brook	Preserved
59/10M		Tulip Poplar	Simonson's Brook	Preserved
59/10S		Red Oak	Simonson's Brook	Preserved
59/10W		Tulip Poplar	Simonson's Brook	Wooded Farm Qualified
Intact Individual Forests				
32/19	28.3	Red Oak	Van Cleef	Partially Preserved
70/1	70.1	Red Maple	Rockingham	Partially Preserved
18/26	9.4	Black Oak	Weston	Wooded Public/Quasi
59/19	7.9	Tulip Poplar	Bunker Hill North	Preserved
11/18	5.4	Red Oak	Alma White	Wooded
16/30	15.2	Pin Oak	Elizabeth	Wooded

Coord	Size (ha)	Dominant Species	Forest Name	Protection Status
71/6D	135.9	Tulip Poplar	Little Rocky Hill	Wooded Farm Qualified
71/6F	36.6	Sweetgum	Princeton View	Wooded Commercial
71/6E	35.8	Sweetgum	Princeton Nurseries	Wooded Farm Qualified
13/33	3.2	Black Oak	Davidson	Wooded Com./Farm Qua
30/23	1.9	White Oak	Grouser Nursery	Wooded Residential
43/30	27.6	Red Oak	Cortelyous North	Wooded Farm Qualified
57/19	19.0	Ash	Shale Brook	Preserved
69/13	3.6	Beech	Old Road	Vacant Woodland
67/10	6.7	Tulip Poplar	Washington	Vacant Woodland
12/21	10.0	White Oak	School House	Wooded Farm
13/32	3.6	Red Oak	New Brunswick	Wooded Commercial
Individual Forests with Encroaching Development				
58/4	3.2	Hickory	Lower Copper Mine	Wooded Residential
61/6	3.0	White Oak	Upper Copper Mine	Wooded Farm Qualified
19/29	29.6	Red Oak	Raritan Brook	Wooded Residential
14/36	2.9	Red Oak	Crown	Vacant Woodland
67/7	1.4	Pin Oak	Georgetown Wedge	Wooded Farm Qualified

* “Ash” would be expected to be white ash (*Fraxinus americana*) in uplands and green ash (*Fraxinus pennsylvanica*) in riparian forests, floodplains and wetlands

Table 22: Franklin Woodlands Developed Since 1986 (2002 and 2016 Air Photo Interpretation)

Coord	Size (ha)	Dominant Species	Forest Name	Development
54/24	33.8	Red Oak	Vliet	Multi-family
14/16	2.0	Black Oak	Weston Canal	Residential
15/38	3.0	Oaks	Cedar Grove	Multi-family
12/27	2.7	Pin Oak	Belmont	Industrial
12/41	5.4	Cedar		Residential
12/26	23.2	Black Oak	Weston	Industrial
18/37	11.4	Ash	Quail Brook Hill	Residential
13/45	3.0	Ash		Educational

9.2.3.2 Forestry Management

The Franklin Township Shade Tree Commission (STC) manages the maintenance and planting of trees on public spaces throughout Franklin. They remove risk trees, provide education, awareness and technical guidance to the community through a newsletter, website and Arbor Day tree plantings.

The STC recently prepared a Community Forestry Management Plan. The six main goals of the plan consist of the following (<http://franklintwpnj.org/home/showdocument?id=4810>):

1. To revive and sustain a robust shade tree program for Franklin Township.
2. To determine the needs for tree planting, tree removals for safety, tree maintenance (pruning) and maintain an effective record keeping system.
3. To implement a hazard tree reduction program to improve tree safety and to extend individual tree vigor/ life expectancy.
4. To plan for and facilitate tree planting in the Township.
5. To have the STC be an advocate for the Township's trees through outreach and educational activities.
6. To encourage and inform residents and elected officials regarding Forest Stewardship Planning and Implementation on public and private forest lands.

Utilizing *i-Tree Canopy* (<http://www.itreetools.org/canopy/>), the Shade Tree Commission worked with the Township's Planning Department to assess the Township's current tree canopy cover. An estimated 39% tree canopy cover was calculated through the i-Tree assessment. Based on this existing canopy cover and various other factors (including the extent of agricultural land, developed land and preserved grasslands), the STC established a tree canopy goal of 42% for the Township.

9.2.3.3 Emerald Ash Borer

The Emerald Ash Borer (*Agrilus planipennis*) is a green jewel beetle native to eastern Asia that feeds on ash species. In its native range, it is typically found at low densities and is not considered a significant pest. Outside its native range, it is an invasive species and is highly destructive to ash trees native to northwest Europe and North America. Emerald Ash Borer was discovered in New Jersey in May 2014 in Somerset County. It was detected in Franklin Township in 2015. Infestations throughout the U.S. and Canada have killed tens of millions of ash trees since 2002. The Township Shade Tree Commission is currently investigating, with the aid of a consultant, the extent of potential exposure within the Township and the appropriate means to address the issue. After the Shade Tree Commission conducts this analysis they will make recommendations to the Township Council on a course of action.

9.2.4 Agricultural Coverage

Under the Land/Use Land Cover Classification System, Agricultural Land includes harvested cropland, inactive cropland (old fields and brush areas), pastureland, orchards, vineyards, nurseries and horticultural areas, and confined feeding operations.

Within Franklin Township, agriculture is generally concentrated within the central portion of the municipality in the protected areas surrounding Six Mile Run and its tributaries, as well as some areas adjacent to the D&R Canal (see Section 11, Figures 12 and 13).

Franklin Township has been an active participant in the State Farmland Preservation Program administered by either the State or Somerset County. Additionally, the Township has preserved several farms on its own. Currently, 30 farms have been permanently preserved within the Township, totaling 1,223 acres. Only the development rights for these properties have been purchased, leaving the land in private ownership to continue in agricultural use. These farms are located on Figure 14. Table 24, below,

identifies the farms within the Township that have been permanently preserved by the Township, County or State via agricultural easements. The table identifies the preserved farms by name and block/lot, identifies the entity responsible for monitoring of the agricultural easement and identifies the acreage of each farm.

In addition to preserved farms, the Township, County and State lease land within the Township to tenant farmers. In total, 2,522 acres of such land within the Township are leased to farmers. The Township leases a number of sites to farmers, totaling 676 acres, with all of these lands consisting of permanently-preserved open space. The County leases a number of sites, totaling 81 acres of County open space for farming. However, the vast majority of the public lands leased for farming is done so by the State with 1,765 acres within the Six Mile Run and the Delaware & Raritan Canal State Parks. More than 3,800 additional acres are farmland assessed based on their agricultural use.

Table 23 identifies common uses of Farmland within Franklin (2005).

Table 23: Dominant Farmland Use in Franklin (2005)

Cropland harvested	Cropland pastured	Permanent Pasture	Unattached woodland	Attached woodland	Equine
49%	6%	9%	23%	12%	<1%

Franklin Township has taken several measures to protect its agricultural resources. In 2000, the Planning Board adopted a Farmland Preservation Plan and incorporated its goals and objectives into the Master Plan (2006). At that time, the Township developed an Agricultural Advisory Committee to rank and evaluate farmland preservation submissions from landowners. In November of 2007, the Township prepared a Comprehensive Farmland Preservation Plan. The Plan was created in response to economic difficulties facing modern farmers and the increasing pressures put upon the agricultural lands of Franklin Township. This plan was updated in 2009 and is currently being updated once again. The plan is currently being updated once again, following the State’s guidelines.

These goals and objectives stated in the Farmland Preservation Plan include the following: maximizing efforts to preserve active farms; preserving prime farmlands; working with willing landowners to develop the best course of preservation; coordinating open space preservation with all appropriate individuals, organizations and agencies; protecting farmland by purchase of development rights, farmland assessment and other effective mechanisms; discouraging the extension of public water and sewer to farmland areas; maintaining open space dedication requirements under cluster options; encouraging on-going dialogue between Township officials and farmers; urging the State to dedicate all viable land to be used for agricultural purposes; developing a wildlife management plan to reduce crop damage; and developing and fostering alternative agricultural opportunities.

Table 24 identifies the current farms within the Farmland Preservation Program within Franklin Township.

Table 24: Farmland Preservation in Franklin

Farm	Block	Lot	Monitored by	Acres
RAJOS/ NEMETH – S. MIDDLEBUSH RD	37.02	46.04	County	75.95
NEGRI ESTATE - SKILLMANS LN	85	20, 65	County	108.91
PEACOS - COPPERMINE RD	9	34, 38, 40	County	65.4
MEADOW GLEN ESTATES/ ADAMS FARM – MARSHALL - CORTELYOUS LN	37.02	2	Township	56.62
CICHOWSKI - BENNETTS LN	85	32	County	37.83
MARSHALL - CORTELYOUS LN	37.02	1.01	County	32.05
GALDI - S. MIDDLEBUSH RD	74.01	9	County	69.29
HARRIS - BENNETTS LN	85	22	State	17.50
MIDDLEBUSH FARMS - BENNETTS LN	85	14.04	County	21.57
JULIUS KISS - RT. 518	10	6.03	County	9.06
KATHLEEN KISS - RT. 518	10	2, 6.04	County	8.5
PERRIN - CORTELYOUS LN	57.01	56	State	6.95
ANDERSON, WEGNER - AMWELL RD	74.01	8.01	County	57.42
MADDEN - OLD GEORGETOWN RD	10	10.03, 10.05	County	18.31
MADDEN - SUYDAM RD	33.01	3.01	County	84.10
LAKE - CEDAR GROVE LN	508.02	10	State	28.56
RIYA - S. MIDDLEBUSH RD	58	9.01, 10.05	State	19.02
CHRIN - OLD GEORGETOWN RD	11.01	23	Township	85.57
SUYDAM - SKILLMANS LN	57.01 85	32.01 62.01	State	141.06
GRIGGSTOWN QUAIL FARM/ QUAIL FARM - CANAL RD & BUNKER HILL RD	20.02	45.03	State	23.30
PAGANO - BENNETTS LN	85	27	Township	7.19
JACKSON, HOLZ, SHIELDS - AMWELL RD	73.01	40	Township	16.77
RANDOLPH - GROUSER RD	59.01	9, 10.02	Township	17.29
FEIBEL-SMITH - OLD GEORGETOWN RD	11.01	24.01	Township	22.67
DUCHAI/ ELVERHIGH - CANAL RD	59.01	3.02	Township	14.65
LISBETH HIGGINS - LAUREL AV	5.02	171	Township	38.10
FRANKLIN TOWNSHIP	58	10.05	Township	13.16
GRIGGSTOWN QUAIL FARM	20.02	45.04	State	24.87
GRIGGSTOWN QUAIL FARM	20.02	45.05	State	25.65
HIGGINS FARM	5.02	26.01	State	75.80
Total				1,223.12

9.3 Open Space

For decades, Franklin Township has demonstrated a commitment to protecting its natural resources and improving the quality of life for its residents. This is evident in the Township studies including water quality and forest studies, and various conservation initiatives and ordinances established by the Township. It is also evident in the Township efforts to protect and acquire open space. In 1999, Franklin Township passed an open space ordinance that accomplished the following:

- Established an Open Space Trust Fund.
- Established a funding mechanism to assist in property acquisition, easements and development rights for preservation of open space, farmland preservation parcels, and historic properties through a special tax.
- Established an Open Space Advisory Committee to prepare an Open Space Plan and to oversee open space acquisition and park development activity in the Township.

To date, the Township has preserved a total of 2,449 acres as permanent open space and parks. In addition, a total of 30 farms, totaling 1,203 acres, have been permanently preserved within the Township by the State, County or Township. Under farmland preservation, the development rights of the properties are purchased, leaving the land in private ownership to continue in agricultural use, but precluded from additional development. As a result of these efforts and the establishment of State and County parks within the municipality, Franklin Township contains significant areas of preserved open space. State-owned open space includes the D&R Canal and Six Mile Run Reservoir Site (see Section 11, Figure 14). Somerset County owned property includes Colonial Park, 651 acres consisting of wooded tracts, gardens, a pond, and a golf-course. In addition to this parks there are various municipally preserved natural areas and areas under farmland preservation within Franklin. These include the Ten Mile Run Greenway/NegriNepote Grassland Preserve and Griggstown Native Grassland Preserve (see below). A summary of the preserved open space within Franklin Township is included in Table 25. See Section 11, Figure 14, Preserved Land

Table 25: Open Space in Franklin Township (2019)

Land Type	Acres
State-owned preserved	4,803
County-owned preserved	1,229
Township-owned Preserved	2,449
Farm Preserved	1,203
Historic Preserved	5
Conservation Easement	222
Private- Non-Profit Preserved	88
Total Acres Preserved	9,999
Percent of Township	34%

Significant Open Space Natural Areas within Franklin:

Six Mile Run Reservoir Site

Six-Mile Run was originally purchased by NJDEP in 1970 for its potential as a reservoir location. The site was transferred to the Division of Parks and Forestry in 1993. Six Mile Run is a 3,037 acre complex of farm fields, old fields and riparian forest. The site is historically significant and is host to a number of 18th Century Dutch farmhouses (see Section 2.2). The patchwork of vegetation communities provides ideal habitat for a number of migrating and nesting bird species.

Potential breeding bird species onsite include grasshopper sparrow, blue grosbeak, meadowlark, wild turkey, eastern bluebird, blue-gray gnatcatcher, warblers including the black and white warbler, American redstart and common yellowthroat, rose-breasted grosbeak, Baltimore and orchard orioles, and white-eyed vireo.

Delaware and Raritan Canal State Park

The D&R canal consists of the 36 mile canal and 22 miles of feeder canal. Construction of the D&R Canal began in 1830. The Canal extended between Bordentown near the Delaware River to New Brunswick along the Raritan River and was designed to provide safe and efficient shipping of goods between the cities of Philadelphia and New York. The feeder canal extends along the Delaware River from Bull's Island to Trenton.

The D&R Canal parallels the Millstone River along the western border of Franklin and then extends southeast along Franklin's northern border, continuing into New Brunswick past Mile Run. The State Park extends throughout this length, terminating within the vicinity of Mile Run before the Route 27 Bridge. The park property is generally 800 to 1000 feet wide along the western border of Franklin and narrows considerably along Franklin's northern border (see Section 11, State Open Space)

In addition to its historical significance, the D&R Canal is an important natural resource. The entire park serves as an important wildlife corridor for facilitating the recruitment and movement of wildlife populations between habitat areas. Much of the park's habitat within Franklin includes areas of floodplain forest dominated by red and silver maple, pin oak and green ash, with some patches of upland forest. Additionally, patches of emergent wetland are found between the Canal and the Millstone River in Franklin.

Significant wildlife habitat for breeding bird species is found throughout the D&R Canal in Franklin. Wood duck, screech owl, great horned owl, eastern phoebe, great crested flycatcher, purple martin, kingbird, northern rough-winged swallow, red-eyed vireo and wood thrush are among the confirmed breeding birds at D&R Canal State Park within the vicinity of Franklin Township (Leck and Holms, 1993).

The Delaware and Raritan Canal Commission

The Delaware and Raritan Canal Commission was created in 1974 with the purpose of reviewing, approving or modifying any action within the park, aiding in park planning and administering a regulatory program that will protect the park from development impacts.

The Commission reviews activities potentially impacting the park. The regulatory area or review zone consists of areas that could have a drainage-oriented, visual or other impact on the Canal Park. The Review Zone is approximately 400 square miles incorporating parts of Hunterdon, Somerset, Middlesex, Mercer, and Monmouth counties. All of Franklin Township falls within the D&R Canal Commission Review Zone. The Review Zone is subdivided into two sub zones - Zone A and Zone B. Zone A is comprised of a 1,000 foot buffer from the park. Zone B represents the remaining balance of the review zone. Review protocols differ between the two subzones as described in the Regulations for the Review Zone of the Delaware and Raritan Canal State Park (N.J.A.C 7:45). In particular, the review protocols differ depending upon whether the activity qualifies as a "major" or "minor" development.

”Major” developments are those that involve: cumulative coverage of one quarter acre of land with impervious surface; the disturbance of one acre or more of land; in Zone A, any structure with a height greater than 40 feet above existing grade; or, the disturbance of one half acre or more of existing impervious surface or significantly disturbed areas, for the purposes of construction, if the project site either drains into the Canal or is located within a drainage area of a water course that discharges into the Canal from the point where the water course enters into the Canal up to the point at which the water course drains less than 50 acres, including drainage areas of any tributary to those water courses up to the point at which the tributary drains less than 50 acres. A “Minor” project is a project that is not a “Major” project.

In Zone A: each Major project is reviewed for visual, historic and natural quality impact, for stormwater runoff and water quality impact, for stream corridor impact, and for traffic impact; each Minor project is reviewed for visual, historic and natural quality impact, and for stream corridor impact; and any Minor project that will result in 800 square feet or more of impervious surface is reviewed for stormwater runoff and water quality. In Zone B: each Major project is reviewed for stormwater runoff and water quality impact, and for stream corridor impact; and any Major project within one mile of any portion of the Park and having direct access to a road that enters Zone A is reviewed for traffic impact. Only Major projects are reviewed in Zone B.

For additional information on Commission regulations, visit the Commission website at www.dandrcanal.com/drc/regulatory.html.

Negri-Nepote Native Grassland Preserve

The Preserve was formed in 2003-04 as the result of a partnership between the Township and the New Jersey Audubon Society. The Negri-Nepote Native Grassland Preserve is part of the Middlebush Greenway located between Skillmans Lane to the east and Bennetts Lane to the north. The site consists of 111 acres of grassland and an additional 53 acres of woodland.

Funding from the US Fish and Wildlife Service and US Department of Agriculture has led to the establishment of native grassland onsite. Habitat restoration for the site involved the planting of warm season grasses including Canada wild-rye, little bluestem, big bluestem, Indian grass and sideoats gramma. Wildflower plantings onsite include heath aster, black-eyed susan, coneflower, wild bergamot, butterflyweed, common milkweed, spiked grayfeather, wild blue lupine, purple Joe-pye weed and blue vervain. In addition, a 2.5 acre wetland and vernal habitat (see Appendix B, Photos) was created on the site in 2005.

Sensitive wildlife species observed on the site include the grasshopper sparrow, Bobolink, Eastern meadowlark and American kestrel (NJAS, 2007).

Griggstown Native Grassland Preserve- Ten Mile Run Greenway

Like Negri-Nepote, the Griggstown Native Grassland Preserve was formed as the result of a partnership between NJ Audubon and Franklin Township. The Griggstown Native Grassland Preserve is the western portion of the 685 acre Ten Mile Run Greenway. The property is situated between Simonson Brook to the North and Coppermine Road to the South. The site contains approximately 102 acres of grassland and open field and 583 acres of woodland. As with the Negri-Nepote site, native grasslands on the site were restored. The site contains big bluestem, Indian grass, sideoats gramma, Virginia wild rye, and eastern gama

grass. Blue vervain, purple cornflower, common sneezeweed, and black-eyed susan are among the common wildflowers present at Griggstown.

Sensitive wildlife species identified onsite include the grasshopper sparrow, bobolink and American kestrel. Short-eared owls have been identified onsite during winter months (NJAS, 2007).

Bunker Hill Natural Area –Ten Mile Run Greenway

The municipally owned Bunker Hill Natural Area is approximately 214 acres. The site is located off of Bunker Hill Road. The Bunker Hill Natural Area forms the eastern end of the Ten-Mile Run Greenway. A unique feature of the natural area is the cliff along Ten Mile Run stream (see Appendix B, Photos). The hardwood forest canopy consists of red oak, American beech and tulip poplar. Forested wetland areas are dominated by red maple and pin oak. Marsh areas contain swamp hibiscus, cattail, buttonbush, tearthumb and tussock sedge. Some areas of successional forest dominated by red cedar and gray birch may also exist within the Bunker Hill Natural Area (NJAS, 2007).

Bunker Hill Environmental Education Center –Ten Mile Run Greenway

This approximate 96 acre municipally owned site consists of mature mixed hardwood forest (Graeber Woods), emergent marsh, forested and shrub wetlands, vernal habitats and successional forest. The site is good for observing forest interior bird species such as wood thrush, oven birds, vireos, scarlet tanager, and warblers including nesting blue-winged warbler. Small conifer stands onsite provide shelter to owl species (see Appendix B, Photos) (Max DeVane, ASGECI). The forested wetlands include vernal habitats that provide breeding habitat for wood frogs. Other amphibians including spring peeper, pickerel frog, green frog, two-lined salamander and red-backed salamander may be observed at the education center. The center contains a hiking trail that winds through the various vegetation communities onsite.

William L. Hutcheson Memorial Forest

Hutcheson Memorial Forest has been recognized by the National Park Service Registry of National Natural Landmarks since 1976. A portion of the forest (Mettler's Woods) is considered one of the last primeval forests in the Northeast and has been a site for forest research for over 50 years. The forest has been the subject site of over 250 scientific publications. The forest was first acquired by Dutch Settlers in 1701 and established in 1955 with the purpose of preserving the old growth forest and to study the ecology of the site. The Buell-Small Succession study has continued at the site since 1958 and is critical in studying the relationships of species surrounding ecological succession. The site is currently administered by Rutgers University and there are regularly scheduled tours of the forest conducted by school faculty.

The old portions of the forest have not been cut for at least 300 years and the soil has never been tilled. The average age of a canopy tree is 235 years while some trees exceed 300 years. This unique pristine condition has given scientists an opportunity to clearly compare differences between the relatively undisturbed soil, plant and animal communities in Hutsheson with the surrounding woodlands; all of which have been plowed or otherwise disturbed.

Within the old growth forest, white oak is the dominant canopy species, followed by red and black oaks, and pignut hickory. Other less common species include sugar maple, red maple, American beech, white ash, Norway maple, pin oak, black gum. The understory is dominated by flowering dogwoods of 35 to 40 feet (Collins and Anderson, 1994). Mayapple (Spring) and enchanter's nightshade (Summer) are the most common forest floor herbs.

The old forest is surrounded by 70 hectares of younger forest and successional fields in varying stages. Species within the successional areas include Canada goldenrod (*Solidago canadensis*), rough stemmed goldenrod (*S. rugosa*) and other *Solidago* species, NY ironweed (Leck and Leck). Successional woody species include black cherry, eastern red-cedar and flowering dogwood. The understory, however, has been much affected by overbrowsing by deer and an effort is currently underway to exclude deer by fencing.

For additional information on William L. Hutcheson Memorial Forest, visit the Rutgers University website rci.rutgers.edu/~hmforest/.

Community Gardens: Naaman Williams Park & Pine Grove Manor School

Vegetable Garden plots (Sponsored by the Franklin Township Environmental Commission) are available in both the Naaman Williams Park and Pine Grove Manor School Community Gardens. In keeping with current "green" farming methods, the goal is to have garden users employ environmentally sensitive growing and recycling methods to include limited use of pesticides and other toxic chemicals. Sign up for either garden is on a first come first served basis. These 8 feet by 14 feet plots (one per family) are free to Franklin Township residents. Another community garden, sponsored by Community Lutheran Church, is located at 1640 Amwell Road.

10.0 WILDLIFE

10.1 Fisheries

10.1.1 Anadromous Species

River herring (alewife, *Alosa pseudoharengus* and blueback herring, *Alosa aestivalis*), and the American shad (*Alosa sapidissima*) are important species that have supported one of the oldest documented fisheries in North America. These species are anadromous, referring to their spawning migration upriver from the sea. They are vital in marine ecosystem food webs; providing food for larger and economically important predatory species such as striped bass (*Morone saxatilis*), itself another anadromous species.

The lower Raritan River is considered a migratory pathway for anadromous species including the American shad (*Alosa sapidissima*), "River herring" including blueback herring (*Alosa aestivalis*) and alewife (*Alosa pseudoharengus*) and striped bass (*Morone saxatilis*). American shad fisheries are recovering in the Raritan River and the species has been reported in recent years to migrate approximately 6 miles upstream from Raritan's confluence with Green Brook (to the Nevius Street Dam). Anadromous clupeid (herring) spawning runs have been confirmed as far upstream as the Nevius Street Dam in Raritan Borough (NJDEP, 2005).

Both river herring and American shad have been identified in the Millstone River at the Weston Causeway dam in Manville (Zich, 1978; NJDEP, 2005).

Striped bass are found in the interior parts of Raritan Bay in the early spring and seem to migrate towards the mouth as the season progresses. Their numbers have been increasing in recent years and they may be

expected to be found through the Raritan River near Franklin Township. Striped bass have also been reported as far upstream as the Nevius Street Dam in Raritan Borough (NOAA, 2006).

The development of dams and other impoundments affects the ability of these species to migrate and spawn successfully. Fish ladders, structures that allow fish to migrate around impoundments, sometimes help these fish to successfully spawn in upstream waters. In-water work that may temporarily impede anadromous species pathways in Franklin may be subject to timing restrictions established by the NJDEP between March 1 and June 30.

10.1.2 Freshwater Fisheries

NJDEP has conducted surveys of several lakes and streams within or near Franklin Township. These surveys include the Fish Index of Biotic Integrity (FIBI) for streams. The following freshwater species have been identified during these surveys:

Common Name	Latin
pumpkinseed sunfish	(<i>Lepomis gibbosus</i>)+#
green sunfish	(<i>Lepomis cyanellus</i>)*+#
bluegill	(<i>Lepomis gibbosus</i>)+
bluespotted sunfish	<i>Eleacanthus gloriosus</i>)
redbreast sunfish	(<i>Lepomis auritis</i>)*+#
largemouth bass	(<i>Micropterus salmoides</i>)+#
tesselated darter	(<i>Etheostoma olmstedii</i>)*+#
redfin pickerel	(<i>Esox americanus</i>)#
yellow bullhead	(<i>Ameiurus natalis</i>)*#
brown bullhead	<i>Ameiurus nebulosus</i>)*
white sucker	(<i>Catostomous commersoni</i>)*+#
banded killifish	(<i>Fundulus diaphanus</i>)*+#
longnose dace	(<i>Rhynchthys cataractae</i>)*+#
blacknose dace	(<i>Micropterus salmoides</i>)*+#
spottail shiner	(<i>Notropis hudsonius</i>)*+#
common shiner	(<i>Notropis cornutus</i>)*+
satinfish shiner	(<i>Notropis analostanus</i>)*+
swallowtail shiner	(<i>Notropis procne</i>)+#
golden shiner	<i>Notemigonus crysoleucas</i>)*+
fallfish	(<i>Semotilus corporalis</i>)*
creek chub	(<i>Semotilus atromaculatus</i>)*#
American eel	(<i>Anguilla rostrata</i>)*+#

* Species identified in Green Brook (8-26-04)

+ Species identified in Middle Brook (7-10-03)

Species identified in Six Mile Run (6-10-02)

The following are additional species potentially existing within the surface waters of Franklin:

black crappie	(<i>Pomoxis alularis</i>)
white crappie	(<i>Pomoxis nigromaculatus</i>)
fathead minnow	(<i>Pimephales promelas</i>)
common carp	(<i>Cyprinus carpio</i>)
goldfish	(<i>Carassius auratus</i>)
creek chubsucker	(<i>Erimyzon oblongus</i>)
chain pickerel	(<i>Esox niger</i>)
mummichog	(<i>Fundulus heteroclitus</i>)
channel catfish	(<i>Ictalurus punctatus</i>)
yellow perch	(<i>Perca flavescens</i>)

Data collected from the FIBI Monitoring Network sample point locations measure the health of the stream based upon multiple attributes of the resident fish assemblage. A stream or water body's FIBI score and rating is based on the deviation from reference conditions and may be classified as either "poor" (10-28), "fair" (29-36), "good" (37-44) or "excellent" (45-50). Results of stream testing within the vicinity of Franklin are listed in Table 26.

Table 26: Fish Index of Biotic Integrity for Streams near Franklin (2000-2005)

FIBI ID/Name	Location	Round 1	Round 2	Round 3
022 Six Mile Run	S Middlebush Road, Franklin	36 - fair (2000)	34 - fair (2005)	36 - fair (2011)
013 Heathcote Brook	Academy St, S. Brunswick	40 - good (2000)	32-fair (2005)	40 - good (2010)
015 Mile Run	Rt 527, New Brunswick	34 – fair (2000)	36-fair (2005)	34 - fair (2010)
091 Green Brook	Rt 28., Middlesex Boro	36-fair (2004)	22 - poor (2009)	n/a
014 Royce Brook	Rt. 533 Manville Boro	40-good (2000)	26- poor (2005)	40-good (2010)
072 Middle Brook	Talmadge Ave, Bound Brook Boro	38-good (2003)	32 - fair (2008)	n/a

10.2 Endangered and Threatened Wildlife Species

Endangered species are those whose prospects for survival in New Jersey (State-listed), or nationally (Federally-listed), are in immediate danger because of a loss or change in habitat, over-exploitation, predation, competition, disease, disturbance or contamination. Assistance is needed to prevent future extinction. Threatened species are those that may become endangered in New Jersey (State-listed) or nationally (Federally-listed) if conditions surrounding them begin or continue to deteriorate.

The New Jersey Natural Heritage Program (NJNHP), NJ Landscape Project mapping (Section 10.3) and U.S. Fish and Wildlife Service (FWS) resources were reviewed (Appendix C) as part of the preparation of this ERI. Data from Landscape Mapping and the Natural Heritage Program indicate records of six State threatened or endangered species within the municipality. The U.S. Fish and Wildlife Service website identifies an historic record of the Federally-threatened bog turtle (*Glyptemys muhlenbergii*) in Franklin Township. These species are discussed in Section 10.4 below.

10.3 The Landscape Project

In 1994, the NJ Division of Fish, Game and Wildlife's Endangered and Nongame Species Program (ENSP) adopted a landscape level approach to rare species protection called the Landscape Project. The Landscape Project has been designed to provide peer reviewed, scientifically sound information that is easily accessible and can be integrated with planning, protection and land management programs at every level of government – State, county and municipal, as well as nongovernmental organizations and private landowners. The ENSP has developed landscape maps that identify critical rare species habitats based on land use classifications, documented rare species locations and habitat models linked to each of the rare, threatened or endangered species. The habitat patches are then assigned a Rank of 1 through 5, based on the status of the species present as follows:

- Rank 5: Presence of one or more Federally - listed threatened or endangered species.
- Rank 4: Presence of one or more State - listed endangered species.
- Rank 3: Presence of one or more State - listed threatened species.
- Rank 2: Presence of one or more occurrence of non-listed State priority species.
- Rank 1: Habitat patches with minimum habitat specific suitability size requirement for threatened or endangered or priority species, but do not intersect with any confirmed occurrence.

These maps and overlays provide a basis for proactive planning, such as the development of local habitat ordinances, zoning to protect critical habitat, management guidelines for rare species protection on public and private lands and prioritizing land acquisition projects. By combining critical area maps with other GIS layers such as roads, development and publicly-owned lands, important areas in need of protection can be easily identified. Incorporation of this information early in the planning process results in less conflict, less time wasted, and less money spent attempting to resolve endangered and threatened species issues.

The highest priority rank will be the one that appears on the Landscape Project Maps, meaning that a higher ranked area could include additional species that would otherwise be mapped under a lower rank category.

NJDEP Landscape Mapping identifies extensive areas of forest, wetland and grassland habitat in Franklin Township ranging from Rank 1 to Rank 4. Rank 3 forest and forested wetland is situated along much of the Six Mile Run corridor and its tributaries and adjacent upland forests; and within D&R Canal State Park between Griggstown and Blackwells Mills (Section 11 Landscape Mapping). Rank 2 emergent wetland is primarily situated along the headwaters tributaries of the Six Mile Run. These wetland areas are Rank 2 for herptile priority species, primarily the box turtle. Extensive Rank 4 landscape mapping for grassland is identified between Six Mile Run to the north and Ten Mile Run to the south. This habitat is Rank 4 due to

the presence of the State endangered vesper sparrow. Other listed species identified in the Rank 4 grassland patches also include the State threatened bobolink and grasshopper sparrow.

The Landscape Project has separate mapping coverage for the wood turtle (*Glyptemys insculpta*) and identifies habitat for the species along a section of the D&R Canal State Park and Millstone River starting approximately 1/2 mile south of Blackwells Mills and extending southward for approximately two miles. Portions of Ten Mile Run and Simonsons Brook have been identified as wood turtle habitat.

Table 27 identifies rare, threatened and endangered species that are identified through the Natural Heritage Database and the Landscape Project.

Table 27: NJDEP Identified Threatened and Endangered Species in Franklin

Common Name	Scientific Name	Status	Documentation/Notes
Bald eagle (foraging area)	<i>Haliaeetus leucocephalus</i>	E*	NHP
Bobolink	<i>Dolichonyx oryzivorus</i>	T	NHP Landscape
Vesper sparrow	<i>Poocetes gramineus</i>	E	NHP Landscape
Grasshopper sparrow	<i>Ammodramus savannarum</i>	T	NHP
Wood turtle	<i>Glyptemys insculpta</i>	T	NHP Landscape
Red-Shouldered hawk	<i>Buteo lineatus</i>	T E (Breeding)	++
Spotted turtle	<i>Clemmys guttata</i>	SC	NHP
Eastern Box turtle	<i>Terrapene carolina</i>	SC	NHP Landscape
Fowler's toad	<i>Bufo woodhousii fowleri</i>	SC	NHP Landscape
Northern copperhead	<i>Agkistrodon contortrix</i>	SC	NHP Landscape
Great blue heron	<i>Ardea herodias</i>	SC (Breeding)	NHP
Triangle floater (mussel)	<i>Alasmidonta undulata</i>	T	NHP Landscape (1/2 mile)

E = State Endangered; T = State threatened; SC; Species of Special Concern; S = Stable

Federally protected under Bald Eagle Protection Act of 1940 (16 U.S.C. 668-668d, 54 Stat. 250) as amended.

++ Not identified through NHP or Landscape data, however the species has been officially reported to the State, and NJDEP has acknowledged records in Franklin Township.

10.4 Rare, Endangered and Threatened Animal Species

Bald Eagle

Although recently delisted by the US Fish and Wildlife Service, the Bald Eagle is still Federally protected under the Bald Eagle Protection Act of 1940 (16 U.S.C. 668-668d, 54 Stat. 250) as amended.

Bald eagles build their nests in large trees (coniferous or deciduous) along forest edges, in woodlots or in forest near large bodies of water, where the species forages (Heintzelman, 1970; NJDEP, 1995). Nest stands were a minimum of 20 acres in Virginia (Cline, 1993). In the Chesapeake Bay area, nest trees averaged 75 feet in height and 24.8 inches in diameter (Andrew and Mosher, 1982). Large bodies of water such as rivers, lakes, and estuaries are favored over smaller ones (NJDEP, 1994).

Despite recent population increases, evidence of eggshell thinning, infertility, and chick mortality from contaminant exposure is still a persistent threat to the recovery efforts of the bald eagle (Paturzo *et al.*, 1998). Environmental contaminants such as DDT (and its analogs), PCBs, and heavy metals such as mercury, cadmium, and arsenic can be bioaccumulated through the food web. Logging of nest and roost site stands threatens to eliminate nest and roost trees, which are often very limited in the landscape. Increasing suburban sprawl and disturbance from various types of human activity also threaten bald eagles, which are generally very sensitive to human disturbance.

Landscape Mapping does not identify bald eagle habitat within Franklin Township, however the species is noted in Natural Heritage Project correspondence (Appendix C) and records of nesting have occurred in the vicinity of Carnegie Lake approximately 2 miles south of Franklin. Suitable foraging habitat includes certain sized forests and wetlands within an approximate 1.6 km radius of the nest. Wet farm fields and other modified wetlands are sometimes included in this buffer.

For the species protection, exact locations are not provided. The USFWS recommends a 150-foot buffer be established along forested wetlands and uplands to protect foraging and roosting sites. The Service may also recommend a seasonal restriction on project activities between December 15 and July 31st for activities beyond the 150-foot buffer. For additional information on the bald eagle and for waivers of seasonal restrictions, contact the NJDEP Endangered and Nongame Species Program at (609) 628-2103.

Grassland birds

The Landscape Project confirms the presence of bobolink, vesper sparrow and grasshopper sparrow within agricultural areas between Six Mile Run to the north and Ten Mile Run to the south. Landscape mapping indicates the presence of Rank 4 grassland bird habitat within this area. A section of the mapped grassland between an upstream portion of Cross Brook and Ten Mile Run has been recently altered by residential development. Much of the area between Jaques Road and Six Mile Run is State-owned agricultural property consisting of hayfields and is periodically rotated, creating highly suitable conditions for grassland birds. Agricultural areas immediately north of Six Mile Run are listed as Rank 2 grassland for bird priority species and herptile priority species. The grasshopper sparrow, and the bobolink (in migration) have been identified in the Griggstown Native Grassland Preserve. The grasshopper sparrow and vesper sparrow have been identified on the Negri-Nepote Grassland Preserve. Both grasshopper and vesper sparrows have been reported in a field at the intersection of Suydam and Canal Roads. In addition, a recent vesper sparrow sighting was reported near the Six Mile Run headquarters near Canal Road.

Vesper Sparrow

Like the savannah sparrow, this bird occupies open areas and grasslands throughout North America. It would typically be found in extensive agricultural areas with rolling topography. It prefers agricultural habitats with a mixture of short grasses, taller vegetation and areas of bare soil. Its foraging and nesting habits are similar to the savannah sparrow; however this species is particularly sensitive to agricultural practices such as pesticide use and heavy tilling and populations may be declining as a result (Jones and Cornely, 2002).

Grasshopper Sparrow

Grasshopper sparrows are grassland breeders utilizing pastures, hayfields and old field habitats and other agricultural areas and airports where vegetative conditions are correct. Grasshopper sparrows may utilize small

grasslands but prefer extensive open areas of over 100 acres (Beans and Niles, 2003). The species feeds on seeds and a variety of invertebrates including insects and earthworms. As with the savannah sparrow, the grasshopper sparrow had inadvertently benefited from the ditching and filling of coastal wetlands and abandoned coastal areas as these practices were ended. Grasshopper Sparrows breed at Negri-Nepote, Griggstown and the field along South Middlebush Road north of Cortleyous Lane.

Bobolink

The bobolink habitat in New Jersey includes extensive open hayfields, pastures and meadows of minimally 5 to 10 acres. Low intensity agricultural areas such as hayfield and pastures are utilized for breeding (Beans and Niles, 2003). Breeding microsites typically include areas of tall and dense vegetation. After breeding, in late June and early July, bobolinks occupy freshwater and coastal marshes for several weeks while molting (Beans and Niles, 2003). Currently, agricultural and open habitat loss is the biggest threat to the bobolink, and the transition of pastures and agricultural areas to urbanized areas has certainly led to the disappearance of breeding individuals within the county.

Bobolink populations are declining due to the increased early mowing of hayfield and increased development. Partnerships with the farming community may greatly increase their breeding success (Walsh *et al*, 1999). There is a connection between wetlands that are flooded or too dry and the success of this species. Potential habitat for the species would exist within any open wet portions of the agricultural fields in central Franklin Township. Bobolinks are believed to have bred at Negri-Nepote this year.

American Kestrel

American Kestrel breeds at Negri-Nepote and bred at Griggstown.

Wood Turtle

Wood turtles are a highly terrestrial turtle and utilize a variety of habitats including open or forested floodplains, wet meadows and forested wetlands with emergent or shrubby vegetation and streams and creeks. Although wood turtle activity often occurs in wooded and marshy stream corridors, turtles may travel well into a variety of atypical upland areas including woodlots, meadows and agricultural fields, particularly after warm spring and summer rains. In addition to berries, mushrooms and green plants, these omnivorous turtles feed on a variety of small animals including fish, frogs, tadpoles, soft bodied invertebrates and carrion.

Wood turtle wetland habitats are often associated with streams over 10 feet in width and at least one foot deep, which they utilize for mating and hibernating. Hibernacula occur directly within streams, often in an undercut stream bank with a submerged root system. In the spring, wood turtles lay eggs in uplands adjacent to their wetland habitats in areas typically containing loose sand or dirt. Upland habitats required for breeding must be considered when determining the full habitat requirements for this species (NJDEP, 2004).

The wood turtle is highly dependent on high quality riparian habitats. Habitat loss and stream degradation from development has significantly reduced wood turtle populations in New Jersey and the species was listed as threatened by the NJ Division of Fish and Wildlife in 1979. Although considered globally stable, several northeastern states have reported wood turtle population declines and the effects of predation and disturbance on the turtle's reproductive success and juvenile mortality remain a concern in New Jersey (Beans and Niles, 2003).

The riparian /floodplain forest of Ten Mile Run and portions of the adjacent agricultural fields west of Hasbrouck Road and lower Simonson's Brook are identified as wood turtle habitat by NJDEP Landscape Mapping. In addition, a forested section of D&R Canal State Park has been identified as containing wood turtle habitat. Recent studies of the Simonson's Brook area confirmed the presence of wood turtle habitat, however no individuals were found.

Triangle Floater

Freshwater mussels are bivalve mollusks related to the more familiar marine mussels. Freshwater mussels are important sources of food for a wide variety of aquatic or semi-aquatic wildlife including ducks, herons, muskrats, otters, raccoons and predatory fish. They also may improve water quality as they act as natural stream filters; straining particles from waterbodies as they feed on plankton, algae, diatoms and organic matter. Many species of freshwater mussels are extremely intolerant of pollutants and are accurate indicators of water quality (Beans and Niles, 2003). As a result of stream pollutants, habitat loss and the introduction of exotics such as the Asian clam, freshwater mussel populations have been severely impacted and the mussel superfamily *Unionoidea* is among the most endangered taxonomic groups of animal species. One in 10 of North America's mussels are now considered extinct with 75% of the remaining species considered rare or imperiled (Sawhill, 1992).

The triangle floater has been identified in the Millstone River south of Carnegie Lake and is identified to be within 1/2 mile of Franklin Township by the Natural Heritage projects. The triangle floater is a generalist mussel found in a wide variety of river habitats. As with many mussels, its larvae feed on the blood of host fish, which in the case of the triangle floater, is thought to be blacknose dace (Beans and Niles, 2003).

Additional Federally-listed Species

Although not necessarily occurring within the Township, portions of Franklin may be subject to restrictions for two Federally listed species, the Indiana bat (*Myotis sodalis*- Federally endangered) and the bog turtle (*Glyptemys muhlenbergii* - Federally threatened). The species and associated USFWS regulations are briefly described below. For more information on bog turtle/Indiana bat restrictions and guidance, contact the New Jersey office of the U.S. Fish and Wildlife in Pleasantville at (609) 646 – 9310 X 12.

Indiana Bat

Between April and August, Indiana bats inhabit upland forests, floodplains and riparian forests of northern New Jersey. The bats roost under loose bark of forest trees during the day. Dead trees or trees with flaky bark such as the shagbark hickory are of particular importance for summer roosting habitat. Other important tree species include bitternut and pignut hickories, sycamore, red oak, white oak, sugar maple, white ash, and cottonwood. One study (Garner and Gardne, 1992) found that 75% of the roost trees were in uplands while the remaining 25% were in riparian habitats. Roost trees also typically have southern sun exposure and are found in forest clearings or edges.

At night in the summer, Indiana bats forage for insects around streams, lakes and reservoirs. Trees in the riparian floodplains are a particularly important part of the foraging habitat. Other forage areas include above the forest canopy, over early successional clearings, over croplands, pasture and other agricultural areas.

Around August, the bats begin to congregate around the hibernacula and build up fat reserves for their winter dormancy (Harvey, 1992). Hibernacula are naturally occurring caves and abandoned mine shafts. There are only two known Indiana bat hibernacula in New Jersey, both of which are in Morris County. From 1975 to 1995, the Indiana bat population dropped from more than 120,000 to approximately 20,000 individuals (USFWS 2001). Threats to Indiana bats include destruction of hibernating and maternity colonies; vandalism or sealing of hibernacula; forest fragmentation and other habitat loss; and use of pesticides and other environmental contaminants. Because Indiana bats utilize relatively few hibernacula and concentrate in large colonies that may number in the tens of thousands, a single catastrophic event such as a disease outbreak could have significant impacts on the entire population (Beans and Niles, 2003).

Because the Indiana bat hibernacula is within 25 miles of Franklin Township, the USFWS may request a tree clearing timing restriction from April 1 to September 30 and has in the past mandated timing restrictions for the Indiana bat within Franklin Township. Under certain circumstances, the USFWS may request forest data including photos, project description, tree sizes, and other information to determine if the timing restriction is required or if a survey is required.

Bog Turtle

The Bog Turtle is the smallest turtle in the United States with a mature shell length of 10 cm. This wetland species forages for a wide variety of foods including insects, slugs, worms and berries. The bog turtle produces small clutches of eggs in clump grasses and sedges.

The habitat for the Bog Turtle includes spring-fed sunlit marshy meadows, spring seeps, bogs, and fens, usually with shallow slow-moving water (Conant 1975; Behler and King 1997). Vegetation can include cattails (*Typha latifolia*, *T. angustifolia*), tussock sedge (*Carex stricta*), other sedge species, rushes (*Juncus spp.*), bulrushes (*Scirpus spp.*), spikerushes (*Eleocharis spp.*), jewelweed (*Impatiens spp.*), alders (*Alnus spp.*), skunk cabbage (*Symplocarpus foetidus*), arrow-leaved tearthumb (*Polygonum sagittatum*), rice cut-grass (*Leersia oryzoides*), and other open canopy wetland species (Cromartie, *et al.* 1982). Bog Turtles utilize soft mucky substrates for basking and hibernation; an interspersal of wet and dry areas within sites, often with the presence of muskrat and meadow vole runways; a mosaic of habitats present such as uplands, shallow water and muck, and deeper water; and a largely open canopy, with scattered areas of shrubs and small trees (USFWS, 1997).

The sensitive wetland habitats of Bog Turtles are highly susceptible to hydrological changes from development and ditching. Illegal collection and invasive species have also impacted populations.

In New Jersey Bog Turtle populations are currently documented throughout portions of northern and central New Jersey and in Gloucester and Salem Counties in the southernmost portion of the State. Although the species has not been recently documented within Franklin Township, the municipality does have a historic record of Bog Turtle presence. As a result, USFWS may require habitat analysis (Phase I) and or Bog Turtle visual/trapping surveys (Phase II or Phase III) by a USFWS recognized qualified Bog Turtle surveyor for activities potentially impacting Bog Turtle habitat.

Additional Wildlife Species

Additional species including the short-eared owl (*Asio flammeus*, State-threatened breeding), American kestrel (*Falco sparverius*, Special concern; listing pending), and Northern harrier (*Circus*

cyaneus, State-endangered breeding) have all been identified utilizing the grasslands in the vicinity of NegriNepote and Griggstown. These species may be expected to occur elsewhere within the municipality's grasslands and open agricultural areas. The short-eared owl and Northern harrier are likely seasonal visitors, however, it is much more likely that the American kestrel breeds within the municipality. Kestrels are cavity nesters that regularly utilize properly designed and located nest boxes.

While regulatory issues regarding wildlife typically focus on threatened and endangered species, it is important to consider the diversity of Special Concern and/or non-listed wildlife existing in the natural communities of Franklin Township. Often, the presence and diversity of these non-listed species is a significant indicator of overall habitat quality. Furthermore, there are indications that some of these species, while not officially listed, are becoming increasingly uncommon within our region. Appendix A of this report provides a checklist of terrestrial vertebrate species potentially existing within Franklin Township. In addition to the common species identified, some of the checklist species are historically located within the county while others species would only be represented by occasional transients.

The numbers and diversity of neotropical migrant bird species are important factors in determining the health of a forest. Neotropical migrant bird species are those species that breed in temperate North America and migrate south to overwinter in the Carribean Islands, Mexican lowlands, and Central and South America. Most species are insect eating passerines and other songbird species of the forest interior (Bradshaw, 1992). Species include warblers, thrushes, orioles, tanagers, grosbeaks, vireos, hummingbirds, flycatchers, swallows and swifts. Forest loss or fragmentation in the Northeast, and increasing losses of wintering habitat in the tropics threaten many neotropical migrant species (Rich and Dobkin, 1994). Diversity of forest interior neotropical migrant species in a forest has been correlated to the size of the tract (Robbins *et al.* 1989). Changes in forest structure and introduction of opportunistic edge species such as cowbirds impact forest bird populations.

A number of neotropical and forest interior species including warblers, vireos, flycatchers and rose-breasted grosbeak have been identified in Franklin (see Section 9.4). Many large forested areas could be surveyed for forest interior bird species to determine if any additional species are breeding within the Township. Areas containing breeding neotropical migrant bird species should be of particular concern for preservation and management. Forested areas may also serve as corridors for a variety of neotropical migrants during their migration. Throughout the State of New Jersey, increasing white-tailed deer populations have impacted the quality of forest understories, which in turn impacts neotropical migrants and forest interior breeders. When browsing, white-tailed deer select for native species while avoiding certain invasives such as Japanese honeysuckle multiflora rose and Japanese barberry. As a result of this selection process, these aggressive non-native species begin to dominate the forest understory. These types of understory impacts due to deer presence have been identified in portions of Hutcheson Memorial Forest and elsewhere in Franklin Township.

All migratory birds are a Federal trust resource and protected under the Migratory Bird Treaty Act (40 Stat. 755; 16 U.S.C. 703-712). NJDEP Landscape Mapping identifies and marks the forest habitats within Franklin that are at least 10 hectares in which no documented threatened or endangered species has been identified. These forests appear as Rank 1 forest habitat (see Section 11, Landscape Mapping).

Franklin's lakes, streams and the D&R Canal would be expected to support a variety of aquatic herptiles including the eastern painted turtle (*Chrysemys picta*), snapping turtle (*Chelydra serpentina*), musk turtle (*Sternotherus odoratus*) and red-bellied turtles (*Chrysemys rubriventris*). Garter snake (*Thamnophus sirtalis*), black racer (*Coluber constrictor*), ringneck snake (*Diadophis punctatus punctatus*), milk snake (*Lampropeltis triangulum*), black ratsnake (*Elaphe obsoleta*), northern brown snake (*Storeria dekayii*) and northern water snake (*Nerodia sipedon*) are some of the snake species expected along ponds, streams, forest habitats and old fields of Franklin.

A special-concern snake, the venomous northern copperhead (*Agkistrodon contortrix*) has been identified in Franklin Township. This secretive snake is typically found in forested uplands with a moderately dense canopy and rocky outcrops. The eastern box turtle is identified by NJDEP Landscape mapping throughout the grassland and forest habitats of Franklin Township. Box turtles are considered the most terrestrial of New Jersey's turtle species. They are typically found in a variety of forests and open areas such as meadows. They may also be found in old fields, emergent and shrub wetlands and along riparian corridors. Box turtles are omnivores, feeding on berries, mushrooms, worms, insects and other invertebrates and occasionally carrion. These turtles are still fairly common, but have significantly declined throughout New Jersey due to loss of habitat and habitat fragmentation, automobile kills, and diseases introduced from the pet trade. A second Special Concern turtle, the spotted turtle, has been identified within Franklin Township. This turtle utilizes a variety of aquatic habitats including ponds, slow moving streams, marshes and swamps.

Obligate vernal pool amphibians (see Section 7.4), such as the wood frog (*Rana sylvestris*) and spotted salamander, and other facultative amphibians including bullfrogs (*Rana catesbiana*), pickerel frogs (*Rana palustris*), green frogs (*Rana clamitans*), northern gray treefrogs (*Hyla versicolor*) and spring peepers (*Pseudacris crucifer*) exist within Franklin Township. Red-backed salamanders, the most common vertebrate in northern forests, are in wooded areas throughout the county and two-lined salamanders (*Eurycea bislineata*) have been identified in the forests and streams of Franklin.

A Special Concern amphibian, the Fowler's toad, has been identified within Franklin Township by NJDEP Natural Heritage data. The Fowler's toad prefers dry rocky or sandy habitats and is therefore the dominant toad species in the pine and dry oak forests of the Pine Barrens and southern New Jersey. It is much rarer in northern New Jersey. The Fowler's toad is often active on rainy nights and sunny days from March through September. Despite its preference for drier sandy areas, it still breeds in aquatic environments including wet ditches and shallow portions of lakes and ponds. It will also utilize vernal pools and should be considered during surveys of these habitats. The patches of Inner Coastal Plain geology in southern Franklin Township (see Section 11, Figure 3) would provide the conditions most typically associated with this species.

Many mammals including white-footed mice, coyote (*Canis latrans*), red fox (*Vulpes vulpes*), eastern gray squirrel (*Sciurus canadensis*), white tailed deer, opossum (*Didelphis virginiana*) and raccoons (*Procyon lotor*) are among the opportunistic species expected to occur throughout Franklin. A number of bat species including big brown bat, little brown bat, long-eared bat and the Eastern pipistrelle would be expected in the waterbodies, forests, agricultural and residential areas of Franklin Township.

In order to accurately determine the species diversity within an urbanized or suburban region, a species inventory may be organized. Bio-blitzes are an enjoyable and useful way to assess the biodiversity of a given

area. A bio-blitz involves a 24-hour field inventory of plant and vertebrate and invertebrate animal species in a given area within the goal of identifying as many taxonomic groups as possible. Bio-blitzes involve groups of volunteers and naturalists led by wildlife experts identifying as many species as possible. Bio-blitzes present a great educational opportunity to participants and provide some indication of the diversity of species within a given community. Recent bio-blitzes have been organized in Union County and one is planned in Essex County for June, 2008. USGS provides information on organizing a bio-blitz at the following website: <http://www.pwrc.usgs.gov/blitz>

10.5 Rare, Endangered and Threatened Plant Species

According to NJDEP Natural Heritage Data, one documentation of a rare or State listed plant exists for Franklin Township. One historic record of the State endangered Robbin's pondweed (*Potamogeton robbinsii*) is from 1916. This plant is recognizable by its dark green tightly spaced leaves that give it the appearance of a palm frond. It is an underwater plant of ponds and similar waterbodies that only reaches the water surface when flowering. No other rare, State or Federal listed plants have been documented in the Township. One additional rare species, cornel-leaved aster, (*Doellingeria infirma*) has been identified within the vicinity of Franklin. This slender aster grows to 3 feet in a zig-zag fashion and produces one inch flat-topped white composite flowers. It grows in dry to mesic partially shaded rocky slopes in forests of oak and hickories.

10.6 Forest Fragmentation and Corridors

Fragmentation of forested areas by means of development isolates stands from the main forest complex, increasing the amount of edge habitat and decreasing the amount of forest interior habitat. Negative effects of forest habitat fragmentation are well documented for breeding birds (Robinson, 1988; Robinson and Wilcove, 1994; Herkert, 1994; Robinson *et al.*, 1995). Large tracts of contiguous forested areas are necessary to support breeding populations of migratory songbirds (Robbins *et al.*, 1989; Robinson *et al.*, 1997) as well as forest dwelling raptors (Thiollay, 1988; Bosakowski *et al.*, 1992; Bosakowski, 1994; Bosakowski and Speiser, 1994). Most forest interior species will only nest within a forest "core" that is at least 90 meters (295 feet) from the nearest forest edge. In addition the forest core must be a minimum of about 10 hectares (25 acres) in size (Dawson *et al.*, 1993). Fragmented forests are characterized by high levels of edge-related nest predation, brood parasitism, or both and prove undesirable for many area sensitive species. In addition, forest fragmentation facilitates the spread of exotic and invasive species, both vegetative and mammalian, that can dramatically change the habitat structure of the forest. Demographic data suggest that populations of many forest-breeding species in severely fragmented landscapes may be "sinks" that produce too few young to compensate for adult mortality. Rates of parasitism and predation are so much lower in large forested landscapes that they may act as "sources" that produce a surplus of young that are able to colonize small tracts in fragmented landscapes (Robinson *et al.*, 1997). Immigration and recolonization are critical for long-term regional survival of local populations, particularly for imperiled species. The loss of habitat is the primary reason for the decline in species and affects plants, mammals, birds, reptiles, amphibians, fish and invertebrates.

Habitat corridors are linear landscape elements that provide wildlife the ability to move between habitat patches. The best corridors are those that are the widest possible and those that connect the largest patches of habitat. Forest interior and neo tropical migrant birds, although able to disperse effectively, have been found to have a higher probability of using wider corridors (Keller *et al.*, 1993). Hodges and Krementz (1996) recommend that the minimum corridor width be no less than 100 meters (330 feet). This will provide adequate width for forest interior dwellers. Most imperiled species are habitat specialists, meaning that they only survive within a specific type of habitat. In addition, they only occur in limited numbers, so it is critical that areas of suitable habitat are connected via adequate corridors. This allows individuals to migrate between habitats and interbreed with subpopulations. This concept is particularly important for many small mammals, reptiles, amphibians and some invertebrates. Many of these creatures can be entirely prohibited from dispersing if impeded by barriers such as roads or unsuitable habitat. Corridors between natural communities help to mitigate the impacts of habitat fragmentation and species isolation. Corridors allow species with limited dispersal capabilities such as herptiles an effective means to disperse.

White and Worthen noted in their 1986 study of Franklin's Forests that riparian and southern regions of Franklin contained approximately 84% of the forest coverage with twice as many mature stands as the north and mid regions of the municipality. Southern Franklin contains large patches of unreserved forested habitat extending west of Route 27 between Kingston and Little Rocky Hill. Some forested areas between Little Rocky Hill and north to the municipally owned Bunker Hill Natural Area have been lost to development since 2002. Substantial tracts of unreserved forest exist north of Old Georgetown Road and extending northward to the vicinity of the Griggstown Native Grassland Preserve. An extension of preserved interior forest runs in a southwesterly direction from the Bunker Hill Natural Area to the Bunker Hill Environmental Education Center and westward along portions of the Griggstown Grassland preserve. In central Franklin, larger forest parcels exist along the Nine Mile and Six Mile Runs, the latter of which connects into the D&R Canal corridor. Within northern Franklin, tracks of forest exist along an unnamed tributary of the Raritan River between Elizabeth and Davidson Roads. A portion of this forested patch south of New Brunswick Avenue has been lost to development since 2002.

White and Worthen noted in 1986 that 90% of Franklin's forests were under 49 acres and that the median forest size was 8.2 acres –indicating general fragmentation of many municipal forests. The forested corridor can be broadened or improved by allowing preserved lands to revert to their natural state or through planting of native species to “jump start” the process. Where feasible, establishing connectivity between the preserved forest patches mentioned above should be considered. In addition, expanding the width of forested corridors may improve the overall habitat quality of the Township's forests. Forest fragmentation and connectivity should always be considered during development review. Projects should be designed to limit forest fragmentation and/or the destruction of forest core area.

10.7 Regulatory Protection for Endangered and Threatened Species

The US Fish and Wildlife Service protects Federally listed endangered and threatened wildlife and plant species and their habitat under the 1973 *Endangered Species Act*. Under Section 7 of this Act, Federal agencies are required to consult with the USFWS to ensure that the actions they authorize, fund, or carry out will not jeopardize listed species. In the event that proposed actions are determined to jeopardize a listed species,

the USFWS must offer reasonable alternatives that will meet the goals of the proposed action without jeopardizing the listed species.

Under Section 9 of the Act, private landowners are prohibited from the "take" of endangered or threatened species. It is unlawful to endanger the livelihood of a listed species and this provision is extended to the habitat required by the species for its survival. Section 10 of the Act provides for the preparation of Habitat Conservation Plans. This provision is made to protect the rights of private landowners to develop or use their land even though they have endangered species on their property. These landowners can receive an "incidental take permit" provided they develop a Habitat Conservation Plan that provides for the conservation of the species.

The State of New Jersey has its own Endangered Species Act, the *Endangered and Nongame Species Conservation Act* (N.J.S.A. 23:2A-13 *et seq*), which resulted in the listing of State endangered animal species (N.J.A.C. 7:25-4:13) and a Nongame Species list, including threatened species (N.J.A.C. 7:25 4.179(a)). As part of this act, all New Jersey animals appearing on the Federal list are also included on this State list.

10.8 White-Tailed Deer Control Program

The large population of white-tailed deer in the Township is having a negative impact on the regeneration of the Township's forests. Further, uncontrolled deer population can affect public safety (including deer-vehicle collisions) and can result in property damage. Accordingly, in an on-going effort to reduce the population of white-tailed deer, Franklin Township has opened up several parcels of Township-owned open space to hunting of white-tailed deer. In the 2015-2016 season the Township opened the following open space properties to hunting:

- Ten Mile Run Greenway (Griggstown Native Grassland Preserve and Bunker Hill Natural Area)
- Negri-Nepote Native Grassland Preserve
- Butler Road Natural Area
- Wilson Road Natural Area
- DeMott Lane Open Space
- Willow Road Open Space
- Elizabeth Ave Open Space
- Weston Road Open Space

The program ran from mid-September through mid-February and was divided into three separate seasons with bow hunting permitted on all of the open space parcels indicated above and firearms permitted on certain sites within certain timeframes. While bow hunting is permitted, non-hunters may enter the site. However, sites are closed to non-hunters when firearms are permitted.

11.0 FIGURES

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Figure 16	Landscape Project Wetland
Figure 17	Landscape Project Wood Turtle

12.0 REFERENCES

- Amy S. Greene Environmental Consultants, Inc., 2006 *Environmental Resource Inventory for Upper Deerfield*, Cumberland County, New Jersey.
- Amy S. Greene Environmental Consultants, Inc. 2007 *Environmental Resource Inventory for Essex County*
- Amy S. Greene Environmental Consultants, Inc, 2006 *Environmental Resource Inventory for Cranbury Township*
- Barksdale, H.C. 1943 et al. *Groundwater Supplies of Middlesex County, New Jersey*. New Jersey State Water Policy Commission, Trenton, NJ
- Beans, B.E and L. Niles. (editors) 2003. *Endangered and Threatened Wildlife of New Jersey*. Rutgers University Press. New Brunswick, NJ.
- Bosakowski, T. 1994. *Landsat Reveals Negative Effect Of Forest Fragmentation On Barred Owl Distribution*. Records Of New Jersey Birds 20:66-70.
- Bradshaw, F.J. 1992. *Quantifying edge effect and patch size formultiple use silviculture—a discussion paper*. Forest Ecology and Management. 48, 249–264
- Carswell, L.D. and Rooney, J.G., 1976. *Summary of Geology and Ground Water Resources of Passaic County, New Jersey*: Trenton, New Jersey, U.S. Geological Survey, Water Resources Investigations, No. 7675
- Center for Remote Sensing and Spatial Analysis (CRSSA) 2007. Vernal Pool Habitat Mapping. Rutgers University. www.dbcrrsa.rutgers.edu/ims/vernal/
- Collins, B.R. and K.H Anderson, 1994. *Plant Communities of New Jersey*. Rutgers University Press, New Brunswick, NJ.
- Conant, R. and J. T. Collins, 1991. *A Field Guide to Reptiles and Amphibians: Eastern and Central North America*. Third edition. Houghton Mifflin Co., Boston, Massachusetts.
- Cowardin, L.M., 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. US Fish and Wildlife Service. FWS/OBS-79/31
- Dawson, D.K., L.J. Darr and C.S. Robbins., 1993. *Predicting the Distribution of Breeding Forest Birds in a Fragmented Landscape*. Trans. North Amer. Will . Nat. Resource Con. 58:35-43.
- Delaware and Raritan Canal Commission website www.dandrcanal.com
- Federal Emergency Management Agency, National Flood Insurance Program, Q3 Flood Data, Disc 18, New Jersey, Puerto Rico, Virgin Islands, September 1996.

Freeze, R. A. and J.A. Cherry, 1979. *Groundwater*. Prentice-Hall, Inc.

Garner, J. D., and J. E. Gardner, 1992. *Determination of Summer Distribution and Habitat Utilization of the Indiana bat in Illinois*. Illinois Department of Conservation. Final Report, Project E-3. Springfield, IL, 23 pp.

Harvey, M.J., 1992. *Bats of the Eastern United States*. Little Rock; Arkansas Fish and Game Commission

Herkert, J.R., 1994 *The effects of habitat fragmentation on midwestern grassland bird communities*. Ecological Applications 4:461-471.

Hodges, M. Jr. and D. Kremetz, 1996. *Neotropical Migratory Breeding Bird Communities in Riparian Forests of Different Widths Along the Altamaha River, Georgia*. The Wilson Bulletin 108:496-506.

Hoffman, J.L. and G.C. Herman. Sole-Source Aquifers in New Jersey. N.J. Geological Survey Digital Geodata Series DGS98-6.

Holms J. and Leck, C., and *Breeding Bird Survey of the D and R Canal State Park 1990 and 1991* (Summer, 1993) Records of New Jersey Birds. NJ Audobon

Jones, S. L., and J. E. Cornely, 2002. Vesper Sparrow (*Pooecetes gramineus*). In *The Birds of North America*, No. 624 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA

Kasabach, H.F., 1966. *Geology and Ground Water Resources of Hunterdon County, New Jersey*, New Jersey Department of Conservation and Economic Development, Division of Water Policy and Supply, Trenton, New Jersey.

Keller, C.C., Robbins and J. Hatfield., 1993. *Avian Communities in Riparian Forests of Different Widths in Maryland and Delaware*. Wetlands 13:137-144.

Leck, M. and C. Leck List of Plants of Hutcheson Memorial Forest, NY-NJ-CT Botany Online <http://nynjctbotany.org/njnbtofc/hutchesn.html>

Meadows Foundation Website: www.mfi.org Information regarding historic structures and history of Franklin Township.

Mulhall M., J. Demicco, P. November, 2004. *Evaluation of Groundwater Resources in the Sourland Mountain Region of Central New Jersey*. Prepared for Sourland Smart Growth Project

Nevoy, A.S. *Gloucester County Ground-Water Resources and Issues*. US Geological Survey

Niles, L.J., M. Valent, P. Winkler and P. Woerner. New Jersey's Landscape Project, Version 2.0 NJDEP, Division of Fish and Wildlife, Endangered and Non-Game Species Program

N.J.A.C. 7:7A. August, 2001, published September 4, 2001. Freshwater Wetlands Protection Act Rules. New Jersey Department of Environmental Protection.

N.J.A.C. 7:8. February, 2004. Stormwater Management Rules. New Jersey Department of Environmental Protection.

N.J.A.C. 7:9B. April, 1998. Surface Water Quality Standards. New Jersey Department of Environmental Protection.

N.J.A.C. 7:13. November, 2007. Flood Hazard Area Control Act Rules. New Jersey Department of Environmental Protection.

N.J.A.C. 7:14A. February, 2004. Phase II New Jersey Pollutant Discharge Elimination System Stormwater Regulation Program Rules. New Jersey Department of Environmental Protection.

NJ Audubon Society Information regarding natural areas in Franklin [Township](http://www.njaudubon.org/conservation/franklin.html).

NJDEP 2006. *Air Quality Monitoring Report*. Bureau of Air [Monitoring](http://www.state.nj.us/dep/airmon/aqi03).

NJDEP 2004. *Protocols for the Establishment of Exceptional Resource Value Wetlands Pursuant to the Freshwater Wetlands Protection Act (NJSA 13:9B-1 et seq.) Based on Documentation of State or Federal Endangered or Threatened Species*. New Jersey Department of Environmental Protection, Land Use Regulation Program, Divisions of Parks & Forestry and The Endangered and Nongame Species Program, Division of Fish, Game, & Wildlife.

NJDEP 2004. *Source Water Assessment Report Franklin Township Source Water Assessment Program*. Division of Water Supply www.state.nj.us/dep/watersupply

NJDEP 2004. Air Toxics Summary. Including data from the New Brunswick Station. Available at www.state.nj.us/dep/airmon/airtoxics

NJDEP 2004. *Regulations for the Review Zone of the Delaware and Raritan Canal State Park* (N.J.A.C. 7:45) Delaware and Raritan Canal [Commission](http://www.dandrcanal.com). www.dandrcanal.com

NJDEP New Jersey Stormwater Best Management Practices. 2004. www.state.nj.us/dep/watershedmgt/bmpmanualfeb2004.htm

NJDEP Stormwater Management Rule – Frequently Asked Questions www.state.nj.us/dep/watershedmgt/stormwaterfaqs.htm

NJDEP 2005. *Locations of Anadromous American Shad and River Herring During Their Spawning Period in New Jersey's Freshwaters Including Known Migratory Impediments and Fish Ladders* Division of Fish and Wildlife

NJDEP 2002. Fish Index of Biotic Integrity for Freshwater and Biological Monitoring. Bureau of Freshwater and Biological Monitoring www.state.nj.us/dep/wms/bfbm/fishibi.html

NJ Department of Labor (NJDOL). Workforce NJ Public Information Network: Population of Franklin Township, Somerset County for 1960.
http://lwd.dol.state.nj.us/labor/wnpjpin/wnpjpin_index.html

NJ Geological Survey (NJGS). 2003. Information on the Piedmont Province
www.state.nj.us/dep/njgs/

NJ Water Supply Authority (NJWSA) 2002. *Groundwater in the Raritan River Basin*.

North Jersey District Water Supply Commission (NJDWSC) November 2002. *Characterization and Assessment: A Technical Report for the Passaic River Basin Watershed Management Project*. WMA 4 Lower Passaic and Saddle River Watersheds

National Oceanographic and Atmospheric Administration (NOAA). Personal Communication contained within a NOAA document from L. Barno, Fisheries Biologist, NJDEP Bureau of Freshwater Fisheries, April and October of 2000 (NOAA Website, 2006).

North Carolina State University. NCSU Water Quality Group. General information on heavy metals.
www.water.ncsu.edu/watershedss/info/hmetals.html

Office of the State Climatologist; Mean Climate Data for Somerset, 1892-2000. NJ Rutgers University.
www.climate.rutgers.edu/stateclim

Office of the NJ State Climatologist, Rutgers University website
www.climate.rutgers.edu/stateclim. NJ Climate Overview, which borrows liberally from Ludlum, D. 1983, *New Jersey Weather Book*, Rutgers University Press, New Brunswick, NJ and also includes information from the National Climatic Center, 1982, *Climate of New Jersey*, Asheville, NC.

Olsen, P.E., 1980. *The Latest Triassic and Early Jurassic formations of the Newark Basin (eastern North America, Newark Supergroup): Stratigraphy, Structure and Correlation*. New Jersey Academy of Science Bulletin, v. 25, pp. 25-51.

Rich, A.C., D.S. Dobkin and L. Niles, 1994. *Defining Forest Fragmentation by Corridor Width: the Influence of Forest Dividing Corridors on Forest Nesting Birds in Southern New Jersey*. Conservation Biology, Vol. 8, No. 4 (Dec., 1994), pp. 1109-1121

Robbins, C.S., D.K. Dawson, and B.A. Dowell, 1989. *Habitat Area Requirements of Breeding Forest Birds of the Middle Atlantic States*. Wildlife Monographs. 103: pp. 1-34.

Robinson, S.K., 1988. *Reappraisal of the Costs and Benefits of Habitat Heterogeneity for Nongame Wildlife*. Transactions of the North American Wildlife and Natural Resources Conference 53: 145-155.

Robinson, S.K. and D.S. Wilcove, 1994. *Forest Fragmentation in the Temperate Zone and its Effect on Migratory Songbirds*. Bird Conservation International 4:233-249.

Robinson, S.K., J.D. Brawn, and J.P. Hoover, 1997. *Effectiveness of Small Nature Preserves for Breeding Birds*. Illinois Natural History Survey. In: Conservation in Highly Fragmented Landscapes. M.W. Schwartz (ed). International Thomson Publishing, New York, NY.

Skinner A., Schrabisch, M. 1913. *Preliminary Report of the Archaeological Survey of the State of New Jersey*. Geological Survey of New Jersey. Bulletin 9A.

Spier, L., 1915. *Indian Remains Near Palinfeld, Union County and along the Lower Delaware Valley*. New Jersey Geological Survey. Bulletin 13 pp. 78-89.

Stevens, A.A., Slocum, C.J., Seeger, D.P., and Roebeck, G.G., 1976. *Chlorination of Organics in Drinking Water*. Journal of the American Water Works Association, v. 68, p. 615.

Stony Brook-Millstone Watershed Association, 2005. *Taking the Next Step: Franklin Township Municipal Assessment*.

Stony Brook-Millstone Watershed Association, Undated, *Resource Protection in Your Municipality Information from the Raritan Basin Watershed Management Project-Compiled and Interpreted for the Millstone Watershed Communities*.

Schwartz, V., D. M Golden., 2002. *Field Guide to Reptiles and Amphibians of New Jersey*. Published by the New Jersey Division of Wildlife.

Tiner, R.W. 1985. *Wetlands of New Jersey*., US Fish and Wildlife Service, National Wetlands Inventory, Newton Corner, MA. 117 pp.

Township of Franklin. 2006. Master Plan: Land Use Plan Element; Conservation Plan Element; Parks Recreation and Open Space Plan Element; Historic Plan Element. Prepared By Schoor DePalma, Inc.

Township of Franklin 1977. Township of Franklin Environmental Resource Inventory. Franklin Township Environmental Commission

Township of Franklin. February, 2004. Flood Mitigation Plan. Prepared with guidance from the USDA Natural Resource Conservation Service.

Township of Franklin Municipal Code. Franklin Township, Somerset County, NJ Updated 1-15- 08. Available at: www.e-codes.generalcode.com

Township of Franklin 1986. *The Extent, History and Composition of the Forests of Franklin Township*. Prepared by Douglas White and Wade Worthen, Rutgers University. Franklin township Environmental Commission.

Township of Franklin, 2004. *Report on Water Quality of Franklin Township Streams*. Franklin Township Environmental Commission

US Environmental Protection Agency. March 1994. Priority Wetlands for the State of New Jersey. Region II, New York, NY.

US Environmental Protection Agency. February, 1988. Federal Register Notice. Vol. 53 #122 Sole Source Aquifer Determination for New Jersey Coastal Plain Aquifer System.

US Environmental Protection Agency. June 1988. Federal register Notice. Vol. 53, No. 121. Sole Source Aquifer Determination for Fifteen Basin Aquifer Systems of New Jersey et al.

U.S. Environmental Protection Agency Federal Register. 2001. part II 40 CFR Parts 9, 141, 142. National Primary Drinking Water Regulations; Radionuclides; Final Rule

US Environmental Protection Agency Region 2. 2008. Superfund Program. Fact Sheet - NPL listing history for the Higgins Farm Site. www.epa.gov/region2/superfund/npl/0201094c.pdf.

US Environmental Protection Agency Region 2. 2008. Superfund Program. Fact Sheet - NPL listing history for the Higgins Disposal Site. www.epa.gov/region02/superfund/npl/0200359c.pdf

U.S. Department of Agriculture, Natural Resources Conservation Service. Raritan Watershed – Description [www.nj.nrcs.usda.gov/programs/csp/Raritan Watershed 2006.html](http://www.nj.nrcs.usda.gov/programs/csp/Raritan_Watershed_2006.html)

U.S. Department of Agriculture, Natural Resource Conservation Service. NRCS Plant [database. www.plants.usda.gov](http://www.plants.usda.gov).

US Geological Survey 2005. *Major Aquifers in New Jersey*. USGS Website: <http://nj.usgs.gov/gw/aquifer.html>

Walsh, J., V. Elia, R. Kane, and T. Halliwell., 1999. *Birds of New Jersey*. New Jersey Audubon Society, Bernardsville, NJ.

Washington State University Dept of Ecology www.ecy.wa.gov

Welsch, David J., 1991. *Riparian Forest Buffers - Function and Design of Protection and Enhancement of Water Resources*. US Department of Agriculture, Forest Service. Publication # NA-PR-07-91.

Zich, H., 1978. *The Collection of Existing Information and Field Investigation of Anadromous Clupeid Spawning in New Jersey*

WEBSITES

- Association of New Jersey Environmental Commissions: www.anjec.org
- Township of Franklin: www.franklintwpnj.org
- Environmental Commission: <http://franklintwpnj.org/government/boards-committees/environmental-commission>
- Open Space Advisory Committee: <http://franklintwpnj.org/government/boards-committees/open-space>
- Shade Tree Commission: <http://franklintwpnj.org/government/boards-commissions-committees/shade-tree-commission>

APPENDIX A WILDLIFE (Terrestrial Vertebrate) INVENTORY LISTS

BIRD SPECIES POTENTIALLY WITHIN FRANKLIN TOWNSHIP

<u>Scientific Name</u>	<u>Common Name</u>
<i>Podilymbus podiceps</i>	pieb-billed grebe
<i>Phalacrocorax auritus</i>	double-crested cormorant
<i>Botaurus lentiginosus</i>	American bittern
<i>Ixobrychus exilis</i>	least bittern b
<i>Ardea herodias</i>	great blue heron b
<i>Casmerodius albus</i>	great egret
<i>Egretta thula</i>	snowy egret
<i>Butorides striatus</i>	green-backed heron b
<i>Nycticorax nycticorax</i>	black-crowned night heron
<i>Cygnus olor</i>	mute swan b
<i>Chen caerulescens</i>	snow goose
<i>Branta canadensis</i>	Canada goose b
<i>Aix sponsa</i>	wood duck b
<i>Anas crecca</i>	green-winged teal
<i>Anas rubripes</i>	American black duck
<i>Anas platyrhynchos</i>	mallard b
<i>Anas acuta</i>	northern pintail
<i>Anas discors</i>	blue-winged teal
<i>Anas clypeata</i>	northern shoveler
<i>Anas strepera</i>	gadwall
<i>Anas americana</i>	American wigeon
<i>Aythya collaris</i>	ring-necked duck
<i>Lophodytes cucullatus</i>	hooded merganser
<i>Mergus merganser</i>	common merganser
<i>Oxyura jamaicensis</i>	ruddy duck
<i>Coragyps atratus</i>	black vulture
<i>Cathartes aura</i>	turkey vulture
<i>Pandion haliaetus</i>	osprey
<i>Haliaeetus leucocephalus</i>	bald eagle
<i>Circus cyaneus</i>	Northern harrier
<i>Accipiter striatus</i>	sharp-shinned hawk
<i>Accipiter gentilis</i>	northern goshawk
<i>Buteo lineatus</i>	red-shouldered hawk
<i>Buteo platypterus</i>	broad-winged hawk b
<i>Buteo jamaicensis</i>	red-tailed hawk b
<i>Buteo lagopus</i>	rough-legged hawk
<i>Aquila chrysaetos</i>	golden eagle

LIST OF BIRD SPECIES - Continued

<u>Scientific Name</u>	<u>Common Name</u>
<i>Falco sparverius</i>	American kestrel b
<i>Falco columbarius</i>	merlin
<i>Falco peregrinus</i>	peregrine falcon
<i>Phasianus colchicus</i>	ring-necked pheasant b
<i>Meleagris gallopavo</i>	eastern wild turkey b
<i>Rallus limicola</i>	Virginia rail b
<i>Fulica americana</i>	American coot
<i>Charadrius vociferus</i>	killdeer b
<i>Tringa melanoleuca</i>	greater yellowlegs
<i>Tringa flavipes</i>	lesser yellowlegs
<i>Tringa solitaria</i>	solitary sandpiper
<i>Actitis macularia</i>	spotted sandpiper b
<i>Bartramia longicauda</i>	upland sandpiper
<i>Calidris minutilla</i>	least sandpiper
<i>Calidris melanotos</i>	pectoral sandpiper
<i>Gallinago gallinago</i>	common snipe
<i>Philohela minor</i>	American woodcock b
<i>Larus delawarensis</i>	ring-billed gull
<i>Larus argentatus</i>	herring gull
<i>Larus marinus</i>	great black-backed gull
<i>Columba livia</i>	rock dove b
<i>Zenaida macroura</i>	mourning dove b
<i>Coccyzus erythrophthalmus</i>	black-billed cuckoo b
<i>Coccyzus americanus</i>	yellow-billed cuckoo b
<i>Tyto alba</i>	common barn owl b
<i>Otus asio</i>	eastern screech owl b
<i>Bubo virginianus</i>	great horned owl b
<i>Strix varia</i>	barred owl b
<i>Asio otus</i>	long-eared owl
<i>Asio flammeus</i>	short-eared owl
<i>Aegolius acadicus</i>	northern saw-whet owl
<i>Chordeiles minor</i>	common nighthawk
<i>Chaetura pelagica</i>	chimney swift b *
<i>Archilochus colubris</i>	ruby-throated hummingbird b *
<i>Ceryle alcyon</i>	belted kingfisher b
<i>Melanerpes erythrocephalus</i>	red-headed woodpecker
<i>Melanerpes carolinus</i>	red-bellied woodpecker b
<i>Sphyrapicus varius</i>	yellow-bellied sapsucker
<i>Picoides pubescens</i>	downy woodpecker b
<i>Picoides villosus</i>	hairy woodpecker b

LIST OF BIRD SPECIES - Continued

<u>Scientific Name</u>	<u>Common Name</u>
<i>Colaptes auratus</i>	Northern flicker b
<i>Dryocopus pileatus</i>	pileated woodpecker b
<i>Contopus borealis</i>	olive-sided flycatcher
<i>Contopus virens</i>	eastern wood pewee b
<i>Empidonax flaviventris</i>	yellow-bellied flycatcher
<i>Empidonax virescens</i>	acadian flycatcher
<i>Empidonax alnorum</i>	alder flycatcher
<i>Empidonax traillii</i>	willow flycatcher b *
<i>Empidonax minimus</i>	least flycatcher b
<i>Sayornis phoebe</i>	eastern phoebe b
<i>Myiarchus crinitus</i>	great crested flycatcher b
<i>Tyrannus Tyrannus</i>	eastern kingbird b *
<i>Eremophila alpestris</i>	horned lark b
<i>Progne subis</i>	purple martin b *
<i>Tachycineta bicolor</i>	tree swallow b *
<i>Stelgidopteryx serripennis</i>	northern rough-winged swallow b *
<i>Riparia riparia</i>	bank swallow b *
<i>Hirundo pyrrhonota</i>	cliff swallow
<i>Hirundo rustica</i>	barn swallow b *
<i>Cyanocitta cristata</i>	blue jay b
<i>Corvus brachyrhynchos</i>	American crow b
<i>Corvus ossifragus</i>	fish crow
<i>Poecile carolinensis</i>	Carolina chickadee b
<i>Parus bicolor</i>	tufted titmouse b
<i>Sitta canadensis</i>	red-breasted nuthatch
<i>Sitta carolinensis</i>	white-breasted nuthatch b
<i>Certhia americana</i>	brown creeper
<i>Thryothorus ludovicianus</i>	Carolina wren b
<i>Troglodytes aedon</i>	house wren b *
<i>Troglodytes troglodytes</i>	winter wren
<i>Cistothorus palustris</i>	marsh wren
<i>Regulus satrapa</i>	golden-crowned kinglet
<i>Regulus calendula</i>	ruby-crowned kinglet
<i>Polioptila caerulea</i>	blue-gray gnatcatcher b *
<i>Sialia sialis</i>	eastern bluebird b
<i>Catharus fuscescens</i>	veery b
<i>Catharus bicknelli</i>	Bicknell's thrush
<i>Catharus minimus</i>	gray-cheeked thrush
<i>Catharus ustulatus</i>	Swainson's thrush
<i>Catharus guttatus</i>	hermit thrush
<i>Hylocichla mustelina</i>	wood thrush b
<i>Turdus migratorius</i>	American robin b
<i>Dumetella carolinensis</i>	catbird b *

LIST OF BIRD SPECIES - Continued

<u>Scientific Name</u>	<u>Common Name</u>
<i>Mimus polyglottos</i>	northern mockingbird b
<i>Toxostoma rufum</i>	brown thrasher b *
<i>Anthus rubescens</i>	water pipit
<i>Bombycilla cedrorum</i>	cedar waxwing b
<i>Sturnus vulgaris</i>	European starling b
<i>Vireo griseus</i>	white-eyed vireo b *
<i>Vireo solitarius</i>	solitary vireo
<i>Vireo flavifrons</i>	yellow-throated vireo b *
<i>Vireo gilvus</i>	warbling vireo b *
<i>Vireo olivaceus</i>	red-eyed vireo b
<i>Vermivora pinus</i>	blue-winged warbler b *
<i>Vermivora chrysoptera</i>	golden-winged warbler
<i>Vermivora peregrina</i>	Tennessee warbler
<i>Vermivora reficapilla</i>	Nashville warbler
<i>Parula americana</i>	northern parula
<i>Dendroica petechia</i>	yellow warbler b *
<i>Dendroica pensylvanica</i>	chestnut-sided warbler b *
<i>Dendroica magnolia</i>	magnolia warbler
<i>Dendroica tigrina</i>	Cape May warbler
<i>Dendroica caerulescens</i>	black-throated blue warbler
<i>Dendroica coronata</i>	yellow-rumped warbler
<i>Dendroica virens</i>	black-throated green warbler
<i>Dendroica fusca</i>	blackburnian warbler
<i>Dendroica dominica</i>	yellow-throated warbler b
<i>Dendroica pinus</i>	pine warbler
<i>Dendroica discolor</i>	prairie warbler b *
<i>Dendroica palmarum</i>	palm warbler
<i>Dendroica castanea</i>	bay-breasted warbler
<i>Dendroica striata</i>	blackpoll warbler
<i>Dendroica cerulea</i>	cerulean warbler b
<i>Miniotilta varia</i>	black and white warbler b
<i>Setophaga ruticilla</i>	American redstart b
<i>Protonotaria citrea</i>	prothonotary warbler
<i>Helmitheros vermivorus</i>	worm-eating warbler b
<i>Seiurus aurocapillus</i>	ovenbird b
<i>Seiurus noveboracensis</i>	northern waterthrush
<i>Seiurus motacilla</i>	Louisiana waterthrush b
<i>Oporornis formosus</i>	Kentucky warbler b
<i>Oporornis agilis</i>	Connecticut warbler
<i>Oporornis philadelphia</i>	mourning warbler
<i>Geothlypis trichas</i>	common yellowthroat b *
<i>Wilsonia citrina</i>	hooded warbler

LIST OF BIRD SPECIES – Continued

<u>Scientific Name</u>	<u>Common Name</u>
<i>Wilsonia pusilla</i>	Wilson's warbler
<i>Wilsonia canadensis</i>	Canada warbler
<i>Icteria virens</i>	yellow-breasted chat b *
<i>Piranga olivacea</i>	scarlet tanager b
<i>Cardinalis cardinalis</i>	northern cardinal b
<i>Pheucticus ludovicianus</i>	rose-breasted grosbeak b
<i>Passerina cyanea</i>	indigo bunting b *
<i>Pipilo erythrophthalmus</i>	rufous-sided towhee b
<i>Spizella arborea</i>	American tree sparrow
<i>Spizella passerina</i>	chipping sparrow b
<i>Spizella pusilla</i>	field sparrow b
<i>Passerculus sandwichensis</i>	Savannah sparrow b
<i>Ammodramus savannarum</i>	grasshopper sparrow b
<i>Passerella iliaca</i>	fox sparrow
<i>Melospiza melodia</i>	song sparrow b
<i>Melospiza lincolni</i>	Lincoln's sparrow
<i>Melospiza georgiana</i>	swamp sparrow b
<i>Zonotrichia albicollis</i>	white-throated sparrow
<i>Zonotrichia leucophrys</i>	white-crowned sparrow
<i>Junco hyemalis</i>	dark-eyed junco
<i>Plectrophenax nivalis</i>	snow bunting
<i>Dolichonyx oryzivorus</i>	bobolink b
<i>Agelaius phoeniceus</i>	red-winged blackbird b
<i>Sturnella magna</i>	eastern meadowlark b
<i>Euphagus carolinus</i>	rusty blackbird
<i>Quiscalus quiscula</i>	common grackle b
<i>Molothrus ater</i>	brown-headed cowbird b
<i>Icterus spurius</i>	orchard oriole b *
<i>Icterus galbula</i>	northern oriole b *
<i>Carpodacus purpureus</i>	purple finch
<i>Carpodacus mexicanus</i>	house finch b
<i>Carduelis flammea</i>	common redpoll
<i>Carduelis pinus</i>	pine siskin
<i>Carduelis tristis</i>	American goldfinch b
<i>Hesperiphona vespertinus</i>	evening grosbeak
<i>Passer domesticus</i>	house sparrow b

b = Potential breeder in Franklin

Birds in Boldface are forest interior neo-tropical migrants potentially breeding in Franklin* =
Neo-tropical migrant that is not forest interior species potentially breeding in Franklin

MAMMALS POTENTIALLY WITHIN FRANKLIN TOWNSHIP

<u>Scientific Name</u>	<u>Common Name</u>	<u>COMMON</u>
<i>Didelphis marsupialis</i>	opossum	X
<i>Sorex cinereus</i>	masked shrew	
<i>Sorex dispar</i>	long-tailed shrew	
<i>Blarina brevicauda</i>	short-tailed shrew	X
<i>Scalopus aquaticus</i>	eastern mole	X
<i>Myotis lucifugus</i>	little brown bat	X
<i>Lasionycteris noctivagans</i>	silver-haired bat	
<i>Pipistrellus subflavus</i>	eastern pipistrel	
<i>Eptesicus fuscus</i>	big brown bat	X
<i>Lasiurus borealis</i>	red bat	X
<i>Lasiurus cinereus</i>	hoary bat	
<i>Plecotus auritus</i>	N. Long eared bat	
<i>Myotis leibii</i>	small-footed myotis	
<i>Myotis sodalus</i>	Indiana bat	
<i>Sylvilagus floridanus</i>	Eastern cottontail	X
<i>Tamias striatus</i>	Eastern chipmunk	X
<i>Marmota monax</i>	woodchuck	X
<i>Sciurus carolinensis</i>	gray squirrel	X
<i>Tamiasciurus hudsonicus</i>	red squirrel	
<i>Glaucomys volans</i>	southern flying squirrel	
<i>Castor canadensis</i>	beaver	
<i>Erethizon dorsatum</i>	porcupine	
<i>Peromyscus leucopus</i>	white-footed mouse	X
<i>Microtus pennsylvanicus</i>	meadow vole	X
<i>Ondatra zibethicus</i>	muskrat	X
<i>Rattus rattus</i>	black rat	X
<i>Rattus norvegicus</i>	brown rat	X
<i>Mus musculus</i>	house mouse	X
<i>Napaeozapus insignis</i>	woodland jumping mouse	
<i>Zapus hudsonius</i>	meadow jumping mouse	
<i>Canis latrans, var.</i>	Eastern coyote	
<i>Vulpes vulpes</i>	red fox	X
<i>Urocyon cinereoargenteus</i>	gray fox	
<i>Procyon lotor</i>	raccoon	X
<i>Ursus americanus</i>	black bear	
<i>Mephitis mephitis</i>	striped skunk	X
<i>Lutra canadensis</i>	river otter	
<i>Neovison vison</i>	mink	
<i>Mustela frenata</i>	long-tailed weasel	
<i>Mustela erminea</i>	short-tailed weasel	
<i>Odocoileus virginianus</i>	white-tailed deer	X

AMPHIBIANS POTENTIALLY WITHIN FRANKLIN TOWNSHIP

<u>Scientific Name</u>	<u>Common Name</u>	<u>COMMON</u>
<i>Ambystoma opacum</i>	marbled salamander	
<i>Ambystoma maculatum</i>	spotted salamander	
<i>Notophthalmus v. viridescens</i>	red-spotted newt	
<i>Desmognathus f. fuscus</i>	Northern dusky salamander	
<i>Plethodon c. cinereus</i>	red-backed salamander	X
<i>Plethodon g. glutinosus</i>	Northern slimy salamander	
<i>Hemidactylium scutatum</i>	four-toed salamander	
<i>Pseudotriton r. ruber</i>	Northern red salamander	
<i>Eurycea b. bislineata</i>	Northern two-lined salamander	X
<i>Bufo americanus</i>	American toad	X
<i>Bufo woodhousii fowleri</i>	Fowler's toad	
<i>Pseudacris triseriata kalmi</i>	NJ Chorus Frog	
<i>Acris c. crepitans</i>	Northern cricket frog	
<i>Hyla c. crucifer</i>	Northern spring peeper	X
<i>Hyla versicolor</i>	Northern gray treefrog	
<i>Rana catesbeiana</i>	bullfrog	X
<i>Rana clamitans melanota</i>	green frog	X
<i>Rana sylvatica</i>	wood frog	X
<i>Rana spenocephala</i>	Southern leopard frog	
<i>Rana palustris</i>	pickerel frog	X

REPTILES POTENTIALLY WITHIN FRANKLIN TOWNSHIP

Scientific Name	Common Name	Common
<i>Chelydra s. serpentina</i>	snapping turtle	X
<i>Sternotherus odoratus</i>	stinkpot	X
<i>Kinosternon s. subrubrum</i>	eastern mud turtle	
<i>Clemmys guttata</i>	spotted turtle	
<i>Clemmys muhlenbergi</i>	bog turtle	
<i>Clemmys insculpta</i>	wood turtle	
<i>Graptemys geographica</i>	common map turtle	
<i>Terrapene c. carolina</i>	eastern box turtle	X
<i>Pseudemys rubriventris</i>	red-bellied turtle	
<i>Pseudemys scripta elegans</i>	red-eared slider #	X
<i>Chrysemys p. picta</i>	eastern painted turtle	X
<i>Nerodia s. sipedon</i>	northern water snake	X
<i>Storeria d. dekayi</i>	northern brown snake	X
<i>Storeria o. occipitamaculata</i>	northern red-bellied snake	
<i>Thamnophis s. sirtalis</i>	eastern garter snake	X
<i>Thamnophis s. sauritus</i>	eastern ribbon snake	
<i>Virginia v. valeriae</i>	eastern smooth earth snake	
<i>Heterodon platyrhinos</i>	eastern hognose snake	
<i>Diadophis punctatus edwardsi</i>	northern ringneck snake	
<i>Carphophis a. amoenus</i>	eastern worm snake	
<i>Coluber c. constrictor</i>	northern black racer	X
<i>Elaphe o. obsoleta</i>	black ratsnake	
<i>Lampropeltis t. triangulum</i>	eastern milk snake	X
<i>Eumeces fasciatus</i>	five-lined skink	
<i>Agkistrodon contortrix</i>	Northern copperhead	

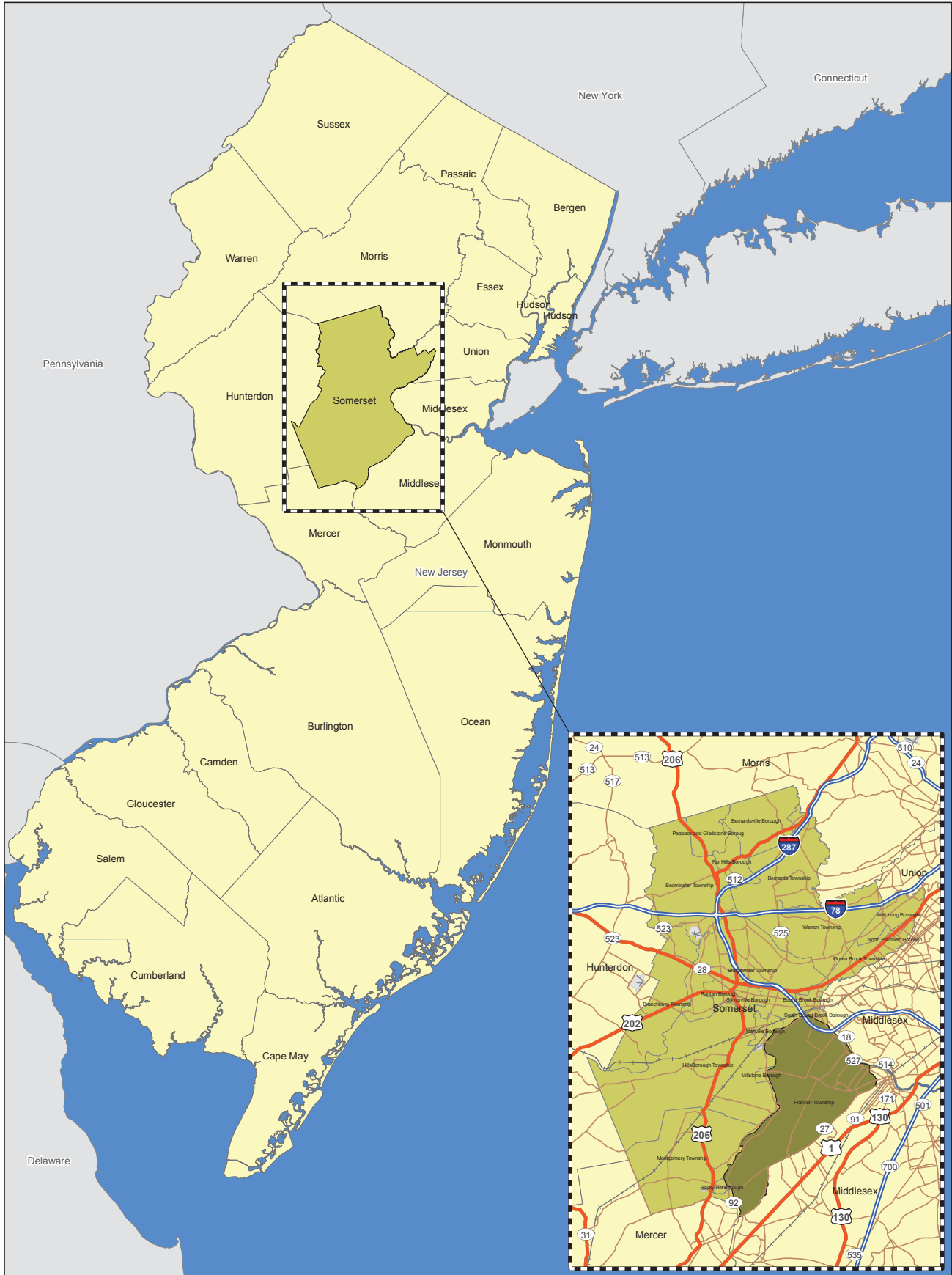
#- non native

Sources: S. Angus/ASGECI Staff
 Theodore Chase, Personal Communication (Birds) NJ
 Audubon
 NJDEP Reptiles and Amphibians of NJ

APPENDIX B: STREAM SAMPLE LOCATION MAP



Location Map



Franklin Township
Somerset County, New Jersey

0 5 10 20
Miles



Figure 1

Aerial Photography



Franklin Township
Somerset County, New Jersey

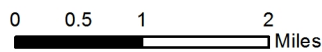
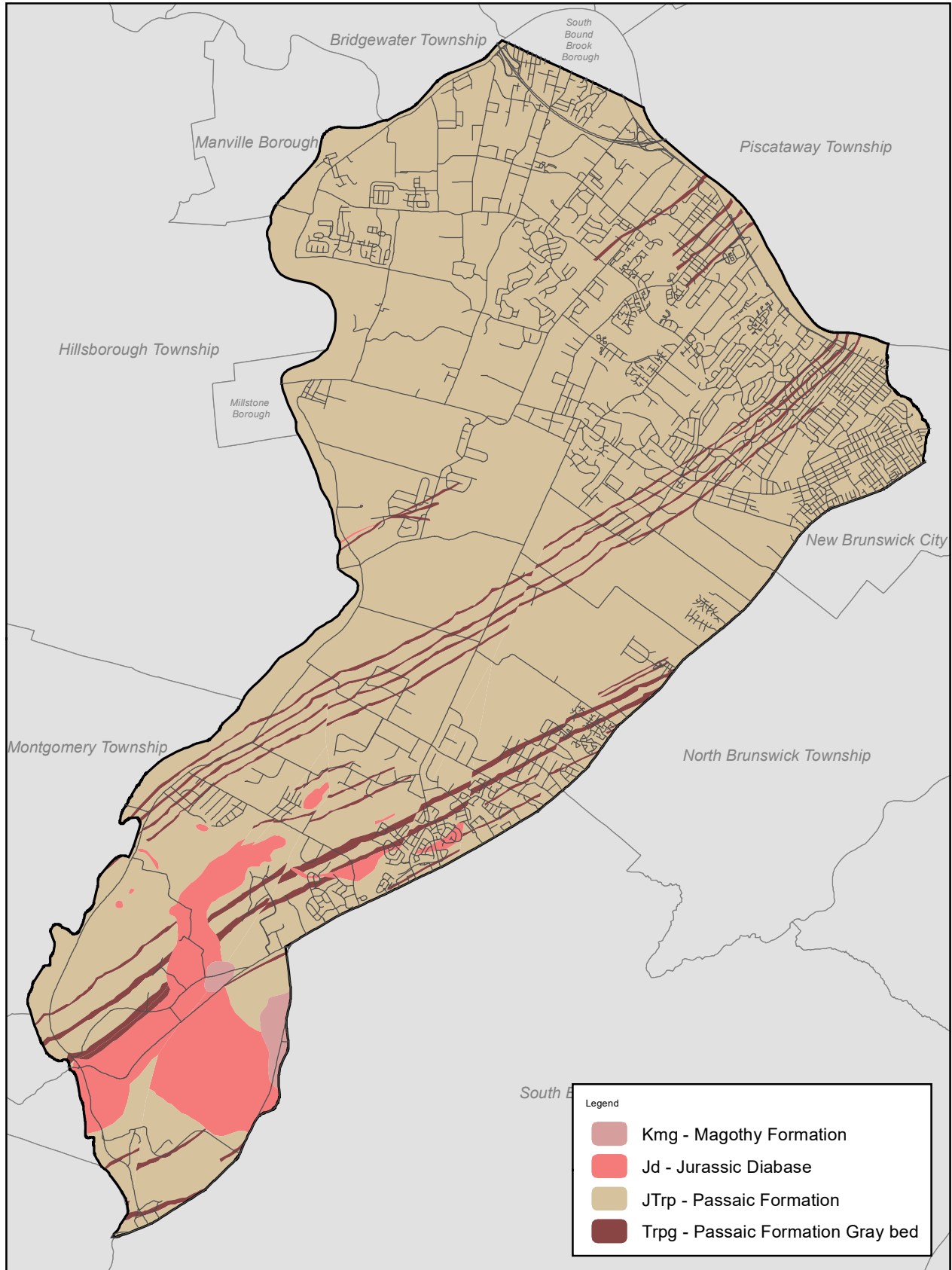


Figure 2

Geology



Franklin Township
Somerset County, New Jersey

0 0.5 1 2
Miles

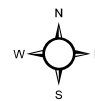
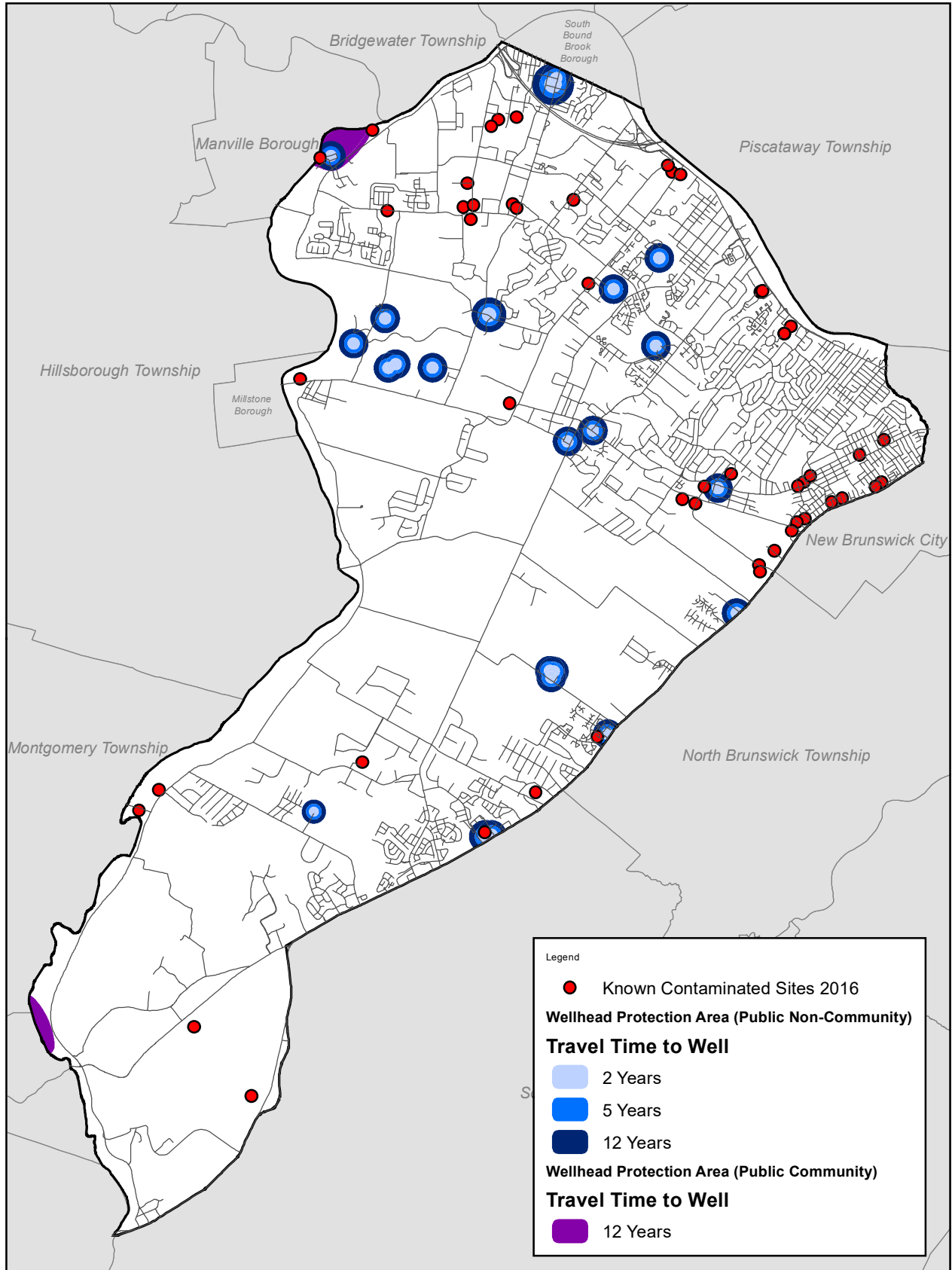


Figure 3

Wellhead Protection Areas and Known Contaminated Sites



Franklin Township
Somerset County, New Jersey

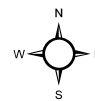
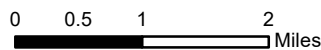
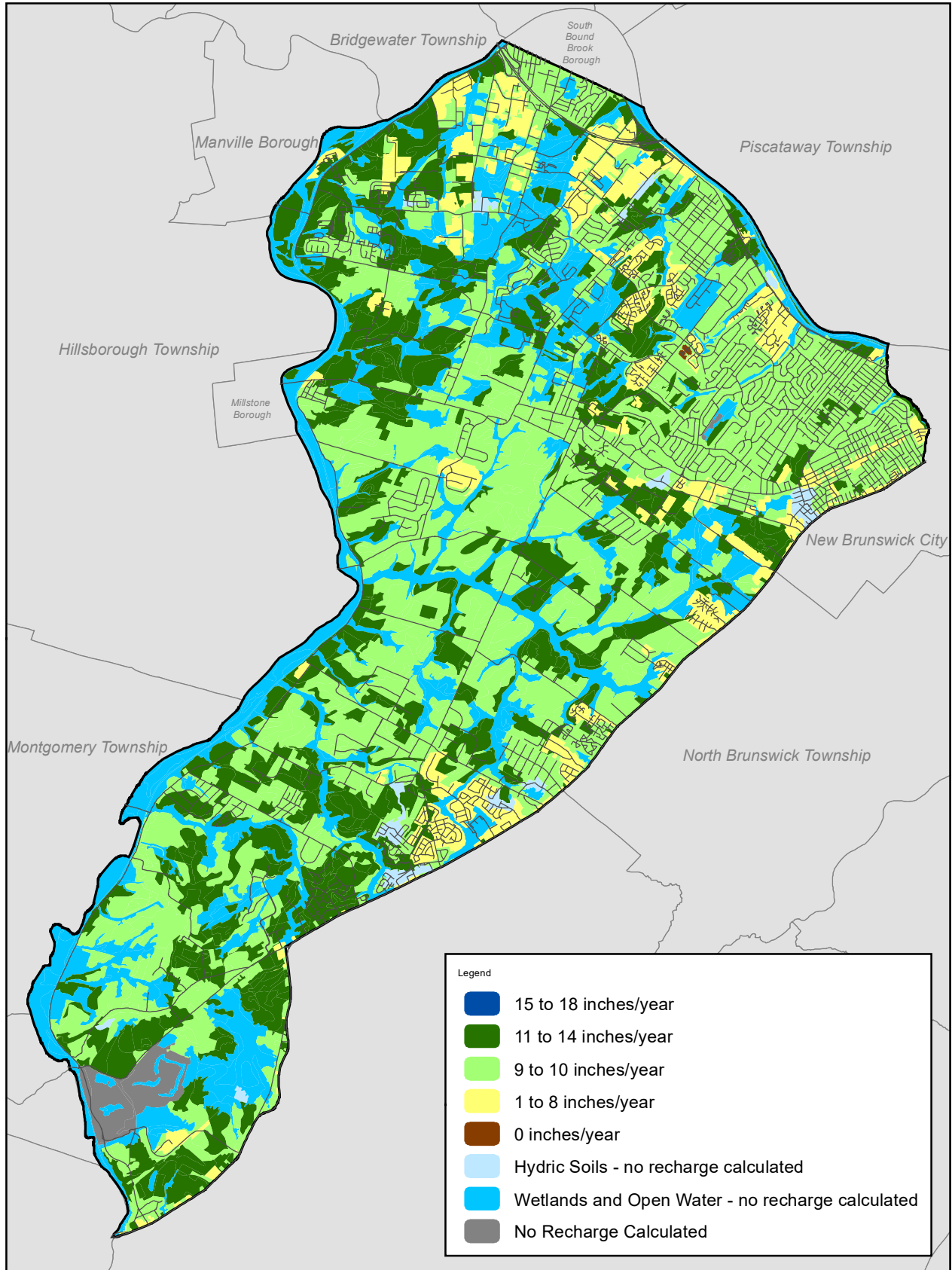


Figure 4

Ground Water Recharge



Franklin Township
Somerset County, New Jersey

0 0.5 1 2 Miles

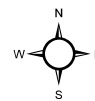
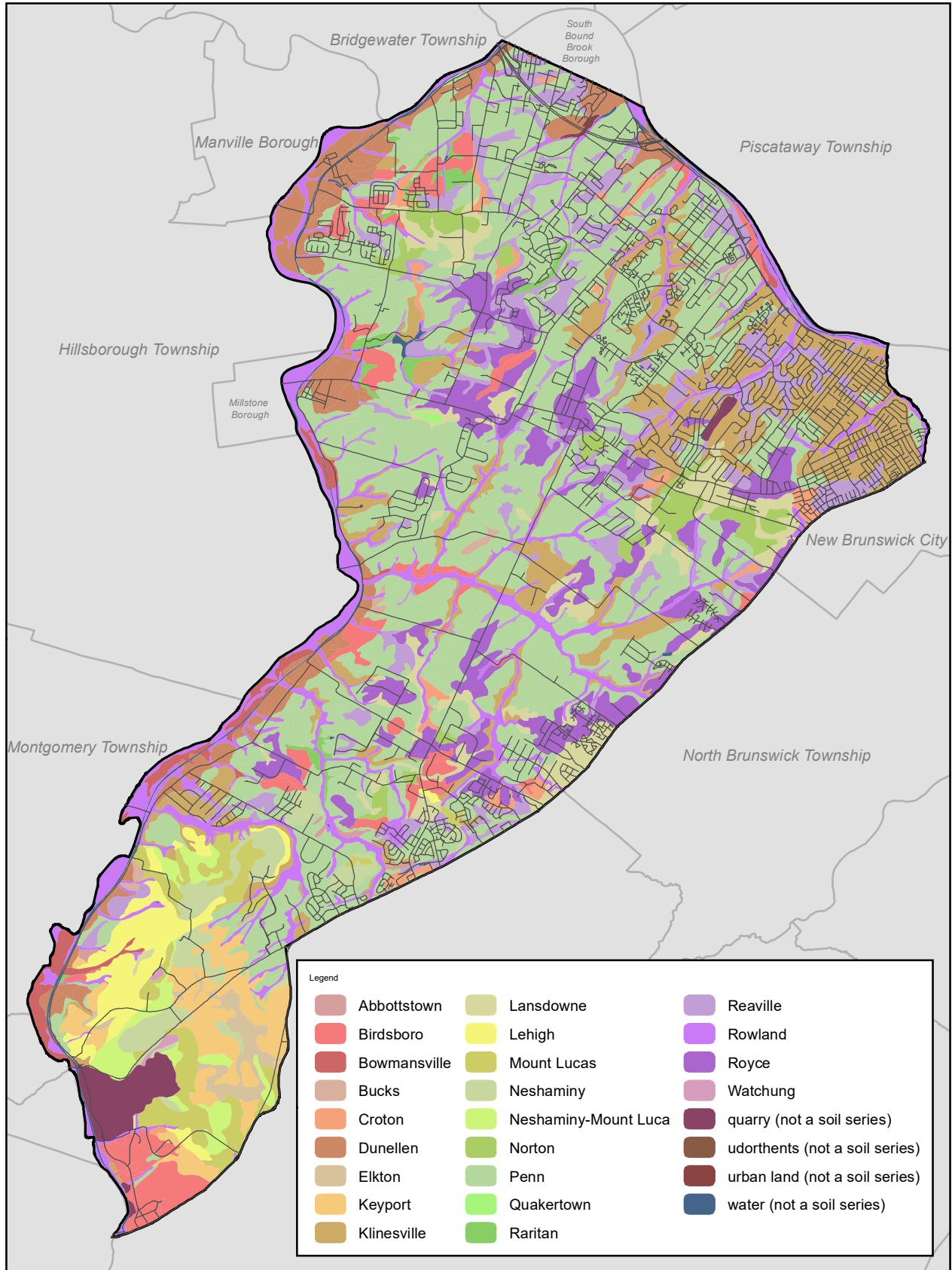


Figure 5

Soil



Franklin Township
Somerset County, New Jersey

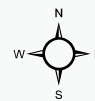
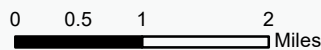
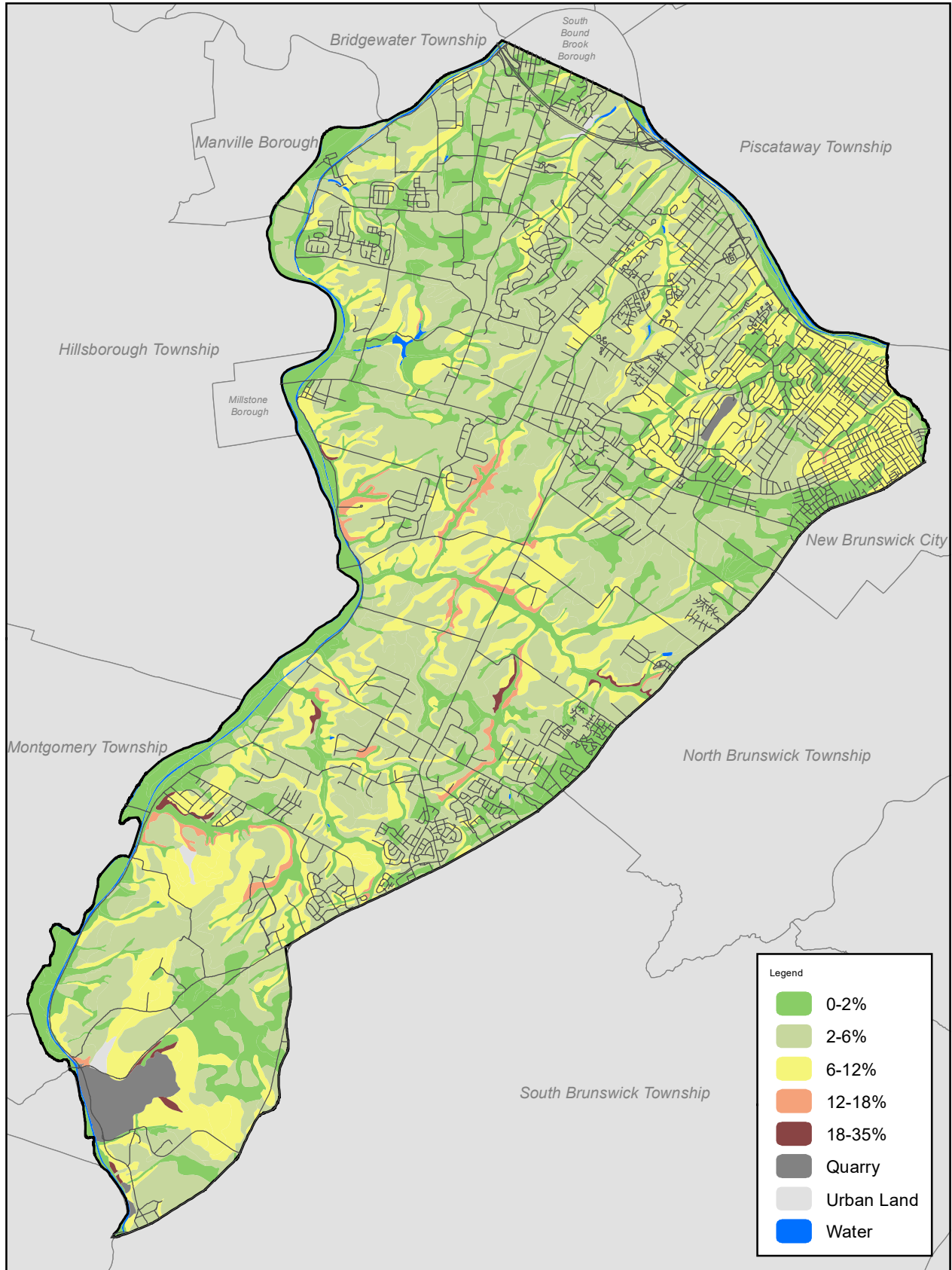


Figure 6

Slopes



Franklin Township
Somerset County, New Jersey

0 0.5 1 2 Miles

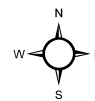
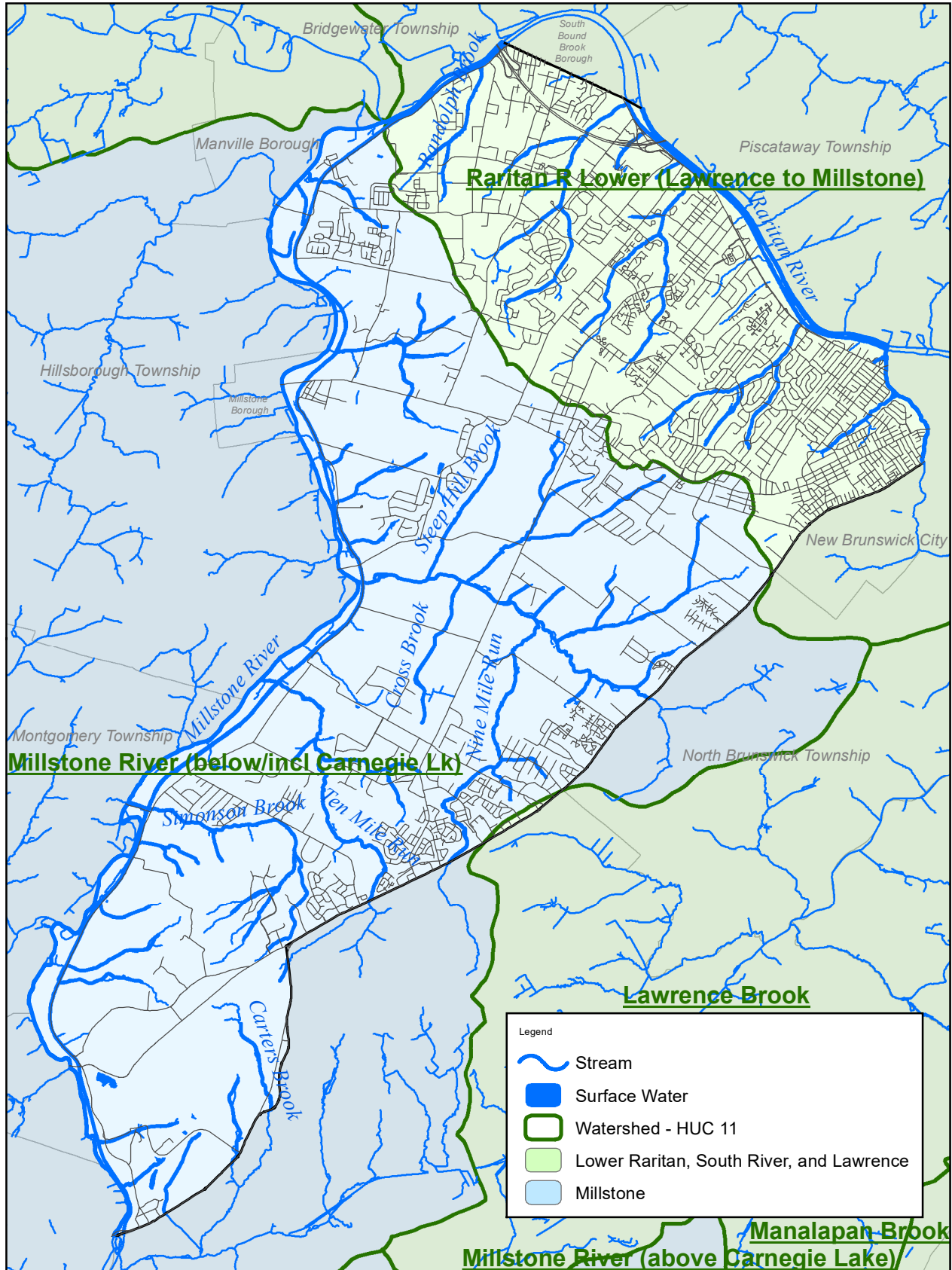


Figure 7

Watersheds



Franklin Township
Somerset County, New Jersey

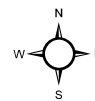
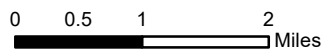
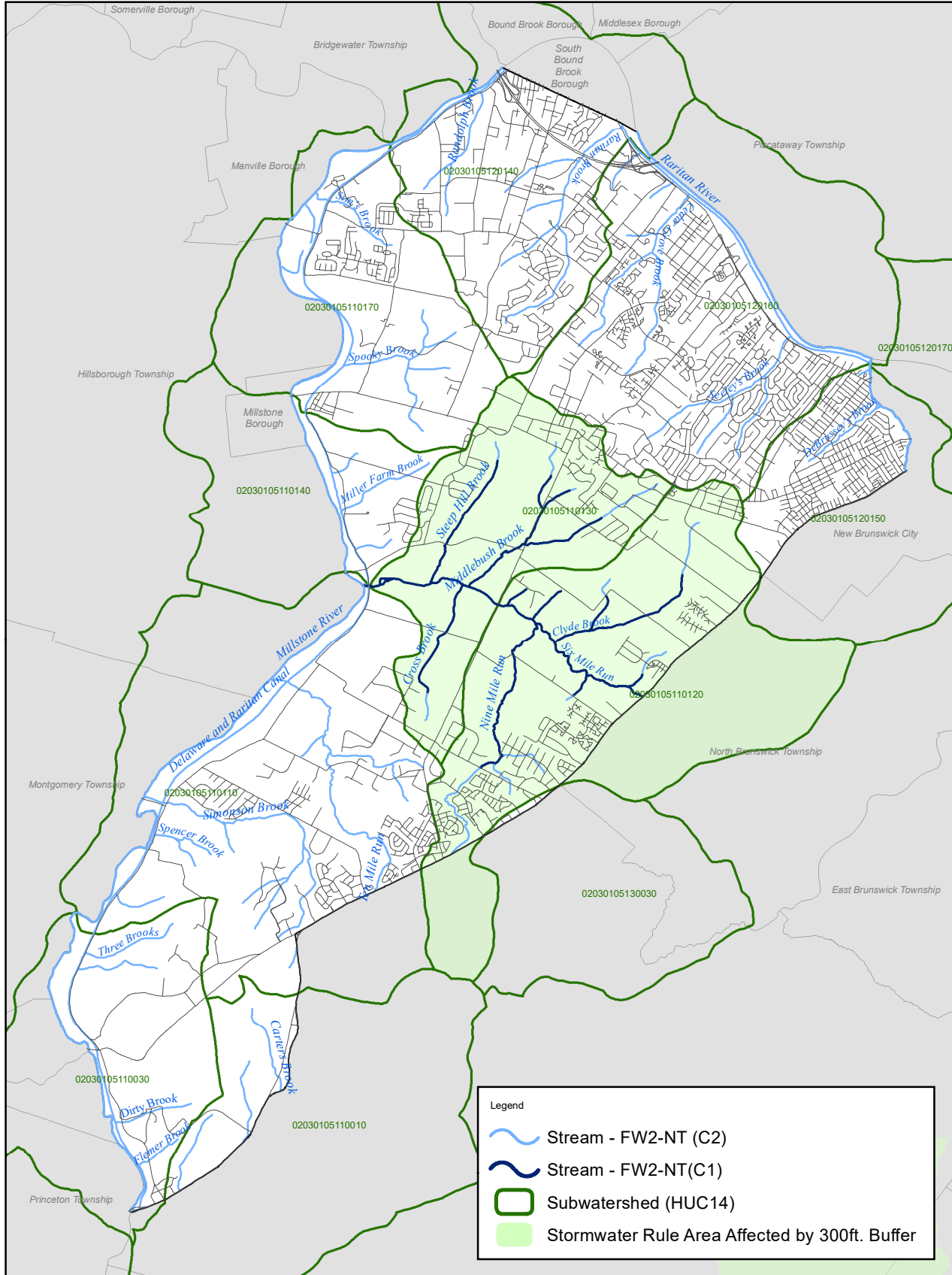
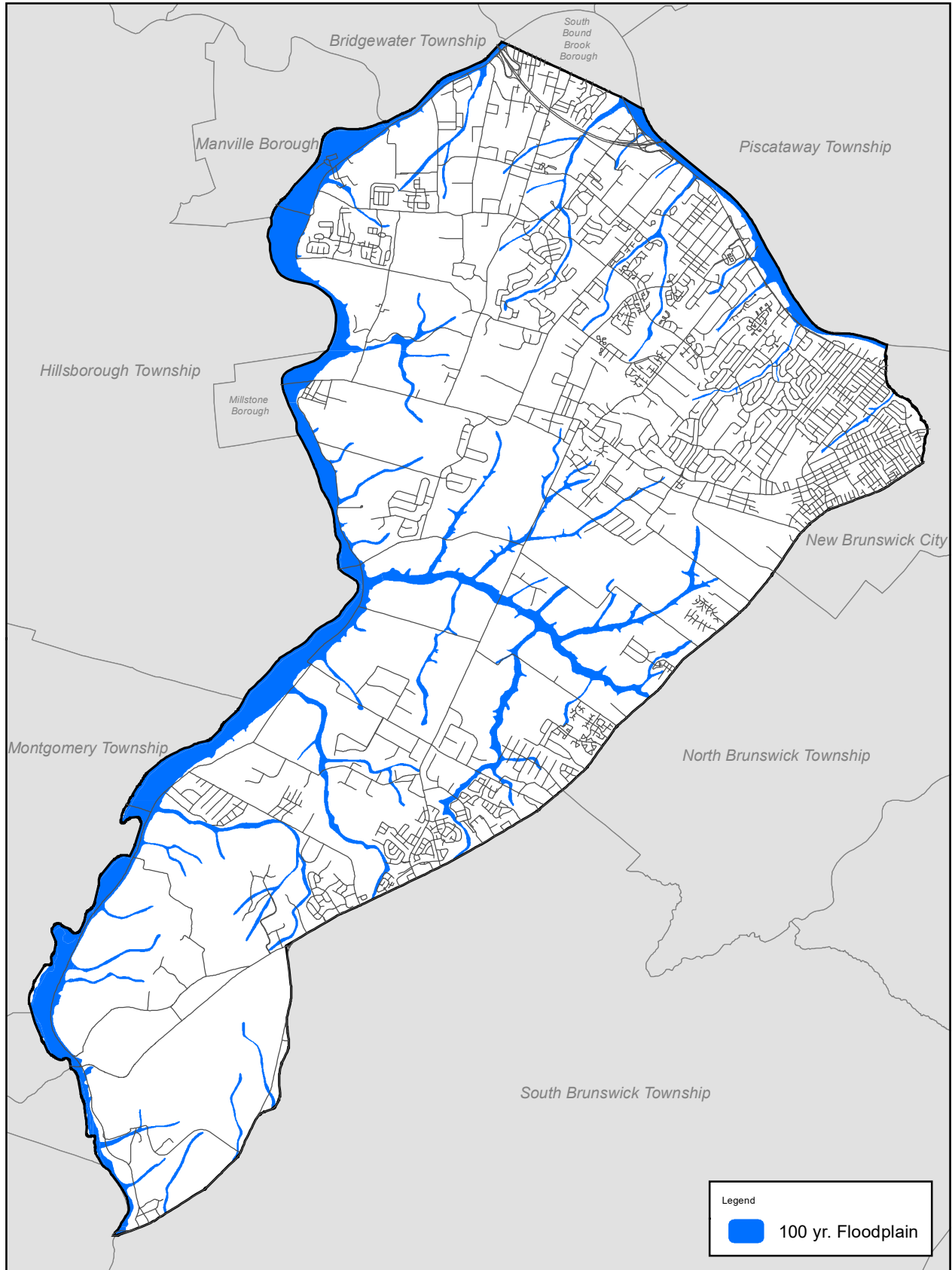


Figure 8

Surface Water Quality



FEMA Floodplain



Franklin Township
Somerset County, New Jersey

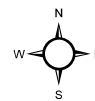
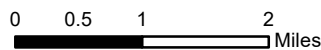
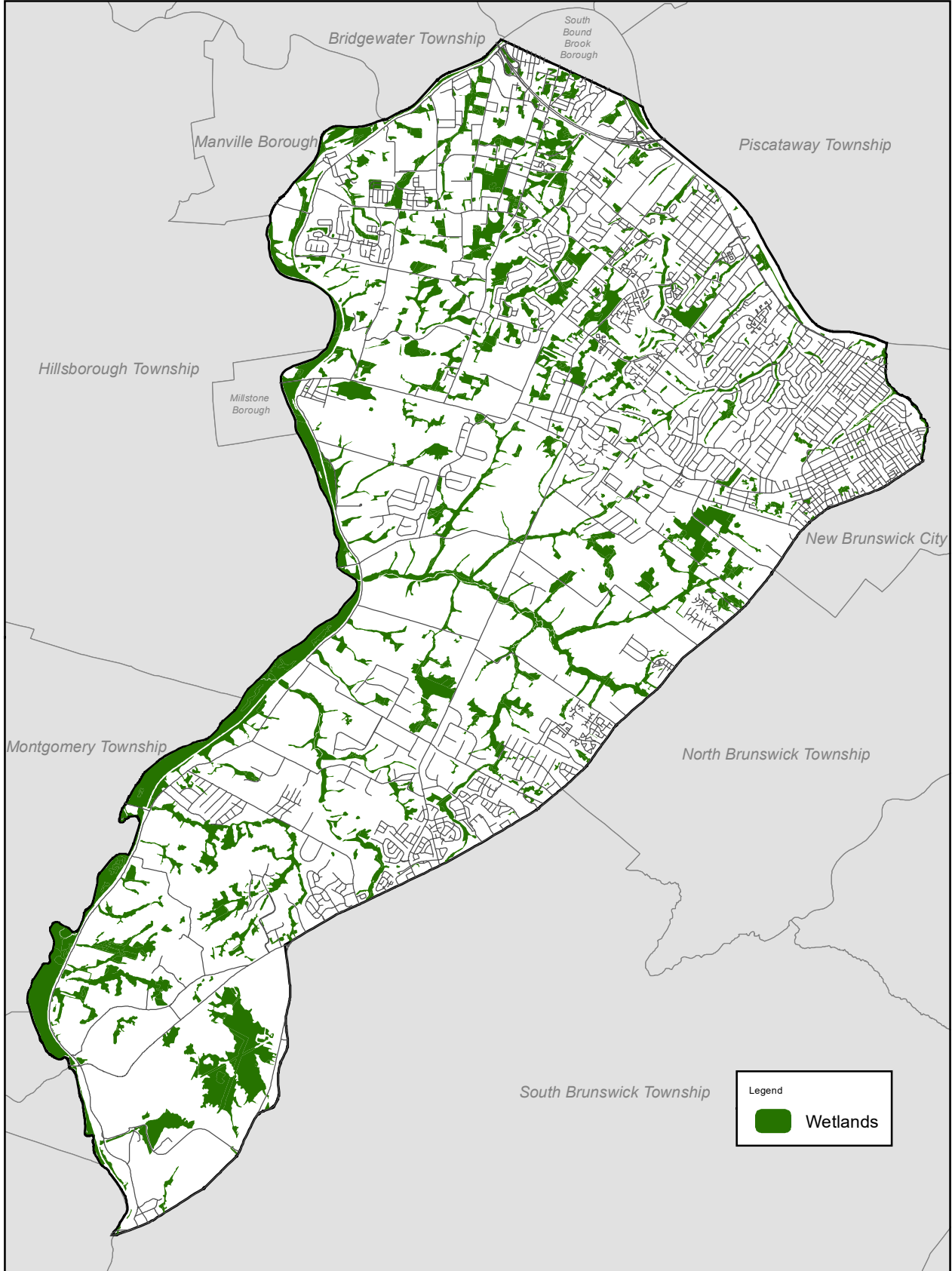


Figure 10

Wetlands



Franklin Township
Somerset County, New Jersey

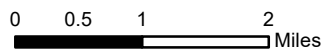
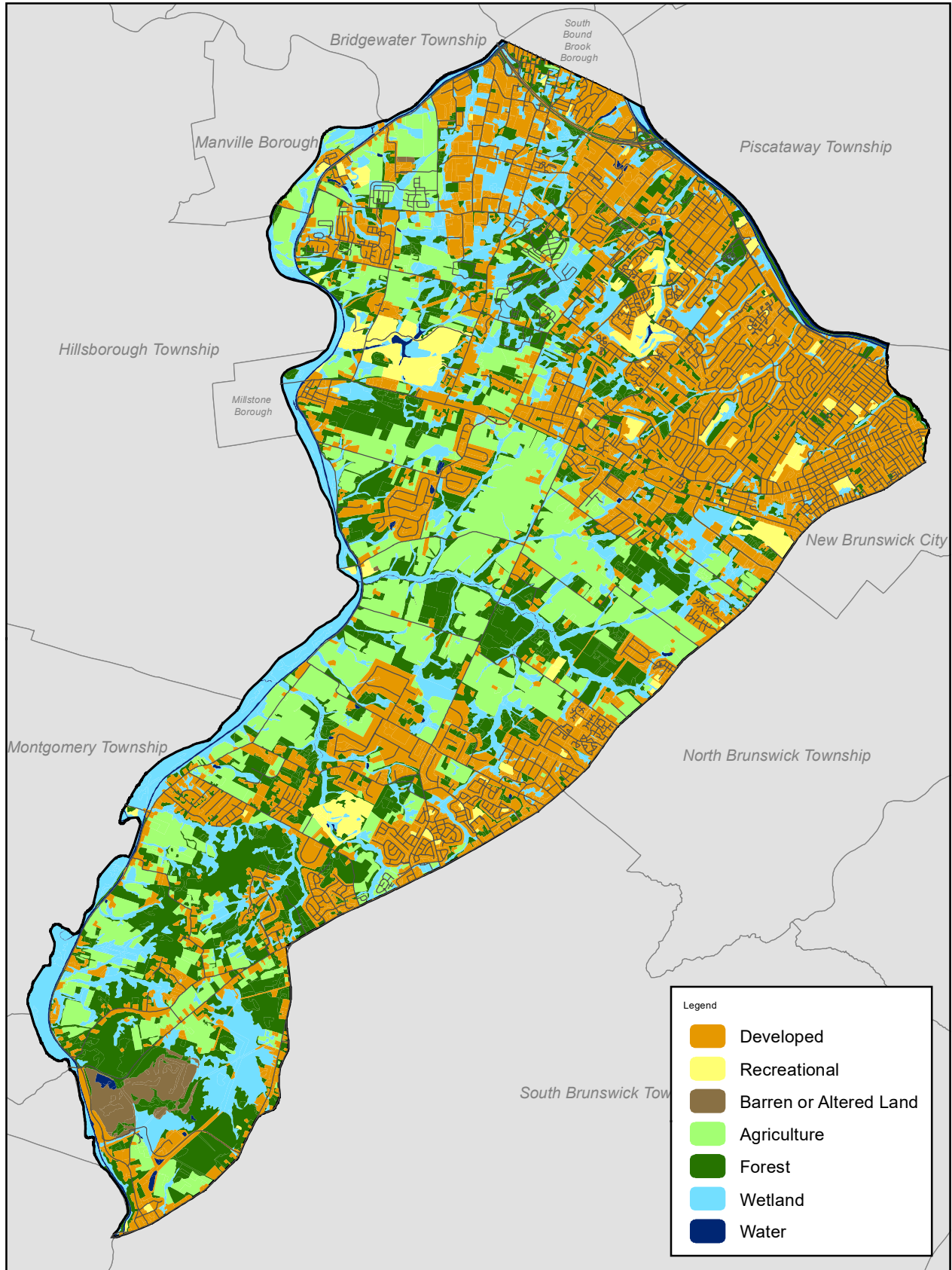


Figure 11

Land Use / Land Cover (2002)



Franklin Township
Somerset County, New Jersey

0 0.5 1 2
Miles

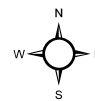
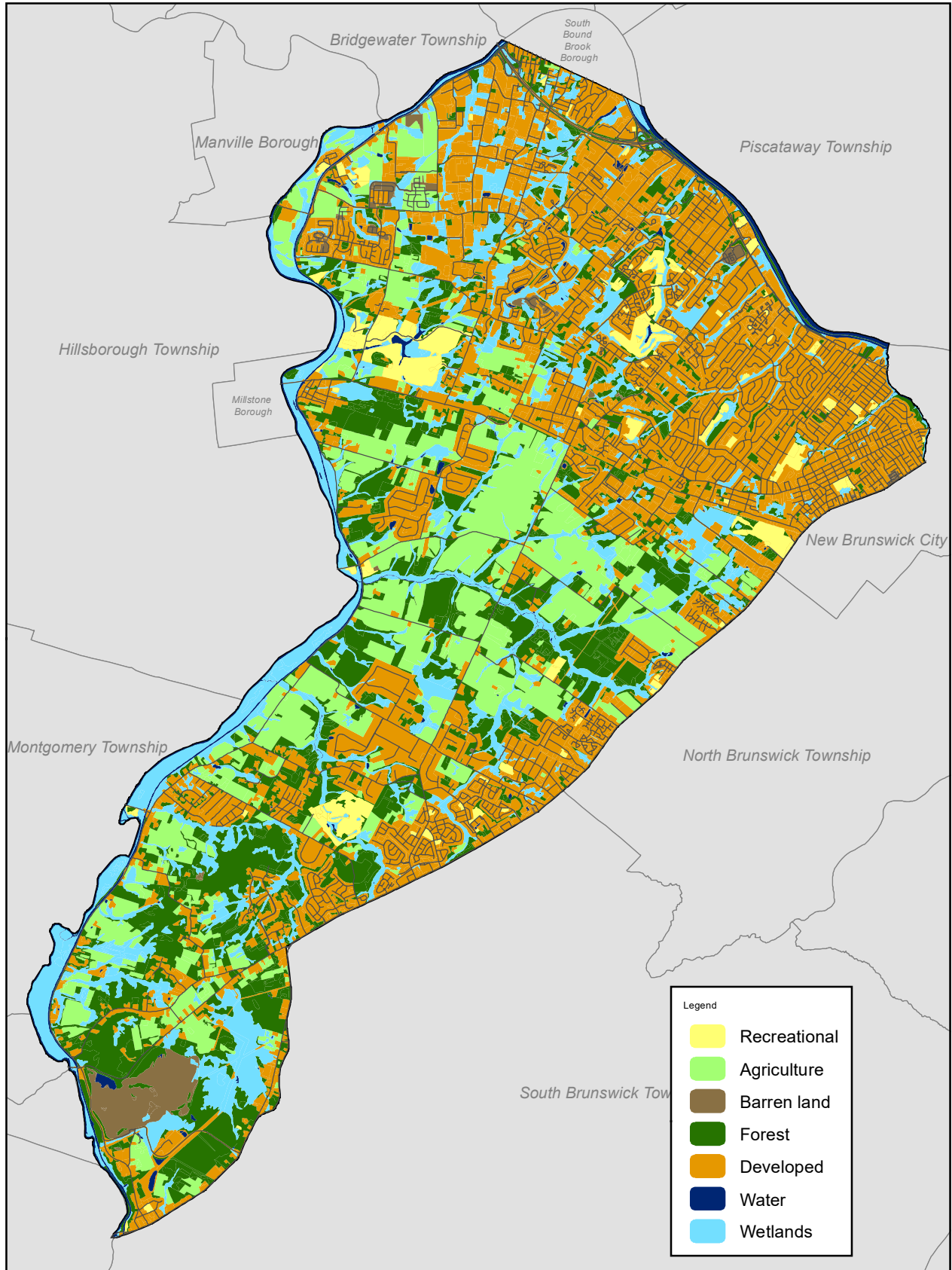


Figure 12

Land Use / Land Cover (2012)



Franklin Township
Somerset County, New Jersey

0 0.5 1 2
Miles

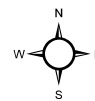
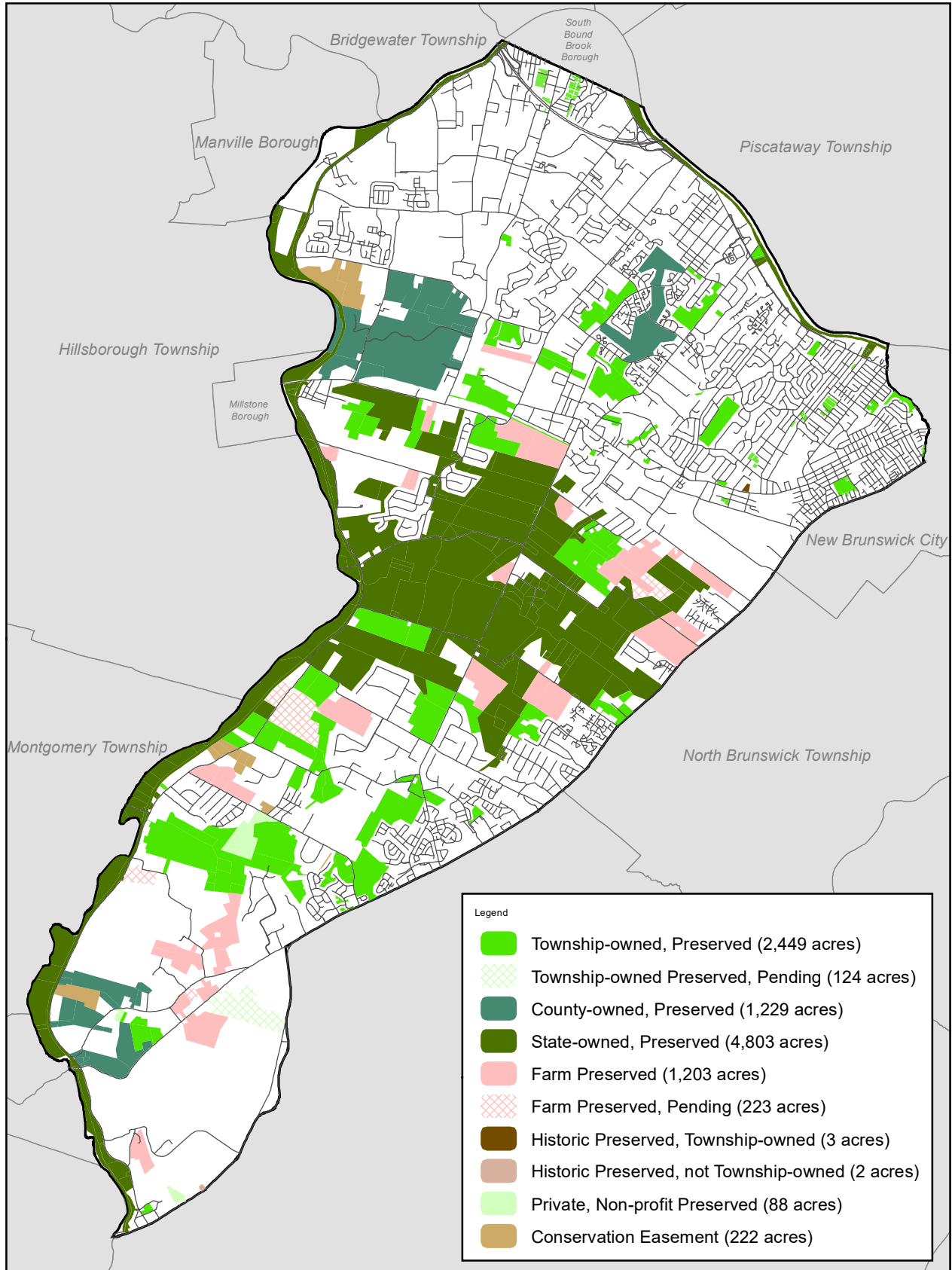


Figure 13

Preserved Land



Franklin Township
Somerset County, New Jersey

0 0.5 1 2 Miles

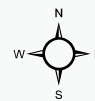
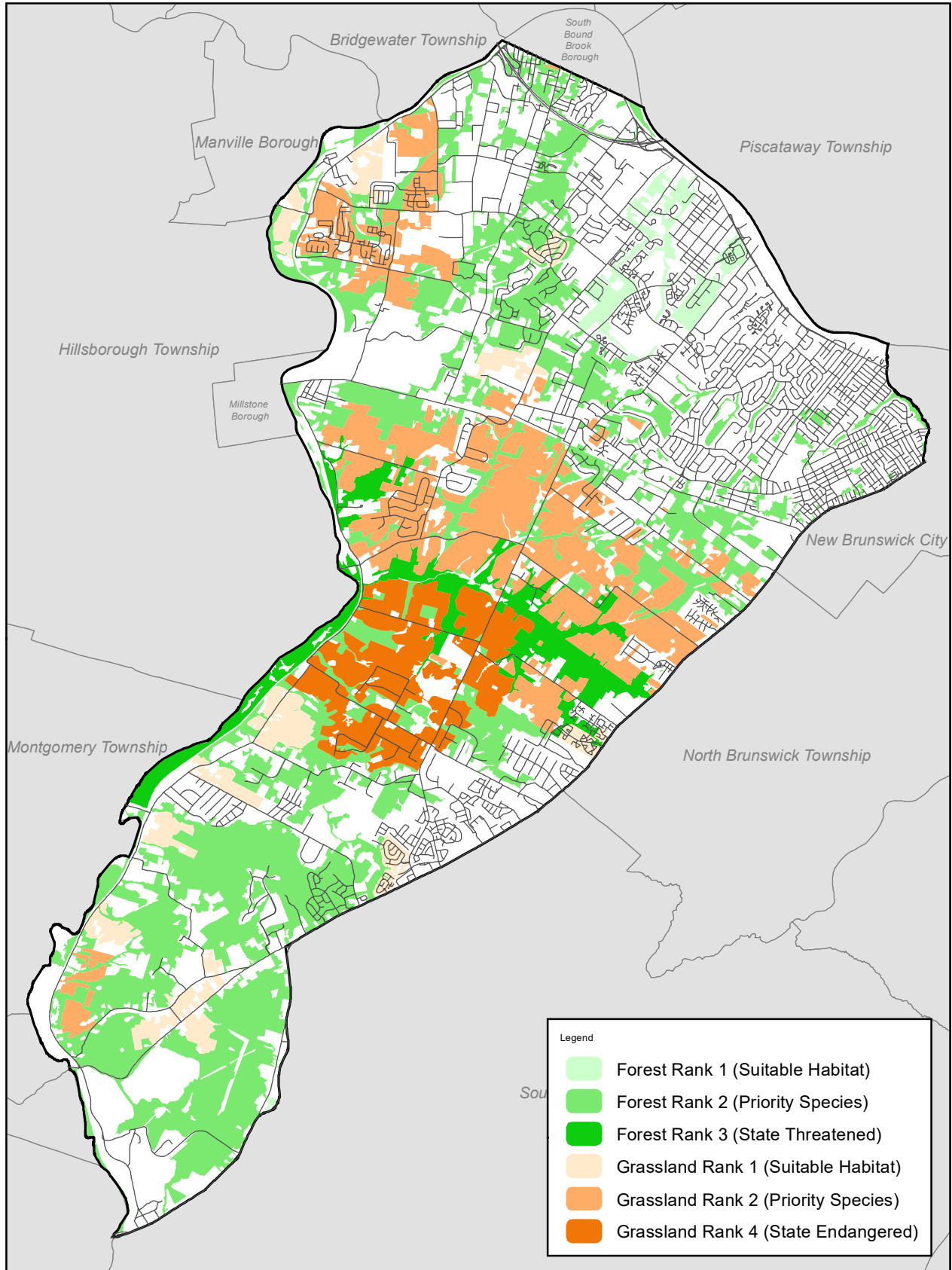


Figure 14

Landscape Project: Forest and Grassland



Franklin Township
Somerset County, New Jersey

0 0.5 1 2 Miles

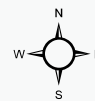
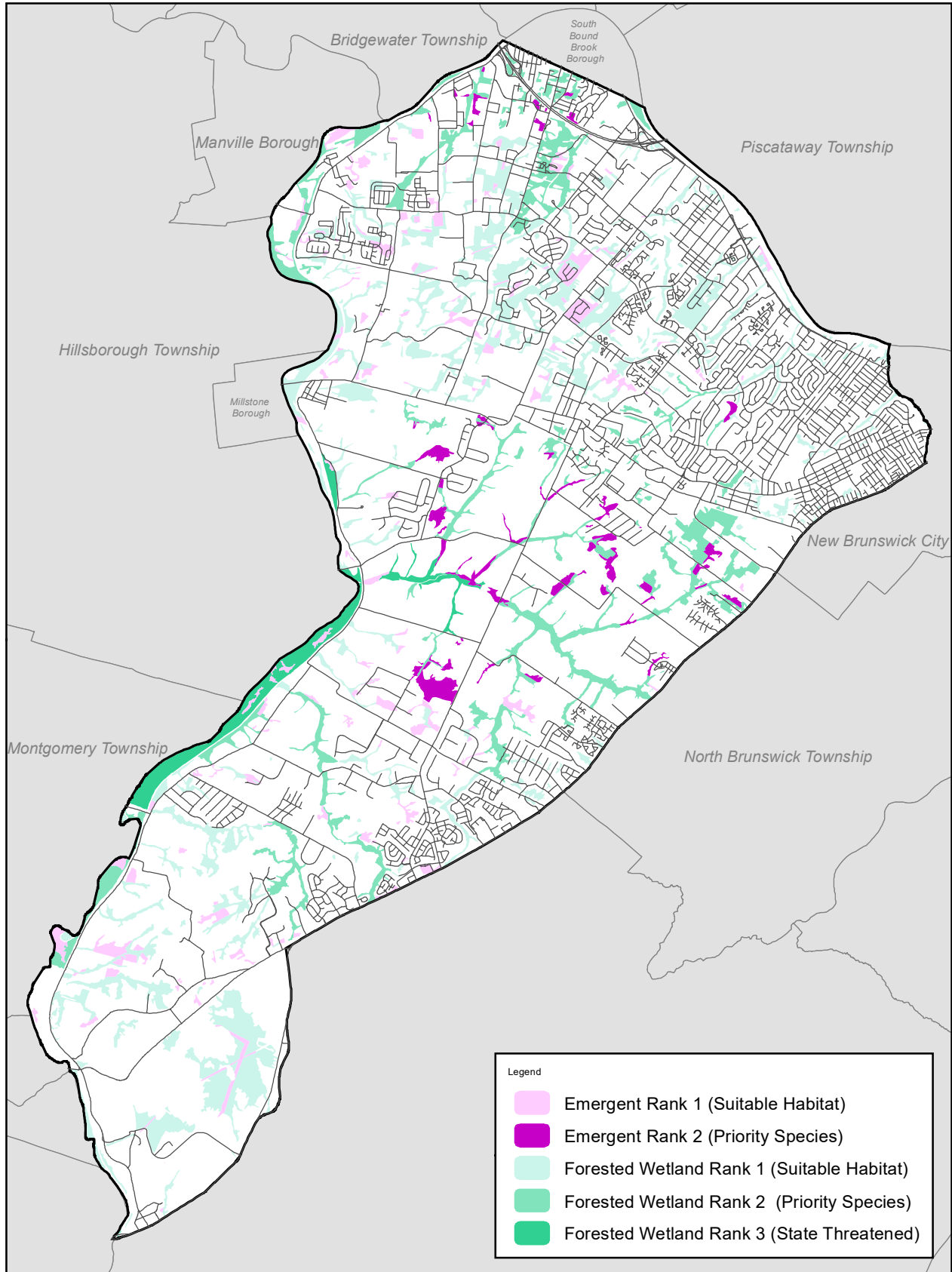


Figure 15

Landscape Project: Emergent and Forested Wetland



Franklin Township
Somerset County, New Jersey

0 0.5 1 2 Miles

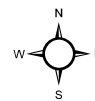
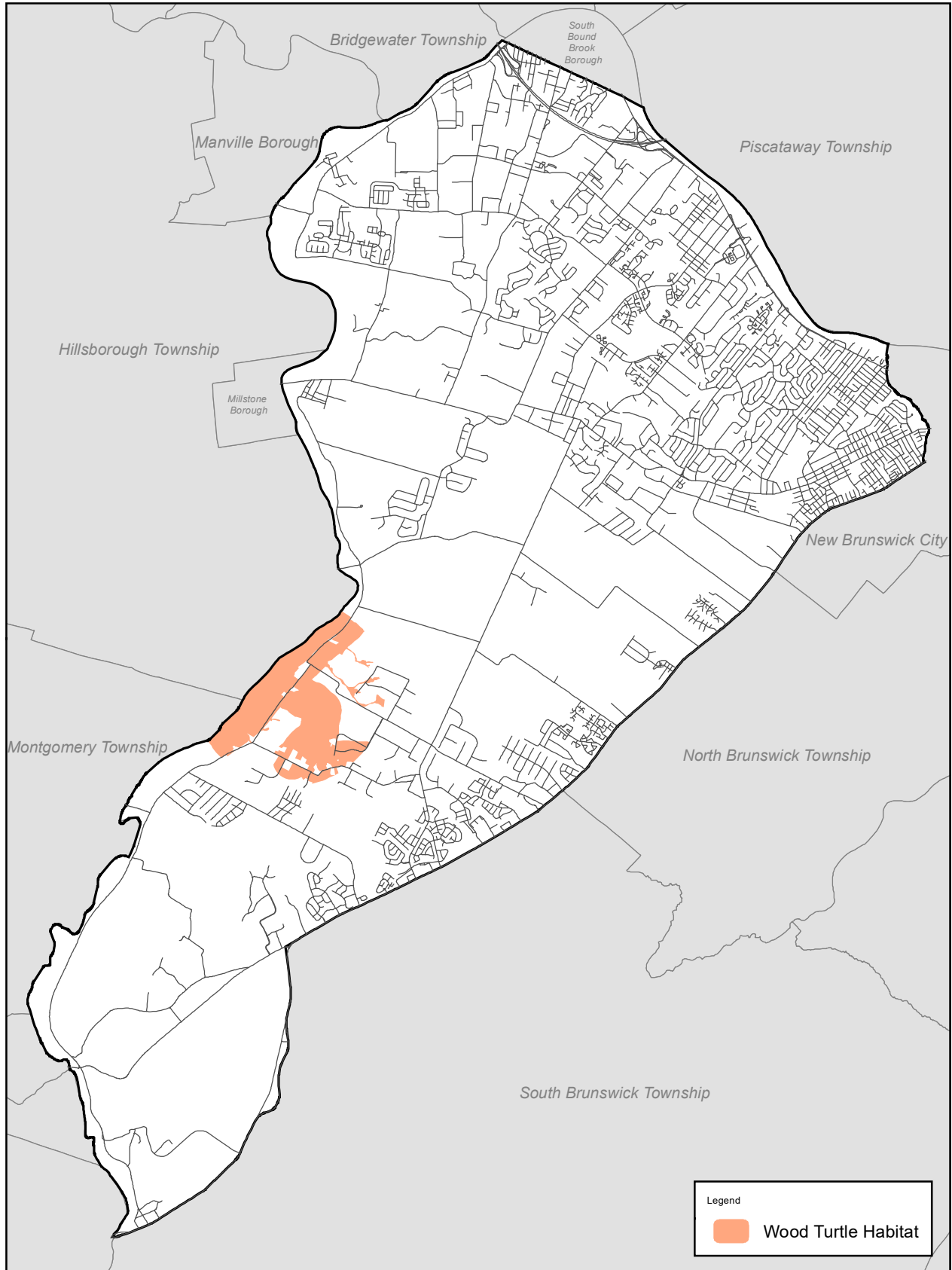


Figure 16

Wood Turtle Habitat



Franklin Township
Somerset County, New Jersey

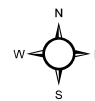
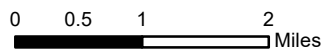


Figure 17