

NATURAL RESOURCES INVENTORY

**TOWNSHIP OF MIDDLE
CAPE MAY COUNTY, NEW JERSEY**

**November 2007
Revised May 2010**

Adopted by the Middle Township Planning Board on

July 22, 2010



Maser Consulting PA
American Metro Center
100 American Metro Boulevard
Suite 152
Hamilton, NJ 08619

Natural Resources Inventory

Middle Township

Cape May County, New Jersey

**November 2007
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Prepared by:

Barbara Edelhauser, Environmental Scientist
William Olson, Environmental Scientist
Loren Kelly, Environmental Specialist
Jacqueline McCort, Environmental Specialist
Sharon White, Cultural Resources Specialist
Jill Slagle, Cultural Resources Specialist
Christopher Walker, Cultural Resources Specialist
Marcia Shiffman, AICP, PP, LLA, Project Manager
Daniel Bloch, PP, Project Planner



Maser Consulting PA
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EXECUTIVE SUMMARY

Middle Township has never prepared an inventory of natural resources, although such resources were sometimes mentioned in Master Planning documents. A detailed natural resources inventory serves to inform the planning process by providing a factual basis for land use decision-making.

This inventory can serve in the refinement of zoning regulations and land use ordinances to further the protection of existing natural areas, the appropriate development of the few remaining vacant, privately-owned land parcels and the redevelopment of developed lands. The identification and understanding of natural systems and their inherent and regulatory limitations for development serve to prevent future environmental problems and associated mitigation costs. The inventory can identify possibilities for regional partnerships and planning activities that can improve environmental conditions and quality of life in the City.

Middle Township is located on the Outer Coastal Plain of New Jersey in the northeastern portion of Cape May County and represents one of its 16 municipalities. The Township occupies a land area of approximately 52,996 acres or 82.8 square miles, according to NJ DEP. Middle Township is surrounded to the north by Dennis Township, to the east by Avalon Borough, Stone Harbor Borough, North Wildwood City and Wildwood City, and to the south by Lower Township. Delaware Bay is located to the west of the municipality.

Geologically, the City is underlain by the unconsolidated sediments of the Cohansey and Cape May Formations. The Atlantic City 800-foot Sand Aquifer System of the Lower Kirkwood Formation provides drinking water to residents of Middle Township. The easterly portions of the Township ultimately drain to the Atlantic Ocean and the westerly portions drain to Delaware Bay. Three subwatersheds further subdivide Middle Township. These subwatersheds are the Dennis Creek Watershed, Cape May Tributaries West and Cape May Bays and Tributaries East.

The majority of the municipality is located within either the 500-year (Zone B) or the 100-year floodplain (Zone A) of the Atlantic Ocean, Delaware Bay and associated tidal wetlands and water bodies, including Stites Sound, Great Sound, Jenkins Sound, Grassy Sound and Richardson Sound. Large expanses of wetlands are present. These wetlands include High and Low Saltmarsh, Brackish and Freshwater Tidal Marshes. There are also a number of upland plant communities present. These include the Marine Intertidal Gravel/Sand Beach, Dunegrass, Beach Heather, Shrub Thicket and Dune Woodland Communities. The extent of floral diversity in plant communities is mirrored by a similar diversity in fauna, particularly for birds and butterflies. Numerous threatened and endangered plants and animals are documented to occur in Middle Township. Portions of Middle Township are included within ten Natural Heritage Program Priority Sites.

The presence of numerous threatened and endangered species is documented for Middle Township. The coastal marshes, bay islands and the Delaware Bayshore host important overwintering, breeding and nesting bird populations. The Bayshore is the site of a huge Horseshoe Crab spawning event. The area has become a critically important migratory bird stopover, for species traveling to the Arctic. State and Federal wildlife agencies maintain considerable interest in the wildlife and habitat resources in the area.

Middle Township has retained many features of its historical heritage. Properties have been identified in Middle Township that may be eligible for listing on the National and New Jersey Registers of Historic Places. Several areas in the Township are likely to contain archaeological resources. The sum of these resources and the awareness thereof helps to establish a sense of place for Middle Township citizens. This inventory can provide the framework for planning and preservation. Valuable cultural resources can be preserved and the restoration of degraded resources can be undertaken.

The mapping and description of sensitive areas facilitates the proper use and protection of existing natural areas, the appropriate development of the remaining vacant, privately-owned land parcels and the redevelopment of developed

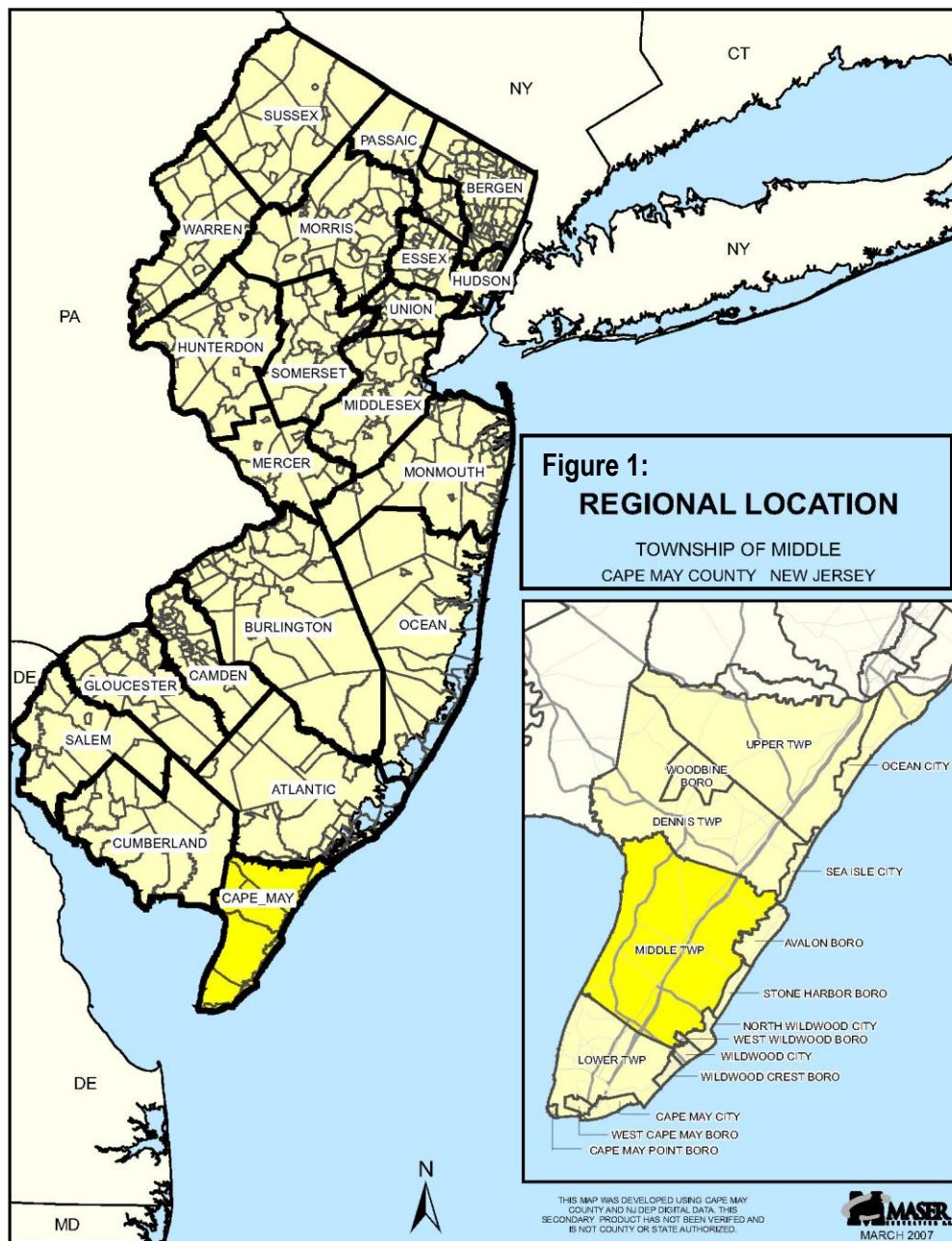
lands. This inventory can serve in the refinement of zoning regulations and land use ordinances and in targeting land appropriate for preservation. The identification and understanding of natural systems and their inherent and regulatory limitations for development serve to prevent future environmental problems and associated mitigation costs. The inventory can identify possibilities for regional partnerships and planning activities that can protect environmental resources as well as the quality of life in the Middle Township.

This Natural Resource Inventory was originally prepared in November 2007. It was revised in May 2010 to update the Open Space and Natural Heritage Priority Sites mapping and text with more recent information.

1.0 LOCATION

1.1 MIDDLE TOWNSHIP LOCATION

Middle Township is located in the southern portion of Cape May County, which occupies a peninsula at the southern tip of the State of New Jersey (see Figure 1). All of Cape May County lies within the Coastal Plain Physiographic Province, characterized by the presence of unconsolidated deposits laid down over a long period of time.



The Township, incorporated in 1798, originally encompassed an area of approximately 10 by 10 miles wide. However, with incorporation of other municipalities within Cape May County, the Township decreased in size and now occupies a land area of approximately 82.8 square miles. Middle Township is surrounded to the north by Dennis Township, to the east by Avalon Borough, Stone Harbor Borough, North Wildwood City, and Wildwood City, and to the south by Lower Township. The Delaware Bay borders the municipality to the west. Major roadways that run through Middle Township include the Garden State Parkway, State Route 9, and State Route 47. Extensive tidal wetlands are located along the easterly and westerly shores of Middle Township.

1.2 REGULATORY JURISDICTIONS

The State of New Jersey has established several areas within the State for extra protection. These are the Pinelands Area, the Coastal Zone, the New Jersey Meadowlands and the Highlands Region. Rules and regulations have been promulgated by the State to regulate development in these areas. Middle Township is almost completely encompassed within the Coastal Zone. The boundary of the Coastal Zone regulatory jurisdiction is shown on Figure 2.

As described in the Coastal Area Facility Review Act (CAFRA) - N.J.S.A. 13:19, the entire Township falls within the CAFRA boundary, with the exception of the following portion: within a line beginning at the intersection of State Route 47 and County Road 654 and continuing westerly on County Road 654. At the intersection of County Road 654 and County Road 603, the boundary extends southeasterly on County Road 603. The boundary extends to the intersection with County Road 647, and follows County Road 647 easterly and northerly to the intersection with U.S. Route 9. The boundary extends northerly along U.S. Route 9 to the intersection with State Route 47, and then westerly along State Route 47 to its intersection with County Road 654. The boundary of the Pinelands Reserve Area is shown on Figure 2, where the Pinelands Management Areas and the CAFRA boundaries overlap.

The Federal Coastal Zone Management Act of 1972 gave States the authority to devise strategies and policies to manage development and use of coastal land and water areas. The State of New Jersey adopted the Coastal Area Facilities Review Act (CAFRA) to manage development in the Coastal Zone. The Coastal Permit Program Rules (N.J.A.C. 7:7) and the Coastal Zone Management Rules (N.J.A.C. 7:7E) are the implementing rules and regulations for CAFRA. Nearly all development located within 150 feet of the mean high water line of a tidal water body is subject to these regulations. Jurisdictional thresholds are higher between 150 and 500 feet from the mean high water line and higher still beyond 500 feet. The development intensity allowed by the coastal regulations varies according to planning area in the coastal zone. The most impervious cover is allowed in designated centers, which can be designated as Urban Centers, Regional Centers, Towns, Villages and Hamlets.

- Cape May Courthouse Regional Center
- Rio Grande Regional Center
- Burleigh/Whitesboro Town Center
- Swainton Hamlet
- Del Haven Hamlet

The most intensive development is allowed in regional centers, with less impervious cover allowable in town centers and still less in hamlets. Land outside of centers is divided into the following planning areas:

- Coastal Metropolitan Planning Area
- Coastal Suburban Planning Area
- Coastal Fringe Planning Area
- Coastal Rural Planning Area
- Coastal Environmentally Sensitive Planning Area

At the present time the first two planning areas are not established in Middle Township. Seven coastal centers were previously established in Middle Township. As of February 2006, the CAFRA Centers were to be eliminated and incorporated into the NJOSG Centers via the Plan Endorsement process. In 2006, municipalities who were in the NJOSG Plan Endorsement Petition process, such as Middle Township, were given an additional year until March 2007 to complete the Plan Endorsement Petition process. In 2008, the NJ Permit Extension Act (P.L. 2008, c.78) temporarily extended the Coastal Centers designation for those municipalities that were in the NJOSG Plan Endorsement Process. These Coastal Centers are now extended until the end of 2010. However, these Centers will be replaced by the proposed Centers through the Plan Endorsement process. The Coastal Centers were identified as:

- Coastal Regional Centers - Cape May Courthouse, Rio Grande
- Coastal Villages – Whitesboro/Burleigh, Del Haven
- Coastal Hamlets – Swainton, Goshen, Green Creek

The three major coastal statutes giving authority for the development of these rules are the Wetlands Act of 1970, the Waterfront Development Law and the Coastal Area Facility Review Act. The Freshwater Wetlands Protection Act allows the regulation of activities in freshwater wetlands within the Coastal Zone, as well as in other parts of the state. The Flood Hazard Area Control Act Rules regulate activities in floodplains and streams. The Coastal Barrier Resources Act of 1982 limits federal spending that might encourage development in coastal barrier areas, which are both hurricane-prone and characterized by abundant and important biological resources. Middle Township contains all or portions of four federal units of the John H. Chafee Barrier Resources System. "System Units" are subject to the full scope of limitations prescribed by the law. "Otherwise Protected Areas" are only limited in that federal flood insurance will not be issued in these areas. The units present in Middle Township are shown in Figure 3.

Lands that are tidally flowed are owned by the State of New Jersey. Most activities proposed below the mean high water line of any tidal water body require review and approval from the NJDEP Bureau of Tidelands. The United States Army Corps of Engineers also regulates activities conducted below the mean high water line and within wetlands that are tributary to a tidal water body and located within 1,000 feet from the mean high water line.

The Pinelands Management Area represents a partnership between the State and Federal government to preserve, protect and enhance the natural and cultural resources of the Pinelands National Reserve. The Township of Middle is completely outside of the Pinelands Management Area, and is not subject to the provisions of the Pinelands Comprehensive Management Plan.

The regulated Pinelands Area is within the Pinelands National Reserve, which extends beyond the limits of Pinelands Area. In Middle Township, the Pinelands National Reserve overlaps the Coastal Zone. It is actually a federally designated area, consisting of approximately one million acres of land. This area was established under Section 502 of the National Parks and Recreation Act of 1978 (PL 95-625). Under a Memorandum of Agreement between the NJ Pinelands Commission and the NJDEP Land Use Regulation Program, the NJDEP is the lead agency in review of development applications in the Pinelands National Reserve Area. The NJ Pinelands Commission is a reviewing agency and may provide comments on development in this area. The Pinelands National Reserve Area in the Township is located to the west of the Garden State Parkway and north of Goshen Swainton Road (CR-646), containing about 10,200 acres.

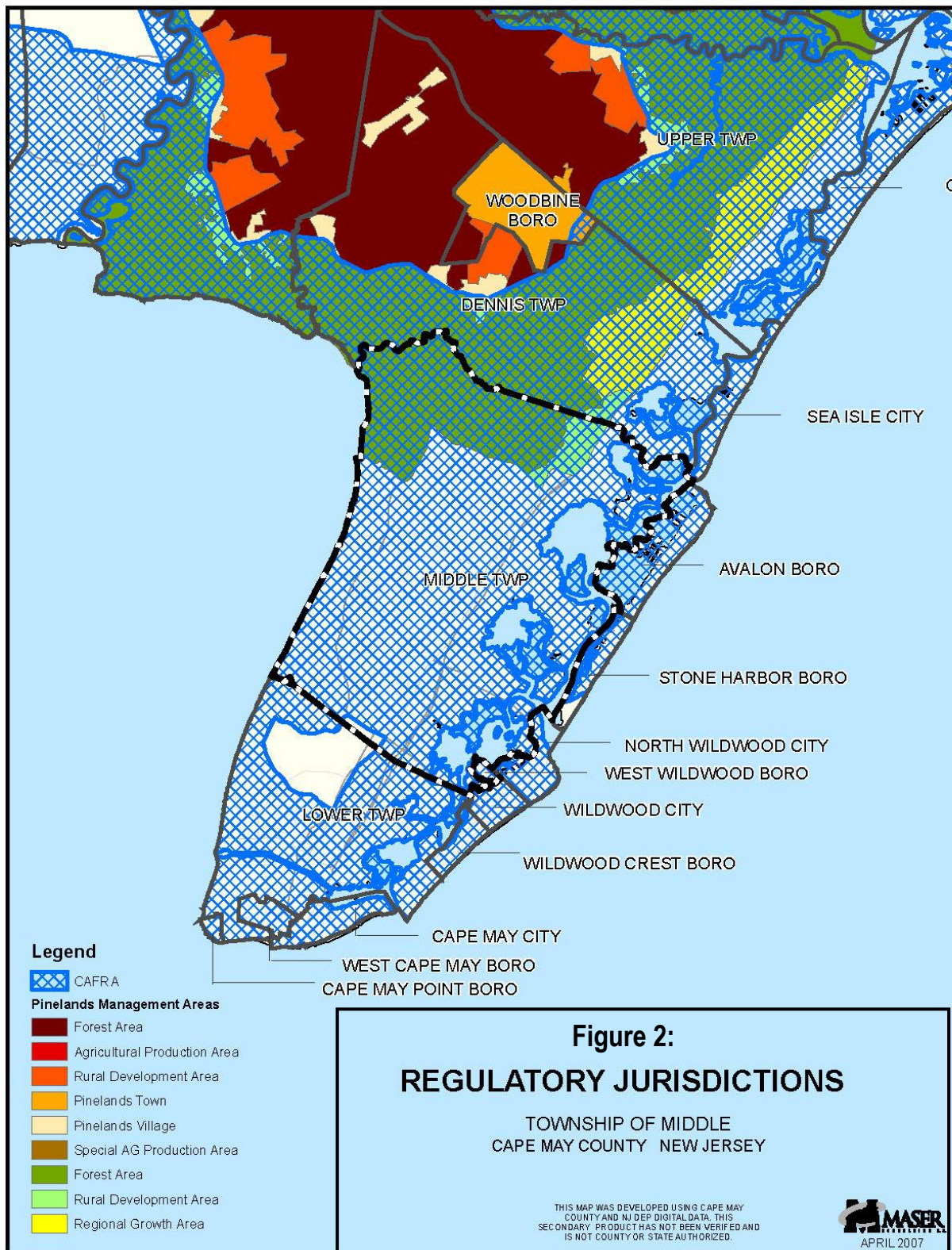
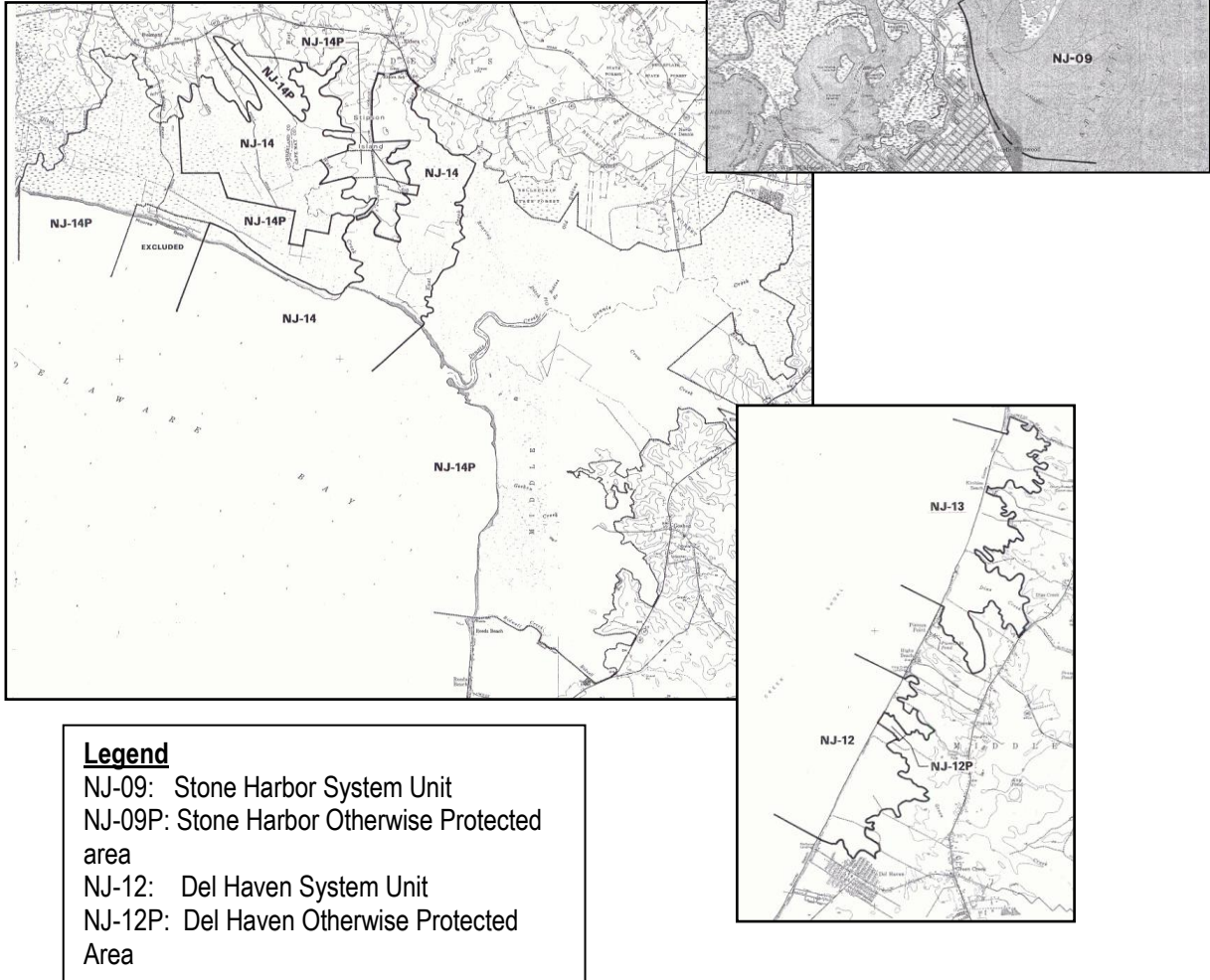


Figure 3: Coastal Barrier Resources System Units

(USFWS. 1990. Coastal Barrier Improvement Act {PL 101-591})



1.3 EXISTING LAND USE AND LAND COVER

The existing land use patterns within Middle Township are depicted on the 2002 Land Use/Land Cover map. It is evident that most land in the Township is publicly-owned, consisting of environmentally-constrained land and wildlife management areas. The Township has approximately 50 percent of its total land mass covered by freshwater and tidal wetlands, more than half of which are saline marsh (see the Wetlands map). There are large areas of land within the Township that are owned and managed by State and Federal agencies for the protection of threatened and endangered species and wildlife habitats. Cape May County provides funds for farmland preservation. Agricultural lands comprise only 3 percent of the land cover in Middle Township. Preserved farmland is shown on the Open Space map.

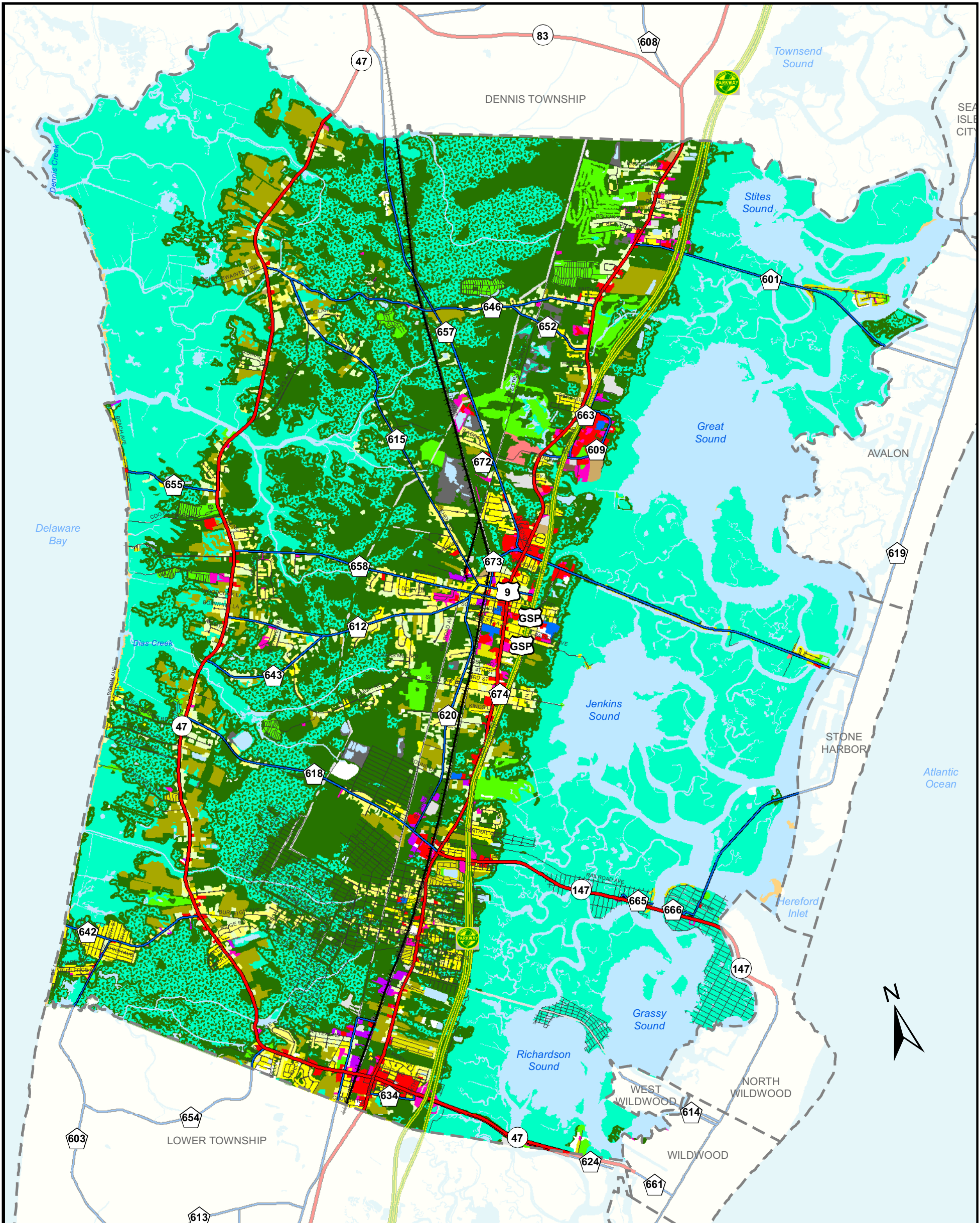
The two most significant regions of undevelopable land are located along the entire eastern and western portions of the municipality. The eastern stretch of land is situated between the Garden State Parkway and the barrier islands and is constrained by tidal wetlands. The western stretch of land is situated along the Delaware Bay and is dominated by tidal wetlands to the west of State Route 47 and by forested wetlands to the east of State Route 47 and west of U.S. Route 9.



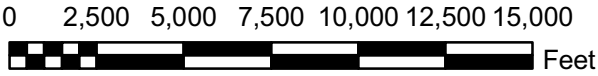
Residential uses account for 7 percent of the land within the Township. The existing residential development consists mainly of single-family homes with the most concentrated areas located in Cape May Courthouse, Rio Grande, Goshen and Whitesboro-Burleigh. It is no surprise that most of Middle Township's commercial developments are located along its major roadways, particularly along the U.S. Route 9 and State Route 47 corridors. The larger shopping centers and retail stores are located in Cape May Courthouse and Rio Grande. Industrial uses are minimal, and measure less than 1 percent of the Township's land cover. These uses are generally located along the U.S. Route 9 corridor and along the NJ Transit Railroad that traverses the approximate center of the Township.

Table 1: Land Use / Land Cover, 2002		
Land Use / Land Cover Classification	Acres	% of Twp
Urban Lands	7,164.02	13.52%
Residential	4,025.57	7.60%
Residential, High Density (Multiple Dwelling)	244.68	0.46%
Residential, Medium Density (Single Dwelling)	1,026.86	1.94%
Residential, Low Density (Single Dwelling)	1,368.84	2.58%
Residential, Rural Density (Single Dwelling)	1,385.18	2.61%
Commercial	650.68	1.23%
Industrial	113.04	0.21%
Mixed Urban Lands	3.69	0.01%
Transportation/Communication/Utilities	822.95	1.55%
Transportation/Communication/Utilities	348.91	0.66%
Major Roadway	247.08	0.47%
Upland Rights-Of-Way Developed	18.50	0.03%
Upland Rights-Of-Way Undeveloped	197.95	0.37%
Stormwater Basin	10.52	0.02%
Cemetery	398.80	0.75%
Cemetery	398.70	0.75%
Cemetery On Wetland	0.10	0.00%
Military Installations	4.64	0.01%
Recreational Lands	56.12	0.11%
Recreational Land	55.77	0.11%
Athletic Fields (Schools)	0.35	0.00%
Stadium Theaters Cultural Centers And Zoos	995.45	1.88%
Other Urban Land	93.09	0.18%
Other Urban Or Built-Up Land	42.85	0.08%
Phragmites Dominate Urban Area	50.24	0.09%
Agricultural Lands	1,752.48	3.31%
Cropland And Pastureland	1,488.06	2.81%
Orchards/Vineyards/Nurseries/Horticultural Areas	110.51	0.21%
Confined Feeding Operations	1.38	0.00%
Other Agriculture	152.53	0.29%
Barren Lands	413.25	0.78%
Extractive Mining	202.33	0.38%
Beaches	85.88	0.16%
Barren Lands	125.04	0.24%
Altered Lands	32.64	0.06%
Transitional Areas	89.93	0.17%
Undifferentiated Barren Lands	2.46	0.00%
Coniferous Forest (10-50% Crown Closure)	160.39	0.30%
Deciduous Forest (10-50% Crown Closure)	364.16	0.69%
Deciduous Forest (>50% Crown Closure)	1,481.83	2.80%

Table 1: Land Use / Land Cover, 2002 (continued)		
Forests	7,972.19	15.04%
Coniferous Forest (10-50% Crown Closure)	160.39	0.30%
Coniferous Forest (>50% Crown Closure)	1,344.09	2.54%
Plantation	8.77	0.02%
Mixed Forest (>50% Coniferous With 10-50% Crown Closure)	2.90	0.01%
Mixed Forest (>50% Coniferous With 10-50% Crown Closure)	214.60	0.40%
Mixed Forest (>50% Coniferous With >50% Crown Closure)	1,401.26	2.64%
Mixed Forest (>50% Deciduous With 10-50% Crown Closure)	398.79	0.75%
Mixed Forest (>50% Deciduous With >50% Crown Closure)	1,440.01	2.72%
Old Field (< 25% Brush Covered)	288.35	0.54%
Phragmites Dominate Old Field	11.17	0.02%
Deciduous Brush/Shrubland	120.31	0.23%
Coniferous Brush/Shrubland	209.31	0.39%
Mixed Deciduous/Coniferous Brush/Shrubland	526.24	0.99%
Water	8,880.03	16.76%
Bridge Over Water	5.32	0.01%
Streams And Canals	8.84	0.02%
Natural Lakes	9.99	0.02%
Artificial Lakes	303.08	0.57%
Tidal Rivers, Inland Bays, And Other Tidal Waters	8,457.20	15.96%
Open Tidal Bays	89.16	0.17%
Dredged Lagoon	6.38	0.01%
Atlantic Ocean	0.05	0.00%
Wetlands	26,807.74	50.58%
Wetland Rights-Of-Way	68.64	0.13%
Managed Wetland In Maintained Lawn Greenspace	17.03	0.03%
Managed Wetland In Built-Up Maintained Rec. Area	69.62	0.13%
Agricultural Wetlands (Modified)	325.93	0.62%
Former Agricultural Wetland (Becoming Shrubby, Not Built-Up)	32.59	0.06%
Saline Marsh (Low Marsh)	14,963.39	28.24%
Saline Marsh (High Marsh)	751.48	1.42%
Vegetated Dune Communities	18.53	0.03%
Phragmites Dominate Coastal Wetlands	267.24	0.50%
Deciduous Wooded Wetlands	2,561.35	4.83%
Coniferous Wooded Wetlands	1,056.58	1.99%
Atlantic White Cedar Wetlands	56.26	0.11%
Deciduous Scrub/Shrub Wetlands	424.62	0.80%
Coniferous Scrub/Shrub Wetlands	71.01	0.13%
Mixed Scrub/Shrub Wetlands (Deciduous Dom.)	485.75	0.92%
Mixed Scrub/Shrub Wetlands (Coniferous Dom.)	957.78	1.81%
Herbaceous Wetlands	405.35	0.76%
Phragmites Dominate Interior Wetlands	130.23	0.25%
Mixed Wooded Wetlands (Deciduous Dom.)	1,777.90	3.35%
Mixed Wooded Wetlands (Coniferous Dom.)	2,239.56	4.23%
Disturbed Wetlands (Modified)	126.57	0.24%
Middle Township Total Land Area	52,995.61	100.00%



Municipal Boundaries	Land Use / Land Cover	Athletic Fields (School)	Beaches
Garden State Parkway	High Density Residential	Cemetery	Forest
State Roads	Medium Density Residential	Transportation / Communications / Utilities	Forested Wetlands
County Roads	Low Density Residential	Military Installations	Wetlands
Local Roads	Rural Density Residential	Recreational Lands	Barren Lands
Railroads	Commercial / Services	Stadium / Theater / Cultural Center / Zoo	Extractive Mining
Water Bodies	Industrial	Other Urban Lands	
	Mixed use	Agriculture	



1 inch equals 5,500 feet

THIS MAP WAS DEVELOPED USING CAPE MAY COUNTY AND NJDEP DIGITAL DATA.
THIS SECONDARY PRODUCT HAS NOT BEEN VERIFIED AND IS NOT COUNTY OR
STATE AUTHORIZED.

2002 LAND USE / LAND COVER

TOWNSHIP OF MIDDLE
CAPE MAY COUNTY NEW JERSEY



APRIL 2007

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2.0 PHYSICAL RESOURCES AND CONDITIONS

2.1 CLIMATE

The undulating flow of air masses, generally moving from west to east across the continent of North America dominates the climate of New Jersey. This pattern of air mass movement is called the westerlies. Since these streams of air vary in intensity and can be wet or dry, cold or warm, New Jersey weather is highly variable on a day to day basis. Despite its small size, differences in geology, proximity to the Atlantic Ocean and the pattern of north-south variation in the track of air masses across the State, allow five distinct climate regions to be delineated. These five regions are Northern, Central, Pine Barrens, Southwest and Coastal (ONJSC 2006a).

Middle Township is located in the Coastal region of the State of New Jersey in terms of climate characteristics. The adjacent Atlantic Ocean tempers and sometimes dominates the continental climate prevalent over inland areas. Because of this, seasonal temperatures are subject to less variation (ONJSC Accessed 2006a). The sea breeze causes local changes in temperature, humidity, wind speed, wind direction, cloud cover, and sometimes precipitation. Weather forecasts for near-shore locales must consider the modifying effects of sea breezes on weather conditions for the general public, as well as for boaters (Dunk 2005). Since Middle Township straddles the Cape May Peninsula the Township will be subject to winds of the Delaware Bay as well as from the Atlantic Ocean.

In the autumn and winter, air over the ocean is warmer than over the land and ocean breezes moderate the cold. The opposite is true in the spring and summer, when the ocean's influence is cooling. During spring and summer, land heats more quickly than the water. As the air over land rises, cooler air over the ocean moves inland (ONJSC 2006a). The patterns of prevalent seasonal wind direction are shown on Figure 4.

The distribution of sea surface temperature along and near the shore both influences and is influenced by sea breezes. During prolonged periods of southwesterly wind flow resulting from pressure differences in the atmosphere, the upwelling of colder water from below the ocean surface can be induced. This upwelling can produce near-shore pockets of water that are at least 5 to 10 degrees Centigrade (C) colder than the surrounding ocean. These cold pockets of upwelling help to get sea breezes started (Dunk 2005).

The National Oceanic and Atmospheric Agency (NOAA) operates climate monitoring stations in Cape May County for which data is available on the web sites of the Office of the New Jersey State Climatologist and the Natural Resources Conservation Service NRCS. The nearest stations to Middle Township are the Belleplain State Forest station and the Cape May 2 NW station.

All stations in New Jersey have registered readings of 100 degrees Fahrenheit (F) or higher and have records of 0 degrees F or below. The average monthly temperatures, average daily minimum and maximum temperatures extending to the year 2006 are depicted in Table 2.

Figure 4: Seasonal Off-shore Wind Direction (Dunk 2005)

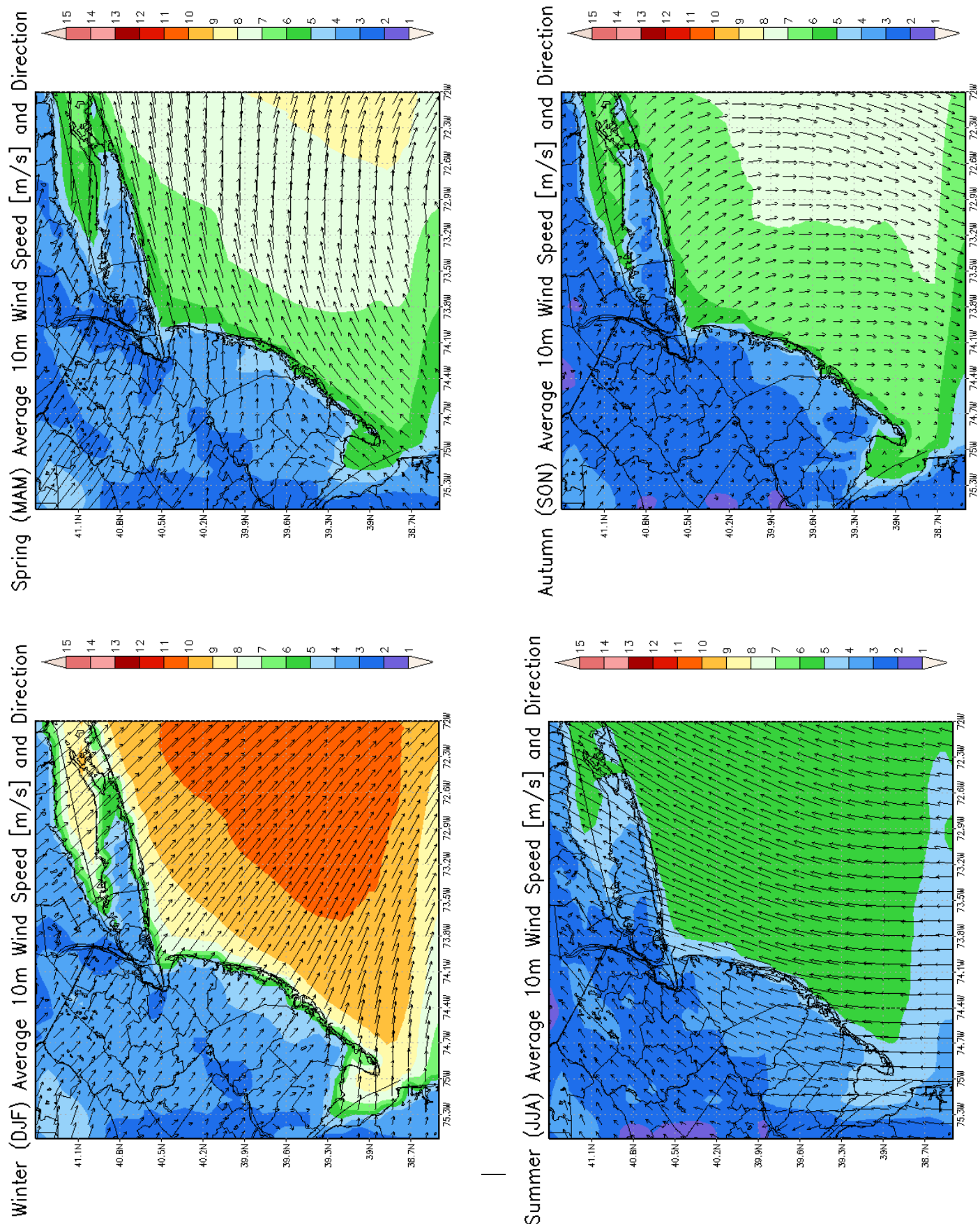


Table 2: Temperatures Measured at Cape May 2 NW (ACMCM 2 W)¹ and Belleplain State Forest (BSF)² (NOAA, NRCS)						
Month	Average Daily Minimum		Average Daily Maximum		Monthly Average	
	CM 2 W	BSF	CM 2 W	BSF	CM 2 W	BSF
January	28.0	23.4	41.7	44.3	34.9	34.0
February	28.6	24.1	42.8	46.2	35.7	35.2
March	35.0	30.6	49.8	53.8	42.4	42.2
April	43.3	38.9	59.1	64.5	51.2	51.7
May	52.8	48.8	68.7	74.8	60.7	61.9
June	61.8	58.2	77.5	82.6	69.7	70.4
July	67.3	63.3	82.6	86.3	74.9	74.8
August	66.5	62.1	81.5	84.6	74.0	73.4
September	61.6	55.1	76.8	79.0	69.2	67.1
October	50.8 /	43.2	66.5	68.9	58.7	56.1
November	41.5	34.7	56.1	58.1	48.8	46.4
December	31.9	26.5	45.7	47.6	38.9	37.1
Annual	47.4	42.4	62.4	66.0	54.8	54.2
1. Data from 1894 to 2006						
2. Data from 1922 to 2006						

As shown in Table 2 above, the variation in the average monthly temperatures between the weather stations at Cape May 2 NW and Belleplain State Forest, do not vary greatly (only 0.6 degrees F) in their annual average temperature. These temperatures constitute a growing season that extends from approximately March 20 to November 30 in Middle Township (Collins & Robichaud 1994).

In the State of New Jersey, the average annual precipitation ranges from about 40 inches along the southeast coast to 51 inches in north-central parts of the state. Coastal storms, often called “nor’easters”, frequently occur between October and April and can constitute a large proportion of the yearly precipitation amounts when they occur. These storms mainly impact coastal areas and may extend up to several hundred miles offshore, bringing strong winds and heavy rains. Typically at least one significant coastal storm occurs each winter, although as many as ten storms can be experienced in a season some years. Tropical storms and hurricanes, with their strong winds and storm surges can be extremely damaging to the natural and built environments (ONJSC 2006a).

Snowstorms in Cape May County produce an average of 14.2 inches of snowfall per year. The record snowfall to occur in one day at the Belleplain station was 14 inches on February 10, 1967 (up to 1990). The highest snow depth between 1961 and 1990 was 20 inches measured on February 19, 1979 (NOAA, NCDC accessed 2006).

Table 3 below shows the average monthly precipitation and snowfall amounts recorded at the Belleplain State Forest and the Cape May 2 NW weather stations. The maximum monthly average snowfall at Belleplain station was for 4.1 inches. The largest monthly average recorded at the Cape May 2 NW station was 6.1 inches. An even larger difference between the amounts of precipitation observed at the two stations. The Belleplain State Forest station recorded 44.03 inches, while only 40.24 inches was received at the Cape May 2 NW station (ONJSC 2006a).

Table 3: Precipitation Measured at Cape May 2 NW (ACMCM 2 W)¹ and Belleplain State Forest (BSF)² (NOAA, NRCS)				
Month	Monthly Average Snowfall		Monthly Average Precipitation	
	BSF	CM 2 NW	BSF	CM 2 NW
January	3.5	3.8	3.38	3.25
February	4.1	6.1	3.04	2.83
March	2.0	1.7	4.13	3.76
April	0.1	0.1	3.59	3.25
May	0.0	0.0	3.43	3.29
June	0.0	0.0	3.20	3.10
July	0.0	0.0	4.19	3.54
August	0.0	0.0	4.96	4.05
September	0.0	0.0	3.62	3.14
October	0.0	0.0	3.50	3.10
November	0.4	0.3	3.45	3.19
December	2.0	1.8	3.54	3.27
Annual	unavailable	unavailable	44.03	40.24
1. Data from 1948 to 2006				
2. Data from 1922 to 2006				

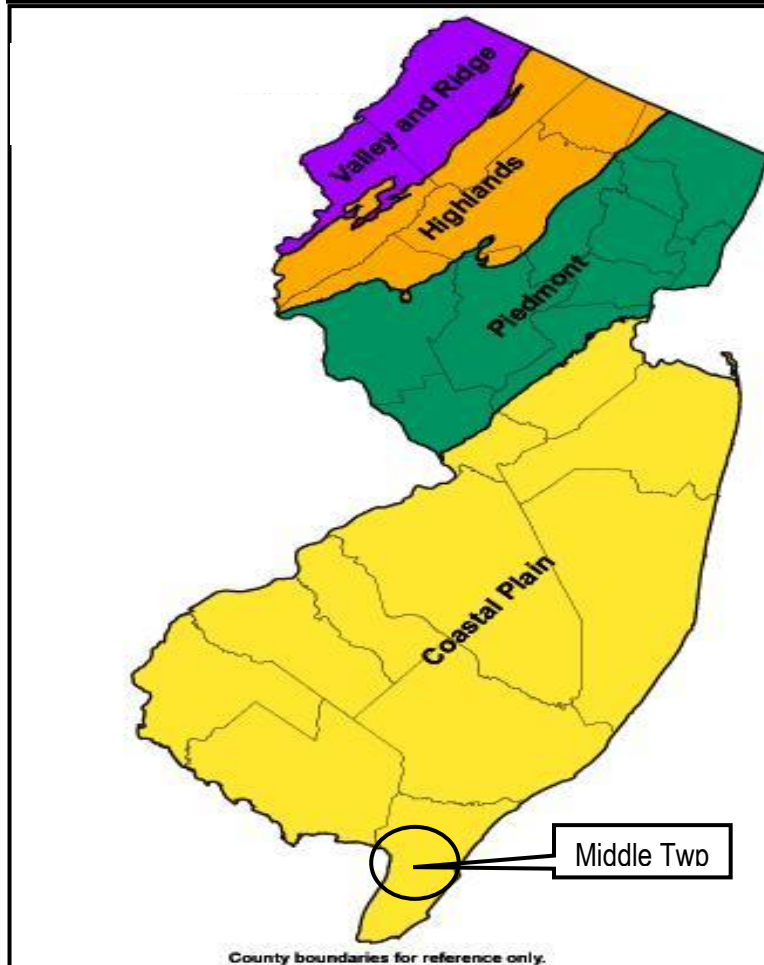
The average temperature in New Jersey in June 2006 was 70.9 degrees Fahrenheit. This was 1.9 degrees F warmer than the 20th century average, the 18th warmest June in 112 years. New Jersey temperature has tended to rise 0.1 degrees Fahrenheit per decade over the period of record, which is 1895 to present. Annual precipitation rates have increased 0.03 inches per decade trend for the period of record (NOAA 2006).

As a coastal municipality, Middle Township could experience significant impacts from global warming, if climate modelers are correct. There is a great deal of uncertainty as to whether global warming will actually cause increasing frequency or intensity of hurricanes and other storms; however the possibility cannot be entirely ruled out (Lively 1996). Sea level rise, however is a certainty. Tide gauges in Cape May show an average sea level rise of 3.98 mm/year since 1965 (Cooper, Beevers & Openheimer 2005). As a result of sea level rise, the frequency of storm-associated floods would result, with the likelihood that events such as a 100-year storm and its attendant flooding could occur at intervals much less than 100 years (Gournich, Couch & Hartig 2002). Higher base water elevation means that storm surges associated with hurricanes and northeasters will be higher and extend further inland (Cooper, Beevers & Openheimer 2005).

2.2 PHYSIOGRAPHIC PROVINCE AND GEOLOGY

Areas that have similar rock types, geologic structures, landforms, and histories are organized into regions called Physiographic Provinces. New Jersey has five Physiographic Provinces, which make it a complex State for its small size. From northwest to southeast across the State, the provinces are (1) the Valley and Ridge, (2) Highlands, (3) Piedmont, (4) Inner Coastal Plain, and (5) Outer Coastal Plain. Each name is descriptive of the rock belt that it identifies. Middle Township is located within the Outer Coastal Plain Physiographic Province (see Figure 5), the largest of the physiographic provinces in New Jersey. Its location within the Outer Coastal Plain provides the framework for a discussion of the geologic history of the Township (NJGS 2006). The Physiogeographic Provinces of New Jersey are shown on Figure 5.

Figure 5: Physiographic Provinces of New Jersey (NJGS 2006)



The geology of the Coastal Plain is characterized by unconsolidated sand, gravel, silt, and clay thickening seaward from a featheredge at the Fall Line to more than 6,500 feet (ft) thick in southern Cape May County (Gill and Farlekas, 1976). As a geologic formation, the Coastal Plain exists, not just in New Jersey, but along the entire Atlantic Coast from Maine to the Gulf of Mexico. Differences in the amount and type of erosion coupled with variability in underlying rock composition distinguish differences in sediments and shoreline types along its length. In general, the Atlantic Coastal Plain is flat and slopes gently seaward. John Tedrow describes the Coastal Plain in New Jersey as having moderate elevation with 80% – 90% lying below the 100 foot contour on a topographic map (Tedrow 1986). Low ridges of sand parallel the coast offshore and are physically separated from the coast by quiet water lagoons. Nearly 300 barrier islands exist between Massachusetts and Texas.

The Fall Line refers to the boundary between the Piedmont and Inner Coastal Plain. As a variety of forces, such as rain and snow, freeze and thaw, act on the mountains, small particles are worn away and carried in rain water, river flows and wind to be deposited eastward along the edge of the continental bedrock. Geologists are able to analyze the sediments. Many layers of sediment and particles form the Coastal Plain, which is a nearly horizontal surface which gently slopes to the edge of the Continental Shelf before steeply falling off under the Atlantic Ocean.

Over time, sea level fluctuates and acts upon the sediments. Wave action intensity increases with storms. During periods of higher ocean levels, which can completely cover the Coastal Plain sediments, marine deposits are added. The sediments are classified based on differences or similarities and the distinctions used to develop names for the layers. It would appear that the shoreline is a stable platform; however, geology is an on-going dynamic process. Change has occurred in the past, continues to take place at the present time and will continue into the future.

The geology of Middle Township is mapped below. The geological classification for the surface sediment layer, or veneer that crops out in Middle Township, is called the Cape May Formation and is described by Tedrow as a “terraced” sediment layer, outcropping along the edge of the Cape May Peninsula. As a veneer, the Cape May Formation is a thin covering overlying the hydrologically productive Cohansey Formation. The Cape May deposits are visible inland on the edges of the many streams. The deposits were laid down during a time when the level of the ocean was 30 to 50 feet lower than today (Tedrow 1986).

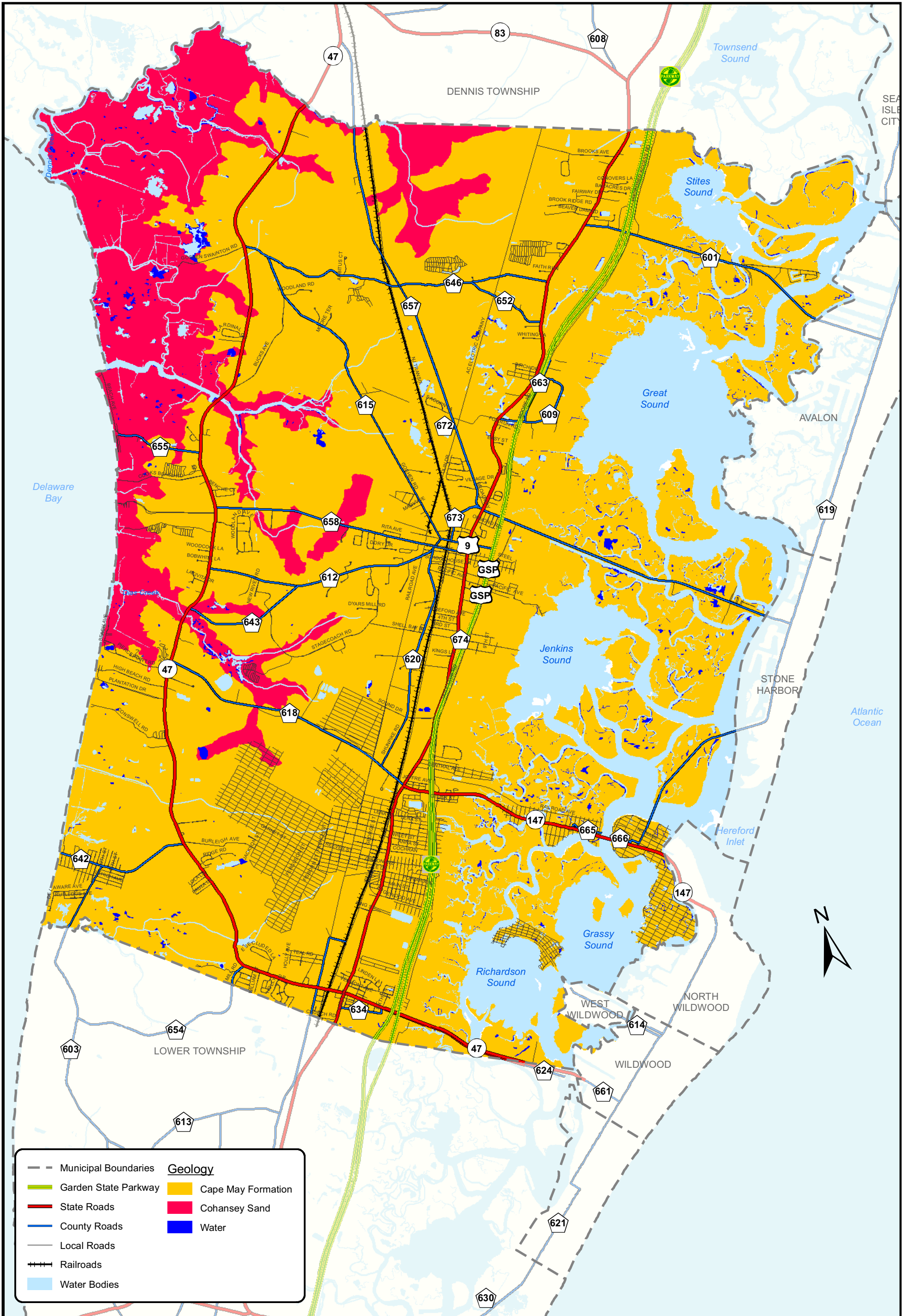
Underlying the Cape May Formation and overlying the entire Cape May Peninsula is the Cohansey Formation which will be discussed in greater detail due to its importance as a drinking water reservoir. Refer to the Geology map to view the extent of the formation within Middle Township. The Cohansey Coastal Plain Sediments are described on the Bedrock Geologic Map of Central and Southern New Jersey as sediments that were laid down during the Miocene Era. The description includes sand, white to yellow, with local gravel and clay, locally stained red or orange-brown by iron oxides and/or cemented into large blocks of ironstone. Unweathered clay is typically dark gray, but weathers white in thin beds of ironstone. The unit is a mixture of marine and non-marine sediments. Sand, consisting of quartz and siliceous rock fragments, is found as medium-size grains and sorted from fine to coarse grains (Owens, et al 1998).

Crossbedding occurs, particularly in non-marine deposits. In some marine deposits, abundant burrows are present. The burrows have been identified as belonging to the fossil, *Ophiomorpha nodosa*. Studies of pollen found in the sediment provide information about plants which existed at the time the sediment was deposited (Owens, et al 1998). It should be noted that the Cohansey Unit, found on both the surface and subsurface in the Coastal Plain depending on location, is often associated with the older Kirkwood Formation (Owens, et al 1998).



2.3 TOPOGRAPHY AND SLOPES

Middle Township exhibits very little topographic relief. According to United States Geological Survey (USGS) Topographic mapping, elevations range from 0 feet on Township beaches to about 25 feet above sea level in the northeastern portion of the Township, just west of U.S. Route 9. Slopes are minimal. Steep slopes only occur where they are manmade, such as along roadway embankments.



0 2,500 5,000 7,500 10,000 12,500 15,000 Feet

1 inch equals 5,500 feet

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GEOLGY

TOWNSHIP OF MIDDLE
CAPE MAY COUNTY NEW JERSEY



APRIL 2007

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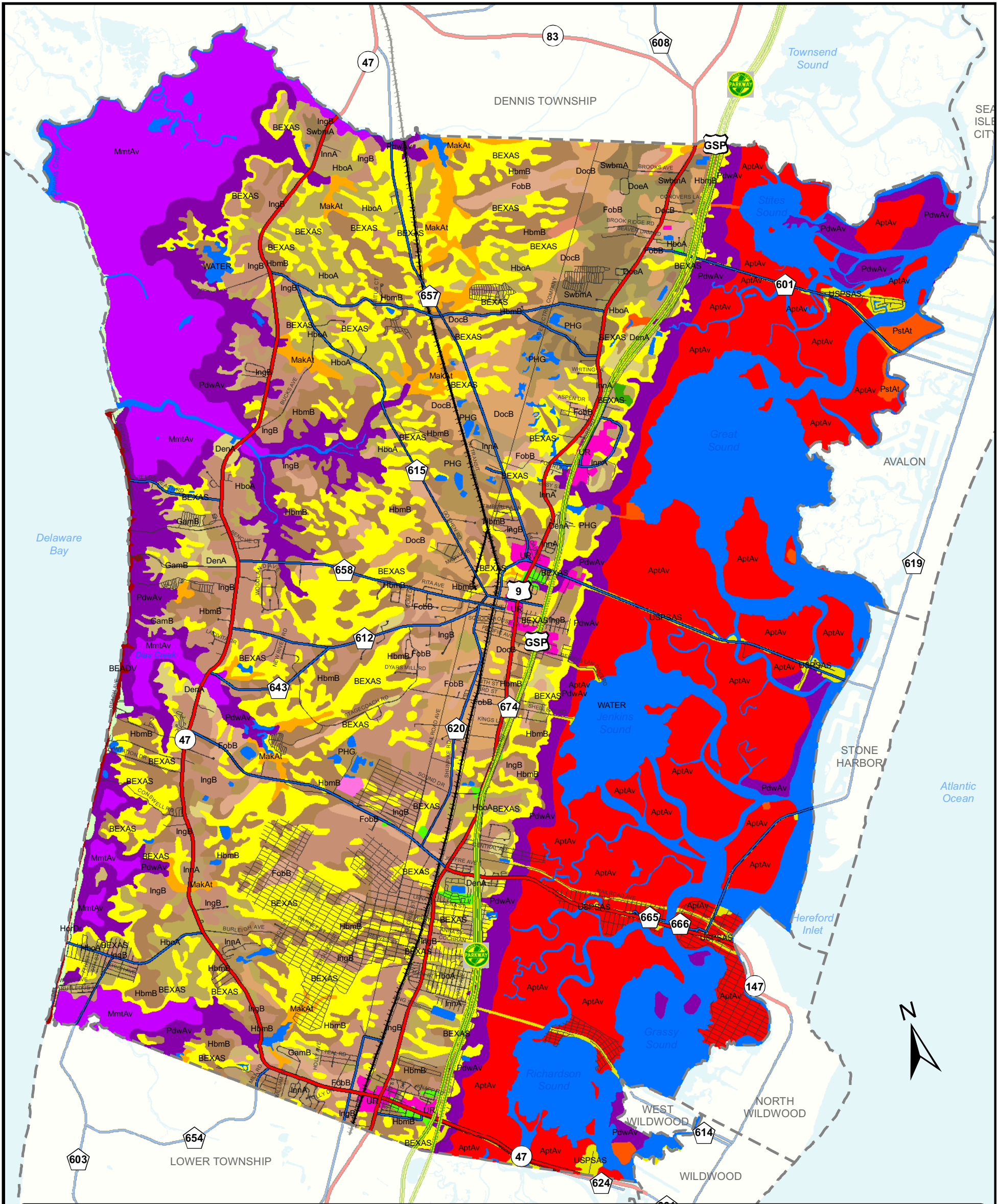
2.4 SOILS

The term "soil" is used to describe the earthy material that is generally found in the garden. Upon greater reflection, it becomes apparent that there is more to the story. New Jersey is a small state, but varied in its geologic history, which allows it to display a variety of processes which have affected land masses since the beginning of time. The processes have created different landforms and topography. The eastern coast of the United States has undergone mountain building with volcanic eruptions followed by weathering from storms and glaciers. The soils of Middle Township were formed in the sediments laid down in glacial outwash plains and marine sediments laid down when the ocean covered the current land area. Unlike soils in the northern part of the State which can be identified with a particular location, the Coastal Plain soils are influenced by greater variability during geologic formation and subsequent modification.

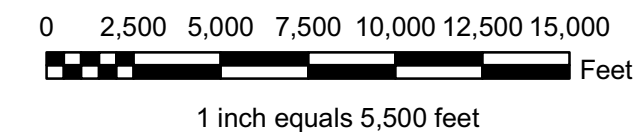
The Soil Conservation Act of 1935 led to the establishment of the Soil Conservation Service and with it, a focus on new characteristics. Today we draw on a combination of factors to describe soils. The United States Department of Agriculture (USDA) has taken the lead in describing the characteristics of soils in New Jersey. Because of the complexity, soils are described as groups with similar characteristics, often based on location (NRCS 2006). The soils types found in Middle Township are mapped on the Soils map and described in Table 4 below.

Table 4: Soil Types of Middle Township (NRCS 2006)	
Appoquinimink-Transquaking-Mispillion complex (AptAv):	This soil is very frequently flooded. It is very poorly drained and annual ponding is frequent. The seasonal water table is at the surface. The parent material consists of loamy stream sediments over herbaceous material. This soil type is considered hydric.
Aura sandy loam (AugA):	The soils in this mapping unit are well-drained and are found on low hills. Annual flooding and annual ponding do not occur.
Beaches (BEADV):	This soil is very frequently flooded and is found on dunes along the coast. Beaches are poorly drained. The parent material of this soil series is beach sand.
Berryland and Mullica soils (BEXAS):	The Berryland soil component is comprised of deep, very poorly drained soils in upland areas. The Mullica soil component is comprised of very deep, very poorly drained soils on flats and in depressions. Both were formed in coastal plain sediments. Annual flooding and ponding are occasional. Parent material consists of sandy stream deposits. This soil is considered hydric, and the seasonal high water table can reach the surface.
Dennisville sandy loam (DenA):	This well-drained soil is found on flats. Annual flooding and annual ponding do not occur. The seasonal high water table is at a depth of 4 feet below the surface. The parent material of the Dennisville sandy loam is sandy and/or loamy marine deposits.
Downer loamy sand (DocB):	This soil is well-drained. Annual flooding and ponding do not occur. The seasonal high water table is at a depth greater than 6 feet below the surface. The parent material consists of loamy and gravelly stream deposits.
Downer sandy loam (DoeA and DoeB):	The soils in this series are well-drained and are found on knolls and low hills. These soils were formed on loamy fluviomarine deposits and/or gravelly fluviomarine deposits. Annual flooding and annual ponding do not occur.
Evesboro sand (EveB):	The soils in this series are excessively drained, and are found on low hills in the landscape. Evesboro sands are not subject to annual flooding or annual ponding. These soils were formed in sandy wind or fluviomarine deposits.
Fort Mott sand (FobB):	This soil is a well-drained soil found on knolls. Annual flooding and ponding do not occur. The seasonal high water table is at a depth of 6 feet. The parent materials of Fort Mott sand are sandy wind deposits or fluviomarine deposits.
Galloway loamy sand (GamB):	Galloway series soils are deep, moderately well-drained soils found in upland areas. The seasonal high water table may reach 21 inches below the surface. There is neither annual flooding nor annual ponding.
Hammonton loamy sand (HbmB):	This soil is a very deep, moderately well-drained soil found in uplands. The Hammonton series soils formed in acidic, moderately coarse-textured coastal plain sediments. The minimum depth to the seasonal high water table is 18 inches. Annual flooding and annual ponding do not occur. This soil has low potential productivity for cultivated crops.

Table 4: Soil Types of Middle Township (continued)	
Hammonton sandy loam (HboA):	This soil is a very deep, moderately well-drained soil found in uplands. The Hammonton series soils formed in acidic, moderately coarse-textured coastal plain sediments. There is neither annual flooding nor annual ponding. The minimum depth to the seasonal high water table is 18 inches.
Hooksan sand (HorDr):	This excessively drained soil is found on dunes and barrier beaches. It was formed in sandy beach sand. Annual flooding is rare, and annual ponding does not occur. The seasonal high water table is 6 feet below the surface.
Ingleside loamy sand (IngB):	The soils in the Ingleside series are very deep, well-drained soils found on uplands and in slight depressions. These soils were formed in alluvial or marine sediments of the coastal plain. Annual flooding and ponding do not occur. This soil has medium potential productivity for cultivated crops.
Ingleside sandy loam (InnA):	The soils in the Ingleside series are very deep, well-drained soils found on uplands and in slight depressions. These soils were formed in alluvial or marine sediments of the coastal plain. Annual flooding and ponding do not occur. The seasonal high water table occurs at a depth of 42 inches. This soil has medium potential productivity for cultivated crops.
Manahawkin muck (MakAt):	This soil is a very deep, very poorly drained soil found in low-lying areas such as back swamps, lake basins and along freshwater channels where they meet tidal waters. Annual flooding and ponding are frequent. The seasonal high water table reaches the surface. This is a hydric soil.
Mispillion-Transquaking-Appoquinimink (MmtAv):	This soil complex consists of very deep, very poorly drained soils located on salt water tidal marshes, estuaries and tidally influenced rivers and creeks. Annual flooding is very frequent, and annual ponding is frequent. The seasonal high water table reaches the surface. This is a hydric soil complex.
Pawcatuck-Transquaking complex (PdwAv):	This soil series consists of very deep, very poorly drained soils found on tidal flats, brackish estuarine marshes and along tidally influenced rivers and creeks. Annual flooding is very frequent and ponding is frequent. The seasonal high water table is at the surface. This soil is not suitable for cultivated crops and is considered a hydric soil.
Pits, sand and gravel (PHG):	This soil mapping unit consists of gravel pits, which are anthropogenic features. The result is sandy material disturbed by human activity. These soils are well-drained and annual flooding and annual ponding do not occur.
Psamments,sulfidic substratum (PstAt):	These Psamments soils are excessively drained to well-drained sandy fill land that has been smoothed. Annual flooding and annual ponding are frequent. The seasonal high water table is at the surface. This soil is not suitable for cultivated crops.
Psamments, wet substratum (PsvAr):	These Psamments soils are moderately well-drained soils found on flats and in filled areas. Annual flooding is rare and annual ponding does not occur. The seasonal high water table is at a depth of 30 inches. The soil is not suitable for cultivated crops.
Swainton sandy loam (SwbmA):	The soils in this series are well-drained soils found on interfluvies, low hills and ridges. Swainton sandy loam is formed in loamy fluviomarine deposits over gravelly fluviomarine deposits. The seasonal high water table is at a depth of 6 feet. Annual flooding and annual ponding do not occur. This soil has low potential productivity for cultivated crops.
Udorthents, refuse substratum (UdrB):	The soils in this mapping unit are well-drained. This unit consists of fill material that has formed low hills. The parent material is comprised of loamy deposits spread over organic material. Annual flooding and ponding do not occur. This soil is not suitable for cultivated crops.
Urban land (UR):	The Urban Land soil type is used to describe areas where much of the surface has been covered by buildings, pavement or other forms of impervious cover.
Urban land-Psamments, sulfidic substratum complex (USPSAS):	The Urban Land soil type is used to describe areas where much of the surface has been covered by buildings, pavement or other forms of impervious cover. The Psamments series component is excessively drained to well-drained sandy fill land that has been smoothed. This Psamments soil component is excessively drained. Annual flooding is occasional, but annual ponding does not occur. The seasonal high water table of the Psamments series component is at the surface.
Urban land-Psamments, wet substratum (USPSBR):	The Urban Land soil type is used to describe areas where much of the surface has been covered by buildings, pavement or other forms of impervious cover. The Psamments series component is excessively drained to well-drained sandy fill land that has been smoothed. This Psamments soil component is excessively drained. Annual flooding is rare, but annual ponding does not occur. The seasonal high water table of the Psamments series component is 18 inches below the surface.



<div><div><div></div></div><div>Municipal Boundaries</div></div> <div><div><div></div></div><div>Garden State Parkway</div></div> <div><div><div></div></div><div>State Roads</div></div> <div><div><div></div></div><div>County Roads</div></div> <div><div><div></div></div><div>Local Roads</div></div> <div><div><div></div></div><div>Railroads</div></div> <div><div><div></div></div><div>Water Bodies</div></div>	<div><div><div></div></div><div>Soils</div></div> <div><div><div></div></div><div>HorDr (Hooksan sand)</div></div> <div><div><div></div></div><div>PsvAr (Psamments, wet substratum)</div></div> <div><div><div></div></div><div>USPSBR (Urban land-Psamments, wet substratum)</div></div> <div><div><div></div></div><div>BEXAS (Berryland and Mullica soils)</div></div> <div><div><div></div></div><div>USPSAS (Urban land-Psamments, sulfidic substr)</div></div> <div><div><div></div></div><div>MakAt (Manahawkin muck)</div></div> <div><div><div></div></div><div>PstAt (Psamments, sulfidic substratum)</div></div> <div><div><div></div></div><div>AptAv (Appoquinimink-Transquaking-Mispillion)</div></div> <div><div><div></div></div><div>BEADV (Beaches)</div></div>	<div><div><div></div></div><div>MmtAv (Mispillion-Transquaking-Appoquinimink)</div></div> <div><div><div></div></div><div>PdwAv (Pawcatuck-Transquaking complex)</div></div> <div><div><div></div></div><div>AugA (Aura sandy loam)</div></div> <div><div><div></div></div><div>DenA (Dennisville sandy loam)</div></div> <div><div><div></div></div><div>DocB (Downer loamy sand)</div></div> <div><div><div></div></div><div>DoeA (Downer sandy loam)</div></div> <div><div><div></div></div><div>DoeB(Downer sandy loam)</div></div> <div><div><div></div></div><div>EveB (Evesboro sand)</div></div> <div><div><div></div></div><div>FobB (Fort Mott sand)</div></div> <div><div><div></div></div><div>GamB (Galloway loamy sand)</div></div>	<div><div><div></div></div><div>HbmB (Hammonton loamy sand)</div></div> <div><div><div></div></div><div>HboA (Hammonton sandy loam)</div></div> <div><div><div></div></div><div>IngB (Ingleside loamy sand)</div></div> <div><div><div></div></div><div>InnA (Ingleside sandy loam)</div></div> <div><div><div></div></div><div>PHG (Pits, sand and gravel)</div></div> <div><div><div></div></div><div>SwbmA (Swainton sandy loam)</div></div> <div><div><div></div></div><div>UdrB (Udorthents, refuse substratum)</div></div> <div><div><div></div></div><div>UR (Urban land)</div></div> <div><div><div></div></div><div>WATER (Water)</div></div>
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SOILS

TOWNSHIP OF MIDDLE

CAPE MAY COUNTY NEW JERSEY

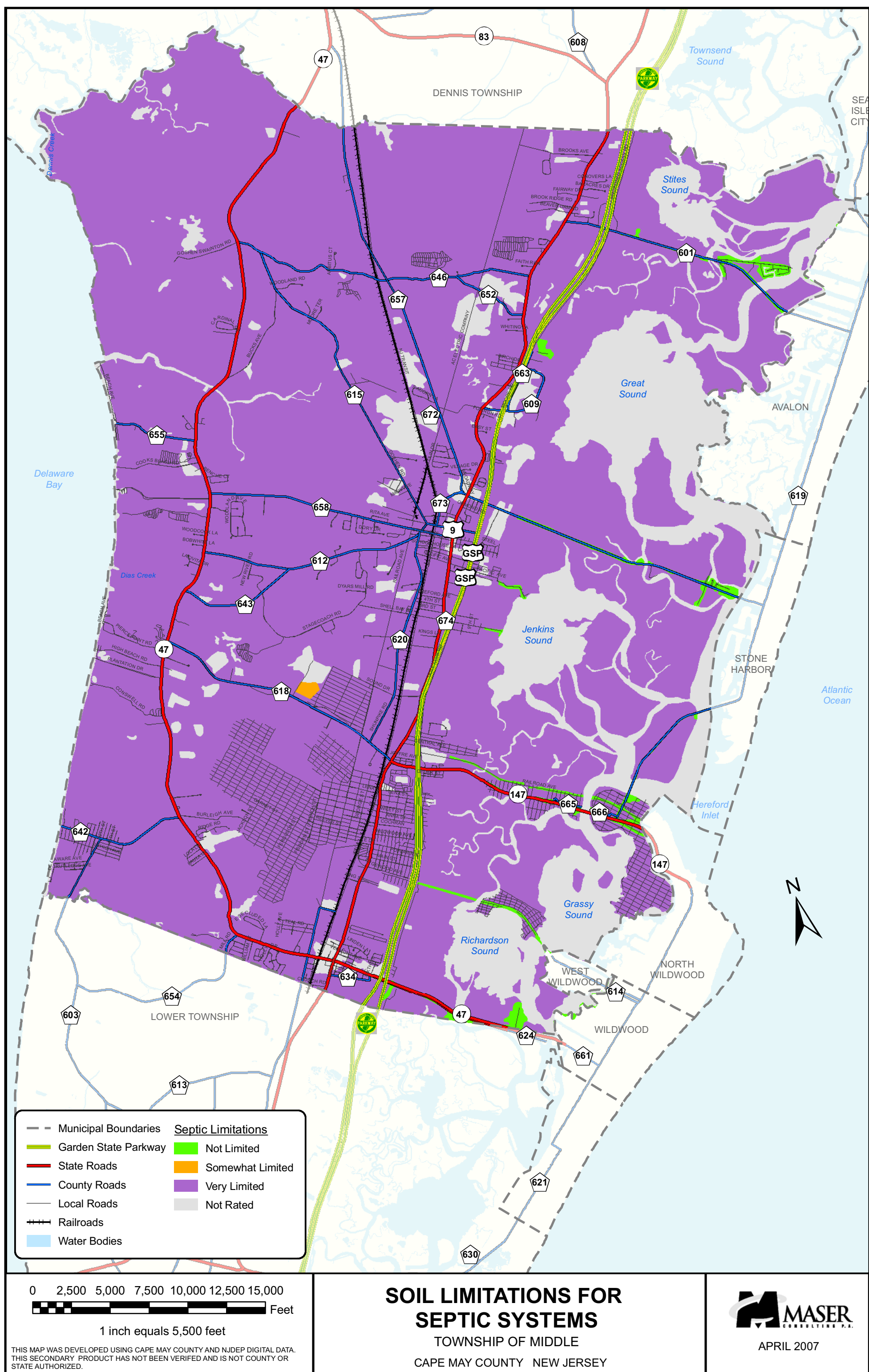


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2.4.1 SOIL LIMITATIONS

Many of the soil types found in Middle Township are very limited for certain types of development. This does not necessarily mean that the soils are undevelopable, but that development costs are likely to be unusually high. Maps included below depict Soil Limitations for Septic Systems and Soil Limitations for Dwellings with Basements. Soil parameters considered in the establishment of these ratings include slope, natural soil drainage, permeability rate and hazard of flooding. Table 5 below shows the limitations of Middle Township soils for certain types of development.

Table 5: Development Limitations of Soils				
Mapping Unit	Depth to Seasonal High Water Table (feet)	Septic Limitations	Erosion Potential (Kw)	Limitations for Dwellings with Basements
Appoquinimink Transquaking Mispillion	0	Very limited	0.37	Very limited
Aura sandy loam	>5	Very limited	0.24	Not limited
Beaches	0-6	Not rated	0.05	Not rated
Berryland and Mullica soils	0	Very limited	0.10	Very limited
Dennisville sandy loam	4	Very limited	0.32	Somewhat limited
Downer loamy sand	>6	Very limited	0.20	Not limited
Downer sandy loam	>5	Very limited	0.28	Not limited
Evesboro sand	>5	Very limited	0.10	Not limited
Fort Mott sand	6	Very limited	0.05	Not limited
Galloway loamy sand	1.75	Very limited	0.17	Very limited
Hammonton loamy sand	1.5	Very limited	0.20	Very limited
Hammonton sandy loam	1.5	Very limited	0.32	Very limited
Hooksan sand	6	Very limited	0.10	Very limited
Ingleside loamy sand	3.5	Very limited	0.20	Somewhat limited
Ingleside sandy loam	3.5	Very limited	0.20	Somewhat limited
Manahawkin muck	0	Very limited	0.05	Very limited
Mispillion Transquaking Appoquinimink	0	Very limited	0.02	Very limited
Pawcatuck Transquaking Complex	0	Very limited	0.02	Very limited
Pits, sand and gravel	---	Not rated	Null	Not rated
Psammets, sulfidic substratum	0	Very limited	0.20	Very limited
Psammets, wet substratum	2.5	Very limited	0.20	Very limited
Swainton sandy loam	6	Very limited	0.32	Not limited
Udorthents, refuse substratum	---	Somewhat limited	0.37	Not limited
Urban land	---	Not rated	Null	Not rated
Urban land-Psammets, sulfidic substratum	---	Not limited*	Null	Not limited
Urban land-Psammets, wet substratum	1.5	Not limited	Null	Not limited*
* Dependent on depth of fill and depth to season highwater table. Site specific soil investigation required.				

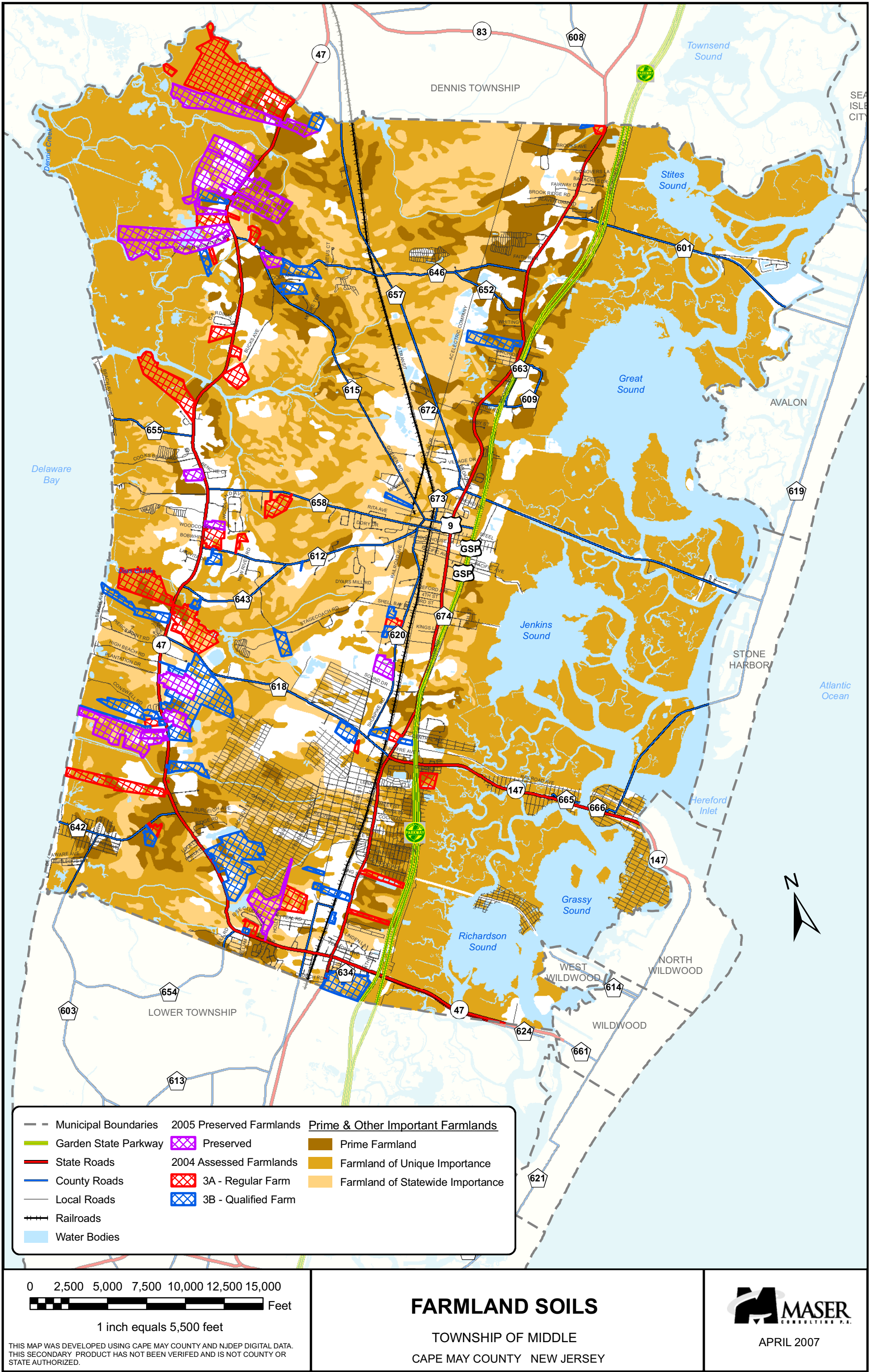


2.4.2 FARMLAND SOILS

While only 3 percent of the land in Middle Township is under active cultivation soils suitable for agriculture are found in many portions of the Township. Prime Farmland Soils, Soils of Statewide Importance and Farmland of Unique Importance have been mapped for Middle Township. These soils are shown on the Farmland Soils map and are listed in Table 6. The NRCS classification of Prime Farmland Soils include soils contained in the Land Capability Class I and selected soils from Land Capability Class II, as listed in the County Soil Survey. These soils exhibit the optimum quality, growing season and available moisture to support continued, economically viable yields of crops. These soils do not exhibit negative characteristics, such as susceptibility to erosion, saturation or flooding (NRCS 1990a).

Soils of Statewide Importance are soils contained in Land Capability Class II and III These soils are only slightly less favorable for agriculture than Prime Farmland Soils and may produce similarly high yields. Farmland Soils of Unique Importance consist of soils that can be used for the production of high value food, fiber or horticultural crops. These soil classifications are shown on the Farmland Soils map.

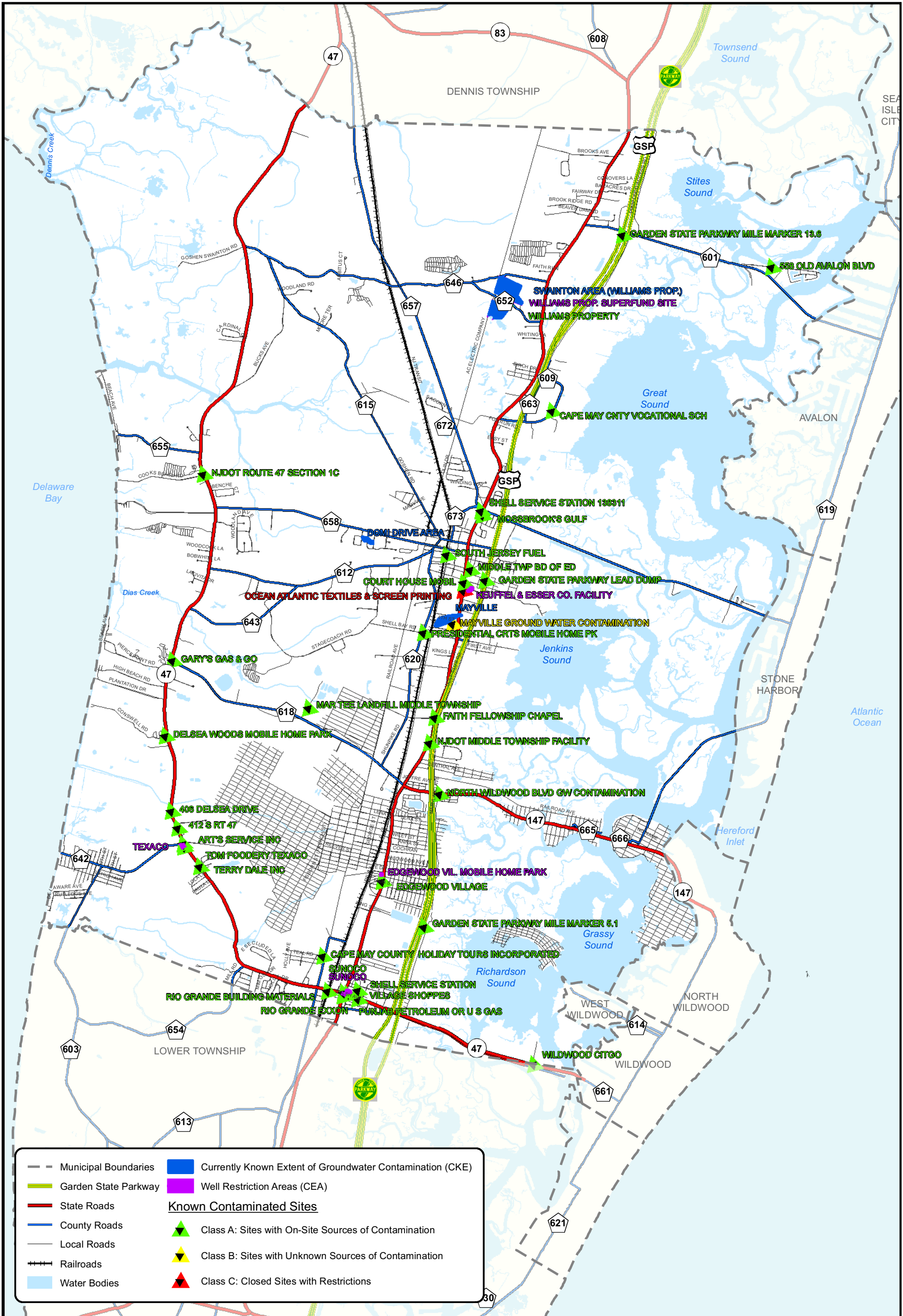
Table 6: Prime & Other Important Farmland Soils, 2006		
Soil Type	Acres	% of Twp
Prime Farmland Soils	406.70	8.26%
<i>AugA - Aura sandy loam</i>	0.51	0.01%
<i>DenA - Dennisville sandy loam</i>	49.57	1.01%
<i>DoeB - Downer sandy loam</i>	7.49	0.15%
<i>HboA - Hammonton sandy loam</i>	207.74	4.22%
<i>InnA - Ingleside sandy loam</i>	82.52	1.68%
<i>SwbmA - Swainton sandy loam</i>	58.87	1.20%
Farmland Soils of Unique Importance	2,403.44	48.82%
<i>AptAv - Appoquinimink-Transquaking-Mispillion</i>	817.26	16.60%
<i>BEXAS - Berryland and Mullica soils</i>	721.07	14.65%
<i>MakAt - Manahawkin muck</i>	63.60	1.29%
<i>MmtAv - Mispillion-Transquaking-Appoquinimink</i>	364.84	7.41%
<i>PdwAv - Pawcatuck-Transquaking complex</i>	436.66	8.87%
Farmland Soils of Statewide Importance	750.19	15.24%
<i>DocB - Downer loamy sand</i>	173.58	3.53%
<i>FobB - Fort Mott sand</i>	104.72	2.13%
<i>GamB - Galloway loamy sand</i>	43.29	0.88%
<i>HbmB - Hammonton loamy sand</i>	428.60	8.71%
Other Soils not Suitable for Farming	1,363.14	27.69%
Middle Township Total Land Area	52,995.61	100.00%
Source: Soil Survey Geographic (SSURGO) database for Cape May County, New Jersey, nj009, 2006, U.S. Department of Agriculture, Natural Resources Conservation Service, December 7, 2006, http://SoilDataMart.nrcs.usda.gov/		



2.5 CONTAMINATED SITES

Locations, identified in NJDEP databases, were used to compile the list identified as contaminated sites. Often soils are contaminated at these sites, by leaking underground chemicals, fuel storage tanks or by surface spills. Information gathered from the databases indicates that the contaminant source is often unknown and the potential for groundwater contamination is present. The NJDEP websites called "Data Miner" and "Public Records, (OPRA)" which can be accessed from the homepage (<http://www.state.nj.us/dep/index.html>) can provide greater information concerning the status of each incident. Please reference "Site I.D. #" from the list below to find the map key number is the map legend of Contaminated Sites map. These sites are current as of November 2007.

Table 7: Known Contaminated Sites List (2007)				
Site #	Site ID	Site Name	Site Address	Status Date
01	64254	Garden State Parkway Mile Marker 13.6	GS PWY MM 13.6	23 Nov 92
02	58391	Williams Property	61 Siegtown Road	15 Nov 79
03	9620	Cape May County Vocational School	Crest Haven Road	28 Oct 94
04	9651	Shell Service Station	233N Route 9 (Main Street)	12 Jan 93
05	9659	Mossbrook's Gulf	220 Main Street N	8 Jul 92
06	75422	NJDOT Route 47 Section 1C	Route 47 Section 1C	5 Sep 00
07	15653	South Jersey Fuel	Stites Avenue	16 Mar 95
08	45504	Middle Twp Board of Education	216 S Main Street	29 Jan 01
09	65007	Garden State Parkway Lead Dump	GS PWY Bridge	30 Sep 92
10	46754	Court House Mobil	Route 9 & Pacific Avenue	28 Jul 92
11	9648	Ocean Atlantic Textiles & Screen Printings	502 Main Street S	20 Apr 98
12	64107	Mayville Ground Water Contamination	Route 9 & 4th & Reading Avenues	15 Feb 92
13	53118	Presidential Crts Mobile Home Pk	479 Shunpike Road	4 Apr 03
14	9637	Gary's Gas & Go	200 S Route 47	29 Jul 98
15	37861	Delsea Woods Mobile Home Park	295 Route 47 S	27 Oct 99
16	15864	Mar Tee Landfill Middle Township	Fishing Creek Road	78 Aug 94
17	92284	406 Delsea Drive	406 Delsea Drive	22 Aug 01
18	94921	412 S Route 47	412 S Route 47	27 Sep 01
19	9619	Tom Foodery Texaco	Route 47 & Bay Shore Road	27 May 04
20	29669	Art's Service Inc.	Bay Shore Road & Delsea Dr.	30 Aug 94
21	9663	Terry Dale Inc.	540 Route 47	10 Apr 02
22	176557	Faith Fellowship Chapel	1159 Route 9 S	23 Jun 04
23	64594	NJDOT Middle Township Facility	Route 9	13 Sep 93
24	176644	North Wildwood Blvd GW Contamination	N Wildwood Blvd & Cedar Avenue	24 Jun 04
25	37919	Edgewood Village	2503 Route 9 (Shore Road)	15 Aug 90
26	64249	Garden State Parkway Mile Markers 5.1	GS PWY MM 5.1	23 Nov 92
27	41500	Cape May County Holiday Tours Incorporated	301 N Railroad Avenue	9 Jul 02
28	73753	Village Shoppes	1304 Route 47	14 May 98
29	9636	Punjab Petroleum OR US Gas	1402 Route 47 S	17 May 99
30	46243	Rio Grande Exxon	Routes 47 & 9	19 May 94
31	9641	Sunoco 0004-5369	1 Wildwood Blvd	29 Jan 99
32	9638	Shell Service Station	Route 9 & Rio Grande Avenue	11 Mar 94
33	43654	Rio Grande Building Materials	1110 S Delsea Drive	15 Nov 04
34	74395	558 Old Avalon Boulevard	558 Old Avalon Blvd.	19 May 99
35	018059	Wildwood CITGO	879 Wildwood Boulevard	8 May 98



Municipal Boundaries

Garden State Parkway

State Roads

County Roads

Local Roads

Railroads

Water Bodies

Currently Known Extent of Groundwater Contamination (CKE)

Well Restriction Areas (CEA)

Known Contaminated Sites

Class A: Sites with On-Site Sources of Contamination

Class B: Sites with Unknown Sources of Contamination

Class C: Closed Sites with Restrictions

0 2,500 5,000 7,500 10,000 12,500 15,000

Feet

1 inch equals 5,500 feet

KNOWN
CONTAMINATED SITES

TOWNSHIP OF MIDDLE

CAPE MAY COUNTY NEW JERSEY

MASER

CONSULTING P.A.

APRIL 2007

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3.0 WATER RESOURCES AND CONDITIONS

Water is a critical resource for life. Groundwater provides wells with drinking water and contributes the base flow of streams and water bodies. Groundwater is found below the ground surface in the spaces between soil and sediment particles in unconsolidated sediment and in the cracks and pore space within bedrock. Surface water, in contrast to groundwater, is water flowing in natural channels carved into the surface of the earth. We refer to this water as streams, rivers, or creeks. Surface water has many uses, including drinking water and recreation for humans. It provides habitat for fish and other aquatic life. Historically, surface water also had an enormous role in waste disposal until surface waters became degraded and required remediation. Groundwater also has been subject to degradation by underground septic disposal, over-application of fertilizers and pesticides and leaking underground fuel and other chemical storage tanks. This experience has shown that it is technically and economically much easier to take steps to avoid contamination than it is to restore the resource to the original state. The groundwater and surface water resources of Middle Township are described below.

3.1 GROUND WATER RESOURCES

Groundwater provides wells with drinking water and contributes the base flow of streams and water bodies. Groundwater is found below the ground surface in the spaces between soil and sediment particles in unconsolidated sediment and in the cracks and pore space within bedrock. Surface water, in contrast to groundwater, is water flowing in natural channels carved into the surface of the earth. We refer to this water as streams, rivers or creeks. Surface water has many uses, including drinking water and recreation for humans. It provides habitat for fish and other aquatic life. Historically, surface water also had an enormous role in waste disposal until surface waters became degraded and required remediation. Groundwater also has been subject to degradation by underground septic disposal, over-application of fertilizers and pesticides and leaking underground fuel and other chemical storage tanks. This experience has shown that it is technically and economically much easier to take steps to avoid contamination than it is to restore the resource to the original state. The groundwater and surface water resources of Middle Township are described below.

3.1.1 AQUIFERS

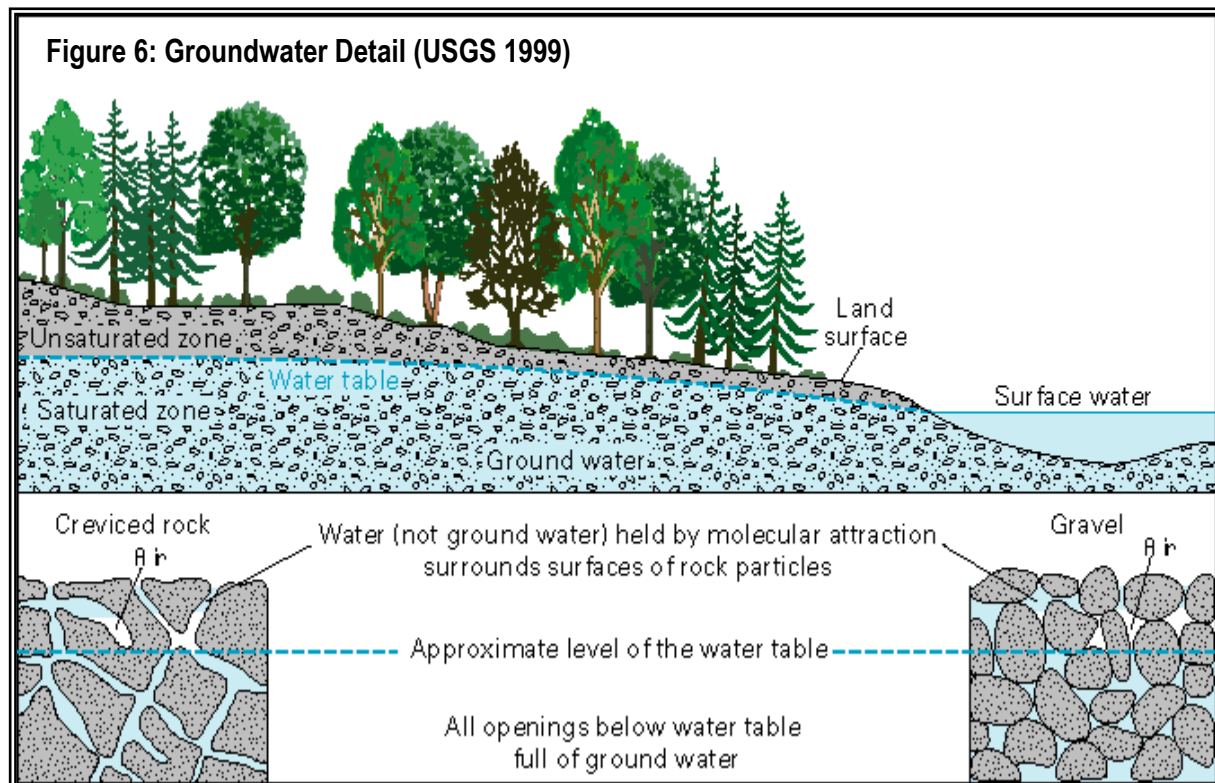
An aquifer is defined by the USDA as “A water-bearing bed or stratum of permeable rock, sand, or gravel capable of fielding considerable quantities of water to wells or springs”. Ground water, located mostly out of site, is one of our most important resources. The underground rock, described in the Geology section and accompanying soils which are described more fully in the Soil section, provide a framework for storing ground water. Between rock and within the soil are spaces or openings that store water and allow fresh water, or precipitation, to replenish or recharge the supply.

Rainfall is able to flow through the pores or empty spaces between the rock and soil to add or replenish (recharge) the existing ground water supply. When the process of recharge occurs quickly, we say the rock or soil is permeable. Water, in useful amounts, which naturally collects within soil or rock under ground and that can be removed easily by pumping (as in a well) is called an aquifer. If ground water seeps out into the surface, it is called a spring.

Figure 6 shows how the ground below the water table (the blue area) is saturated with water. The “unsaturated zone” above the water table (the greenish area) still contains water (plant roots live in this area), but is not totally saturated with water.

Sometimes there is another layer which is not as permeable and does not allow rain to easily flow into stored groundwater. This is an example of a confining layer and its presence defines a “confined aquifer”. Freshwater aquifers along the coast of the Atlantic Ocean, such as those located in Cape May County, are bordered by saline groundwater. Withdrawals from these aquifers can cause the movement of the surrounding saltwater. Saltwater intrusion has been documented throughout the east coast of the United States. Withdrawal can change the patterns

of groundwater flow and discharge to coastal ecosystems, which can alter the salinity of coastal waterways and wetlands.



In Cape May County, five ground water reservoirs or freshwater aquifers have been mapped and studied by County, State and Federal agencies such as USGS. These aquifers are named as follows:

- **Holly Beach** (shallow water bearing zone that is in direct contact with seawater)
- **Estuarine Sand Aquifer** (about 50' thick)
- **Cohansey Aquifer** (varies from 60' – 180' thick)
- **Rio Grande water bearing zone** (50' – 100' thick)
- **Atlantic City Sand** (800' thick)

The sediments underlying Cape May County consist mostly of unconsolidated gravel, sand, silt, clay and shell fragments. In most cases, these materials are permeable and readily allow rainfall to recharge ground water supplies, in most cases. These sediments are also capable of storing large amounts of water.

According to the map named "Aquifers of New Jersey" (Herman, et. al., 1998), the Holly Beach water bearing zone underlies the majority of the municipality and the Kirkwood-Cohansey aquifer system underlies the northwestern corner of the municipality. The Holly Beach water zone is composed of sand, gravel and silt. Clay is present where there are areas thicker than 50 feet. The water-table aquifer includes beach, dune, deltaic and marine sands, as well as recent alluvium. The Estuarine Clay confining unity and the Estuarine Sand aquifer underlie the Holly Beach water bearing zone. The water found within this aquifer is fresh, acidic and corrosive and it contains low dissolved solids. The corrosive nature of the water decreases in confined parts near the coastal areas of the aquifer. Sodium chloride water is common, due to the proximity of the aquifer to the coastal waters (Herman, 1998). The Holly Beach

water bearing zone which is at or near sea level, is in direct connection with seawater and therefore has limited use for freshwater supply. However, Holly Beach supplies non-potable uses.

The Kirkwood-Cohansey aquifer system is a water-table aquifer composed of sand and gravel with lenses of silt and clay. The Cohansey aquifer is confined in Cape May County and is underlain by confined Kirkwood aquifers. Leakage to confined parts of the aquifer provides water, which is fresh, acidic and highly corrosive, as well as low in dissolved solids. Less corrosive water are common in confined aquifers and the salinity of the water within the Cohansey and Kirkwood aquifers may be elevated due to the close proximity of coastal areas. Iron and manganese levels are locally elevated and sodium chloride type water is common (Herman, 1998).

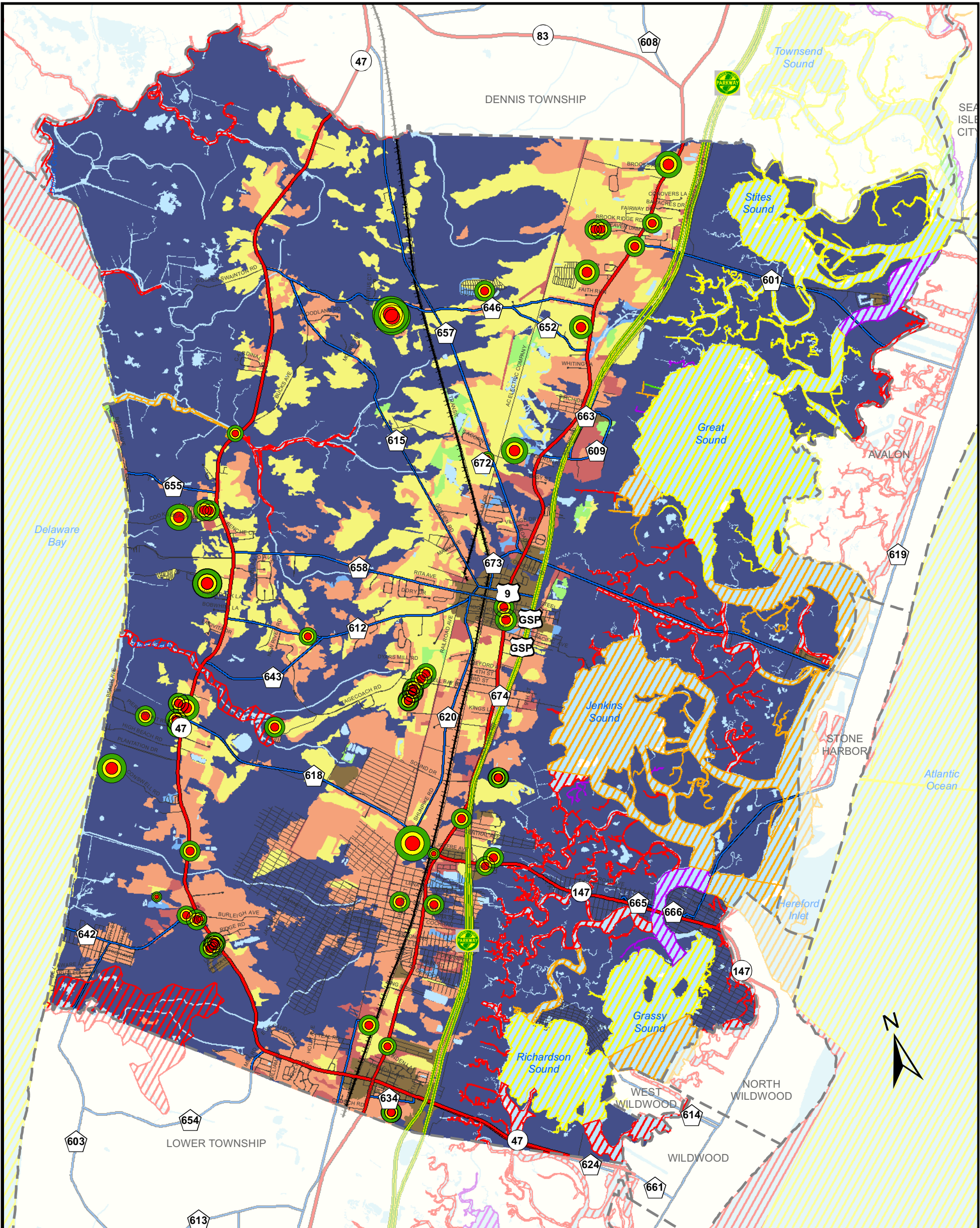
One of the principal water resource issues within Cape May County is drinking water supply. The resource is largely dependent upon groundwater that is in turn highly vulnerable to saltwater intrusion from the west, south and east, especially in the southern portion of the peninsula. According to correspondence with Kathleen Meers, Director of Sewer Utility, and the Middle Township Master Plan (2003), water service for the municipality is currently provided by multiple purveyors, including NJ American Water (NJAW) and City of Wildwood Water Utility. NJAW provides service along the Route 9 corridor from Swainton to Whitesboro. The NJAWC draws water from the 800 Foot Sands and the Cohansey aquifers via a network of four wells and one tank. Wildwood Water Utility provides service to the Rio Grande section of the Township. This purveyor draws water from the Upper Kirkwood, Cohansey and Holly Beach aquifers via a network of four wells. Water District #1 services Avalon Manor and Water District #2 provides service to the Stone Harbor Boulevard and Stone Harbor Manor areas. Water District #1 has two wells in Avalon which draw water from the Kirkwood Formation (Middle Township Planning Board 2003). Most of the public sewer areas in the municipality are served by public water and the remaining residents are serviced by individual wells that are regulated by the County Health Department.

The USGS in cooperation with NJDEP have studied water supply issues and released the report entitled Hydrogeologic Framework, Availability of Water Supplies, and Saltwater Intrusion, Cape May County, New Jersey, Water-Resources Investigations Report 01-4246 in 2002 which was consulted for this Inventory. The report provides guidelines for future withdrawal volumes and recommended well locations in order to safeguard potable water supplies in the future. Alternative strategies for safeguarding freshwater include conservation and groundwater recharge using recycled supplies.

3.1.2 AQUIFER RECHARGE

The NJ Geological Survey ("NJGS") has developed a method to estimate ground water recharge for Cape May County. Land-use, soil and climate data were combined to generate ground water recharge rates shown on the Water Resources map in Appendix A. New Jersey receives an average of 44 inches of precipitation annually, of which approximately 15 to 39 inches recharge the groundwater reservoir by seeping into the ground.

According to Aquifers of New Jersey (Herman, et. al., 1998), the aquifer rank associated with the Holly Beach water bearing zone is C, which yields a median of 100 to 250 gallons per minute. The Cohansey aquifer has an aquifer rank of B-A. This double rank means that more than one area was analyzed and the average well-yield was between 250 to 500 gallons per minute and more than 500 gallons per minute. According to the New Jersey Department of Environmental Protection iMap and Water Resources map, the majority of the municipality contains wetlands and open waters and therefore does not have a recharge ranks in these areas. Recharge rates of 11 to 15 inches per year and 8 to 10 inches per year are located down the center of the municipality, north to south, as well as in areas from north and south in the western region of the municipality. Smaller areas of 13 to 14 inches per year, 1-7 inches per year and no inches per year are located within the central regions of the municipality.



	Wellhead Protection Areas	Shellfish Harvest Areas	Ground Water Recharge Rates
--- Municipal Boundaries	Tier 1 (Time of Travel = 2 Years)	Approved	Rank A: 13 - 14 in/yr
--- Garden State Parkway	Tier 2 (Time of Travel = 5 Years)	Seasonal (Jan - Apr)	Rank B: 11 - 12 in/yr
--- State Roads	Tier 3 (Time of Travel = 12 Years)	Seasonal (Nov - Apr)	Rank C: 8 - 10 in/yr
--- County Roads		Special Restriction	Rank D: 1 - 7 in/yr
--- Local Roads		Prohibited	Rank E: 0 in/yr
--- Railroads			Rank L: Hydric Soil - No Recharge Calculated
--- Water Bodies			Rank W: Wetlands & Open Water - No Recharge Calculated

0 2,500 5,000 7,500 10,000 12,500 15,000

Feet

1 inch equals 5,500 feet

THIS MAP WAS DEVELOPED USING CAPE MAY COUNTY AND NJDEP DIGITAL DATA.
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STATE AUTHORIZED.

WATER RESOURCES

TOWNSHIP OF MIDDLE
CAPE MAY COUNTY NEW JERSEY

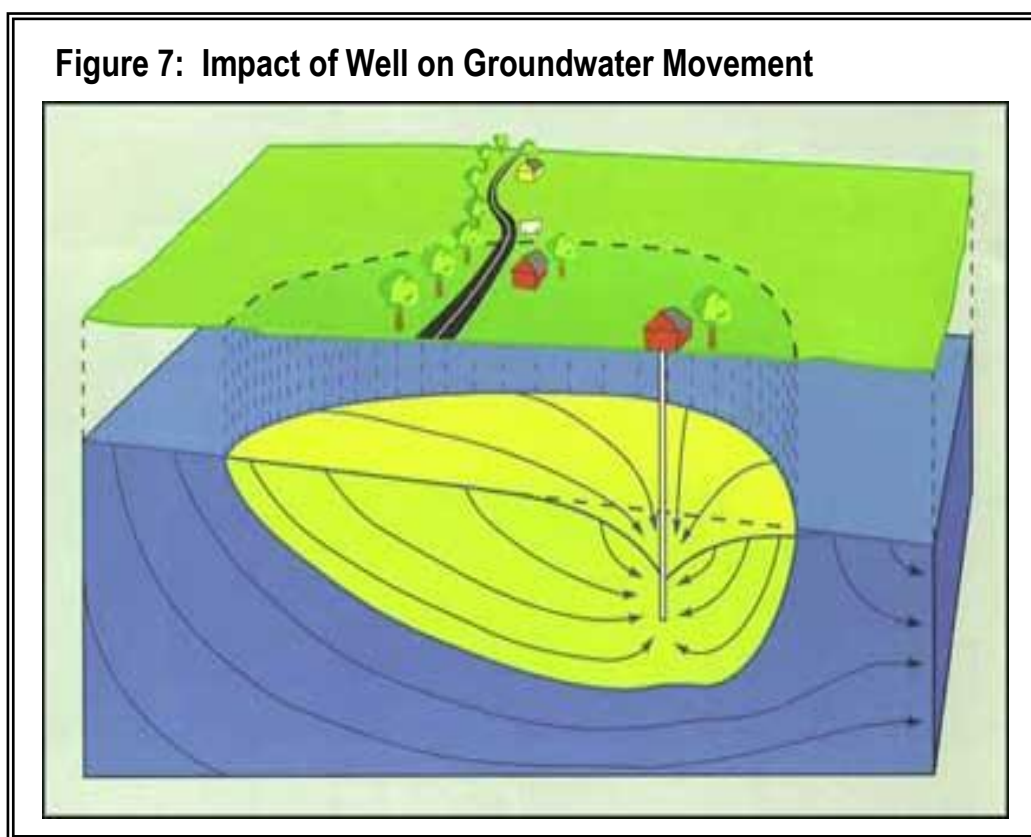


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3.1.3 WELL HEAD PROTECTION AREA

For a community such as Middle Township, in which water is supplied via wells drilled into the ground, knowledge about potential contamination and how contaminants can travel help safeguard the water supply. Safeguarding the susceptible area to prevent contaminants from entering the water supply reservoir is important for both individual wells and larger wells serving multiple dwellings. Wells become vulnerable to contamination when contaminated groundwater accrues within the area that a well draws water from.

The USGS has developed a “Tier System” to distinguish three zones or horizontal surface areas that can add to recharge as the well intake pipe influences infiltration. Having established the area of land and the influence of well water withdrawal, based upon geology and soil characteristics, flow analysis has been generated for movement over 2 years, 5 years and 12 years. The colored tiers, one for each time period, provide a visual guide to the surface area which needs protection to safeguard a well’s supply of water. The diagram below demonstrates the movement of groundwater through the soil in three dimensions resulting from the use of a well.



The NJDEP has mapped “Wellhead Protection Areas” around public wells, so that extra care can be taken in the development of these areas. According to the NJDEP iMap, 24 public community wells are located throughout the municipality. Although not mentioned on the State’s Well Head Protection Area Inventory, the NJDEP has mapped “Wellhead Protection Areas” around the wells and have established a well head protection area of 50 feet for these mapped wells, since they are deep within confined aquifers and less susceptible to contamination than wells in unconfined aquifers.

The Water Resources map depicts wells that have been studied in Middle Township as part of the Wellhead Protection Program. The three areas around the well are distinguished by colors. Each colored ring or Tier designates the time interval which will allow a substance to travel horizontally to the water supply reservoir when

influenced by water withdrawal. Wellhead Protection Areas for larger community wells are shown in Red (2 year, Tier #1), Yellow (5 year as Tier 2) and Green (defining the 12 year area of horizontal movement of Tier #3). Understanding how drinking water is susceptible to contamination is the first step in developing protection for the supply.

The Wellhead Protection and Aquifer sections describe recharge as it relates to the highly permeable soils (sands / sediments) found in Middle Township. The factors facilitating recharge are the same that facilitate the migration of contamination when chemicals or hazardous materials are exposed to the open ground. In addition to estimates of ground water recharge rates, NJDEP has mapped sites where ground water contamination has been identified. The known ground water contaminated sites are included on the Water Resources map for planning purposes. Areas with contaminated groundwater with the Currently Known Extent (CKE) (of contamination) and Well Restriction Areas are also depicted on the map of Known Contaminated Sites.

3.2 WETLANDS

Wetlands occur between dry uplands and land permanently inundated with water (USFWS 1985). Activities in wetlands have been regulated under Section 404 of the Clean Water Act, since its passage in 1972. For the purpose of the regulation of wetlands, the Federal definition follows. Wetlands are:

“Those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil condition” (EPA, 40 CFR 230.3 and CE 33 CFR 328.3).

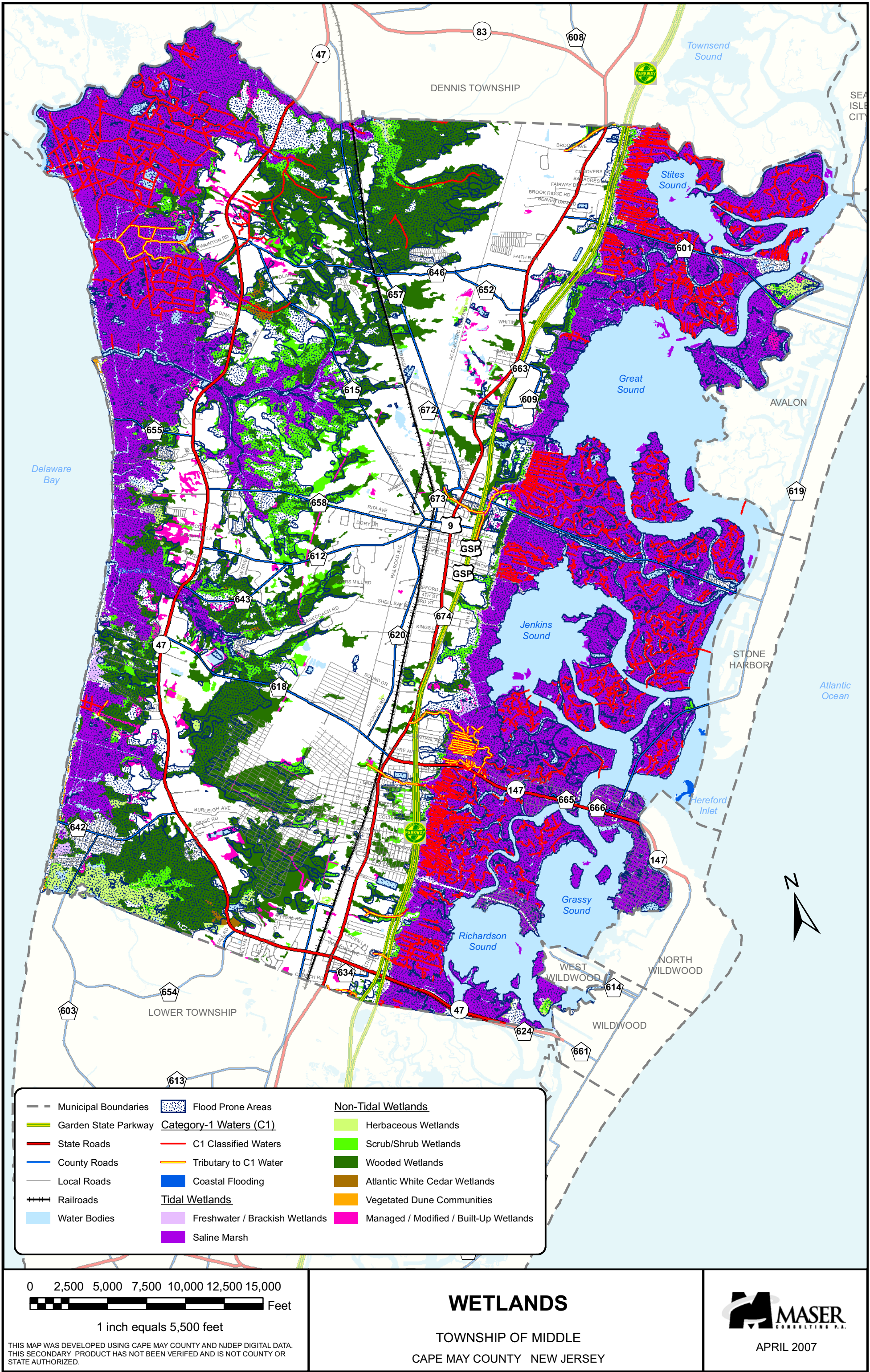
The NJDEP has taken over the regulation of wetlands in the State. Wetlands which are regulated under New Jersey’s Freshwater Wetlands Protection Act (N.J.A.C. 7:7A) are identified and delineated using the U.S. Army Corps of Engineer’s three-parameter approach. Wetlands must exhibit evidence that the seasonal high water table occurs near the surface, hydrophytic vegetation must be present and evidence that water stands or flows through the area should be evident (Federal Interagency Committee for Wetland Delineation 1989).

The freshwater wetlands (FWW) included in this data set were originally mapped under the Fresh Water Wetlands Mapping Program, an effort undertaken to support the Freshwater Wetlands Protection Act, which was enacted in 1988. Using aerial photography captured in 1986 as the basis, a comprehensive, mapped inventory of non-tidal wetlands within New Jersey was produced. Mapped wetlands were classified according to the U.S Fish and Wildlife Service Cowardin Classification System. While these wetland delineations are not regulatory lines, they represent important resource data in determining potential wetland resources. In 1995, NJDEP acquired aerial imagery, and began updating the Land Use/Land Cover (LU/LC) layer from 1986. The 1986 layer was examined with the new imagery, and areas of change delineated, with any new line work and land use codes needed to map the changes added to the base data set. This updated LU/LC layer is identified as the 1995/97 LU/LC update. This information is shown on the Wetlands map.



Approximately 20% of total land mass in Middle Township is occupied by freshwater wetlands, while approximately 30% of total land mass in the Township is occupied by coastal or saltwater wetlands. Freshwater wetlands are found associated with:

- Beaver Swamp
- Lizard Tail Swamp in the northern portion of the Township
- Headwaters of Dias Creek, Bidwell Creek, Crow Creek, Green Creek and Fishing Creek.



Saltwater wetlands have formed adjacent to the main tidal water bodies of:

- Stites Sound
- Great Sound
- Jenkins Sound
- Grassy Sound
- Richardson Sound
- Delaware Bay

The U.S. Fish and Wildlife Service has designated several wetlands on the Cape May Peninsula as priority wetland sites under the Federal Emergency Wetlands Resources Act of 1986, including Cape Island/Pond Creek, Great Cedar Swamp (Cape May National Wildlife Refuge), Great Egg/Jarvis, and Sewall Point. The Cape May marshes (Delaware Bay) and Great Egg/Jarvis wetlands (Atlantic coast) are focus areas under the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan. Acquisition and protection of 7,690 hectares (19,000 acres) in the Cape May marshes and 5,422 hectares (13,400 acres) in the Great Egg-Jarvis wetlands is recommended (USFWS, 1986).

Freshwater wetlands are regulated by the NJDEP, under the Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A). Some activities are prohibited in wetlands, while other activities are allowed, but are restricted in a real extent. In some cases, mitigation is required for the disturbance or destruction of wetlands. In these cases, wetlands must be created, an existing wetland must be enhanced, or a monetary donation to a wetlands mitigation bank must be made.

The NJDEP also determines the size of a wetlands buffer assigned to freshwater wetlands. Activities in these buffers are also regulated. Human made ditches and swales are considered ordinary resource value wetlands and are assigned a buffer of zero feet. A buffer width of 150 feet is assigned to exceptional resource value wetlands. Wetlands known to contain threatened or endangered animal species or critical habitat for such species would be assigned this larger buffer width. Intermediate resource value wetlands, which are generally all wetlands that cannot be categorized as ordinary or exceptional resource value wetlands, are assigned a buffer of fifty feet.

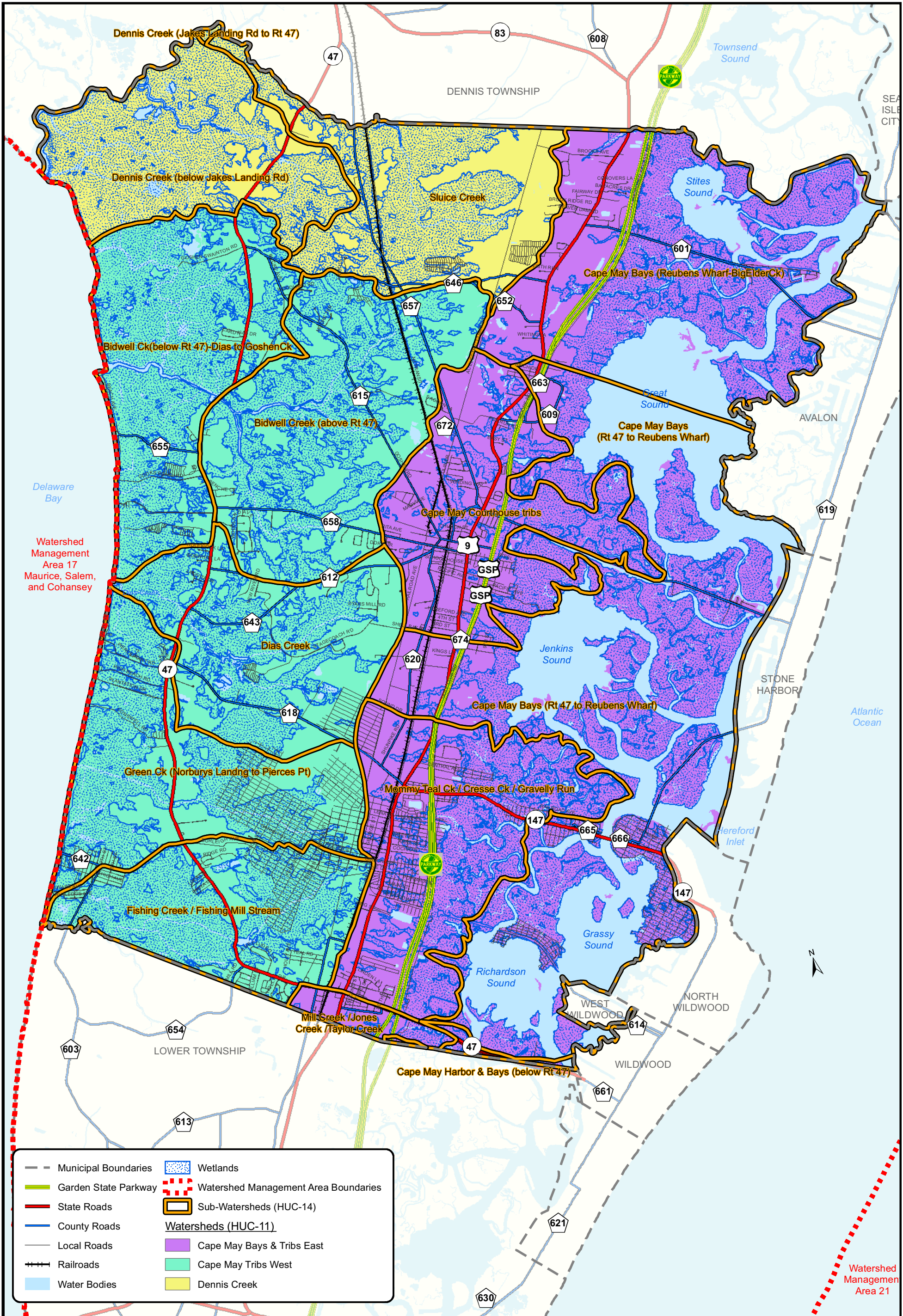
Wetlands can be adversely affected by a variety of human activities. Wetlands losses directly occur through the building of roads and other development and farming. Pollutants and excess nutrients are discharged to wetlands and adjacent water bodies through both point sources from industrial and sewage treatment. Global warming poses additional threats to wetlands in Middle Township. Coastal wetlands will be subject to inundation, allowing the salt front to migrate further inland. Freshwater wetlands may become saline. Unless adequate land is available for wetlands to shift inland through potential accretion, freshwater wetlands will be lost (Cooper, Beevers & Oppenheimer 2005).

3.3 WATERSHEDS

The New Jersey Department of Environmental Protection defines watershed as “the area of land that drains into a body of water such as a river, lake, stream or bay. It is separated from other systems in the area by high points such as hills or slopes. It includes not only the waterway itself, but also the entire land area that drains to it” (NJDEP Division of Watershed Management, 2005). Middle Township is located within the Atlantic Coastal Drainage Basin. This basin drains lands located adjacent to the Atlantic Ocean. The westerly portions of the Township drain to Delaware Bay, before waters discharge to the Atlantic Ocean.

Watershed Management Areas are a designation used by NJDEP. The entire municipality is located within the Cape May Watershed Management Area #16 for NJDEP purposes. Refer to the Watershed Management Areas map to view the boundaries of the watershed and the Watershed Management Areas boundaries within the municipality.

In addition to the NJDEP Watershed Management Area designation, the USGS uses watershed units for the purpose of surface water management. The USGS designated Hydrologic Unit Codes (HUC 11 and HUC 14) for watersheds.



--- Municipal Boundaries	Wetlands
— Garden State Parkway	Watershed Management Area Boundaries
— State Roads	Sub-Watersheds (HUC-14)
— County Roads	Watersheds (HUC-11)
— Local Roads	Cape May Bays & Tribs East
+++ Railroads	Cape May Tribs West
Water Bodies	Dennis Creek

0 2,500 5,000 7,500 10,000 12,500 15,000
Feet
1 inch equals 5,500 feet

**WATERSHED
MANAGEMENT AREAS**
TOWNSHIP OF MIDDLE
CAPE MAY COUNTY NEW JERSEY


APRIL 2007

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The HUC 11 and HUC 14 areas are displayed on the Watershed map. At the HUC 11 level, Middle Township is divided into three different regions: **Dennis Creek Watershed** (HUC 11: 02040206220), **Cape May Tributaries West** (HUC 11: 02040206230) and **Cape May Bays and Tributaries East** (HUC 11: 02040302080). The subwatersheds of the HUC 11 watersheds subdivide Middle Township into smaller drainage areas within the larger Cape May Watershed. These subwatersheds are listed below:

Dennis Creek Watershed HUC 11:

Dennis Creek (Jakes Landing Road to Route 47) – HUC 14: 02040206220030
 Dennis Creek (below Jakes Landing Road) – HUC 14: 02040206220040
 Sluice Creek – HUC 14: 02040206220020

Cape May Tributaries West HUC 11:

Bidwell Creek (below Route 47)/Dias to Goshen Creek – HUC 14: 02040206230020
 Bidwell Creek (above Route 47) – HUC 14: 02040206230010
 Dias Creek – HUC 14: 02040206230030
 Green Creek (Norburys Landing to Pierces Point) – HUC 14: 02040206230040
 Fishing Creek/Fishing Mill Stream – HUC 14: 02040206230050



Cape May Bays and Tributaries East HUC 11:

Mill Creek/Jones Creek/Taylor Creek – HUC 14: 02040302080080
 Cape May Bays (Route 47 to Reubens Wharf) – HUC 14: 02040302080070
 Cape May Harbor and Bays (below Route 47) – HUC 14: 02040302080090
 Mommy Teal Creek/Cresse Creek/Gravelly Run – HUC 14: 02040302080060
 Cape May Courthouse Tributaries – HUC 14: 02040302080050
 Cape May Bays (Reubens Wharf-Big Elder Creek) – HUC 14: 02040302080040

3.4 SURFACE WATER QUALITY

Cape May County, located at the southernmost point of New Jersey, contains a continuation of the Atlantic Coastal Plain along its eastern boarder. The County is 267 square miles in area and is bounded on the north by Atlantic and Cumberland Counties, on the east by the Atlantic Ocean and on the west and south by Delaware Bay. The region is characterized by a low-lying, gently rolling plain whose highest point is 54 feet above sea level and whose surface is largely covered by wet soils and wetlands. Land Swamps (Great Cedar, Timber and Beaver Swamps) occupy the north-central part of the County. Most, if not all, streams are tidal in their lower reaches and terminate by flowing into fresh water swamps that, in turn, discharge to saltwater marshes near the shore (USFWS, 1997). Surface waters in Middle Township include streams, lakes and bogs.

Surface Water Classifications

The NJDEP has established use designations in its Surface Water Quality Standards (N.J.A.C. 7:9-4.1). These designations are described briefly below.

- **FW** – signifies fresh waters and include all nontidal and tidal waters with a salinity of less than 3.5 parts per thousand.

- **FW-1** – fresh waters that originate in and are wholly within federal or state parks, forests, fish and wildlife lands, and other special holdings, that are to be maintained in their natural state of quality and not subject to any man-made wastewater discharges.
- **FW-2** – refers to fresh waters that are not designated FW1 or PL.
- **PL** – includes all waters within the boundaries of the Pinelands Area, as established in the Pinelands Protection Act.
- **SE** – is a general surface water classification of waters with salinity greater than 3.5 parts per thousand.
- **C1 (Category One)** - waters are to be protected "...from measurable changes in water quality characteristics because of their clarity, color, scenic setting, other characteristics of aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resource(s)" (NJDEP 2006).

Waters that are classified by the NJDEP as Category One waters receive extra protection under the State's Stormwater Management Rules (N.J.A.C.7:8). These rules apply to development projects that involve the disturbance of at least one acre of land or the placement of an additional one quarter acre of impervious cover on a site. Special water resource protection areas must be established along all waters designated Category One. This includes perennial or intermittent streams that drain into or upstream of the Category One waters as shown on the USGS Quadrangle Maps or in the County Soil Surveys, within the associated HUC 14 drainage area. These areas will consist of a 300-foot special buffer on each side of the waterway. On undeveloped sites most development is prohibited within these buffers. Development activities are limited within the buffers on developed or active agricultural sites. Category One waters and their tributaries are shown on the Wetlands map.

All classifications have designated uses. For example, FW2 waters are designated for maintenance, mitigation and propagation of natural land and established biota, for primary and secondary contact recreation, for industrial and agricultural water supply, for public potable water supply after conventional filtration treatment (a series of sedimentation, resulting in substantial particulate removal but no consistent removal of chemical constituents) and disinfection and for other reasonable uses. SE1 designated uses are for shellfish harvesting in accordance with N.J.A.C. 7:12, for the maintenance, migration and propagation of the natural and established biota, for primary and secondary contact recreation and for any other reasonable uses.

According to the same rules, "all those streams and segments of streams that flow directly into the Atlantic Ocean or into back bays of the Ocean which are not included elsewhere in this list, are not within the boundaries of the Pinelands Protection or Preservation Areas and are not mapped as C1 waters by the Department are classified as FW2-NT/SE (NJDEP 2005). Therefore, the majority of all unnamed and uncoded tributaries within the drainage area of the Atlantic Ocean in Middle Township are classified as FW2-NT/SE1 waters.

Water Body	Water Quality Classification	Water Body	Water Quality Classification
Bidwell Ditch	FW2-NT/SE1	Grassy Sound	FW2-NT/SE1
Bidwell Creek	FW2-NT/SE1	Richardson Sound	FW2-NT/SE1
Green Creek	FW2-NT/SE1	Dias Creek	FW2-NT/SE1
Fishing Creek	FW2-NT/SE1	Deep Creek	FW2-NT/SE1
Mommy Teel Creek	FW2-NT/SE1	Holmes Creek	FW2-NT/SE1
Cresse Creek	FW2-NT/SE1	Crooked Oyster Creek	FW2-NT/SE1
Sugar Farm Creek	FW2-NT/SE1	Shellbed Creek	FW2-NT/SE1
Gravelly Run	FW2-NT/SE1	Uncle Aaron's Creek	FW2-NT/SE1
Jenkins Sound	FW2-NT/SE1	Sluice Creek	FW2-NT/SE1
Stites Sound	FW2-NT/SE1	Crow Creek	FW2-NT/C1/SE1
Great Sound	FW2-NT/SE1	Goshen Creek	FW2-NT/SE1

3.4.1 SHELLFISH HARVEST AREAS

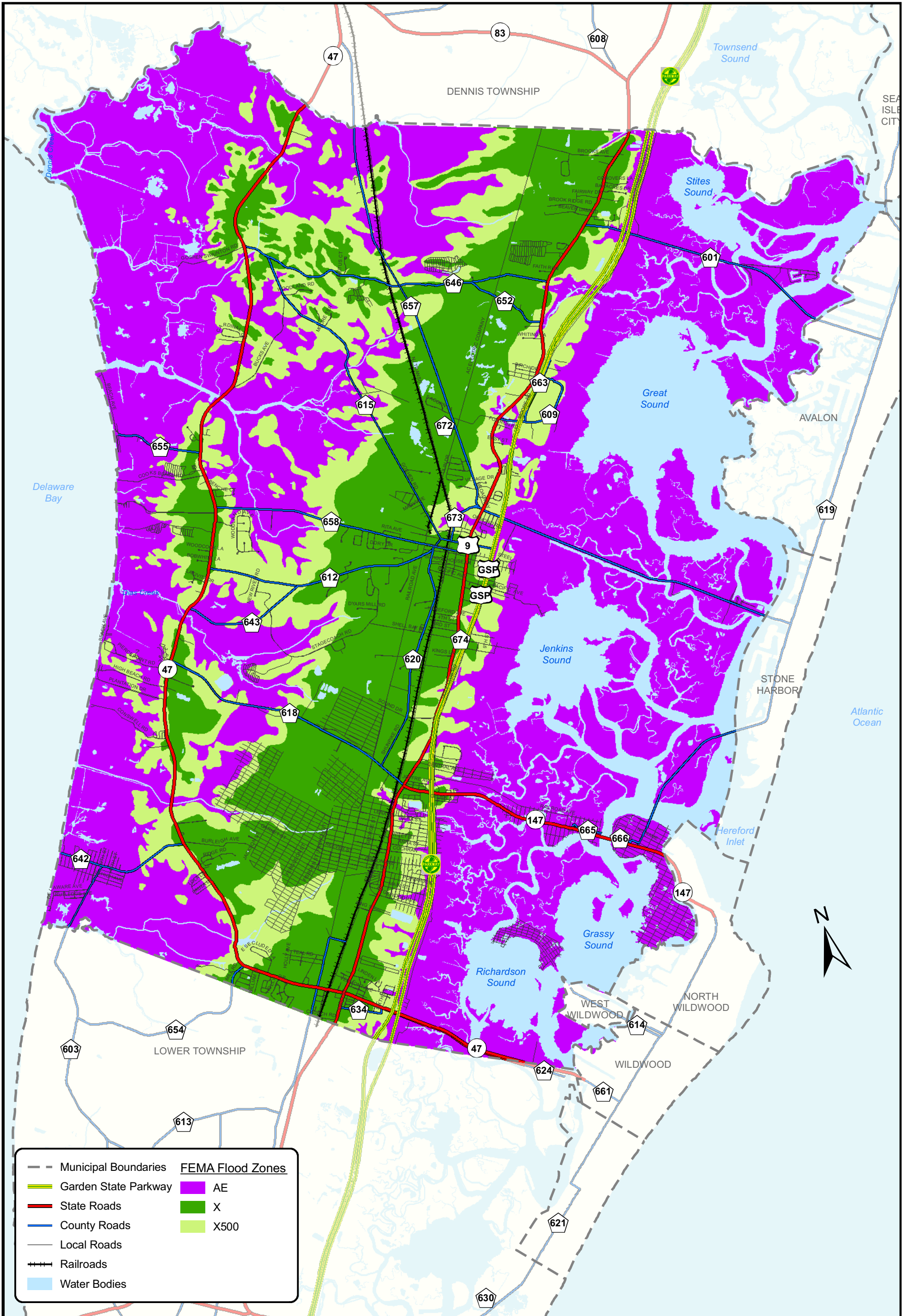
New Jersey harbors extensive commercial shellfish resources, including oysters, hard clam, soft clam and surf clam beds. The NJDEP Bureau of Marine Monitoring periodically assesses water quality in the location of shellfish beds to determine the safety of ingesting shellfish growing there. The transmission of shellfish borne infectious diseases begins with the contamination of growing waters with fecal matter. Contamination can reach shellfish growing waters through stormwater runoff from urban and agricultural areas from direct discharges such as wastewater treatment facilities and septic systems. Since shellfish filter large quantities of water through their bodies while feeding, microorganisms, heavy metals and chemicals become concentrated in their tissues, which can lead to disease or poisoning in human ingesting contaminated shellfish (Watkins, 1998).



The NJDEP maps areas with shellfish classification, including approved, prohibited, seasonal (November to April), seasonal (January to April), and special restriction. The waters adjacent to Middle Township, both along the Delaware Bay and the tidal waterways associated with the Atlantic Ocean, are included within the classification mapping. Stites Sound, Great Sound, Grassy Sound and Richardson Sound all have an approved shellfish harvest area. The majority of Jenkins Sound has a seasonal (November to April). A small section at the southern point is listed as prohibited. Waters receiving Dennis Creek and Goshen Creek, and the waterways themselves, have a prohibited classification, as well as Dias Creek, Fishing Creek and associated tributaries to Fishing Creek. Bidwell Ditch contains both seasonal (November to April) and prohibited shellfish classifications. All four classification areas are located along the tidal waterways associated with the Atlantic Ocean, as shown on the Water Resources map.

3.5 FLOODWAYS AND FLOODPLAINS

According to the Federal Emergency Management Agency ("FEMA") mapping (Community Panel Nos. 340154C 0001 through 340154C 0011), the majority of the municipality is located within either the 500-year (Zone B) or the 100-year floodplain (Zone A) of the Atlantic Ocean, Delaware Bay and associated tidal wetlands and water bodies, including Great Sound, Jenkins Sound, Grassy Sound and Richardson Sound. According to the FEMA Flood Zone Designations and Explanations, flood areas classified as AE or as A1 through A30 represent areas subject to 100-year flood with the base flood elevation determined. The portions of the municipality located within Zone A (or the 100-year flood areas) have a flood elevation of 9 feet, even within the regions adjacent to the Delaware Bay and Atlantic Ocean tidal water bodies. The FEMA Floodplain Designations map shows that most land located outside of the 100-year floodplain is between the Garden State Parkway and Route 47, with some additional area of high ground aggregated on the westerly side of Route 47. The NJDEP regulates development in floodplains under the Flood Hazard Area Control Act Rule (N.J.A.C. 7:13). The floodplains are shown on the FEMA Flood Designations map.



--- Municipal Boundaries	FEMA Flood Zones
— Garden State Parkway	AE
— State Roads	X
— County Roads	X500
— Local Roads	
+++ Railroads	
Water Bodies	

0 2,500 5,000 7,500 10,000 12,500 15,000 Feet

1 inch equals 5,500 feet

THIS MAP WAS DEVELOPED USING CAPE MAY COUNTY AND NJDEP DIGITAL DATA. THIS SECONDARY PRODUCT HAS NOT BEEN VERIFIED AND IS NOT COUNTY OR STATE AUTHORIZED.

**FEMA FLOOD
ZONE DESIGNATIONS**

TOWNSHIP OF MIDDLE
CAPE MAY COUNTY NEW JERSEY



APRIL 2007

According to the Cape May County 2006 Hurricane Conference Local Impacts Report (Foster, 2006), the majority of the municipality would be inundated with floodwaters just during a Category 1 or Category 2 hurricane. During a Category 4 hurricane, the entire municipality, with the exception of a small section in the northern portion of the Township, would be completely flooded. The report states that at an elevation of 6.7 feet above Mean Lower Low Water (MLLW), minor tidal flooding begins to occur within Cape May County. At 7.5 feet above MLLW, moderate tidal flooding will occur and at 8.7 ft, severe tidal flooding will occur within the County (Foster, 2006). Three separate



storms have occurred in the last 20 years, including Hurricane Gloria in September 1985, associated with high water lines beyond the 8.7-ft water mark. An additional two storm events caused high water levels higher than the 7.5-ft moderate tidal flooding mark (Foster, 2006). The report also states that Avalon Boulevard at the Avalon Canal Bridge at would be severely impacted during the 100-year flood (Foster, 2006).

As mentioned previously, the sea level rise associated with global warming is expected to increase the frequency of what is currently considered to be the 100-year flood. A rise of mean sea level to the 2-foot elevation contour (50% probability of occurring by 2050) would mean that the 100-year flood would become the 30-year flood

(Cooper, Beevers & Oppenheimer 2005). Higher base water elevations also mean that storm surges will exhibit higher flood elevations and extend further inland. Planning for increased flood hazards is clearly important for a municipality like Middle Township, with a large portion of low elevation land. As stated by Cooper, et al (2005),

“Episodic flooding events due to storm surges are often perceived as natural disasters’, not failures in land use planning and building code requirements...However, current research suggests that property damage related to coastal hazards is highly dependent on the design and elevation of the homes, buildings and other structures near the shoreline” (Cooper, Beevers & Oppenheimer 2005).

4.0 BIOLOGICAL RESOURCES

Biological resources include the botanical (plant) and zoological (animal) related attributes of an area. Botanical resources include the flora (plants characteristic of a region, period, or special environment), and vegetation (Plant life or total plant cover of an area as in plant communities or habitats) and the zoological resources include the invertebrate and vertebrate animals and animal communities. Rare, threatened, and endangered species and species of special concern also are considered within this section.

4.1 BOTANICAL RESOURCES

Middle Township extends geographically from the Atlantic Ocean shoreline in the eastern section to the Delaware Bay to the west. Freshwater streams and rivers flow from the interior section of the Township east and west into brackish then marine conditions with respect to salinity. Wetlands range from tidal saltmarshes to freshwater cedar bogs and red maple swamps. General wetland types re shown on the Wetlands map. Forests grade from Coastal Plain Oak and Oak-Pine Forests to Pine Barren Forest types. Successional vegetation, which colonizes sites after human or natural disturbance, runs a similar gamut from coastal to interior types. Forest cover and cover mapped for various successional plant communities is shown on the Present and Potential Forest Coverage map. Since a large proportion of Middle Township consists of protected lands, many of its plant communities are of exceptional quality, containing threatened and endangered plants and community types.



Plant communities can be divided into different types of communities. General plant community types are shown on the Present and Potential Forest Coverage map. Plant communities will be discussed at a greater level of detail in this section. New Jersey has tried utilizing a number of different scenarios as far as their community classification is concerned. Our description follows Breden, 1989 and Collins and Anderson, 1994. Plant communities present in this portion of Cape May County include the following systems: Marine, Estuarine, Palustrine and Terrestrial.

4.1.1 MARINE PLANT COMMUNITIES

The Marine System contains plant communities of our coastline and in Middle Township the Marine plant communities are represented by the Marine Gravel/Sand Beach Community, the Dunegrass Community, the Beach Heather Community, the Shrub Thicket Community and the Dune Woodland Community. All except for the Marine Gravel/Sand Beach Community are terrestrial systems and will be discussed under Terrestrial Plant Communities.

The Marine Gravel/Sand Beach Community consists of many annual or biennial plant species more or less restricted to beach habitats. Due to wave action, these communities are considered to be high-energy systems. Salinities exceed 30 ppt (parts per thousands). Plant species in this community must tolerate salt-spray and periodic inundations with salt water. The plant species found in this community are listed in the following.

Plants of the Marine Intertidal Gravel/Sand Beach Community are listed in the table below.

Table 9: Plants of the Marine Intertidal Gravel/Sand Beach Community (after Breden 1989, p. 166)			
Common Name	Scientific Name	Common Name	Scientific Name
Sea Rocket	<i>Cakile edentula</i>	Seaside Spurge	<i>Chamaesyce polygonifolia</i>
Saltwort	<i>Salsola kali</i>	Sandbur	<i>Cenchrus tribuloides</i>
Seaside Sandplant	<i>Honckenya peploides</i>	Slender Seapurslane	<i>Sesuvium maritimum</i>
Red-root Amaranth	<i>Amaranthus retroflexus</i>	Lamb's Quarters	<i>Chenopodium album</i>
American Burnweed	<i>Erechtites hieracifolia</i>	Crested Saltbush	<i>Atriplex cristata</i>
American Beach Grass	<i>Ammophila breviligulata</i>		

4.1.2 ESTUARINE PLANT COMMUNITIES

The Estuarine System consists of deepwater tidal habitats and adjacent tidal wetlands where ocean water is diluted by freshwater runoff from the land. Estuaries are generally considered to be low-energy systems due to the absence of wave action. Salinities can vary from 0.5 ppt to 30 ppt. Four communities are found in Middle Township that are part of the Estuarine System. They are Polyhaline Subtidal Aquatic Bed, Mesohaline/Oligohaline Subtidal Aquatic Bed, Salt Marsh Complex and Brackish Tidal Marsh Complex.

The Polyhaline Subtidal Aquatic Bed communities are found behind barrier islands on the Outer Coastal Plain. The common algae found in this community are Sea Lettuce (*Ulva lactuca*), Green Fleece (*Codium fragile*) and Redweed (*Gracilaria spp.*). Eelgrass (*Zostera marina*) and Beaked Ditch-Grass (*Ruppia maritima*) are the common vascular plants and Sago Pondweed (*Stuckenia pectinata*) and Horned-Pondweed (*Zannichellia palustris*) are found in bay areas where the salinity is lower.

The Mesohaline/Oligohaline Subtidal Aquatic Bed community is found in lower salinity portions of the coastal rivers. Included in this community are coastal salt ponds, large ponds adjacent to ocean or tidal bays which are occasionally breached by storm tides. The vascular plants found in this community are listed in the following.

Table 10: Plants of the Mesohaline/Oligohaline Subtidal Aquatic Bed			
Common Name	Scientific Name	Common Name	Scientific Name
Redhead Pondweed	<i>Potamogeton perfoliatus</i>	Ribbon-Leaf Pondweed	<i>Potamogeton epihydrus</i>
Slender Pondweed	<i>Potamogeton pusillus</i>	Redhead Grass	<i>Potamogeton perfoliatus</i>
Water Celery	<i>Vallisneria americana</i>	Naiad	<i>Najas flexilis</i>
Hooded Arrowhead (submerged form)	<i>Sagittaria calycina</i>	Parker's Pipewort (submerged form)	<i>Eriocaulon parkeri</i>
Redhead Pondweed	<i>Potamogeton perfoliatus</i>	Ribbon-Leaf Pondweed	<i>Potamogeton epihydrus</i>
Slender Pondweed	<i>Potamogeton pusillus</i>	Redhead Grass	<i>Potamogeton perfoliatus</i>
Eastern Grasswort	<i>Lilaeopsis chinensis</i>		

The Salt Marsh Complex community occupies saline reaches of estuaries. Low marsh areas which experience twice daily flooding are dominated by Saltmarsh Cordgrass (*Spartina alterniflora*). The following lists the dominants and associates found in the low marsh areas.

Table 11: Plants of the Low Marsh Community (after Collins and Anderson 1994, pp. 204)			
Common Name	Scientific Name	Common Name	Scientific Name
Salt-marsh Cordgrass	<i>Spartina alterniflora</i>	Spike Grass	<i>Distichlis spicata</i>
Salt-meadow grass	<i>Spartina patens</i>	Black Grass	<i>Juncus gerardi</i>
Big Cordgrass	<i>Spartina cynosuroides</i>	Sea Lavender	<i>Limonium carolinianum</i>
Perennial Salt Marsh Aster	<i>Symphyotrichum tenuifolium</i>	Seaside Mallow	<i>Kosteletzkya virginica</i>
Slender Glasswort	<i>Salicornia europaea</i>	Woody Glasswort	<i>Salicornia virginica</i>
Orache	<i>Atriplex patula</i>	Salt Marsh Sand Spurrey	<i>Spergularia maritima</i>
Salt-marsh Fleabane	<i>Pluchea odorata</i>	Switchgrass	<i>Panicum virgatum</i>

High marsh areas are flooded less often and are dominated by the following plant species.

Table 12: Plants of the High Marsh Community (after Collins and Anderson 1994, pp. 206)			
Common Name	Scientific Name	Common Name	Scientific Name
Shrubs		Shrubs	
Marsh Elder	<i>Iva frutescens</i>	Bayberry	<i>Morella pensylvanica</i>
Groundsel Bush	<i>Baccharis halimifolia</i>		
Herbs		Herbs	
Salt-meadow grass	<i>Spartina patens</i>	Spike Grass	<i>Distichlis spicata</i>
Big Cordgrass	<i>Spartina cynosuroides</i>	Black Grass	<i>Juncus gerardi</i>
Perennial Salt Marsh Aster	<i>Symphyotrichum tenuifolium</i>	Sea Lavender	<i>Limonium carolinianum</i>
Salt Marsh Bulrush	<i>Scirpus robustus</i>	Seaside Goldenrod	<i>Solidago sempervirens</i>
Beaked spike-rush	<i>Eleocharis rostellata</i>	Salt Marsh Cockspur Grass	<i>Echinochloa walteri</i>
Orache	<i>Atriplex patula</i>	Seaside Gerardia	<i>Agalinus maritima</i>
Salt Marsh Sand Spurrey	<i>Spergularia maritima</i>	Sea-pink	<i>Sabatia stellaris</i>
Slender Glasswort	<i>Salicornia europaea</i>	Woody Glasswort	<i>Salicornia virginica</i>
Switchgrass	<i>Panicum virgatum</i>	Rose Mallow	<i>Hibiscus moscheutos</i>
Seaside Mallow	<i>Kosteletzkya virginica</i>		

The frequency of tidal inundation distinguished the High Marsh from the Low Marsh Community. The High Marsh Low Marsh Community is flooded twice daily by tides. The High Marsh is generally inundated only during spring high tides, which occur twice monthly or during coastal storms. Water evaporates from the Marsh and salts are left behind. Therefore, soils tend to be saltier in this community. The High Marsh is fringed by a drier area that floods

even less frequently. Woody plants begin to colonize this zone. The plants from the latter zone are included in the list of plants commonly found in the High Marsh Community (Collins & Anderson 1994).

Brackish tidal marshes occupy zones in estuaries where fresh and salt water mix. The following dominants and associate plant species are found in this community.



Table 13: Plants of the Brackish Tidal Marsh Community (after Collins and Anderson 1994, pp. 208, Breden 1989, p. 170)

Common Name	Scientific Name	Common Name	Scientific Name
Shrubs		Shrubs	
Marsh Elder	<i>Quercus ilicifolia</i>	Indigo Bush	<i>Amorpha fruticosa</i>
Groundsel Bush	<i>Baccharis halimifolia</i>	Few others	
Herbs		Herbs	
Salt-meadow grass	<i>Spartina patens</i>	Spike Grass	<i>Distichlis spicata</i>
Big Cordgrass	<i>Spartina cynosuroides</i>	Black Grass	<i>Juncus gerardi</i>
Perennial Salt Marsh Aster	<i>Symphyotrichum tenuifolium</i>	Sea Lavender	<i>Limonium carolinianum</i>
Salt Marsh Bulrush	<i>Scirpus robustus</i>	Seaside Goldenrod	<i>Solidago sempervirens</i>
Beaked spike-rush	<i>Eleocharis rostellata</i>	Salt Marsh Cockspur Grass	<i>Echinochloa walteri</i>
Orache	<i>Atriplex patula</i>	Seaside Gerardia	<i>Agalinus maritima</i>
Salt Marsh Sand Spurrey	<i>Spergularia maritima</i>	Sea-pink	<i>Sabatia stellaris</i>
Slender Glasswort	<i>Salicornia europaea</i>	Woody Glasswort	<i>Salicornia virginica</i>
Switchgrass	<i>Panicum virgatum</i>	Rose Mallow	<i>Hibiscus moscheutos</i>
Seaside Mallow	<i>Kosteletzkya virginica</i>		

4.1.3 PALUSTRINE PLANT COMMUNITIES

The Palustrine system contains all non tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens. In addition, it includes wetlands that occur in tidal areas where the salinity is below 0.5 ppt. The only tidal Palustrine plant community found in Middle Township is the Freshwater Tidal Marsh Complex.

Upstream of the further reach of salty ocean waters, tidal influence extends into strictly freshwater areas. Here plants no longer need to be salt-tolerant, but they must endure daily inundations and fluctuating water levels. The plant community that develops under these conditions is called a Freshwater Tidal Wetland Community.

The NJDEP Natural Heritage Program has recognized the importance of tidally influenced wetland communities found in Middle Township are valuable in their own right and as habitat for threatened and endangered plant and

animal species. Many acres of freshwater tidal wetlands are included within Natural Heritage Priority Sites within the Township boundaries.

Table 14: Plants of the Freshwater Tidal Wetland Community (after Collins and Anderson 1994, pp. 208, Breden 1989, p. 170)

Common Name	Scientific Name	Common Name	Scientific Name
Shrubs		Shrubs	
Buttonbush	<i>Cephalanthus occidentalis</i>	Silky Dogwood	<i>Cornus amomum</i>
Few others			
Herbs		Herbs	
Wild Rice	<i>Zizania aquatica</i>	Narrow-leaved cattail	<i>Typha angustifolia</i>
Broad-leaved cattail	<i>Typha latifolia</i>	Halberd-leaved Tearthumb	<i>Bidens cernua</i>
Common Reed	<i>Phragmites australis</i>	Nodding Beggar-ticks	<i>Polygonum sagittatum</i>
Blue Flag	<i>Iris versicolor</i>	Arrow-leaved Tearthumb	<i>Amaranthus cannabinus</i>
Rose Mallow	<i>Hibiscus moscheutos</i>	Water Hemp	<i>Ambrosia trifida</i>
Bur-marigold	<i>Bidens laevis</i>	Great Ragweed	<i>Helenium autumnale</i>
Jewelweed	<i>Impatiens capensis</i>	Sneezeweed	<i>Helenium autumnale</i>
Pickernelweed	<i>Pontederia cordata</i>	Arrow arum	<i>Peltandra virginica</i>
Rice Cutgrass	<i>Leersia oryzoides</i>	Spatterdock	<i>Nuphar advena</i>
Woolgrass	<i>Scirpus cyperinus</i>	Broad-leaved Arrowhead	<i>Sagittaria latifolia</i>
Dotted Smartweed	<i>Polygonum punctatum</i>	Sweet Flag	<i>Acorus calamus</i>

There are many nontidal Palustrine plant communities represented in Middle Township. They can be divided into Open Canopy and Forested communities. The nontidal, open canopy Palustrine communities include Coastal Interdunal Marsh, Coastal Plain Intermittent Ponds, and Pine Barren Shrub Swamp. The nontidal, forested Palustrine communities include Coastal Plain Atlantic White Cedar Swamp, Liquidambar/Acer Hardwood Swamp, Pine Barren Hardwood Swamp, Pitch Pine Lowland Forest, and Cape May Lowland Swamp. The Coastal Interdunal Marsh occupies lows areas between dunes along the coast. These communities are likely to be found along the Delaware Bayshore and on bay islands to the west of the Garden State Parkway. These communities can be dominated by robust emergents, shrubs or even shrub thickets. The following plant species are dominants and associates of this community.

Table 15: Plants of the Coastal Interdunal Marsh Community (after Breden 1989, p. 174)

Common Name	Scientific Name	Common Name	Scientific Name
Trees		Trees	
Red Maple	<i>Acer rubrum</i>	Few others	
Red Cedar	<i>Juniperus virginiana</i>		
Shrubs		Shrubs	
Highbush Blueberry	<i>Vaccinium corymbosum</i>	Poison Ivy	<i>Toxicodendron radicans</i>
Rugose Rose	<i>Rosa rugosa</i>	Groundsel Bush	<i>Baccharis halimifolia</i>
Bayberry	<i>Morella pensylvanica</i>	Red Chokeberry	<i>Aronia arbutifolia</i>
Herbs		Herbs	
Common Reed	<i>Phragmites australis</i>	Bald Spike-Rush	<i>Eleocharis erythropoda</i>
Broad-leaved cattail	<i>Typha latifolia</i>	White Thoroughwort	<i>Eupatorium album</i>
Rose Mallow	<i>Hibiscus moscheutos</i>	Small Evening Primrose	<i>Oenothera perennis</i>
Marsh Fern	<i>Thelypteris palustris</i>	Nodding Beggar-ticks	<i>Osmunda cinnamomea</i>
Bushy Bluestem	<i>Andropogon glomeratus</i>	Arrow-leaved Tearthumb	<i>Osmunda regalis</i>
Fern Flat Sedge	<i>Cyperus filicinus</i>	Water Hemp	<i>Polygonum pennsylvanicum</i>
Rusty Flat Sedge I	<i>Cyperus odoratus</i>	Great Ragweed	<i>Scirpus americanus</i>
Rusty Flat Sedge I	<i>Cyperus odoratus</i>	Great Ragweed	<i>Scirpus americanus</i>

Coastal Plain Intermittent Pond communities are dominated by herbaceous vegetation and several ponds have been surveyed in New Jersey for endangered plants and animals. Dominants, associates and some rare plant species found in this community are listed in the following table.

Table 16: Plants of the Coastal Plain Intermittent Pond Community (after Breden 1989, p. 176)			
Common Name	Scientific Name	Common Name	Scientific Name
Herbs		Herbs	
Walter's Sedge	<i>Carex striata</i> var. <i>brevis</i>	Warty Panic Grass	<i>Panicum verrucosum</i>
Netted Nut Rush	<i>Scleria reticularis</i>	Common Panic Grass	<i>Panicum capillare</i>
Pink Tickseed	<i>Coreopsis rose</i>	Smooth Saw-Grass	<i>Cladium mariscoides</i>
New Jersey Muhly	<i>Muhlenbergia torreyana</i>	Small-fruited Spike-Rush	<i>Eleocharis microcarpa</i>
Rare Species		Rare Species	
Canby's Lobelia	<i>Lobelia canbyi</i>	Floating Heart	<i>Nymphoides cordata</i>
Boykin's Lobelia	<i>Lobelia boykinii</i>	Slender Arrowhead	<i>Sagittaria teres</i>
Wright's Panic Grass	<i>Dichanthelium wrightianum</i>	Short-beak Beak Sedge	<i>Rhynchospora nitens</i>
Mudbank Crown Grass	<i>Paspalum dissectum</i>	Narrow-leaved Primrose-Willow	<i>Ludwigia linearis</i>
Hirst's Panic Grass	<i>Dichanthelium hirstii</i>	Wrinkled Joint-Tail Grass	<i>Coelorachis rugosa</i>
Small's Yellow-Eyed Grass	<i>Xyris smalliana</i>	Horsetail Spike-Rush	<i>Eleocharis equisetoides</i>
Bryophytes		Bryophytes	
Large-leaved Peatmoss	<i>Sphagnum macrophyllum</i>	Lescur's Peatmoss	<i>Sphagnum lescurii</i>

The Pine Barren Shrub Swamp community is found in the Outer Coastal Plain and is dominated by Leatherleaf (*Chamaedaphne calyculata*) and associates of Highbush Blueberry (*Vaccinium corymbosum*) and/or Inkberry (*Ilex glabra*). Virginia Chainfern (*Woodwardia virginica*) and Sphagnum moss are common ground covers.

The Coastal Plain Atlantic White Cedar Swamp community forms along streams or in low areas of the Coastal Plain. Atlantic White Cedar (*Chamaecyparis thyoides*) dominates with over 50% of the tree canopy. The associate plant species are listed in the following table.

Table 17: Plants of the Coastal Plain Atlantic White Cedar Swamp Community (Breden 1989, p. 182)			
Common Name	Scientific Name	Common Name	Scientific Name
Dominant Tree		Trees	
Atlantic White Cedar	<i>Chamaecyparis thyoides</i>	Red Maple	<i>Acer rubrum</i>
		Blackgum	<i>Nyssa sylvatica</i>
		Sweetbay	<i>Magnolia virginiana</i>
Shrubs		Shrubs	
Highbush Blueberry	<i>Vaccinium corymbosum</i>	Sweet Pepperbush	<i>Clethra alnifolia</i>
Leucothoe	<i>Leucothoe racemosa</i>	Dangleberry	<i>Gaylussacia frondosa</i>
Inkberry	<i>Ilex glabra</i>	Swamp Azalea	<i>Rhododendron viscosum</i>
Herbs		Herbs	
Curly Grass Fern	<i>Schizaea pusilla</i>	Dragon's Mouth Orchid	<i>Arethusa bulbosa</i>
Rose Pogonia Orchid	<i>Pogonia ophioglossoides</i>		
Bryophytes		Bryophytes	
Sphagnum moss	<i>Sphagnum fallax</i>	Sphagnum moss	<i>Sphagnum flavicomans</i>
Sphagnum moss	<i>Sphagnum magellanicum</i>	Sphagnum moss	<i>Sphagnum pulchrum</i>
Sphagnum moss	<i>Sphagnum recurvum</i>		

The Liquidambar/Acer Hardwood Swamp community is dominated by Sweetgum (*Liquidambar styraciflua*) and Red Maple (*Acer rubrum*) and is found on the Inner Coastal Plain and along fringes of the Outer Coastal Plain of southern New Jersey. The plant species found in this community are listed in the following table.

Table 18: Plants of the Liquidambar/Acer Hardwood Swamp Community (Breden 1989, p. 185)			
Common Name	Scientific Name	Common Name	Scientific Name
Dominant Trees		Dominant Trees	
Sweetgum	<i>Sweetgum</i>	Red Maple	<i>Acer rubrum</i>
Trees		Trees	
Blackgum	<i>Nyssa sylvatica</i>	Sweetbay	<i>Magnolia virginiana</i>
Shrubs		Shrubs	
Arrowwood	<i>Viburnum dentatum</i>	Spicebush	<i>Lindera benzoin</i>
Highbush Blueberry	<i>Vaccinium corymbosum</i>	Sweet Pepperbush	<i>Clethra alnifolia</i>
Swamp Azalea	<i>Rhododendron viscosum</i>		

The Pine Barren Hardwood Swamp community is found on areas of the Outer Coastal Plain where the typical Pine Barrens soils dominate the area. This community is dominated by Red Maple (*Acer rubrum*). The other plant species found in this community can be found on the following table.

Table 19: Plants of the Pine Barren Hardwood Swamp Community (Breden 1989, p. 185)			
Common Name	Scientific Name	Common Name	Scientific Name
Dominant Trees		Dominant Trees	
Red Maple	<i>Acer rubrum</i>		
Trees		Trees	
Pin Oak	<i>Quercus palustris</i>	Willow Oak	<i>Quercus phellos</i>
Southern Red Oak	<i>Quercus falcata</i>	Tulip Tree	<i>Liriodendron tulipifera</i>
American Beech	<i>Fagus grandifolia</i>	Swamp White Oak	<i>Quercus bicolor</i>
Ash	<i>Fraxinus spp.</i>	Elm	<i>Ulmus spp</i>
Sassafras	<i>Sassafras albidum</i>	American Holly	<i>Ilex opaca</i>
Common Persimmon	<i>Diospyros virginiana</i>		
Shrubs		Shrubs	
Highbush Blueberry	<i>Vaccinium corymbosum</i>	Leatherleaf	<i>Chamaedaphne calyculata</i>
Sweet Pepperbush	<i>Clethra alnifolia</i>	Leucothoe	<i>Leucothoe racemosa</i>
Swamp Azalea	<i>Rhododendron viscosum</i>	Dangleberry	<i>Gaylussacia frondosa</i>

The Pitch Pine Lowland Forest is a Pitch Pine (*Pinus rigida*) dominated wetland forest with a well developed understory shrub layer. The ground water level lies just below the soil surface. The wet sandy soils in this community allows for its diverse suite of species. Openings in Pitch Pine Lowland Forest provide excellent habitat for herbaceous plants such as orchids, grasses, sedges and rushes as well as flowering forbs. A number of rare species can be found in this community. Plant species characteristic of this community can be found in the following table.

Table 20: Plants of the Pitch Pine Lowland Forest Community (Breden 1989, p. 185)			
Common Name	Scientific Name	Common Name	Scientific Name
Dominant Trees		Dominant Trees	
Pitch Pine	<i>Pinus rigida</i>		
Shrubs		Shrubs	
Sheep Laurel	<i>Kalmia angustifolia</i>	Bog Huckleberry	<i>Gaylussacia dumosa</i>
Sweet Pepperbush	<i>Clethra alnifolia</i>	Staggerbush	<i>Lyonia mariana</i>
Highbush Blueberry	<i>Vaccinium corymbosum</i>	Leucothoe	<i>Leucothoe racemosa</i>

Table 20: Plants of the Pitch Pine Lowland Forest Community (continued)			
Common Name	Scientific Name	Common Name	Scientific Name
Shrubs		Shrubs	
Swamp Azalea	<i>Rhododendron viscosum</i>	Dangleberry	<i>Gaylussacia frondosa</i>
Typical Groundcover Species		Typical Groundcover Species	
Sand Myrtle	<i>Leiophyllum buxifolium</i>	Pyxie Moss	<i>Pyxidantha barbulata</i>
Turkey Beard	<i>Xerophyllum asphodeloides</i>	Orange Milkwort	<i>Polygala lutea</i>
Pine Barren Reed Grass	<i>Calamovilfa brevipilis</i>		
Wet Swale Species		Wet Swale Species	
Walter's Sedge	<i>Carex striata</i> var. <i>brevis</i>	Slender Iris	<i>Iris prismatica</i>
Redroot	<i>Lachnanthes tinctoria</i>	Red-top Panic Grass	<i>Panicum rigidulum</i>
Virginia Chainfern	<i>Woodwardia virginiana</i>	Hidden-fruit Bladderwort	<i>Utricularia geminiscapa</i>
Engelmann's Arrowhead	<i>Sagittaria engelmanniana</i>	Striped Bladderwort	<i>Utricularia striata</i>
Atlantic Manna Grass	<i>Glyceria obtusa</i>		
Rare species		Rare species	
Canby's Lobelia	<i>Lobelia canbyi</i>	Bunched Beak-Sedge	<i>Rhynchospora cephalantha</i>
Livid Sedge	<i>Carex livida</i>	New Jersey Muhly	<i>Muhlenbergia torreyana</i>
Long's Bulrush	<i>Scirpus longii</i>		

The Cape May Lowland Swamp community is predominantly known from Cape May County. It typically occurs along the headwaters of streams where they are likely to be fed by groundwater discharge. Plant species found in this community are listed in the following table.

Table 21: Plants of the Cape May Lowland Swamp Community (Breden 1989, p. 187)			
Common Name	Scientific Name	Common Name	Scientific Name
Canopy Trees		Canopy Trees	
Red Maple	<i>Acer rubrum</i>	Sweetgum	<i>Liquidambar styraciflua</i>
Pumpkin Ash	<i>Fraxinus profunda</i>	Blackgum	<i>Nyssa sylvatica</i>
Understory Trees		Understory Trees	
Sweetbay	<i>Magnolia virginiana</i>	American Holly	<i>Ilex opaca</i>
Shrubs		Shrubs	
Sweet Pepperbush	<i>Clethra alnifolia</i>	Spicebush	<i>Lindera benzoin</i>
Virginia Sweetspire	<i>Itea virginica</i>	Swamp Azalea	<i>Rhododendron viscosum</i>
Southern species		Southern species	
Swamp Chestnut Oak	<i>Quercus michauxii</i>	Water Oak	<i>Quercus nigra</i>
Willow Oak	<i>Quercus phellos</i>	Swamp Cottonwood	<i>Populus heterophylla</i>
Rare species		Rare species	
Glade Spurge	<i>Euphorbia purpurea</i>	Greater Marsh St. Johnswort	<i>Triadenum walteri</i>
Greater March St. Johnswort	<i>Triadenum walteri</i>	American Featherfoil	<i>Hottonia inflata</i>
Pumpkin Ash	<i>Quercus profunda</i>	Southern Twayblade	<i>Listera australis</i>
Swamp Cottonwood	<i>Populus heterophylla</i>	Swamp Chestnut Oak	<i>Quercus michauxii</i>

4.1.4 TERRESTRIAL PLANT COMMUNITIES

Terrestrial plant communities include habitats that are often termed "uplands." These upland communities have non-hydrophytic vegetation (vegetation not characteristic of wetlands), non-hydric soils (soils not characteristic of wetlands) and negative wetland hydrology (hydrology not characteristic of wetlands). Similar to the Palustrine System, the Terrestrial System is divided up into Open Canopy communities and into Forested communities. The typical open canopy, upland plant communities found in Middle Township include Coastal Dune Grass community, Coastal Dune Shrubland, and Coastal Dune Woodland.

Sand is continually shifting on ocean beaches. Windblown and storm-driven sand form ridges of sand called dunes. The dunes are above the normal high tide levels, but plants still must be tolerant to salt spray. In natural dune systems, several parallel dune ridges are present. The nearest dunes to the ocean are called primary dunes. Conditions on the primary dunes are the most dynamic. Plants here must tolerate frequently shifting sands. The Dunegrass Community described below is most well-developed on the primary dune. American Beachgrass is often the dominant plant on the primary dune, particularly the foredune (portion of dune facing the ocean). This species is healthiest when sand is shifting and accreting (Collins & Anderson 1994).

Table 22: Plants of the Dunegrass Community (after Collins & Anderson 1994, p. 213)			
Common Name	Scientific Name	Common Name	Scientific Name
Herbs		Herbs	
American Beachgrass (Dunegrass)	<i>Ammophila breviligulata</i>	Sea Rocket	<i>Cakile edentula</i>
Sandbur	<i>Cenchrus tribuloides</i>	Seaside Spurge	<i>Euphorbia polygonifolia</i>
Long-spined Sandbur	<i>Cenchrus longispinus</i>	Sandgrass	<i>Triplasis purpurea</i>
Saltwort	<i>Salsola kali</i>	Sea-beach Panic Grass	<i>Panicum amarum</i>
Seaside Goldenrod	<i>Solidago sempervirens</i>	Sedge	<i>Carex kobomugi</i>
Cocklebur	<i>Xanthium strumarium</i>	Beach Pea	<i>Lathyrus japonicus</i>
Dusty Miller	<i>Artemisia stelleriana</i>	Slender Seapurslane	<i>Sesuvium maritimum</i>



Secondary and tertiary dunes ideally are present landward of the primary dune. Here sands are more stable. Plants are also more protected by saltspray. American beachgrass loses its vigor on the secondary and tertiary dunes. Here Beach Heather often dominates. The most common plants found in the Beach Heather Community are listed below.

Table 23: Plants of the Beach Heather Community (after Collins and Anderson 1994, pp. 216)			
Common Name	Scientific Name	Common Name	Scientific Name
Shrubs and Vines		Shrubs and Vines	
Virginia Creeper	<i>Parthenocissus quinquefolia</i>	Poison Ivy	<i>Toxicodendron radicans</i>
Herbs		Herbs	
Beach Heather	<i>Hudsonia tomentosa</i>	Sea-beach Three-awn	<i>Aristida tuberculosa</i>
American Beachgrass (Dunegrass)	<i>Ammophila breviligulata</i>	Sea Rocket	<i>Cakile edentula</i>
Sandbur	<i>Cenchrus tribuloides</i>	Seaside Spurge	<i>Chamaecyce polygonifolia</i>
Long-spined Sandbur	<i>Cenchrus longispinus</i>	Sandgrass	<i>Triplasis purpurea</i>
Saltwort	<i>Salsola kali</i>	Sea-beach Panic Grass	<i>Panicum amarum</i>
Seaside Goldenrod	<i>Solidago sempervirens</i>	Sand Sedge	<i>Carex kobomugi</i>
Cocklebur	<i>Xanthium strumarium</i>	Beach Pea	<i>Lathyrus japonicus</i>
Dusty Miller	<i>Artemisia stelleriana</i>	Slender Seapurslane	<i>Sesuvium maritimum</i>
Little Bluestem	<i>Schizachyrium scoparium</i>	Cocklebur	<i>Xanthium strumarium</i>
Prickly Pear	<i>Opuntia humifusa</i>	Beach Pinweed	<i>Lechea maritima</i>
Trailing Wild Bean	<i>Strophostyles helvola</i>		
Lichens and Mosses		Lichens and Mosses	
Thorn Lichen	<i>Cladonia uncialis</i>	Coastal Reindeer Lichen	<i>Cladina submitis</i>

Farther from the ocean, where the land receives less salt spray and soils are less xeric, woody plants can take hold. Tree species may even be present, though they will be stunted to the degree that salt spray reaches them. Tree heights rarely exceed 15 feet (Collins & Anderson 1994).

Table 24: Plants of the Shrub Thicket Community (after Collins and Anderson 1994, pp. 218)			
Common Name	Scientific Name	Common Name	Scientific Name
Trees		Trees	
Red Cedar	<i>Juniperus virginiana</i>	Black Cherry	<i>Prunus serotina</i>
American Holly	<i>Ilex opaca</i>		
Shrubs and Vines		Shrubs and Vines	
Scrub Oak	<i>Quercus ilicifolia</i>	Bayberry	<i>Morella pensylvanica</i>
Beach Plum	<i>Prunus maritima</i>	Shadbush	<i>Amelanchier canadensis</i>
Highbush Blueberry	<i>Vaccinium corybosum</i>	Winger Sumac	<i>Rhus copallina</i>
Virginia Creeper	<i>Parthenocissus quinquefolia</i>	Poison Ivy	<i>Toxicodendron radicans</i>
Herbs		Herbs	
Common Greenbriar	<i>Smilax rotundifolia</i>	Sea-beach Three-awn	<i>Aristida tuberculosa</i>
American Beachgrass (Dunegrass)	<i>Ammophila breviligulata</i>	Sandgrass	<i>Triplasis purpurea</i>
Sandbur	<i>Cenchrus tribuloides</i>	Seaside Spurge	<i>Chamaesyce polygonifolia</i>
Long-spined Sandbur	<i>Cenchrus longispinus</i>	Sandgrass	<i>Triplasis purpurea</i>
Dusty Miller	<i>Artemisia stelleriana</i>	Little Bluestem	<i>Schizachyrium scoparium</i>
Prickly Pear	<i>Opuntia humifusa</i>	Beach Pinweed	<i>Lechea maritima</i>

Dune Woodlands develop in the swales between the secondary and tertiary dunes. These communities occur where soil moisture is more available than in other types of dune plant communities. Little salt spray reaches these plants allowing for more robust growth and the appearance of less salt-tolerant species.

Table 25: Plants of the Dune Woodland Community (after Collins and Anderson 1994, pp. 220)			
Common Name	Scientific Name	Common Name	Scientific Name
Trees		Trees	
Red Cedar	<i>Juniperus virginiana</i>	Black Cherry	<i>Prunus serotina</i>
American Holly	<i>Ilex opaca</i>	Red Maple	<i>Acer rubrum</i>
Hackberry	<i>Celtis occidentalis</i>	Sassafras	<i>Sassafras albidum</i>
Pitch Pine	<i>Pinus rigida</i>		
Shrubs and Vines		Shrubs and Vines	
Scrub Oak	<i>Quercus ilicifolia</i>	Bayberry	<i>Myrica pensylvanica</i>
Beach Plum	<i>Prunus maritima</i>	Shadbush	<i>Amelanchier canadensis</i>
Highbush Blueberry	<i>Vaccinium corybosum</i>	Winger Sumac	<i>Rhus copallina</i>
Virginia Creeper	<i>Parthenocissus quinquefolia</i>	Poison Ivy	<i>Toxicodendron radicans</i>
Others			
Herbs		Herbs	
Switchgrass	<i>Panicum virgatum</i>	Sea-beach Three-awn	<i>Aristida tuberculosa</i>
Little Bluestem	<i>Schizachyrium scoparium</i>	Others	

The forested, upland plant communities found in Middle Township include Dry Oak-Pine Forest, Dry Pine-Oak Forest, and Mesic Coastal Plain Mixed Oak Forest.

The Dry Oak-Pine Forest community is the oak dominated forest of the outer coastal plain. The dominant trees usually cover 40% or more of the ground. Pitch Pine is present in nearly all stands, although, Short-leaf Pine outnumbers Pitch Pine in some stands. At least three subtypes of Dry Oak-Pine Forests have been described. They are the Mixed Oak-Pine Forest, the Oak Hilltop Forest and the Scarlet Oak-Short-leaf Pine Forest.



In the Mixed Oak-Pine Forest, either Black Oak or Southern Red Oak dominates depending on where it is located on the Coastal Plain in New Jersey. Chestnut Oak, Scarlet Oak and White Oak are also present, but vary in their abundance. Post Oak is present also and is usually more abundant than Blackjack Oak. Pines form about 50% of the basal area in these stands.

The Oak Hilltop Forests dominated by Chestnut Oak and Black Oak form about 90% of the canopy. They occur on many small hilltops and a few larger areas in the Pine Barrens. Woody growth covers about 25% of the ground and is a mix of Dangleberry, Scrub Oak, Black Huckleberry and Early Lowbush Blueberry.

The Scarlet Oak-Shortleaf Pine Forests occur on the eastern half of the Pine Barrens and north of the Mullica River. So they are probably not found in Cape May County.

Table 26: Plants of the Dry Oak-Pine Forest Community (after Collins and Anderson 1994, p. 180-180, Whittaker 1998, p. 318-319, and Breden, 1989, p. 195)

Common Name	Scientific Name	Common Name	Scientific Name
Trees		Trees	
White Oak	<i>Quercus alba</i>	Black Oak	<i>Quercus velutina</i>
Chestnut Oak	<i>Quercus prinus</i>	Post Oak	<i>Quercus stellata</i>
Shrubs and Vines		Shrubs and Vines	
Scrub Oak	<i>Quercus illicifolia</i>	Dwarf Chestnut Oak	<i>Quercus prinoides</i>
Early Lowbush Blueberry	<i>Vaccinium pallidum</i>	Black Huckleberry	<i>Gaylussacia baccata</i>
Dangleberry	<i>Gaylussacia frondosa</i>	Bayberry	<i>Morella pensylvanica</i>
Late Lowbush Blueberry	<i>Vaccinium angustifolium</i>	Sheep Laurel	<i>Kalmia angustifolia</i>
Herbs		Herbs	
Bracken fern	<i>Pteridium aquilinum</i>	Rattlesnake Weed	<i>Hieracium venosum</i>
Pennsylvania Sedge	<i>Carex pensylvanica</i>	Cow-wheat	<i>Melampyrum lineare</i>
Little Bluestem	<i>Schizachyrum scoparium</i>	Goat's Rue	<i>Tephrosia virginica</i>
Wild Indigo	<i>Baptisia tinctoria</i>	Indian Pipe	<i>Monotropa uniflora</i>

The Dry Pine-Oak Forest community is dominated in most stands by Pitch Pine. Black Oak, Chestnut Oak, Scarlet Oak, Post Oak and White Oak cover no more than 25% of the ground, while Pitch Pine contributes to 50% or more of the ground. The shrub understory is either dominated by Black Huckleberry and Early Lowbush Blueberry or by Scrub Oak emerging above the heaths. Three subtypes of Dry Pine-Oak Forest communities have been described



in southern New Jersey. They are: the Pine-Blackjack Oak Forest, the Pine-Post Oak Forest and the Pine-Black Oak Forest. The plants characteristic of the Dry Pine-Oak Forest community are listed in the following table.

Table 27: Plants of the Pine-Oak Forest Community (after Breden 1989 p.195, Collins and Anderson 1994, p. 174-175, Olsson 1998 p.250, Whittaker 1998, p. 319)

Common Name	Scientific Name	Common Name	Scientific Name
Dominant Trees		Other Trees	
Pitch Pine	<i>Pinus rigida</i>	Shortleaf Pine	<i>Pinus echinata</i>
Trees		Black Oak	<i>Quercus velutina</i>
Chestnut Oak	<i>Quercus prinus</i>	Post Oak	<i>Quercus stellata</i>
White Oak	<i>Quercus alba</i>	Scrub Oak	<i>Quercus illicifolia</i>
Scarlet Oak	<i>Quercus coccinea</i>	Sassafras	<i>Sassafras albidum</i>
Shrubs and Vines		Shrubs and Vines	
Scrub Oak	<i>Quercus illicifolia</i>	Eastern Teaberry	<i>Gaultheria procumbens</i>
Blackjack Oak	<i>Quercus marilandica</i>	Staggerbush	<i>Lyonia mariana</i>
Dangleberry	<i>Gaylussacia frondosa</i>	Black Huckleberry	<i>Gaylussacia baccata</i>
Early Lowbush Blueberry	<i>Vaccinium pallidum</i>	Glaucous Greenbrier	<i>Smilax glauca</i>
Sweet Fern	<i>Comptonia peregrina</i>	Common Greenbrier	<i>Smilax rotundifolia</i>
Late Lowbush Blueberry	<i>Vaccinium angustifolia</i>	Wild Indigo	<i>Baptisia tinctoria</i>
Heath	<i>Arctostaphylos uva-ursi</i>	Trailing arbutus	<i>Epigaea repens</i>
Herbs		Herbs	
Golden Heather	<i>Hudsonia ericoides</i>	Little Bluestem	<i>Schizachyrum scoparium</i>
Bracken fern	<i>Pteridium aquilinum</i>	Rattlesnake Weed	<i>Hieracium venosum</i>
Pennsylvania Sedge	<i>Carex pensylvanica</i>	Frostweed	<i>Helianthemum canadense</i>
Wild Indigo	<i>Baptisia tinctoria</i>	Goat's Rue	<i>Tephrosia virginica</i>
Sweet Goldenrod	<i>Solidago odora</i>	Ipecac Spurge	<i>Euphorbia ipecacuanhae</i>
Pine Barren's Sandwort	<i>Arenaria caroliniana</i>	Stiff Aster	<i>Aster linariifolius</i>

Of the Mesic Coastal Plain Mixed Oak Forest community, there are three subtypes and it is one of these subtypes: the Southern Coastal Plain Mixed Oak Forest that is found in Cape May County. It is dominated by Southern Red Oak, Willow Oak, Sweetgum, Red Maple, American Beech, American Holly and Flowering Dogwood. The plant species found in this subtype are listed in the following table.

Table 28: Plants of the Southern Coastal Plain Mixed Oak Forest Community (Breden 1989 p. 198)

Common Name	Scientific Name	Common Name	Scientific Name
Dominant Trees		Dominant Trees	
Willow Oak	<i>Quercus phellos</i>	Southern Red Oak	<i>Quercus falcata</i>
Sweetgum	<i>Liquidambar styraciflua</i>	Red Maple	<i>Acer rubrum</i>
American Holly	<i>Ilex opaca</i>	American Beech	<i>Fagus grandifolia</i>
Flowering Dogwood	<i>Cornus florida</i>		
Trees		Other Trees	
Swamp Chestnut Oak	<i>Quercus michauxii</i>	Water Oak	<i>Quercus nigra</i>
Shrubs and Vines		Shrubs and Vines	
Arrowwood	<i>Viburnum dentatum</i>	Black Huckleberry	<i>Gaylussacia baccata</i>
Glaucous Greenbrier	<i>Smilax glauca</i>	Bayberry	<i>Morella pensylvanica</i>
Highbush Blueberry	<i>Vaccinium corymbosum</i>	Sweet Pepperbush	<i>Clethra alnifolia</i>
Virginia Creeper	<i>Parthenocissus quinquefolia</i>	Poison Ivy	<i>Toxicodendron radicans</i>
Swamp Azalea	<i>Rhododendron viscosum</i>		

Table 28: Plants of the Southern Coastal Plain Mixed Oak Forest Community (continued)			
Common Name	Scientific Name	Common Name	Scientific Name
Herbs		Herbs	
Bracken fern	<i>Pteridium aquilinum</i>	Rattlesnake Weed	<i>Hieracium venosum</i>
Pennsylvania Sedge	<i>Carex pensylvanica</i>	Cow-wheat	<i>Melampyrum lineare</i>
Spotted Wintergreen	<i>Chimaphila maculate</i>	Stemless Lady's Slipper	<i>Cypripedium acaule</i>
Indian Pipe	<i>Monropa uniflora</i>		

4.1.5 RARE VEGETATION COMMUNITIES AND SPECIES

The State's Natural Heritage Program maintains a database of rare plant communities and rare plant species. According to this database, nine types of rare plant communities occur in Middle Township. These are:

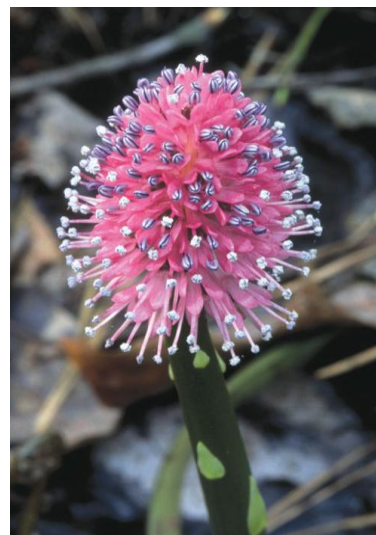
- Cape May Lowland Swamp
- Walter's Sedge Coastal Plain Intermittent Pond
- Coastal Dune Woodland
- Coastal Plain Intermittent Pond
- Spikerush-Yelloweyed Grass Coastal Plain Intermittent Pond
- Freshwater Tidal Marsh Complex
- Riice Cutgrass-Marsh Pepper Knotweed Coastal Plain Intermittent Pond
- Maritime Forest and
- White Waterlily – Robbin's Spike-Rush Coastal Plain Intermittent Pond

Five variations of the Coastal Plain Intermittent Pond community are represented in Middle Township. This community is described under the Palustrine system of plant communities. The Cape May Lowland Swamp is a forested wetland community that is predominately found in Cape May County and is described further under the Palustrine system of forest wetland communities. The Coastal Dune Woodland and Maritime Forest are similar types of communities found on the landward edge of the coastal dune communities. They differ in the plant species that dominate each particular community. Both the Coastal Dune Woodland and the Maritime Forest are dominated by Eastern Red Cedar (*Juniperus virginiana*) and have associated species such as American Holly (*Ilex opaca*) and Bayberry (*Morella pensylvanica*). There is another type of Maritime Forest in NJ that is dominated by American Holly. However, it does not occur in Cape May County. The very diverse Freshwater Tidal Marsh is described under the Palustrine system of tidal communities.

Rare Plant Species

The NJDEP's Natural Heritage Program contains a number of species of special concern which are recorded from Middle Township. These species are assigned several classifications. These are:

- LP - species listed by the New Jersey Pinelands Commission indicating that these taxa are endangered or threatened within their legal jurisdiction and are included in the New Jersey Pinelands Comprehensive Management Plan
- E – endangered, native New Jersey plant species whose survival in the State or nation is in jeopardy
- LT - species listed by the Federal government as threatened
- LE - species listed by the Federal government as endangered
- SH - species element rank by the NJ NHP as elements of historical occurrence in New Jersey



- S1 - species element rank by the NJ NHP as critically imperiled in New Jersey because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres)
- S2 - species element rank by the NJ NHP as imperiled in New Jersey because of rarity (6 to 20 occurrences).
- S3 - species element rank by the NJ NHP as rare in the state with 21 to 50 occurrences. Includes elements which are widely distributed in the state, but with small populations/acreage or elements with restricted distribution, but locally abundant. Not yet imperiled in the state, but may soon be if current trends continue (NJDEP, NHP, 2007).

Table 29: Rare Plant Species of Middle Township (Lord 2007)

Scientific name	Common Name	Status/ Rank	Scientific name	Common Name	Status/ Rank
<i>Asclepias lanceolata</i> (2)	Smooth Orange Milkweed	S2	<i>Pinus taeda</i> (1)	Loblolly Pine	S2
<i>Asclepias rubra</i> (2)	Red Milkweed	LP S2	<i>Platanthera ciliaris</i> (1)	Yellow Fringed Orchid	LP S2
<i>Asclepias verticillata</i> (2)	Whorled Milkweed	S2	<i>Platanthera flava</i> var. <i>flava</i> (1)	Southern Rein Orchid	LP S1 E
<i>Bidens mitis</i> (1)	Small-fruit Beggar-ticks	S1	<i>Platanthera peramoena</i> (1)	Purple Fringeless Orchid	LP S1 E
<i>Carex mitchelliana</i> (5)	Mitchell's Sedge	S2	<i>Pluchea foetida</i> (3)	Stinking Fleabane	LP S1 E
<i>Clitoria mariana</i> (2)	Butterfly-pea	LP S1 E	<i>Polygonum densiflorum</i> (2)	Dense-flower Knotweed	LP S1 E
<i>Cyperus retrofractus</i> (1)	Rough Flatsedge	LP SH E	<i>Polygonum setaceum</i> var. <i>setaceum</i> (2)	Bristly Smartweed	S2
<i>Elatine americana</i> (1)	American Waterwort	S2	<i>Polymnia uvedalia</i> (1)	Bear's-foot	LP S1 E
<i>Eleocharis quadrangulata</i> (3)	Angled Spike-rush	S2	<i>Populus heterophylla</i> (2)	Swamp Cottonwood	S2
<i>Eleocharis tortilis</i> (2)	Twisted Spike-rush	LP S1 E	<i>Potamogeton oakesianus</i> (1)	Oakes' Pondweed	S2
<i>Eryngium aquaticum</i> var. <i>aquaticum</i> (1)	Marsh Rattlesnake-master	S3	<i>Prunus angustifolia</i> (1)	Chickasaw Plum	LP S2 E
<i>Eupatorium aromaticum</i> var. <i>aromaticum</i> (1)	Smaller White Snakeroot	S1	<i>Quercus michauxii</i> (1)	Basket Oak	S3
<i>Eupatorium capillifolium</i> (1)	Dog-fennel Thoroughwort	LP S1 E	<i>Rhexia interior</i> (3)	Showy Meadow-beauty	LP S1 E
<i>Euphorbia purpurea</i> (1)	Darlington's Glade Spurge	LP S1 E	<i>Rhododendron atlanticum</i> (1)	Dwarf Azalea	LP S1 E
<i>Fraxinus profunda</i> (1)	Pumpkin Ash	LP S1 E	<i>Rhynchospora globularis</i> (1)	Coarse Grass-like Beaked-rush	LP S1 E
<i>Gentiana autumnalis</i> (1)	Pine Barren Gentian	LP S3	<i>Rhynchospora nitens</i> (1)	Short-beaked Bald-rush	S2
<i>Gratiola pilosa</i> (1)	Hairy Hedge Hyssop	S2	<i>Rhynchospora pallida</i> (1)	Pale Beaked-rush	S3
<i>Gratiola virginiana</i> (1)	Round-fruit Hedge Hyssop	S2	<i>Rhynchospora rariflora</i> (2)	Rare-flower Beaked-rush	LP S1 E
<i>Helonias bullata</i> (6)	Swamp-pink	LP S3 E LT	<i>Ruellia caroliniensis</i> (1)	Carolina Petunia	LP SH E
<i>Hottonia inflata</i> (2)	Featherfoil	LP S1 E	<i>Scleria verticillata</i> (1)	Whorled Nut-rush	LP S1 E
<i>Juncus articulatus</i> (1)	Jointed Rush	S2	<i>Sclerolepis uniflora</i> (2)	Bog Buttons	LP S2
<i>Listera australis</i> (2)	Southern Twayblade	LP S2	<i>Setaria magna</i> (1)	Giant Fox-tail	S2
<i>Ludwigia hirtella</i> (2)	Hairy Primrose-willow	LP S2	<i>Solidago elliottii</i> (1)	Elliott's Goldenrod	S3
<i>Oldenlandia uniflora</i> (2)	Clustered-bluets	S3	<i>Sphenopholis pensylvanica</i> (2)	Swamp Oats	S2
<i>Phlox maculata</i> var. <i>maculata</i> (1)	Spotted Phlox	S3	<i>Spiranthes tuberosa</i> (1)	Little Ladies'-tresses	S3
<i>Phoradendron leucarpum</i> (1)	American Mistletoe	LP S2	<i>Triadenum walteri</i> (4)	Walter's St. John's-wort	LP S1 E

4.2 ZOOLOGICAL RESOURCES

As with plant resources, Middle Township can support a great diversity of wildlife, including many threatened and endangered species, particularly those that find suitable habitat unique to a barrier island ecosystem. Many species are present at the northerly limits of their range. Since Middle Township primarily encompasses coastal habitats including ocean beaches and dunes and tidal wetlands, specialized coastal species, as well as common and widespread species have the potential to be present.

Middle Township possesses extremely important wildlife habitat and wildlife populations. These wildlife resources occur throughout Middle Township. The United States Fish and Wildlife Service (USFWS) has deemed several areas to be of federal interest, due to their capacity to support nationally important and even globally important wildlife populations. These areas are the Delaware Bayshore, Cape May Wildlife Refuge, Atlantic coastal marshes, and Hereford Inlet, including Champagne Island.

4.2.1 AQUATIC ANIMALS

The surface waters of Middle Township range from salty ocean waters to brackish rivers and creeks to freshwater rivers and streams and ponds. The vertebrate aquatic biota, or animals with backbones, are the fishes. The State of New Jersey supports the populations of 85 freshwater fish. The waters of the Township are not known to support trout populations, since they require cooler waters than those present in Middle Township. However, Brook Trout are known to occur in South Jersey streams, since they are tolerant of relatively low pH. Anadromous fish, such as American eel, Herring or Shad migrate upstream and breed in the freshwater portions of rivers discharging to saltwater bays and the ocean (NJDEP, DFW, Bureau of Freshwater Fisheries 2000).

Water quality is excellent in Pinelands stream waters. Pinelands waters are low in dissolved solids and are quite acidic, with pH averaging 4.4. While these high-quality acid waters support indigenous fish and amphibian communities that are tolerant of the acidity of the waters, they are inhospitable to many non-indigenous plant and animal species (USFWS, SNE-NYB Coastal Program 1997). On the periphery of the Pine Barrens and in areas where water characteristics are altered by agriculture or development, higher levels of pH allow a greater number of fish species to survive (Hastings 1998). Freshwater and anadromous fish are listed in the table below. Saltwater fish, which will also occur in the waters of Delaware Bay and seasonally in the extensive estuarine waters in the Township.



The Delaware Bayshore is one of the most important breeding sites for Horseshoe Crabs (*Limulus polyphemus*). The eggs of the crabs are the nutrient rich food that powers the last leg of the journey to the Arctic for several migratory waterfowl.

Freshwater fish species found in New Jersey streams, ponds and lakes are listed in the table below.

Table 30: New Jersey Freshwater Fishes (NJDEP, DFW 2005)

Common Name	Scientific Name	HP	Common Name	Scientific Name	HP
American Brook Lamprey	<i>Lampetra appendix</i>	N	Sea Lamprey	<i>Petromyzon marinus</i>	N
Atlantic Sturgeon	<i>Acipenser oxyrinchus</i>	N	Blueback Herring	<i>Alosa aestivalis</i>	N
Shortnose Sturgeon	<i>Acipenser brevirostrum</i>	N	Hickory Shad	<i>Alosa mediocris</i>	N
Brook Trout	<i>Salvelinus fontinalis</i>	N	Alewife	<i>Alosa pseudoharengus</i>	N
Gizzard Shad	<i>Dorosoma cepedianum</i>	N	American Shad	<i>Alosa sapidissima</i>	N
Rainbow Smelt	<i>Osmerus mordax</i>	N	Bowfin	<i>Amia calva</i>	I
Redfin Pickerel	<i>Esox americanus</i>	N	Eastern Mudminnow	<i>Umbra pygmaea</i>	N
Chain Pickerel	<i>Esox niger</i>	N	Northern Pike	<i>Esox lucius</i>	I
Goldfish	<i>Carassius auratus</i>	E	Muskellunge	<i>Esox masquinon</i>	I
Quillback	<i>Carpoides cyprinus</i>	N	Common Carp	<i>Cyprinus carpio</i>	E
Eastern Silvery Minnow	<i>Hybognathus regius</i>	N	Cutlips Minnow	<i>Exoglossum maxilligua</i>	N
Comely Shiner	<i>Notropis amoenus</i>	N	Golden Shiner	<i>Notemigonus crysoleucas</i>	N
Bridle Shiner	<i>Notropis bifrenatus</i>	N	Satinfin Shiner	<i>Cyprinella analostana</i>	N
Common Shiner	<i>Luxilis cornutus</i>	N	Ironcolor Shiner	<i>Notropis chalybaeus</i>	N
Swallowtail Shiner	<i>Notropis procne</i>	N	Spottail Shiner	<i>Notropis husdonius</i>	N
Fathead Minnow	<i>Pimephales promelas</i>	I	Spotfin Shiner	<i>Cyprinella spiloptera</i>	N
Blacknose Dace	<i>Rhinichthys atratulus</i>	N	Bluntnose Minnow	<i>Pimephales notatus</i>	I
Creek Chub	<i>Semotilus atromaculatus</i>	N	Longnose Dace	<i>Rhinichthys cataractae</i>	N
Grass Carp	<i>Ctenopharyngodon idella</i>	E	Fallfish	<i>Semotilus corporalis</i>	N
Creek Chubsucker	<i>Erimyzon oblongus</i>	N	White Sucker	<i>Catostomus commersoni</i>	N
White Catfish	<i>Ameiurus catus</i>	N	Northern Hog Sucker	<i>Hypentelium nigricans</i>	N
Yellow Bullhead	<i>Ameiurus natalis</i>	N	Black Bullhead	<i>Ameiurus melas</i>	I
Channel Catfish	<i>Ictalurus punctatus</i>	I	Brown Bullhead	<i>Ameiurus nebulosus</i>	N
Margined Madtom	<i>Noturus insignis</i>	N	Tadpole Madtom	<i>Noturus gyrinus</i>	N
Banded Killifish	<i>Fundulus diaphanus</i>	N	Pirate Perch	<i>Aphredoderus sayanus</i>	N
Eastern Mosquitofish	<i>Gambusia holbrooki</i>	N	Mummichog	<i>Fundulus heteroclitus</i>	N
Fourspine Stickleback	<i>Apletes quadracus</i>	N	Mosquitofish	<i>Gambusia affinis</i>	I
Ninespine Stickleback	<i>Pungitius pungitius</i>	N	Threespine Stickleback	<i>Gasterosteus aculeatus</i>	N
Striped Bass	<i>Morone saxatilis</i>	N	White Perch	<i>Morone americana</i>	N
Rock Bass	<i>Ambloplites rupestris</i>	I	Mud Sunfish	<i>Acantharchus pomotis</i>	N
Bluespotted Sunfish	<i>Eleacanthus gloriosus</i>	N	Blackbanded Sunfish	<i>Eleacanthus chaetodon</i>	N
Green Sunfish	<i>Lepomis cyanellus</i>	I	Banded Sunfish	<i>Eleacanthus obesus</i>	N
Bluegill	<i>Lepomis macrochirus</i>	I	Pumpkinseed	<i>Lepomis gibbosus</i>	N
Warmouth	<i>Lepomis gulosus</i>	I	Redbreasted Sunfish	<i>Lepomis auritus</i>	N
Largemouth Bass	<i>Micropterus salmoides</i>	I	Smallmouth Bass	<i>Micropterus dolomieu</i>	I
Black Crappie	<i>Pomoxis nigromaculatus</i>	I	White Crappie	<i>Pomoxis alularis</i>	I
Tessellated Darter	<i>Etheostoma olmstedii</i>	N	Swamp Darter	<i>Etheostoma fusiforme</i>	N
Shield Darter	<i>Percina peltata</i>	N	Yellow Perch	<i>Perca flavescens</i>	N
Slimy Sculpin	<i>Cottus cognatus</i>	N	Walleye	<i>Sander vitreus</i>	I
Hogchoker	<i>Trinectes maculatus</i>	N	Oriental Weatherfish	<i>Misgurnus anguillicaudatus</i>	E
HP- Historical Presence		E – Exotic	N – Native	I – Introduced	

The bays, estuaries and marine waters of New Jersey can be home to 28 marine mammals and 336 marine finfish at some point during the year. The marshes and tidal creeks of the Cape May peninsula are important nursery areas for Summer flounder, Bluefish, American eel and blue crab, among others. Ken Able, of Rutgers University, has compiled extensive lists of marine fish which can be found in New Jersey waters. The historical status of each species in terms of abundance and season of occurrence is also indicated (NJDEP, DFW 2005).

Table 31: New Jersey Saltwater Fishes (NJDEP, DFW 2005)					
Common Name	Scientific Name	Status	Common Name	Scientific Name	Status
Atlantic Hagfish	<i>Myxine glutinosa</i>	R	Clearnose Skate	<i>Raja eglanteria</i>	A
Sea Lamprey	<i>Petromyzon marinus</i>	C	Little Skate	<i>Raja erinacea</i>	A
Sand Tiger	<i>Odontaspis Taurus</i>	A	Rosette Skate	<i>Raja garmani</i>	C
Bigeye Thresher Shark	<i>Alopias superciliosus</i>	O	Barndoor Skate	<i>Raja laevis</i>	C
Thresher Shark	<i>Alopias vulpinus</i>	R	Winter Skate	<i>Raja ocellata</i>	A
Basking Shark	<i>Cetorhinus maximus</i>	R	Thorny Skate	<i>Raja radiata</i>	O
White Shark	<i>Carcharodon carcharias</i>	R	Southern Stingray	<i>Dasyatis americana</i>	R
Shortfin Mako	<i>Isurus oxyrinchus</i>	R	Roughtail Stingray	<i>Dasyatis centroura</i>	C
Porbeagle	<i>Lamna nasus</i>	R	Atlantic Stingray	<i>Dasyatis sabina</i>	R
False Cat Shark	<i>Pseudotriakis microdon</i>	R	Bluntnose Stingray	<i>Dasyatis say</i>	O
Chain Dogfish	<i>Scyliorhinus rotifer</i>	A	Spiny Butterfly Ray	<i>Gymnura altavela</i>	R
Silky Shark	<i>Carcharhinus falciformis</i>	R	Smooth Butterfly Ray	<i>Gymnura micrura</i>	
Bull Shark	<i>Carcharhinus leucas</i>	R	Spotted Eagle Ray	<i>Aetobatus narinari</i>	R
Blacktip Shark	<i>Carcharhinus limbatus</i>	R	Bullnose Ray	<i>Myliobatis freminvillei</i>	O
Dusky Shark	<i>Carcharhinus obscurus</i>	CS	Cownose Ray	<i>Rhinoptera bonasus</i>	OS
Sandbar Shark	<i>Carcharhinus plumbeus</i>	AS	Manta	<i>Manta birostris</i>	R
Tiger Shark	<i>Galeocerdo cuvier</i>	R	Devil Ray	<i>Mobula mobular</i>	R
Smooth Dogfish	<i>Mustelus canis</i>	A	Bonnethead	<i>Sphyrna tiburo</i>	R
Lemon Shark	<i>Negaprion brevirostris</i>	R	Smooth Hammerhead	<i>Sphyrna zygaena</i>	R
Blue Shark	<i>Prionace glauca</i>	C	Spiny Dogfish	<i>Squalus acanthias</i>	ASF
Atlantic Sharpnose Shark	<i>Rhizoprionodon terraenovae</i>	R	Atlantic Angel Shark	<i>Squatina dumeril</i>	CSF
Scalloped Hammerhead	<i>Sphyrna lewini</i>	R	Smalltooth Sawfish	<i>Pristis pectinata</i>	R
Shortnose Sturgeon	<i>Acipenser brevirostrum</i>	C	Atlantic Torpedo	<i>Torpedo nobiliana</i>	R
Atlantic Sturgeon	<i>Acipenser oxyrinchus</i>	R	Gafftopsail Catfish	<i>Bagre marinus</i>	R
Ladyfish	<i>Elops saurus</i>	R	Rainbow Smelt	<i>Osmerus mordax</i>	T
Tarpon	<i>Megalops atlanticus</i>	R	Rainbow Trout	<i>Oncorhynchus mykiss</i>	R
Bonefish	<i>Albula vulpes</i>	R	Atlantic Salmon	<i>Salmo salar</i>	R
American Eel	<i>Anguilla rostrata</i>	A	Brown Trout	<i>Salmo trutta</i>	R
Green Moray	<i>Gymnothorax funebris</i>	R	Longtooth Anglemouth	<i>Gonostoma elongatum</i>	R
Spotted Moray	<i>Gymnothorax moringa</i>	R	Mullers Pearlsides	<i>Maurolucus muelleri</i>	R
Speckled Worm Eel	<i>Myrophis punctatus</i>	R	Oceanic Lightfish	<i>Vinciguerra nimbaria</i>	R
Margined Snake Eel	<i>Ophichthus cruentifer</i>	O	Shortnose Greeneye	<i>Chlorophthalmus agassizi</i>	C
Palespotted Eel	<i>Ophichthus ocellatus</i>	R	Inshore Lizardfish	<i>Synodus foetens</i>	O
Conger Eel	<i>Conger oceanicus</i>	C	Snakefish	<i>Trachinocephalus myops</i>	R
Blueback Herring	<i>Alosa aestivalis</i>	A	White Barracudina	<i>Notolepis rissoi</i>	R
Hickory Shad	<i>Alosa mediocris</i>	C	Duckbill Barracudina	<i>Paralepis atlantica</i>	R
Alewife	<i>Alosa pseudoharengus</i>	A	Sharpchin Barracudina	<i>Paralepis coregonoides</i>	R
American Shad	<i>Alosa sapidissima</i>	T	Glacier Lanternfish	<i>Benthosema glaciale</i>	R
Atlantic Menhaden	<i>Brevoortia tyrannus</i>	A	Smallfin Lanternfish	<i>Benthosema suborbitale</i>	R
Atlantic Herring	<i>Clupea harengus</i>	CW	Horned Lanternfish	<i>Ceratoscopelus maderensis</i>	C
Gizzard Shad	<i>Dorosoma cepedianum</i>	O	Warming's Lanternfish	<i>Ceratoscopelus warmingi</i>	R
Round Herring	<i>Etrumeus teres</i>	O	Longfin Lanternfish	<i>Diogenichthys atlanticus</i>	R
Scaled Sardine	<i>Harengula jaguana</i>	R	Benoit's Lanternfish	<i>Hygophum benoiti</i>	R
Atlantic Thread Herring	<i>Opisthonema oglinum</i>	O	Slender Lanternfish	<i>Hygophum reinhardtii</i>	R
Spanish Sardine	<i>Sardinella aurita</i>	O	Winged Lanternfish	<i>Lampanyctus alatus</i>	R
Striped Anchovy	<i>Anchoa hepsetus</i>	C	Largescale Lanternfish	<i>Symbolophorus veranyi</i>	R
Bay Anchovy	<i>Anchoa mitchilli</i>	A	Antenna Codlet	<i>Bregmaceros atlanticus</i>	R

Table 31: New Jersey Saltwater Fishes (continued)					
Common Name	Scientific Name	Status	Common Name	Scientific Name	Status
Silver Anchovy	<i>Engraulis eurystole</i>	O	Cusk	<i>Brosme brosme</i>	R
Fourbeard Rockling	<i>Enchelyopus cimbrius</i>	R?	Gag	<i>Myxeroperca microlepis</i>	R
Atlantic Cod	<i>Gadus morhua</i>	CWS	Glasseye snapper	<i>Priacanthus cruentatus</i>	R
Haddock	<i>Melanogrammus aeglefinus</i>	OWS	Blackline Tilefish	<i>Caulolatilus cyanops</i>	R
Offshore Hake	<i>Merluccius albidus</i>	C	Tilefish	<i>Lopholatilus chamaeleonticeps</i>	A
Silver Hake	<i>Merluccius bilinearis</i>	A	Bluefish	<i>Pomatomus saltatrix</i>	A
Atlantic Tomcod	<i>Microgadus tomcod</i>	C	Cobia	<i>Rachycentron canadum</i>	R
Pollock	<i>Pollachius virens</i>	C	Sharksucker	<i>Echeneis naucrates</i>	R
Red Hake	<i>Urophycis chuss</i>	A	Whitefin Sharksucker	<i>Echeneis neucratoides</i>	R
Carolina Hake	<i>Urophycis earlii</i>	R	Marlinsucker	<i>Remora osteochir</i>	R
Spotted Hake	<i>Urophycis regia</i>	C	Remora	<i>Remora remora</i>	R
White Hake	<i>Urophycis tenuis</i>	O	White Suckerfish	<i>Remorina albescent</i>	R
Fawn Cusk-eel	<i>Lepophidium profundorum</i>	A	African Pompano	<i>Alectis ciliaris</i>	R
Striped Cusk-eel	<i>Ophidion marginatum</i>	C	Yellow Jack	<i>Caranx bartholomaei</i>	R
Crested Cusk-eel	<i>Ophidion welschi</i>	R	Blue Runner	<i>Caranx crysos</i>	OSF
Oyster Toadfish	<i>Opsanus tau</i>	A	Crevalle Jack	<i>Caranx hippos</i>	CSF
Goosefish	<i>Lophius americanus</i>	C	Horse-eye Jack	<i>Caranx latus</i>	R
Striated Frogfish	<i>Antennarius striatus</i>	R	Bar Jack	<i>Caranx ruber</i>	O
Sargassumfish	<i>Histrio histrio</i>	R	Atlantic Bumper	<i>Chloroscombrus chrysurus</i>	R
Redeye Gaper	<i>Chaunax stigmaeus</i>	R	Round Scad	<i>Decapterus punctatus</i>	R
Clearwing Flyingfish	<i>Cypselurus comatus</i>	R	Pilotfish	<i>Naucrates ductor</i>	R
Bandwing Flyingfish	<i>Cypselurus exciliens</i>	R	Leatherjack	<i>Oligoplites saurus</i>	O
Spotfin Flyingfish	<i>Cypselurus furcatus</i>	R	Bigeye Scad	<i>Selar crumenophthalmus</i>	R
Atlantic Flyingfish	<i>Cypselurus melanurus</i>	R	Atlantic Moonfish	<i>Selene setapinnis</i>	OS
Flying Halfbeak	<i>Euleptorhamphus velox</i>	R	Lookdown	<i>Selene vomer</i>	OS
Ballyhoo	<i>Hemiramphus brasiliensis</i>	R	Greater Amberjack	<i>Seriola dumerili</i>	R
Silverstripe Halfbeak	<i>Hyporhamphus unifasciatus</i>	O	Almaco Jack	<i>Seriola rivoliana</i>	R
Flat Needlefish	<i>Ablennes hians</i>	R	Banded Rudderfish	<i>Seriola zonata</i>	OS
Atlantic Needlefish	<i>Strongylura marina</i>	CS	Florida Pompano	<i>Trachinotus carolinus</i>	CS
Agujon	<i>Tylosurus acus</i>	R	Permit	<i>Trachinotus falcatus</i>	CS
Atlantic Saury	<i>Scomberesox saurus</i>	R	Palometa	<i>Trachinotus goodei</i>	CS
Sheepshead Minnow	<i>Cyprinodon variegatus</i>	A	Rough Scad	<i>Trachurus lathami</i>	R
Marsh Killifish	<i>Fundulus confluentus</i>		Cottonmouth Jack	<i>Uraspis secunda</i>	R
Banded Killifish	<i>Fundulus diaphanous</i>	A	Dolphin	<i>Coryphaena hippurus</i>	CS
Mummichog	<i>Fundulus heteroclitus</i>	A	Atlantic Pomfret	<i>Brama brama</i>	R
Spotfin Killifish	<i>Fundulus luciae</i>	C	Schoolmaster	<i>Lutjanus apodus</i>	R
Striped Killifish	<i>Fundulus majalis</i>	A	Red Snapper	<i>Lutjanus campechanus</i>	R
Rainwater Killifish	<i>Lucania parva</i>	C	Cubera Snapper	<i>Lutjanus cyanopterus</i>	R
Eastern Mosquitofish	<i>Gambusia holbrooki</i>	C	Gray Snapper	<i>Lutjanus griseus</i>	OS
Rough Silverside	<i>Membras martinica</i>	C	Yellowtail Snapper	<i>Ocyurus chrysurus</i>	R
Inland Silverside	<i>Menidia beryllina</i>	A	Vermillion Snapper	<i>Rhomboplites aurorubens</i>	R
Atlantic Silverside	<i>Menidia menidia</i>	A	Tripletail	<i>Lobotes surinamensis</i>	
Deep Water Squirrelfish	<i>Holocentrus bullisi</i>	R	Irish Pompano	<i>Diapterus auratus</i>	R
Dusky Squirrelfish	<i>Holocentrus vexillarius</i>	R	Spotfin Mojarra	<i>Eucinostomus argenteus</i>	R
Buckler Dory	<i>Zenopsis cochlifera</i>	C	Silver Jenny	<i>Eucinostomus gula</i>	R
Fourspine Stickleback	<i>Apeltes quadracus</i>	C	Tidewater Mojarra	<i>Eucinostomus harengulus</i>	R
Threespine Stickleback	<i>Gasterosteus aculeatus</i>	C	Flagfin Mojarra	<i>Eucinostomus melanopterus</i>	R
Ninespine Stickleback	<i>Pungitius pungitius</i>	R	Pigfish	<i>Orthopristis chrysoptera</i>	R
Bluespotted Cornetfish	<i>Fistularia tabacaria</i>	R	Sheepshead	<i>Archosargus probatocephalus</i>	R
Longspine Snipefish	<i>Macrorhamphosus scolopax</i>	R	Sea Bream	<i>Archosargus rhomboidalis</i>	R
Lined Seahorse	<i>Hippocampus erectus</i>	CSF	Spottail Pinfish	<i>Diplodus holbrooki</i>	R
Opossum Pipefish	<i>Microphis brachyuros</i>	R	Pinfish	<i>Lagodon rhomboides</i>	R
Northern Pipefish	<i>Syngnathus fuscus</i>	A	Scup	<i>Stenotomus chrysops</i>	A
Chain Pipefish	<i>Syngnathus louisianae</i>	R	Silver Perch	<i>Bairdiella chrysoura</i>	C
Sargassum Pipefish	<i>Syngnathus pelagicus</i>	R	Spotted Seatrout	<i>Cynoscion nebulosus</i>	R

Table 31: New Jersey Saltwater Fishes (continued)					
Common Name	Scientific Name	Status	Common Name	Scientific Name	Status
Flying Gurnard	<i>Dactylopterus volitans</i>	R	Weakfish	<i>Cynoscion regalis</i>	A
Blackbelly Rosefish	<i>Helicolenus dactylopterus</i>	A	Banded Drum	<i>Larimus fasciatus</i>	R
Spinycheek Scorpionfish	<i>Neomerinthe hemingwayi</i>	R	Spot	<i>Leiostomus xanthurus</i>	C-A
Highfin Scorpionfish	<i>Pontinus rathbuni</i>	R	Southern Kingfish	<i>Menticirrhus americanus</i>	O
Barbfish	<i>Scorpaena brasiliensis</i>	R	Horned Whiff	<i>Citharichthys cornutus</i>	R
Mushroom Scorpionfish	<i>Scorpaena inermis</i>	R	Angelfin Whiff	<i>Citharichthys gymnorhinus</i>	R
Smoothcheek Scorpionfish	<i>Scorpaena isthmensis</i>	R	Bay Whiff	<i>Citharichthys spilopterus</i>	R
Spotted Scorpionfish	<i>Scorpaena plumieri</i>	R	Smallmouth Flounder	<i>Etropus microstomus</i>	C
Acadian Redfish	<i>Sebastes fasciatus</i>	O	Gulf Flounder	<i>Paralichthys albigutta</i>	R
Armored Searobin	<i>Peristedion miniatum</i>	C	Summer Flounder	<i>Paralichthys dentatus</i>	A
Northern Searobin	<i>Prionotus carolinus</i>	A	Fourspot Flounder	<i>Paralichthys oblongus</i>	C
Striped Searobin	<i>Prionotus evolans</i>	A	Windowpane	<i>Scophthalmus aquosus</i>	C
Sea Raven	<i>Hemitripterus americanus</i>	C	Dusky Flounder	<i>Syacium papillosum</i>	R
Grubby	<i>Myoxocephalus aeneus</i>	C	Witch Flounder	<i>Glyptocephalus cynoglossus</i>	C
Longhorn Sculpin	<i>Myoxocephalus octodecemspinosus</i>	C	American Plaice	<i>Hippoglossoides platessoides</i>	R
Shorthorn Sculpin	<i>Myoxocephalus scorpius</i>	R	Atlantic Halibut	<i>Hippoglossus hippoglossus</i>	R
Alligatorfish	<i>Aspidophoroides monopterygius</i>	R	Winter Flounder	<i>Pleuronectes americanus</i>	A
Lumpfish	<i>Cyclopterus lumpus</i>	R	Yellowtail Flounder	<i>Pleuronectes ferrugineus</i>	C
Atlantic Seasnail	<i>Liparis atlanticus</i>	R	Hogchoker	<i>Trinectes maculatus</i>	C
Inquiline Seasnail	<i>Liparis inquilinus</i>	C	Blackcheek Tonguefish	<i>Symphurus plagiosa</i>	R
White Perch	<i>Morone americana</i>	A	Orange Filefish	<i>Aluterus schoepfi</i>	R
Striped Bass	<i>Morone saxatilis</i>	A	Gray Triggerfish	<i>Balistes caprisкус</i>	R
Wreckfish	<i>Polyprion americanus</i>	R	Queen Triggerfish	<i>Balistes vetula</i>	R
Swallowtail Bass	<i>Anthias woodsi</i>	O	Ocean Triggerfish	<i>Canthidermis sufflamen</i>	O
Black Sea Bass	<i>Centropristis striata</i>	A	Fringed Filefish	<i>Monacanthus ciliatus</i>	R
Red Grouper	<i>Epinephelus morio</i>	R	Planehead Filefish	<i>Monacanthus hispidus</i>	R
Warsaw Grouper	<i>Epinephelus nigritus</i>	R	Scrawled Cowfish	<i>Lactophrys quadricornis</i>	R
Snowy Grouper	<i>Epinephelus niveatus</i>	R	Trunkfish	<i>Lactophrys trigonus</i>	R
Black Grouper	<i>Mycteroperca bonaci</i>	R	Smooth Trunkfish	<i>Lactophrys triqueter</i>	R
Northern Kingfish	<i>Menticirrhus saxatilis</i>	C	Web Burrfish	<i>Chilomycterus antillarum</i>	R
Atlantic Croaker	<i>Micropogonias undulatus</i>	C	Spotted Burrfish	<i>Chilomycterus atinga</i>	R
Black Drum	<i>Pogonias cromis</i>	C	Striped Burrfish	<i>Chilomycterus schoepfi</i>	O
Red Drum	<i>Sciaenops ocellatus</i>	O	Porcupinefish	<i>Diodon hystrix</i>	R
Red Goatfish	<i>Mullus auratus</i>	R	Smooth Puffer	<i>Lagocephalus laevigatus</i>	OS
Spotted Goatfish	<i>Pseudupeneus maculatus</i>	R	Northern Puffer	<i>Spherooides maculatus</i>	CS
Bermuda Chub	<i>Kyphosus sectatrix</i>	R	Checkered Puffer	<i>Spherooides testudineus</i>	R
Atlantic Spadefish	<i>Chaetodipterus faber</i>	R	Ocean Sunfish	<i>Mola mola</i>	O
Foureye Butterflyfish	<i>Chaetodon capistratus</i>	R	Wahoo	<i>Acanthocybium solandri</i>	R
Spotfin Butterflyfish	<i>Chaetodon ocellatus</i>	F	Frigate Mackerel	<i>Auxis thazard</i>	R
Banded Butterflyfish	<i>Chaetodon striatus</i>	R	Little Tunny	<i>Euthynnus alletteratus</i>	CS
Gray Angelfish	<i>Pomacanthus arcuatus</i>	R	Skipjack Tuna	<i>Katsuwonus pelamis</i>	R
Sergeant Major	<i>Abudefduf saxatilis</i>	R	Blue Marlin	<i>Makaira nigricans</i>	R
Striped Mullet	<i>Mugil cephalus</i>	A	White Marlin	<i>Tetrapterus albidus</i>	C
White Mullet	<i>Mugil curema</i>	A	Black Ruff	<i>Centrolophus niger</i>	R
Great Barracuda	<i>Sphyræna barracuda</i>	R	Black Fathead	<i>Cubiceps baxteri</i>	R
Northern Sennet	<i>Sphyræna borealis</i>	C	Barrelfish	<i>Hyperoglyphe perciformis</i>	R
Atlantic Threadfin	<i>Polydactylus octonemus</i>	R	Harvestfish	<i>Peprilus alepidotus</i>	O
Tautog	<i>Tautoga onitis</i>	A	Butterfish	<i>Peprilus triacanthus</i>	A
Cunner	<i>Tautoglabrus adspersus</i>	C	Freckled Driftfish	<i>Psenes cyanophrys</i>	R
Emerald Parrotfish	<i>Nicholsina usta</i>	R	Bluefin Driftfish	<i>Psenes pellucidus</i>	R
Ocean Pout	<i>Macrozoarces americanus</i>	C	Bigeye Squaretail	<i>Tetragnathus atlanticus</i>	R
Snakeblenny	<i>Lumpenus lumpetæformis</i>	R	Twospot Flounder or Spottail Flounder	<i>Bothus robbinsi</i>	R

Table 31: New Jersey Saltwater Fishes (continued)					
Common Name	Scientific Name	Status	Common Name	Scientific Name	Status
Arctic Shanny	<i>Stichaeus punctatus</i>	R	Gulf Stream Flounder	<i>Citharichthys arctifrons</i>	A
Radiated Shanny	<i>Ulvaria subbifurcata</i>	R	Blue Tang	<i>Acanthurus coeruleus</i>	R
Rock Gunnel	<i>Pholis gunnelus</i>	R	Oilfish	<i>Ruvettus pretiosus</i>	R
Atlantic Wolffish	<i>Anarhichas lupus</i>	R	Atlantic Cutlassfish	<i>Trichiurus lepturus</i>	R
Northern Stargazer	<i>Astroscopus guttatus</i>	O	Atlantic Bonito	<i>Sarda sarda</i>	O
Striped Blenny	<i>Chasmodes bosquianus</i>	O	Chub Mackerel	<i>Scomber japonicus</i>	R
Crested Blenny	<i>Hypleurochilus germinatus</i>	R	Atlantic Mackerel	<i>Scomber scombrus</i>	A
Feather Blenny	<i>Hypsoblennius hentz</i>	O	King Mackerel	<i>Scomberomorus cavalla</i>	O
Seaweed Blenny	<i>Parablennius marmoratus</i>	R	Spanish Mackerel	<i>Scomberomorus maculatus</i>	O
American Sand Lance	<i>Ammodytes americanus</i>	A	Cero	<i>Scomberomorus regalis</i>	O
Northern Sand Lance	<i>Ammodytes dubius</i>	A	Albacore	<i>Thunnus alalunga</i>	C
Fat Sleeper	<i>Dormitorator maculatus</i>	R	Yellowfin Tuna	<i>Thunnus albacares</i>	C
Darter Goby	<i>Gobionellus boleosoma</i>	R	Bigeye Tuna	<i>Thunnus obesus</i>	O
Highfin Goby	<i>Gobionellus oceanicus</i>	R	Bluefin Tuna	<i>Thunnus thynnus</i>	CS
Naked Goby	<i>Gobiosoma bosc</i>	A	Swordfish	<i>Xiphias gladius</i>	CS
Seaboard Goby	<i>Gobiosoma ginsburgi</i>	O	Sailfish	<i>Istiophorus platypterus</i>	R
Ocean Surgeon	<i>Acanthurus bahianus</i>	R			
A – Abundant AS – Abundant in summer ASF – Abundant in spring and fall F – Frequent R – Rare T – Threatened C – Common C-A – Common-abundant CS – Common in summer CSF – Common in summer and fall CW – Common in winter CWS – Common in winter and spring O – Occasional OS – Occasional in summer OSF – Occasional in summer and fall OWS – Occasional in winter and spring					

4.2.2 TERRESTRIAL ANIMALS

The numerous terrestrial and aquatic habitat types present were discussed in the Botanical Resources section.



Coastal habitats include beaches and dunes and salt marsh complexes. Interior habitats include upland and lowland forests, intermittent coastal plain ponds, hardwood swamps, cedar swamps and savannah. Agriculture and other human activities, such as abandoned quarries, create disturbed habitat types that are attractive to certain types of wildlife. The variety of habitat types present in



Middle Township can be considered home to many species of wildlife. Generally, the unique ecosystems of the Cape May peninsula lead to a vast array of wildlife species in a small geographic area. Dozens of species of native mammals are known to reside in the New Jersey Pinelands and Southern New Jersey. The mammals of New Jersey are listed in the table below. Four of the bats in the table below are only present during migration (USFWS, SNE-NYB Coastal Program 1997).

Table 32: New Jersey Mammals (NJDEP, DFW 2005b, Wolgast 1998)					
Common Name	Scientific Name	Status	Common Name	Scientific Name	Status
Opossum	<i>Didelphis marsupialis</i>	S	Eastern Cottontail	<i>Sylvilagus floridanus</i>	S
Masked Shrew	<i>Sorex cinereus</i>	S	Eastern Chipmunk	<i>Tamias striatus</i>	S
Short-tailed Shrew	<i>Blarina brevicauda</i>	S	Woodchuck	<i>Marmota monax</i>	S
Least Shrew	<i>Cryptotis parva</i>	U	Gray Squirrel	<i>Sciurus carolinensis</i>	S
Eastern Mole	<i>Scalopus aquaticus</i>	S	Red Squirrel	<i>Tamiasciurus hudsonicus</i>	S
Star-nosed Mole	<i>Condylura cristata</i>	U	Southern Flying Squirrel	<i>Glaucomys volans</i>	U
Little Brown Bat	<i>Myotis lucifugus</i>	S	Beaver	<i>Castor canadensis</i>	INC
Keen Myotis	<i>Myotis septentrionalis</i>	U	Marsh Rice Rat	<i>Oryzomys palustris</i>	S
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	U	White-footed Mouse	<i>Peromyscus leucopus</i>	S
Eastern Pipistrel	<i>Pipistrellus subflavus</i>	U	Red-backed Vole	<i>Clethrionomys gapperi</i>	S
Big Brown Bat	<i>Eptesicus fuscus</i>	S	Meadow Vole	<i>Microtus pennsylvanicus</i>	S
Red Bat	<i>Lasiurus borealis</i>	S	Pine Vole	<i>Microtus pinetorum</i>	S
Hoary Bat	<i>Lasiurus cinereus</i>	U	Muskrat	<i>Ondatra zibethicus</i>	S
Meadow Jumping Mouse	<i>Zapus hudsonius</i>	U	Southern Bog Lemming	<i>Synaptomys cooperi</i>	U
Red Fox	<i>Vulpes vulpes</i>	S	House Mouse	<i>Mus musculus</i>	I
Black Bear	<i>Ursus americanus</i>	INC	Gray Fox	<i>Urocyon cinereoargenteus</i>	S
Long-tailed Weasel	<i>Mustela frenata</i>	S	Raccoon	<i>Procyon lotor</i>	S
Mink	<i>Mustela vison</i>	S	Striped Skunk	<i>Mephitis mephitis</i>	S
River Otter	<i>Lutra canadensis</i>	S	White-tailed Deer	<i>Odocoileus virginianus</i>	D
Coyote	<i>Canis latrans</i>				
St – Status E – Endangered D – Decreasing INC – Increasing S – Stable U – Undetermined I – Introduced P – Peripheral					

The diversity of terrestrial fauna in Middle Township is exemplified by the birds. Cape May County, New Jersey is renowned for its bird diversity. Famous ornithologists, such as Alexander Wilson, George Ord and William and Spencer Baird have worked in Cape May County. John James Audubon painted in the saltmarshes of the Great Egg Harbor Estuary (USGS 2006).

The County is a peninsula encompassing many habitat types. It is strategically located along East Coast migratory bird flyways. Middle Township is situated in the central portion of the peninsula, with the Atlantic coastal marshes to the east and the Delaware Bay and Bayshore to the west. A large breeding population of Horseshoe Crabs spawns just as a number of migratory birds are completing a 1,500 mile leg of their journey to the Arctic (USFWS 2007). Important populations of Snow Goose (*Chen caerulescens*), Gulls (*Larus spp.*) and American Black Duck (*Anas rubripes*) overwinter in the marshes on both sides of the Township. Colonial waterbird species, such as Black-crowned Night Heron (*Nycticorax nycticorax*), Yellow-crowned Night Heron (*Nyctanassa violacea*), Little Blue Heron (*Egretta caerulea*), Snowy Egret (*Egretta thula*), Glossy Ibis (*Plegadis falcinellus*), Common Tern (*Sterna hirundo*), Forster's Tern (*Sterna forsteri*). Forested wetlands, another habitat found in Middle Township, are favored by neotropical songbirds as stopover places during migration. The list of bird species below includes birds found in Cape May County, the waters of Delaware Bay, and offshore to a distance of 50 miles (USGS 2006).

Table 33: Birds of Cape May County, New Jersey (USGS 2006)				
Common Name	Common Name	Common Name	Common Name	Common Name
Red-throated Loon	Common Loon	Pied-billed Grebe	Horned Grebe	Common Barn Owl
Cory's Shearwater	Greater Shearwater	Sooty Shearwater	Audubon's Shearwater	Eastern Screech Owl
Wilson's Storm Petrel	American White Pelican	Brown Pelican	Northern Gannet	Short-eared Owl
Great Cormorant	Double-crested Cormorant	American Bittern	Least Bittern	Great Horned Owl
Glossy Ibis	White Ibis	Wood Duck	Brant	Snowy Owl
Green-winged Teal	American Black Duck	Northern Pintail	Blue-winged Teal	Barred Owl
Northern Shoveler	Gadwall	Eurasian Widgeon	American Widgeon	Long-eared Owl

Table 33: Birds of Cape May County, New Jersey (continued)

Common Name	Common Name	Common Name	Common Name	Common Name
Canvasback	Redhead	Ring-necked Duck	Greater Scaup	Northern Saw-whet Owl
Lesser Scaup	Common Eider	King Eider	Harlequin Duck	Common Nighthawk
Oldsquaw	Black Scoter	Surf Scoter	White-winged Scoter	Chuck-Will's-Widow
Common Goldeneye	Bufflehead	Hooded Merganser	Common Merganser	Whip-poor-will
Red-breasted Merganser	Ruddy Duck	Osprey	Swallow-tailed Kite	Horned Lark
Mississippi Kite	Bald Eagle	Ring-necked Pheasant	Ruffed Grouse	Purple Martin
Great Blue Heron	Snow Goose	Wild Turkey	Black Rail	Tree Swallow
Great Egret	Canada Goose	Clapper Rail	King Rail	Bank Swallow
Snowy Egret	Mallard	Virginia Rail	Sora	Brown Creeper
Little Blue Heron	Black Vulture	Purple Gallinule	Common Morhen	Carolina Chickadee
Tricolored Heron	Turkey Vulture	American Coot	Sandhill Crane	Eastern Bluebird
Cattle Egret	Northern Harrier	Greater Yellowlegs	Willet	Veery
Green Heron	Sharp-shinned Hawk	Lesser Yellowlegs	Spotted Sandpiper	Gray Catbird
Black-crowned Night Heron	Cooper's Hawk	Solitary Sandpiper	Upland Sandpiper	Ruby-throated Hummingbird
Yellow-crowned Night Heron	Northern Goshawk	Northern Bobwhite	Whimbrel	Red-headed Woodpecker
Tundra Swan	Red-shouldered Hawk	Marbled Godwit	Hudsonian Godwit	Red-bellied Woodpecker
Mute Swan	Broad-winged hawk	Ruddy Turnstone	Red Knot	Hairy Woodpecker
Black-bellied Plover	Swainson's Hawk	Sanderling	Semipalmated Sandpiper	Rock Dove
American Golden-plover	Red-tailed Hawk	Western Sandpiper	Least Sandpiper	White-winged Dove
Semipalmated plover	Rough-legged Hawk	White-rumped Sandpiper	Pectoral Sandpiper	Mourning Dove
Piping Plover	American Kestrel	Baird's Sandpiper	Purple sandpiper	Eastern Wood Pewee
Killdeer	Merlin	Dunlin	Stilt Sandpiper	Acadian Flycatcher
American Oystercatcher	Peregrine Falcon	Buff-breasted Sandpiper	Ruff	Willow Flycatcher
Black-necked Stilt	Golden Eagle	Short-billed Dowitcher	Long-billed Dowitcher	Eastern Phoebe
American Avocet	Common Snipe	American Woodcock	Wilson's Phalarope	Western Kingbird
Red-necked Phalarope	Red Phalarope	Pomarine Jaeger	Parasitic Jaeger	Eastern Kingbird
Gull-billed Tern	Caspian Tern	Sandwich Tern	Royal Tern	No. Rough-winged Swallow
Roseate Tern	Arctic Tern	Common Tern	Forster's Tern	Cliff Swallow
Least Tern	Black Tern	Black Skimmer	Dovekie	Golden-crowned Kinglet
Razorbill	Belted Kingfisher	Least Flycatcher	Chimney Swift	Ruby-crowned Kinglet
Laughing Gull	American Crow	Great Crested Flycatcher	Yellow-bellied Sapsucker	Blue-gray Gnatcatcher
Little Gull	Fish Crow	Scissor-tailed Flycatcher	Downy Woodpecker	Swainson's Thrush
Common Black-headed Gull	Blue Jay	Barn Swallow	Northern Flicker	Gray-cheeked Thrush
Bonaparte's Gull	White-breasted Nuthatch	Carolina Wren	Black-billed Cuckoo	Eastern Meadowlark
Ring-billed Gull	Tufted Titmouse	Winter Wren	Yellow-billed Cuckoo	Brewer's Blackbird
Herring Gull	Red-breasted Nuthatch	Sedge Wren	Olive-sided Flycatcher	Orchard Oriole
Iceland Gull	Bicknell's Thrush	Marsh Wren	Yellow-bellied Flycatcher	Baltimore Oriole
Lesser Black-backed Gull	American Robin	House Wren	Alder Flycatcher	Brown-headed Cowbird
Glaucous Gull	Brown Thrasher	Wood Thrush	Cedar Waxwing	Red Crossbill
Great Black-backed Gull	Loggerhead Shrike	American Pipit	White-eyed Vireo	Rusty Blackbird
Northern Mockingbird	Yellow Warbler	Hermit Thrush	Blue-headed Vireo	Common Grackle
Northern Shrike	Chestnut-sided Warbler	European Starling	Yellow-throated Vireo	Evening Grosbeak
Blue-winged Warbler	Magnolia Warbler	Yellow-throated Warbler	Warbling Vireo	American Goldfinch
Golden-winged Warbler	Cape May Warbler	Pine Warbler	Philadelphia Vireo	Purple Finch
Tennessee Warbler	Black-throated Blue Warbler	Prairie Warbler	Red-eyed Vireo	House Finch
Orange-crowned Warbler	Black-throated Green Warbler	Black-and-white Warbler	Palm Warbler	Lapland Longspur
Northern Parula	Blackburnian Warbler	Louisiana Waterthrush	Bay-breasted Warbler	Yellow-headed Blackbird
Nashville Warbler	Cerulean Warbler	Kentucky Warbler	American Redstart	White-throated Sparrow
Yellow-rumped Warbler	Ovenbird	Wilson's Warbler	Connecticut Warbler	Snow Bunting
Blackpoll Warbler	Northern Waterthrush	Scarlet Tanager	Mourning Warbler	Bobolink
Worm-eating Warbler	Hooded Warbler	Indigo Bunting	Canada Warbler	Red-winged Blackbird
Prothonotary Warbler	Summer Tanager	Chipping Sparrow	Northern Cardinal	Boat-tailed Grackle
Common Yellowthroat	Blue Grosbeak	Yellow-throated Warbler	Dickcissel	

Table 33: Birds of Cape May County, New Jersey (continued)

Common Name	Common Name	Common Name	Common Name	Common Name
Yellow-breasted Chat	Rose-breasted Grosbeak	Saltmarsh Sharp-tailed Sparrow	Pine Warbler	Wilson's Warbler
Dickcissel	American Tree Sparrow	Nelson's Sharp-tailed Sparrow	Prairie Warbler	Connecticut Warbler
Eastern Towhee	Louisiana Waterthrush	Fox Sparrow	Black-and-white Warbler	Red-eyed Vireo
Chipping Sparrow	Scarlet Tanager	Song Sparrow	Kentucky Warbler	Palm Warbler
Clay-colored Sparrow	Indigo Bunting	Grasshopper Sparrow	Mourning Warbler	Bay-breasted Warbler
Savannah Sparrow	Lark Sparrow	Lincoln's Sparrow	Canada Warbler	American Redstart
Field Sparrow	Seaside Sparrow	Vesper Sparrow	Northern Cardinal	Swamp Sparrow
House Sparrow	White-crowned Sparrow	Dark-eyed Junco	Pine Siskin	Common Redpoll



Southern New Jersey is home to numerous herptile species (reptiles and amphibians). As is the case for plants and other terrestrial animals, one of the reasons for this diversity is that many species are at the limits of their ranges, particularly southern Coastal Plain species. Coastal Plain Intermittent Ponds provide important breeding habitat for amphibians (USFWS, SNE-NYB Coastal Program 1997). Because Middle Township has a diverse array of habitats, as described in the Botanical Resources section, many of the below listed species may be present.

Table 34: Cape May County Reptiles (NJDEP, DFW 2001 NJDEP, DFW 2005)

Common Name	Scientific Name	Status	Common Name	Scientific Name	Status
Common Snapping Turtle	<i>Chelydra serpentina</i>	S	Common Musk Turtle	<i>Sternotherus odoratus</i>	S
Eastern Mud Turtle	<i>Kinosternon s. subrubrum</i>	U	Spotted Turtle	<i>Clemmys guttata</i>	SC
Bog Turtle	<i>Clemmys muhlenbergii</i>	E	Eastern Box Turtle	<i>Terrapene c. carolina</i>	SC
Red-eared Slider	<i>Malaclemys t. terrapin</i>	U	Eastern Painted Turtle	<i>Chrysemys p. picta</i>	U
Redbelly Turtle	<i>Pseudemys rubriventris</i>	U	Northern Brown (DeKay's) Snake	<i>Storeria d. dekayi</i>	S
Northern Water Snake	<i>Nerodia s. sipedon</i>	S	Eastern Garter Snake	<i>Thamnophis s. sirtalis</i>	S
Northern Redbelly Snake	<i>Storeria o. occipitamaculata</i>	S	Eastern Smooth Earth Snake	<i>Virginia v. valeriae</i>	U
Eastern Ribbon Snake	<i>Thamnophis sauritis sauritis</i>	S	Northern Ringneck Snake	<i>Diadophis punctatus edwardsi</i>	S
Eastern Hognose Snake	<i>Heterodon platyrhinos</i>	D	Southern Ringneck Snake	<i>Diadophis p. punctatus</i>	S
Eastern Worm Snake	<i>Carphophis a. amoenus</i>	U	Northern Black Racer	<i>Coluber constrictor constrictor</i>	U
Rough Green Snake	<i>Opheodrys vernalis</i>	S	Black Rat Snake	<i>Elaphe o. obsoleta</i>	U
Eastern King Snake	<i>Lampropeltis g. getula</i>		Northern Pine Snake	<i>Pituophis m. melanoleucus</i>	T
Scarlet King Snake	<i>Lampropeltis triangulum elapsoides</i>	SC	Coastal plain Milk Snake intergrade	<i>Lampropeltis t. triangulum X L. t. elapsoides elapsoides</i>	SC
Five-lined Skink	<i>Eumeces fasciatus</i>	U	Northern Fence Lizard	<i>Sceloporus undulatus hyacinthus</i>	S

St – Status E - Endangered D - Decreasing INC - Increasing S - Stable U – Undetermined I - Introduced P - Peripheral



More than 200 certified and potential vernal pools are located within Middle Township. These pools are important breeding areas for many amphibians. Since vernal pools dry up every year, they do not support the fish populations that would prey on amphibian eggs and young. The table below contains amphibians that may occur in the Township.

Table 35: Cape May County Amphibians (NJDEP, DFW 2001 NJDEP, DFW 2005)

Common Name	Scientific Name	Status	Common Name	Scientific Name	Status
Marbled Salamander	<i>Ambystoma opacum</i>	SC	Eastern Tiger Salamander	<i>Ambystoma t. tigrinum</i>	E
Red-spotted Newt	<i>Notophthalmus v. viridescens</i>	D	Four-toed Salamander	<i>Hemidactylium scutatum</i>	D
Red-backed Salamander	<i>Plethodon c. cinereus</i>	S	Eastern Mud Salamander	<i>Pseudotriton m. montanus</i>	T
Northern Red Salamander	<i>Pseudotriton r. ruber</i>	D	Fowler's Toad	<i>Bufo woodhousii fowleri</i>	SC
Eastern Spadefoot Toad	<i>Scaphiopus h. holbrookii</i>	D	Northern Cricket Frog	<i>Acris c. crepitans</i>	U
Northern Gray Treefrog	<i>Hyla versicolor</i>	S	Northern Spring Peeper	<i>Hyla c. crucifer</i>	S
New Jersey Chorus Frog	<i>Pseudacris triseriata kalmi</i>	S	Bullfrog	<i>Rana catesbeiana</i>	S
Carpenter Frog	<i>Rana virgatipes</i>	SC	Green Frog	<i>Rana clamitans melanota</i>	S
Wood Frog	<i>Rana sylvatica</i>	S	Southern Leopard Frog	<i>Rana spenocephala</i>	S
Pickereel Frog	<i>Rana palustris</i>	S			

St – Status E - Endangered D - Decreasing INC - Increasing S - Stable U – Undetermined I - Introduced P - Peripheral



The incredible diversity observed in bird species also holds true for butterflies. In addition to its importance for migratory birds, Cape May County is a crossroads for huge migrations of Monarch butterflies and the common Green Darner, a dragonfly species (Russell, et al 1998, USFWS 2007). Wright and Sutton (1999) have compiled the list below based on review of private and museum collections and the entomology literature.

Table 36: Butterflies of Cape May County, New Jersey (Wright & Sutton 1999)

Common Name	Common Name	Common Name	Common name
Pipevine Swallowtail	Banded Hairstreak	Aphrodite Fritillary	Appalachian Brown
Zebra Swallowtail	Striped Hairstreak	Regal Fritillary	Georgia Satyr
Black Swallowtail	Southern (No.) Hairstreak	Silver-Bordered Fritillary	Little Wood Satyr
E. Tiger Swallowtail	Brown Elfin	Meadow Fritillary	Common Wood Nymph
Spicebush Swallowtail	Frosted Elfin	Pearl Crescent	Monarch
Palamedes Swallowtail	Henry's Elfin	Baltimore	Silver-Spotted Skipper
Checkered White	Eastern Pine Elfin	Question Mark	Long-Tailed Skipper
Cabbage White	'Olive' Juniper Hairstreak	Eastern Comma	Hoary Edge
Falcate Orangetip	Hessel's Hairstreak	Gray Comma	Southern Cloudywing
Clouded Sulphur	White M Hairstreak	Compton Tortoiseshell	Northern Cloudywing
Orange Sulphur	Gray Hairstreak	Mourning Cloak	Hayhurst's Scallopwing
Cloudless Sulphur	Red-Banded Hairstreak	American Lady	Sleepy Duskywing
Little Yellow	Eastern Tailed Blue	Painted Lady	Juvenal's Duskywing
Sleepy Orange	'Northern' Spring Azure	Red Admiral	Horace's Duskywing
Harvester	Coastal Holly Azure	Common Buckeye	Zarucco Duskywing
American Copper	Summer Azure	Red-Spotted Purple	Wild Indigo Duskywing
Bronze Copper	American Snout	Viceroy	Common Checkered Skipper
Bog Copper	Gulf Fritillary	Hackberry Emperor	Common Sootywing
Great Purple Hairstreak	Variegated Fritillary	Tawny Emperor	Swarthy Skipper
Coral Hairstreak	Great Spangled Fritillary	Eyed Brown	Clouded Skipper
Least Skipper	European Skipper	Fiery Skipper	Leonard's Skipper
Cobweb Skipper	Peck's Skipper	Tawny-Edged Skipper	Crossline Skipper
Whirlabout	Northern Broken Dash	Little Glassywing	Sachem
Delaware Skipper	Rare Skipper	Mulberry Wing	Zabulon Skipper
Aaron's Skipper	Broad-Winged Skipper	Dion Skipper	Black Dash
Two-Spotted Skipper	Dun Skipper	Dusted Skipper	Common Roadside Skipper
Eufala Skipper	Brazilian Skipper	Salt Marsh Skipper	Ocola Skipper
Giant Swallowtail	Southern Dogface	Orange-Barred Sulphur	Edward's Hairstreak
Hoary Elfin	Golden-Banded Skipper	Confused Cloudywing	Dotted Skipper
Indian Skipper	Arogos Skipper	Hobomok Skipper	

4.3 RARE SPECIES AND SPECIES OF SPECIAL CONCERN

A search of State and Federal maps and databases to determine if records exist for occurrences of threatened and endangered wildlife species, rare plants or natural communities, or critical wildlife habitat on or in the immediate vicinity of the project site identified numerous areas of critical habitat and the presence of rare, threatened and endangered species within Middle Township. Specifically, a search of the New Jersey Department of Environmental Protection Natural Heritage Program (NHP) Database was performed and the New Jersey Landscape Mapping Project was reviewed. Several threatened and endangered animals and habitat associated with them are known to occur within Middle Township. Foraging habitat for Black Skimmer, Least Tern, Black-crowned Night Heron, Yellow-crowned Night Heron and tern species and colonial waterbirds are present in the NHP database. Nesting habitat for Black-crowned Night Heron and colonial waterbirds are also present in the NHP database, as well as a coastal heron rookery. Rare vertebrates are listed below. No rare, threatened or endangered invertebrates were identified within the Township limits by the NHP.

Table 37: Rare Wildlife of Middle Township (Lord 2007)

Common Name	Scientific Name	Status	Common Name	Scientific Name	Status
Bald eagle	<i>Haliaeetus leucocephalus</i>	E (LT)	Barred owl	<i>Strix varia</i>	T/T
Black rail	<i>Laterallus jamaicensis</i>	T/T	Black skimmer	<i>Rynchops niger</i>	E
Black-crowned night heron	<i>Nycticorax nycticorax</i>	T/S	Bobcat	<i>Lynx rufus</i>	E
Broad-winged hawk	<i>Buteo platypterus</i>	SC	Carpenter frog	<i>Rana virgatipes</i>	SC
Cattle egret	<i>Bubulcus ibis</i>	INC/INC	Comet darner	<i>Anax longipes</i>	
Common tern	<i>Sterna hirundo</i>	D/S	Cooper's hawk	<i>Accipiter cooperii</i>	T/T
Cope's gray treefrog	<i>Hyla chrysoscelis</i>	E	Eastern box turtle	<i>Terrapene carolina</i>	SC
Eastern kingsnake	<i>Lampropeltis g. getula</i>	U	Eastern tiger salamander	<i>Ambystoma t. tigrinum</i>	E
Forster's tern	<i>Sterna forsteri</i>	INC/S	Fowler's toad	<i>Bufo woodhousii fowleri</i>	SC
Frosted elfin	<i>Callophrys irus</i>	T	Glossy ibis	<i>Plegadis falcinellus</i>	D/S
Great blue heron	<i>Ardea herodias</i>	S/S	Great egret	<i>Casmerodius albus</i>	S/S
Least tern	<i>Sterna antillarum</i>	E	Little blue heron	<i>Egretta caerulea</i>	S/S
Marbled salamander	<i>Ambystoma opacum</i>	D	Martha's pennant	<i>Celithemis Martha</i>	
Northern diamondback terrapin	<i>Malaclemys t. terrapin</i>	SC	Northern harrier	<i>Circus cyaneus</i>	E/U
Osprey	<i>Pandion haliaetus</i>	T/T	Peregrine falcon	<i>Falco peregrinus</i>	E
Pine barrens treefrog	<i>Hyla andersonii</i>	T	Piping plover	<i>Charadrius melodus</i>	E (LT)
Rare skipper	<i>Problema bulenta</i>		Red knot	<i>Calidris canutus</i>	T
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	T/T	Red-shouldered hawk	<i>Buteo lineatus</i>	E/T
Snowy egret	<i>Egretta thula</i>	S/S	Spotted turtle	<i>Clemmys guttata</i>	SC
Tricolored heron	<i>Egretta tricolor</i>	INC/S	Yellow-breasted chat	<i>Icteria virens</i>	SC
Yellow-crowned night heron	<i>Nyctanassa violacea</i>	T/T			

E – Endangered T – Threatened S – Stable SC – Special Concern INC – Increasing

E/T, T/T, T/S – Dual Status, letter before the slash is status of breeding population, letter after the slash is for the migratory population

(LT) – Federal Status, formally listed as threatened

A database search from the NJDEP's Natural Heritage Program revealed the documented presence of a number of rare species. The USFWS indicated that some additional rare species of Federal interest could be found in Middle Township, such as nesting Piping Plover (*Charadrius melodus*) on Champagne Island. These wildlife species are listed in the following table.

The list includes avian species, reptiles and amphibians, and mammalian species that are very familiar to a great deal of people who are interested in nature. Less known are the invertebrates on the list. It contains two lepidopterans (in this case two species of butterflies) and two species of odonates (dragonflies). These species of invertebrates are interesting in that they require specific habitats. In the case of the butterflies, they require specific types of host plants in order to raise their young and also require nectar plants in order to feed as adults (if they feed as adults).

Of these species of invertebrates, the Frosted Elfin (*Callophrys irus*) is the rarest and is considered to be a threatened species in New Jersey. It is known from Massachusetts to northern Florida and from Texas and Louisiana. In New Jersey, it is a much localized and rarely common species with colonies in open areas such as clearings, burns, woodland edges and power line easements. The adults fly in the spring into early summer. The host plant in New Jersey is Yellow Wild Indigo (*Baptisia tinctoria*). It is also known to use Wild Lupine (*Lupinus perennis*). This species of butterfly has disappeared from some of its known locations. However, a new location has recently been found in New Jersey along a power line easement.

The Rare Skipper (*Problema bulenta*) can be locally common in brackish coastal marshes, but habitat is limited and many colonies are inaccessible. It is found from New Jersey south to Georgia with some gaps in the range in North Carolina and Virginia. It flies in summer and the host plant is Wild Rice (*Zizania aquatica*) and other unknown grass species.

The two dragonflies on the list are the Comet Darter (*Anax longipes*) and Martha's Pennant (*Celithemis martha*). The Comet Darter is a rare species that can be found throughout the State, but is more likely to be seen in coastal areas. It is active from May to September with the most seen during July flying over lakes and ponds.

Martha's Pennant is a species of special concern and is most likely secure as far as conservation is concerned, but should be watched. It is a southern New Jersey species that is found around marshy edges of ponds and lakes. It is active from July to October with most flights seen in July.

In addition to these invertebrates, the Blue-faced Meadowhawk (*Sympetrum ambiguum*) should be surveyed for in Middle Township. It has been seen and photographed in Lower Township and there are no reasons that it should not be found in Middle Township. It is normally seen in August and September and is found associated with temporary woodland ponds and swamps. It is considered to be a threatened species in New Jersey.

4.4 CRITICAL HABITATS AND SPECIAL ECOLOGICAL COMMUNITIES

4.4.1 FEDERAL HABITAT COMPLEXES

The US Fish and Wildlife Service (USFWS) has identified regionally significant habitats and species populations in the New York Bight Watershed. The USFWS recognizes the importance of delineating the larger habitat complexes that link local habitat patches and species populations, forming regional ecological assemblages. This landscape level perspective is critical to establishing uniform and effective management practices to replace site-by-site, uncoordinated practices that do not take into account real ecological complexity. For instance, species may utilize different habitat types at different life stages. Interbreeding between populations of a species promotes genetic health. Habitat patches that lose species can be recolonized from populations in other patches, if connectivity is preserved. In identifying these habitat complexes, the USFWS was particularly interested in locations of naturally occurring populations of federally and state-listed endangered and threatened species and candidates for listing, and

those areas that contain significant concentrations of, or are otherwise important to critical life-history stages of, other indigenous species. The following use categories were prioritized:

- breeding, nesting, or spawning sites;
- migration pathways and stopover areas, including areas of open space in urban areas;
- roosting sites;
- nursery areas;
- staging areas;
- dispersal corridors;
- core concentration areas;
- overwintering areas;
- major feeding or foraging areas (USFWS, SNE-NYB Coastal Program 1997).

Middle Township lies within the Cape May Peninsula Habitat Complex. The Cape May Peninsula habitat complex includes the entire Cape May Peninsula, encompassing marine, estuarine, wetland and upland habitats within this boundary. Developed barrier island and inland sites are not included. Within Middle Township the habitat complex includes the barrier beaches and backbarrier lagoon system on the Atlantic side, coastal plain intermittent ponds, hardwood and Atlantic white cedar swamps, upland forests and agricultural areas. Significant habitat for migratory



landbirds, raptors, migratory shorebirds, colonial nesting waterbirds and regionally rare wetland and upland communities and plants can be found within this complex. Also included are the nearshore waters of the New York Bight known to be important for marine mammals. The complex includes the Delaware Bayshore and near shore waters as well (USFWS, SNE-NYB Coastal Program 1997).

Conservancy. The Ramsar Convention on Wetlands names the site as a Wetland of International Importance. The Presence of the refuge along the Delaware Bay contributed to Delaware Bay's classification as a Hemispheric Reserve by the Western Hemisphere Shorebird Reserve Network.

The Delaware Bay Division of the Cape May National Wildlife Refuge is partially located in Middle Township. The Refuge is classified as a Globally Important Bird Area by the American Bird

4.4.2 STATE OF NEW JERSEY CRITICAL HABITAT MAPPING

The NJDEP's Division of Fish and Wildlife has developed maps identifying critical areas for threatened and endangered species based on land-use classifications and species locations. This effort was coordinated through a study known as the Landscape Project. The project focuses on large areas throughout the State that are ecologically similar in regard to plant and animal communities referred to as Landscape Regions. Cape May County is situated within three Landscape Regions, the Atlantic Coast, Delaware Bay and the Pinelands Landscape Regions. The Atlantic Coast Region is identified as one of the most productive coastal habitats in the country. The low-lying marsh and beaches of the barrier island communities support some of the state's most important colonies of nesting birds. The Delaware Bay Landscape Region encompasses most of the County and features populations of bald eagles, gray tree frogs and over thirty other endangered species in its vast woodlands. The extensive salt-water marshes support a vital shorebird migration habitat. The Pinelands Landscape Region is a unique ecosystem that supports diverse reptile, amphibian and invertebrate populations. The extensive cedar swamps and wetlands systems support large populations of insects, birds and aquatic communities.

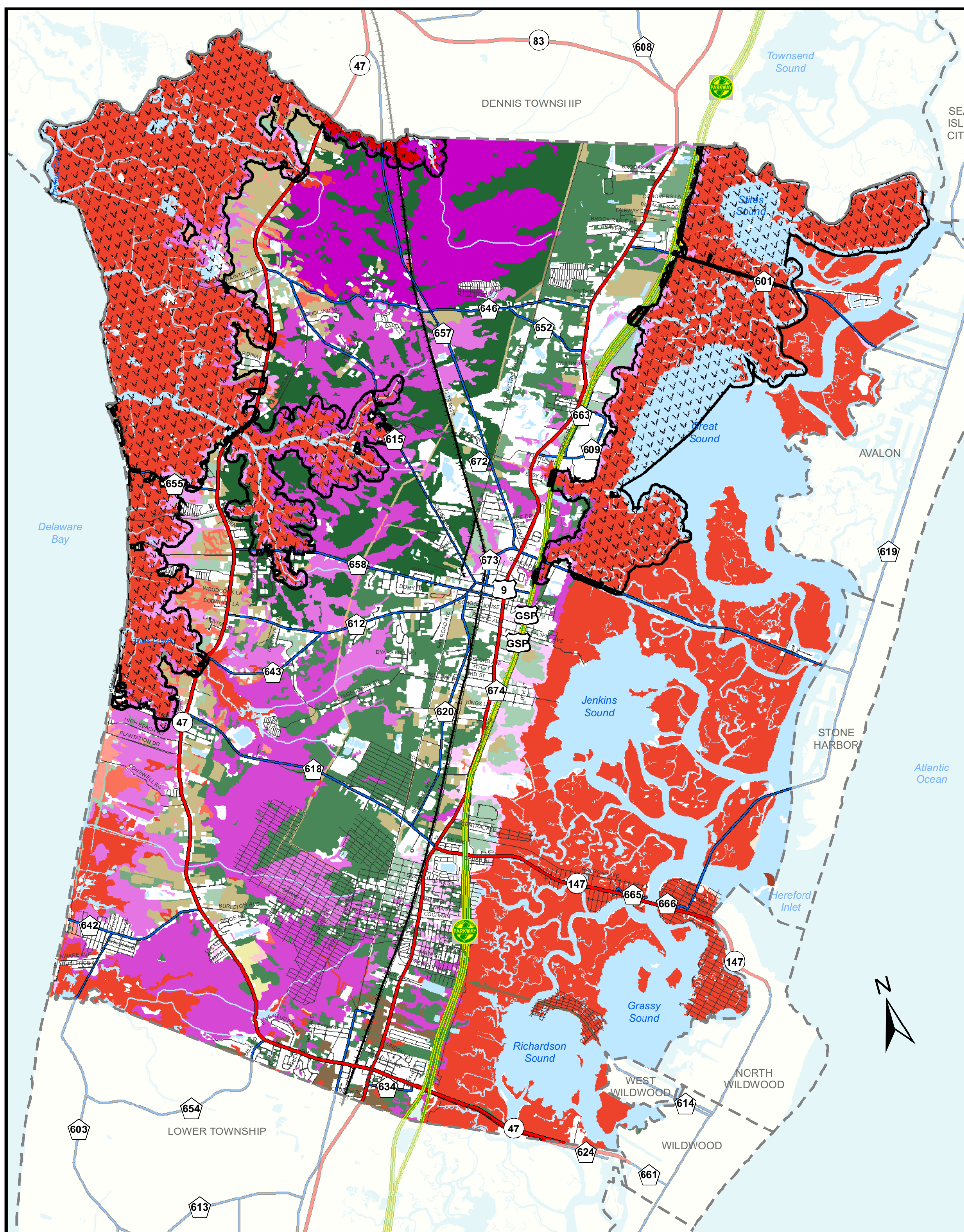
The Landscape Project delineates the State into five habitat classes; forest, grassland, forested wetland, emergent wetland and beaches. These classes are based on information extracted from the NJDEP's Land Use/Land Cover data. Habitat patches within these areas are classified by a ranking system based on the status of the species present in each.

The prioritized ranking system is as follows:

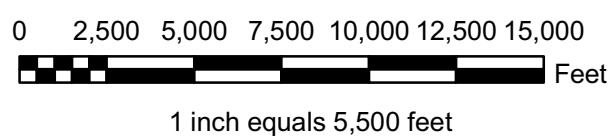
- **Rank 5** is assigned to areas containing one or more occurrences of at least one wildlife species listed as endangered or threatened on the Federal list of endangered and threatened species.
- **Rank 4** is assigned to areas containing one or more occurrences of at least one State endangered species.
- **Rank 3** is assigned to areas containing one or more occurrences of at least one State threatened species.
- **Rank 2** is assigned to areas containing one or more occurrences of at least one non-listed State priority species.
- **Rank 1** is assigned to areas that meet habitat-specific suitability requirements such as minimum size criteria for endangered, threatened or priority wildlife species, but do not intersect with any confirmed occurrences of such species.

The largest portion of Middle Township's critical habitat is identified as the forested wetlands and emergent wetlands classification, most of which is recognized as containing one or more State endangered species (Rank 4) or State threatened species (Rank 3). The NJDEP has also mapped Natural Heritage Priority Sites which include habitats for threatened and endangered species. Forested habitat of varying ranks generally falls within a central north-south corridor through the Township. Emergent wetland habitat flanks the western and eastern coasts of the Township, along the Delaware Bay and barrier islands of the Atlantic Ocean, respectively. Grassland habitat is dispersed throughout, with a concentration of grassland areas along the State Route 47 corridor.

Rank 5 habitat mapped in Middle Township is associated with Bald eagle foraging areas and nest buffers and known populations of Piping plover, since the Bald eagle and Piping plover are Federally threatened and State-endangered species. Rank 4 habitat consists of critical habitat for Black skimmer, Bobcat, Southern (Cope's) gray treefrog, Eastern tiger salamander, Least tern, breeding Northern harriers, Peregrine falcon and breeding Red-shouldered hawks. All of these species are State-endangered. Habitat mapped as Rank 3, for State-threatened species, includes habitat for Barred owl, Black rail, Black-crowned night heron, Cooper's hawk, Frosted elfin, Osprey, Pine barrens treefrog, Red knot, Red-headed woodpecker, non-breeding Red-shouldered hawks and Yellow-crowned night heron. Large areas within Middle Township are mapped as habitat for threatened and endangered species. Much of this habitat occurs on publicly-owned land. Where it occurs on private land, special measures may be needed to preserve valuable wildlife habitat, while allowing necessary economic development and redevelopment in the Township (see the Threatened and Endangered Species map).



	Municipal Boundaries	Bald Eagle Foraging	Emergent Wetlands	Forested Wetlands	Forests	Grasslands
	Garden State Parkway	Federal T and E (5)				
	State Roads	Beaches	Suitable Habitat (1)	Suitable Habitat (1)	Suitable Habitat (1)	Suitable Habitat (1)
	County Roads	Suitable Habitat (1)	Priority Species (2)	Priority Species (2)	Priority Species (2)	Priority Species (2)
	Local Roads	State Threatened (3)	State Threatened (3)	State Threatened (3)	State Threatened (3)	State Threatened (3)
	Railroads	State Endangered (4)	State Endangered (4)	State Endangered (4)	State Endangered (4)	State Endangered (4)
	Water Bodies	Federal T and E (5)	Federal T and E (5)	Federal T and E (5)	Federal T and E (5)	



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STATE AUTHORIZED

THREATENED & ENDANGERED SPECIES

TOWNSHIP OF MIDDLE
CAPE MAY COUNTY NEW JERSEY



APRIL 2007

4.4.3 NJ NATURAL HERITAGE PROGRAM PRIORITY SITES

The NJDEP's Natural Heritage Program has identified Natural Heritage Priority Sites that exhibit exceptional natural diversity or consist of prime habitat for threatened and endangered plant species and ecological communities. These Natural Heritage Priority Sites are assigned a biodiversity rank based on a scale developed by the Nature Conservancy and a network of Natural Heritage Programs. The scale indicates the significance of the diversity of the site on a local versus global level.

The global biodiversity ranks are defined as follows:

- **B1** is assigned to those sites that are of outstanding significance on a global level, which may contain the only known occurrence of an element such as a species or ecological community.
- **B2** is assigned to those sites that are of very high significance on a global level, such as the most outstanding occurrence of an ecological community.
- **B3** is assigned to those sites that are of high significance on a global level, with the occurrence of an element that is imperiled globally, or with a concentration of elements that are critically imperiled within the State of New Jersey.
- **B4** is assigned to those sites that are of moderate significance on a global level, with the only viable state occurrence of an element critically imperiled in the State of New Jersey, or excellent occurrences of elements that are rare in the State.
- **B5** is assigned to those sites that are of general biodiversity interest on a global level.

The state biodiversity ranks are defined as follows (not all sites are assigned a state biodiversity rank):

- **V1** is assigned to those sites that are of outstanding significance on a state level, such as a site containing the only known occurrence of an element in the State.
- **V2** is assigned to those sites that are of very high significance on a state level, and may include sites containing elements that are critically imperiled in the State of New Jersey, or a concentration of imperiled or rare elements.
- **V3** is assigned to those sites that are of high significance on a state level, such as those sites containing the best occurrence in the State of an imperiled element.
- **V4** is assigned to those sites that are of moderate significance on a state level, such as those containing an excellent occurrence of a state rare element.
- **V5** is assigned to those sites with any other occurrence of a state rare element.

The Natural Heritage Program has mapped several of these ecological communities within Middle Township, as shown on the Natural Heritage Priority Sites map. In fact approximately 7,400 acres, or 14 percent of Middle Township, is contained within mapped Natural Heritage Priority Sites. In March 2007, the Natural Heritage Program released a new version of priority site mapping that focuses on rare plants and natural communities, as opposed to animals. As a result, some of the previous priority sites were removed from the NHP mapping, including the Avalon-Stone Harbor Marsh Macrosite, Cape May Court House Maintenance Yard, Cape May Corridor Macrosite, Court House Pit Site, Crooked Creek Pit Site, Delaware Bayshore Macrosite, Dennis Creek Marsh Macrosite, Gravens Inlet, Ottens Harbor, and Townsends Inlet. The remaining sites are named and described below.

Baseball Swamp Site

Located on the outer coastal plain of the Cape May peninsula, the Baseball Swamp Natural Heritage Priority Site is in a headwater tributary of Bidwell Creek. Plant communities in this site include dry oak-pine forest, dry pine-oak forest, Cape May lowland swamp and other hardwood swamps. The site is approximately 132 acres in size. The site has a biodiversity rank of B4, and contains a state endangered and federally threatened plant species within the headwater wetland (NJDEP, NHP 2001b).

Bucks Avenue Site

The Bucks Avenue Natural Heritage Priority Site is located on the outer coastal plain of the Cape May peninsula. Specifically, it is located at the headwaters and upper watershed of Goshen Creek. Plant communities in this site include dry oak-pine forest, mesic coastal plain mixed oak forest, hardwood swamp (including old-growth stands) and intermittent coastal plain ponds. The site is approximately 761 acres in size and has a biodiversity rank of B3, because it contains a federally threatened species and a concentration of globally rare intermittent coastal plain pond communities (NJDEP, NHP 2001c).

Green Creek Site

This Natural Heritage Priority Site is located on the Delaware Bayshore, adjacent to the saltmarshes of Green Creek and Dias Creek, on the outer coastal plain of the Cape May peninsula. Plant communities within the site include mesic coastal plain mixed oak forest, fringes of hardwood swamp and intermittent coastal plain ponds. The site measures approximately 612 acres in area. The Green Creek Site is assigned a biodiversity rank of B5 because two state endangered plant species and two special concern plant species are found here. Three or more small intermittent ponds are also located within this site (NJDEP, NHP 2001d).

Indian Trail Swamp Site

The Indian Trail Swamp Site, located on the outer coastal plain of the Cape May peninsula, contains the headwaters and critical upper watersheds of Green Creek and Dias Creek. Plant communities include dry oak-pine forest, mesic coastal plain mixed oak forest, Sweetgum-Red Maple swamp, Cape May lowland swamp and an intermittent coastal plain pond. The Indian Trail Swamp Site measures almost 3,000 acres in size, and has been assigned a biodiversity rank of B2. There are excellent examples of the rare Cape May lowland swamp and intermittent coastal plain pond communities, as well as an excellent population of a globally imperiled, State-endangered plant species and a concentration of state and globally rare plant species. Imperiled raptors and migrating passerine bird species find refuge in the forest interior habitat found within this macrosite (NJDEP, NHP 2001e).

Lizard Tail Swamp Site

Located on the outer coastal plain of the Cape May peninsula, the Lizard Tail Swamp Site is located on the headwaters of Bidwell Creek, east of Goshen Road (County Route 615). Plant communities within this site include dry oak-pine forest, dry pine-oak forest, mesic coastal plain mixed oak forest, Cape May lowland swamp, Sweetgum-Red Maple swamp and brackish tidal marsh complex. This site is approximately 986 acres in area. The Lizard Tail Swamp Site has been assigned a biodiversity rank of B2, as it has an excellent example of a globally rare Cape May lowland swamp community, as well as state and globally significant plant and animal occurrences (NJDEP, NHP 2001f).

Mayville Site

The Mayville Natural Heritage Priority Site includes a 14-acre abandoned gravel pit within a patch of forest at the mainland/salt marsh interface, on the outer coastal plain of Cape May peninsula. Wetlands of Shell Bed Creek and an unnamed creek cross the site. Plant communities within the boundary of the Mayville site include mesic coastal plain mixed forest, hardwood swamp and successional areas. The site has been assigned a biodiversity rank of B5, as it contains a State-endangered plant species and one of the few remaining patches of forest cover along the Atlantic mainland/salt marsh interface. This forest cover may be significant for migrating birds. The Mayville Site covers approximately 355 acres (NJDEP, NHP 2001g).

Pierces Pit Site

The Pierces Pit Site contains three sand pits in the outer coastal plain of the Cape May peninsula. These sand pits have been excavated to the water table, creating saturated sandy soils and seasonally flooded areas. Adjacent areas are

dominated by dry oak-pine forest fragments and agricultural fields. The site only covers 150 acres, and has been assigned a biodiversity rank of B4 for the concentration of several state imperiled plant species (NJDEP, NHP 2001h).

Rio Grande Swamp Site

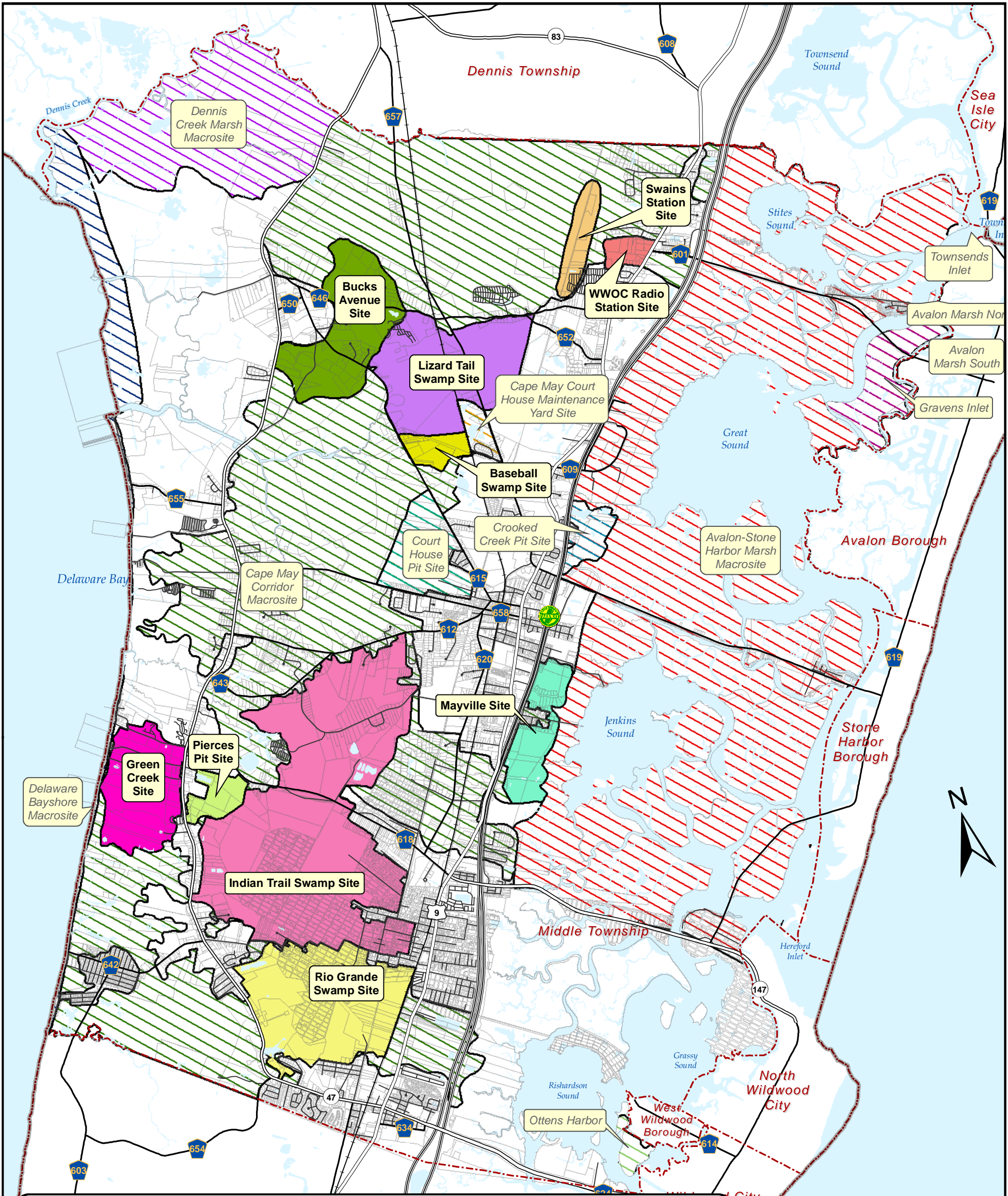
This priority site is located at the headwaters of Fishing Creek on the outer coastal plain of the Cape May peninsula. The Rio Grande Swamp Site encompasses an area of wetlands and mesic uplands at the headwaters of Fishing Creek. Plant communities within this site include dry oak-pine forest, mesic coastal plain mixed oak forest, old growth hardwood swamp, Cape May lowland swamp and an intermittent coastal plain pond. The transition zones between hardwood swamps and mesic mixed oak forest contain American beech, Tulip-tree and Basket oak in addition to the more common species of this area. The Rio Grande Swamp Site covers almost 1,150 acres of the southern portion of the Township. The site has been assigned a biodiversity rank of B2 because it contains an excellent example of the rare Cape May lowland swamp community, an intermittent pond and a concentration of State Endangered and Special Concern plant and wildlife species (NJDEP, NHP 2001i).

Swains Station Site

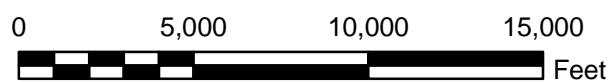
The Swains Station Site, which covers approximately 182 acres, contains wetlands of Sluice Creek along an abandoned railroad grade near Swain, on the outer coastal plain of the Cape May peninsula. This site has been assigned a biodiversity rank of B5, as it contains globally and state rare plants (NJDEP, NHP 2001j).

WWOC Radio Station Site

The WWOC Radio Station Site, on the outer coastal plain of the Cape May peninsula, contains a group of abandoned gravel pits that were excavated to the below the water table level. The abandoned pits are surrounded by dry oak-pine forest, successional pine forest and agricultural fields. There are a radio station, botanical garden and residential development on and adjacent to the site. The site has a biodiversity rank of B5, as it contains a good occurrence of a State-endangered animal, last observed in 1991 (NJDEP, NHP 2001l).



- | | | |
|--|---|--|
| <ul style="list-style-type: none">County BoundaryMunicipal BoundaryGarden State ParkwayUS RouteNJ State RouteCounty RouteLocal RoadRailroadParcelsOpen Water Bodies | Natural Heritage Priority Sites <ul style="list-style-type: none">Baseball Swamp SiteBucks Avenue SiteGreen Creek SiteIndian Trail Swamp SiteLizard Tail Swamp SiteMayville SitePierces Pit SiteRio Grande Swamp SiteSwains Station SiteWWOC Radio Station Site | Former Natural Heritage Priority Sites <ul style="list-style-type: none">Avalon-Stone Harbor Marsh MacrositeCape May Court House Maintenance YardCape May Corridor MacrositeCourt House Pit SiteCrooked Creek Pit SiteDelaware Bayshore MacrositeDennis Creek Marsh MacrositeGravens InletOttens HarborTownsends Inlet |
|--|---|--|



NATURAL HERITAGE PRIORITY SITES

TOWNSHIP OF MIDDLE
CAPE MAY COUNTY NEW JERSEY



MAY 2010

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5.0 CULTURAL RESOURCE INVENTORY

5.1 PREHISTORIC CONTEXT

The Paleo-Indian period coincides climatologically with the Early Holocene. For New Jersey, the environment was probably much like that of the modern Eastern Sub-Arctic with boreal forests of fir, spruce, and sporadic stands of pine, birch, and maple predominant (Webb 1987: 183). Geologically, the New Jersey coastline lay some sixty to eighty miles east of its present-day location. The lower sea levels that resulted from glacial expansion exposed a broad, flat continental shelf of marshes and meadows cut by deep river channels and branching streams (Kraft 1977; Chesler 1982; Cavallo 1981). Early human populations inhabiting the upper Mid-Atlantic were most likely organized as small hunter-gatherer bands characterized by low population density and high mobility that occupied both caves and rockshelters as well as short-term open air camps. Custer (1996: 106) suggests that these populations could have ranged over broad areas during the course of a year exploiting a wide range of food resources. The following discussion of human prehistoric cultures will be discussed by subperiod. The following table shows the time periods associated with the archaeological subperiods.

Table 38: Archaeological Subperiods		
Time Period	Begins (yrs. B.P.)	Ends (yrs. B.P.)
Paleo-Indian	14,000	10,000
Early Archaic	10,000	8,500
Middle Archaic	8,500	6,000
Late Archaic	4,000	3,800
Terminal Archaic	3,800	3,000
Early Woodland	3,000	2,000
Middle Woodland	2,000	1,900
Late Woodland	1,900	350
Initial Colonization	350	280

Early Archaic

The Early Archaic subperiod is associated with a continuing expansion of forest habitats. Spruce forests covered large areas of the region affording few edible resources to human populations. Floodplains and river islands were attractive locations for hunter-gatherer camps as upland areas continue to be predominated by boreal forest. However, during this period limited use of upland lakes and bogs is evidenced by a small number of archaeological sites adjacent to these locales. Sinkhole complexes may have supported complexes of natural ponds throughout the Late Pleistocene and Early Holocene that would have been attractive locations for migratory wildlife and the human populations that exploited them. Such freshwater wetlands added to the diversity of resources available in the periods immediately following the last glaciation making broad-spectrum foraging a successful subsistence strategy for human populations (Custer 1996; Meltzer and Smith 1986; Cavallo and Mounier 1980; Pagoulatos 1991).

Middle Archaic

At approximately 6500 B.C. technological and settlement pattern shifts, as well as climatological changes, signal the beginning of a new phase of human settlement. Decline in boreal species and an increase in oak and hemlock favored the influx of new plant and animal communities. However, the distribution of these resources differed markedly from that of contemporary communities. The increase in temperature and rainfall (known as the Atlantic Episode) also favored the expansion of wetlands throughout the region. Archaeological remains suggest a greater reliance on plant resources many of which were certainly localized, short-term, seasonal food sources. An increased use of nut-bearing tree species is evident in technological innovations. Caches of tools, suggesting more predictable and regularized movements of population over an annual cycle, appear in the archaeological record for the first time. Likewise, site distribution reveals

the utilization of a wider variety of habitats as well as much more intensive utilization of riverine and wetland settings (Custer 1996; Chesler 1982; Meltzer and Smith 1986; Pagoulatos 1991).

Late Archaic

The Late Archaic period represents a stabilization of cultural and environmental changes onset in the previous time period. More repeated and intensive use of estuarine/riverine settings is indicated. Moreover, use of more productively marginal resource areas increases and regional exchange networks appear for the first time. Tools specialized for plant processing, and also for fishing and fish processing, appear in quantity. These technological developments, coupled with continued caching of tools and the development of storage pits, suggest a greater emphasis on base camp settlement patterns (Carbone 1982; Custer 1984; Custer 1996). Also, important to local resource distribution were changes in marine environments occurring at this time. Slowing sea level rise favored a stabilization of coastal environments leading in turn to the development of shellbeds and estuarine marshes (Carbone 1982; Custer 1984; Custer 1996). Overall, climatic changes during the Late Archaic would have significantly enhanced the productivity of some habitats, such as coastal marshes and mixed interior forests, while diminishing the output of traditional resource rich areas (Carbone 1982; Custer 1996; Pagoulatos 1991). Settlement patterns and subsistence strategies appear to have been radically altered to accommodate local populations in the face of changing resource availability. Significant increases in population density are noted in some areas as is a general decrease in mobility. Especially in proximity to riverine settings, large sites characterized by dense scatters of artifacts begin to appear. Use of swamp and marsh habitats intensifies during this period (Custer 1996: 188).

Early and Middle Woodland

The Early Woodland period marks the shift to modern climatological and environmental regimes in the Eastern United States. Vast deciduous forests dominant the landscape and temperature and rainfall patterns take on marked seasonal fluctuations. Mixed Oak-Chestnut forests characterized by a rich variety of tree species develop adding to the resource abundance of the region (Shelford 1963; Custer, 1996). Culturally, the environmental changes of the Early Woodland favor the continued development of trends initiated during the Late Archaic. Intensification in the use of plant foods as well as a trend toward increasing degrees of sedentism mark the transition from the Archaic to Woodland eras. Floodplains and their surroundings continue to attract base camp settlement in an even more focused manner than the previous period. Coupled with these cultural trends is the development of a crude ceramics technology most likely influenced by groups to the south and west.

Late Woodland

The Late Woodland period for the northeastern United States is the last period commonly classified as prehistoric. Environmental and climatic characteristics have assumed fully modern form by this point in time. Increasing population density throughout the Late Woodland led to the development of fully sedentary villages throughout the region. At the beginning of the Late Woodland, settlement patterns exhibit a shift away from estuarine settings in favor of more exclusively floodplain locations. The introduction of the bow and arrow and maize agriculture from the south and west throughout the period aided the transformation to fully sedentary lifestyles and horticultural subsistence. Ceramics continued to develop during this period as vessel walls became thinner and decorations more complex. Conversely, much of the Late Woodland also shows a marked decrease in exchange and mortuary ceremonialism in comparison to earlier periods (Kraft 1986a, 1986b; Kraft and Mounier 1982; Custer, 1996). Perhaps the result of population movements at the beginning of the period, exchange networks do not begin to re-assert themselves until nearly the end of the Late Woodland.

5.2 HISTORIC CONTEXT

Cape May County was constituted in 1692 as one of the oldest counties in the state. The maritime tradition of the county was established early in the seventeenth century as a station for Dutch fishermen and whalers in the 1630s, fishermen from New England Long Island, later, in mid-century and by late seventeenth and early eighteenth century pirates who combed the waters of the Atlantic coast and occasionally put into the shallow bays of the Cape May coastline.

Throughout the eighteenth century the smuggling of illegal imports through Cape May's ports added to its sea-oriented economy. During the Revolutionary War Cape May privateers attacked British shipping and captured cargo to support Colonial war efforts. Hindered by a lack of roads into the area and a deep cedar forest, population grew slowly in the county. In 1725, the population of Cape May County was less than 1000 inhabitants. However, by the end of the eighteenth century urbanites from Philadelphia, Baltimore, and Washington were regular vacationers to Cape May.

As the population of Cape May County grew, some inhabitants turned to the exploitation of the county's natural resources including its southern hardwood forests, cedar swamps, and salt hay meadows. Coastal erosion has encroached upon some of these loci of early industry by as much as one mile. In filling of the marshes surrounding the sounds is also evident.

Prior to its inception as a county, Cape May was the landholding of Dr. Daniel Cox, one of the West Jersey proprietors. Cox held title to some 95,000 acres, but never sailed to America to develop his holdings. Instead, he sold his lands to the West Jersey Society in 1692. Throughout the 1690s plantations developed throughout the county, held by a few principal families. In 1690 Shamgar Hand obtained 1,000 acres where Cape Court House is today. In 1691 the Leaming family and the Spicer family each took large land holdings that went from the ocean to the bay. Two roads cut in the early 1700s, provided north-south and east-west access routes for these early settlers. In 1723, Cape May County was divided into Upper, Middle, and Lower precincts, each of which became townships in 1798. Dennis Township was formed from portions of Upper Township in 1827.

Towns of eighteenth and nineteenth century Cape May County were associated principally with shipbuilding, mills, agriculture or fishing. However, two nineteenth century towns, Whitesboro and Woodbine, were developed as enclaves for African-Americans and Jewish immigrants, respectively. Whaling, shellfishing, timbering and cedar mining, grain cultivation, salt hay harvesting, shipbuilding, and a variety of milling enterprises constituted the economy of the county. Cape May Court House and Dennisville also supported glassmaking factories for a time in the nineteenth century.

Middle Township

Whalers from Connecticut and Long Island were the earliest settlers of the Cape May Area. However, more important for the early economy of Middle Township were fur trapping and lumbering activities. Cape May established a County court in 1693, but it was not until 1745 that Cape May Court House was designated the county seat. In 1695, Shamgar Hand purchased 1,108 acres from the West Jersey Society and established a plantation called Romney Marsh, which developed into the hamlet of Middletown. In 1704, the general sessions of the county court were ordered to be held at Shamgar Hand's house and the hamlet began to be known as Cape May Court House. Christopher Leaming, a whaler and cooper, established a farmstead with frontage on Stites Sound in 1694. Leaming was part of a group of original whaling families to settle the Cape May area drawn by the promise of both lucrative whaling and land ownership. Whaling remained a successful enterprise up to the first quarter of the 1700s.



The hamlets and villages of Middle Township developed around these early pioneers homesteads.

Arthur Cresse, Jonathan Swain, Samuel Matthews, and Aaron Leaming, who settled near present-day Goshen, were among these early settlers. Goshen, one of the County's oldest towns, developed at an intersection of two major colonial roads. Agricultural enterprises, shipbuilding and commerce were centered in Goshen throughout the nineteenth century.

Whitesboro, a town founded by George White, the first African-American elected to the United State House of Representatives, is a notable Middle Township historical community in its own right. As a planned community designed to provide land ownership and business opportunities to African-Americans in the Northeast, Whitesboro is significant as an example of social and economic development in the region. Other historically noteworthy locations in the township include Rio Grande, Green Creek, and Dias Creek, each of which served as loci of early nineteenth century settlement and industry. The prevailing agricultural character of Middle Township's development throughout the eighteenth, nineteenth and early twentieth centuries generated a dispersed settlement pattern of evenly distributed farmsteads situated in upland areas anchored by a few larger centers of political and economic activity. As a result, some of the oldest homes in the township are situated outside areas of development.

5.3 INVENTORIED CULTURAL RESOURCES



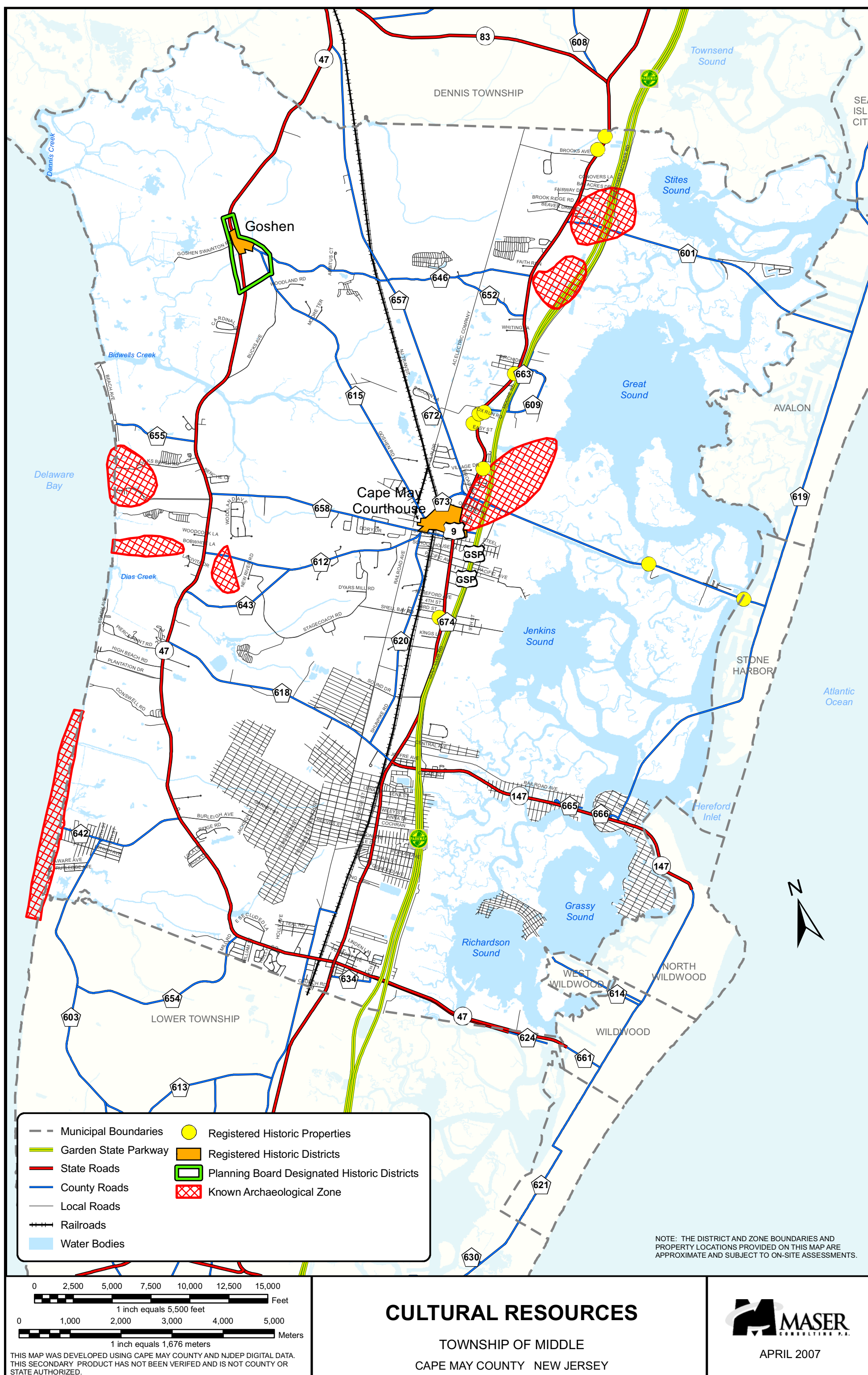
Over thirty archaeological or cultural resources surveys have been conducted within Middle Township. These investigations have resulted in the identification of eighteen registered prehistoric and historic archaeological sites (see map of Cultural Resources), three of which are considered eligible for the National Register of Historic Places, and seventeen registered historic properties or historic districts, of which six are listed on the National Register of Historic Places and one that is listed on the New Jersey Register of Historic Places only (See table of Historic Properties). Additionally, one multi-county historic district, the Garden State Parkway, traverses the eastern third of Middle Township. Since the focus of previous cultural resources investigations has been

the main traffic corridors through Middle Township and their associated population centers, the majority of these identified cultural resources are clustered along Routes 9 and 47, Cape May Court House, Burleigh and Rio Grande.

Prehistoric archaeological sites exhibit a preference for fast land adjacent to marshes with access to sounds. Historic properties are typically located on gently sloping, well-drained soils further from marsh edges or in proximity to water sources that could serve as suitable mill seats. Prehistoric archaeological sites and registered historic properties listed in this inventory constitute only those cultural resources documented as known to exist within Middle Township based on a review of existing cultural resources records. The scope of investigations precluded the identification of every potential cultural resource zone for all time periods as well as the development of a predictive model for prehistoric and historic cultural resources location. Cultural resources predictive models are complex functions built on multiple environmental, social, and economic factors. This inventory does not provide a means to predict the location of undocumented cultural resources or to verify the current integrity of known cultural resources on file with New Jersey state agencies. Those areas not listed as sensitive may still contain isolated historic properties or archaeological sites as well as cultural resources that are atypical of the region and which, therefore, may yield significant information. The absence of inventoried historic properties or archaeological zones in some locations should not be interpreted to mean that development in those areas may proceed without a reasonable effort to demonstrate an absence of significant historical properties or archaeological materials. A comparison of historic maps to cultural resources survey boundaries indicates that several high probability areas for cultural resources have not been adequately surveyed to date. These include interior road alignments some portions of which may be historic such as Burleigh Road, Indian Trail Road, Goshen Road, the Goshen-Swainton Road, and South Dennisville Road. Additionally, nineteenth century maps depict a series of early industrial and residential centers along Green Creek, Dias Creek, and Fishing Creek where mills, manufactories or farmsteads may have been located at one time. These areas have not been surveyed for archaeological remains.

Table 39: Inventoried Cultural Resources				
	Property Name	Location	Date	Eligibility Status
3051	28-Cm-25	protected	prehistoric, Woodland	SHPO Opinion 10/5/1989
3052	28-Cm-28	protected	prehistoric, Woodland	SHPO Opinion 10/5/1989
3053	Thomas Beesley Jr. House	605 US Route 9 North	1870	NR: 2/12/1998 SR: 12/22/1997
330	Cape May Court House Motor Vehicle Inspection Station	546 West Shell Bay Avenue	1937	SHPO Opinion 6/9/1998
1002	Cape May Courthouse Historic District	North Main St., Hereford Ave., Mechanic St., and Dias Creek Rd.	late 18 th to early 20 th centuries	SHPO Opinion 6/14/1993
1003	Eldridge House	145 Seashore Rd.	1820	SHPO Opinion 9/14/1992
3874	Garden State Parkway Historic District	GSP Right-of-Way	1954	SHPO Opinion 10/12/2001
3054	Goshen Historic District	Delsea Drive	late 18 th to early 20 th centuries	SHPO Opinion 3/31/1993
3060	Great Channel Bridge	Stone Harbor Boulevard	1930	SHPO Opinion 3/8/1983
3055	Hand-Labrum Property	700 U.S. Route 9 North	1875-1900	SHPO Opinion 1/19/1996
3056	John H. Hand/Oliver Property	619 U.S. Route 9 North	late 1700's	SHPO Opinion 1/19/1996
2761	Harbor Bay Square Site (28-Cm-50)	Deep Creek	prehistoric, Late Woodland	SHPO Opinion 12/8/1999
1004	John Holmes House	Swainton, Shore Road	1755	NR: 6/12/1979 SR: 3/29/1979
3057	Thomas Leaming House	1845 U.S. Route 9 North	1706	NR: 8/1/1997 SR: 6/3/1997
1005	New Asbury Methodist Episcopal Meetinghouse	Shore Road (U.S. Route 9)	1852	NR: 9/17/1980 SR: 4/18/1980
1006	Old Cape May County Court House Building	North Main Street (U.S. Route 9)	1848	NR: 12/22/1981 SR: 10/29/1981
1007	Railroad Bridge	Railroad over Scotch Bonnet Creek	late 19 th century	SHPO Opinion 4/29/2004
314	The remnant sluice system	south of Green Creek	17 th to 19 th centuries	SHPO Opinion 4/29/2004
4548	Whitesboro School	East Main Street	1908	SHPO Opinion 8/17/2005
3954	Dr. John Wiley House	2 North Main Street	1854	SR: 12/20/2001 NR: 2002

See the Cultural Resources map for the location of resources in Middle Township.



5.4 OPEN SPACE / PUBLIC LAND

Open space is defined, for the purpose of this inventory, as undeveloped land that is permanently deed restricted. The presence of open space confers social, economic and ecological benefits to municipalities that preserve and protect it. Much of the tourist industry in coastal municipalities is based on the presence of public open space containing beaches, dunes and fishable waters. Extensive wetlands attract birds and birdwatchers and provide habitat for the juveniles of many commercial and sport fish species. These wetlands can act as a buffer and can mitigate impacts of storm events and floods by removing pollutants from stormwater from paved areas before it enters water bodies (Kane nd).

Cape May County has established a trust fund to preserve open space and agricultural lands. The Trust is funded by a County property tax of 1 cent per 100 dollars of assessed valuation and currently generates approximately 1.3 million dollars a year. Since its inception, the program has preserved approximately 3,000 acres of open space and farmland (almost 5 square miles) in the County.

The Cape May County Open Space and Farmland Preservation Department has a map showing existing areas of open space and preserved farmland throughout the County. As of May 2010, there were 23 properties with over 1,700 acres in farmland preservation in Middle Township. Additionally, the County of Cape May had preserved over 1,480 acres of open space in Middle Township.

Table 40: Preserved Farmland in Middle Township			
Block	Lot	Identifier	Acreage
1	7	Lindemon, James N & Veronica G	70.48
1	8	John Jr. Wheeler	107.34
1	17.02	USDA	86.97
1	20	USDA	23.31
1	24	James Redmond	126.06
1	31	James Kane	127.84
2	8	Barbara Kozak	139.09
5	16	Raker/James	96.16
5	21	M. Tomlin, (Wheeler Sr.)	45.57
5	39	James Hazlett	28.04
5	111	Hand	44.62
38.01	12	Gregory Meranshian	114.04
43	9	Barber, Gary & Lucille	18.14
51	67	Schlender, Holly H	18.18
55.01	43	Carlough, Robert J & Linda L	44.79
55.01	56	Frederick Schlender	36.44
115.01	6-9	Klein	267.48
163.01	277	William Eckstein	11.97
348.03	38.08	Nicole-Kirstie LLC	20.40
388	19.01	Nancy Shivers	190.55
472	25	Arthur Conover	28.96
472	42	P. Church, (Hoff)	58.45
1414.01	2	M. Mattera (Pagano)	59.30



As of May 2010, much of the State lands preserved in Middle Township consisted of protected watershed management areas, including the Cape May Wetlands in the east, Dennis Creek in the northwest, Beaver Swamp and Lizard Tail Swamp in the north. The Dennis Creek Wildlife Management Area encompasses over 3,000 acres within the Township, the Beaver Swamp Wildlife Management Area is made up of over 1,800 acres, and the Cape May Wetlands Wildlife Management Area is comprised of approximately 7,400 acres.

Additional areas include the Frye Preserve, a 211-acre parcel owned by the New Jersey Lands Trust and the Cape May National Wildlife Refuge, located on Kimbles Beach Road, which is considered to be the second largest concentration of shorebirds in the County (Middle Township Planning Board 2003). This refuge provides wintering habitat for a variety of migratory raptors.

Other additional areas protected within the municipality include the Cape May Wetlands State Park located in the northeast and Shorebird preserves (Jarvis, Charles Foster and Carl Foster) located in the southwest. Small areas located in the eastern portion of the site, inland of the tidal wetlands and within the tidal wetlands, are classified as protected greenways, associated with the Cape May Wetlands. Other areas along the east coast of Middle Township are protected for miscellaneous reasons, but not listed by the NJDEP iMap.

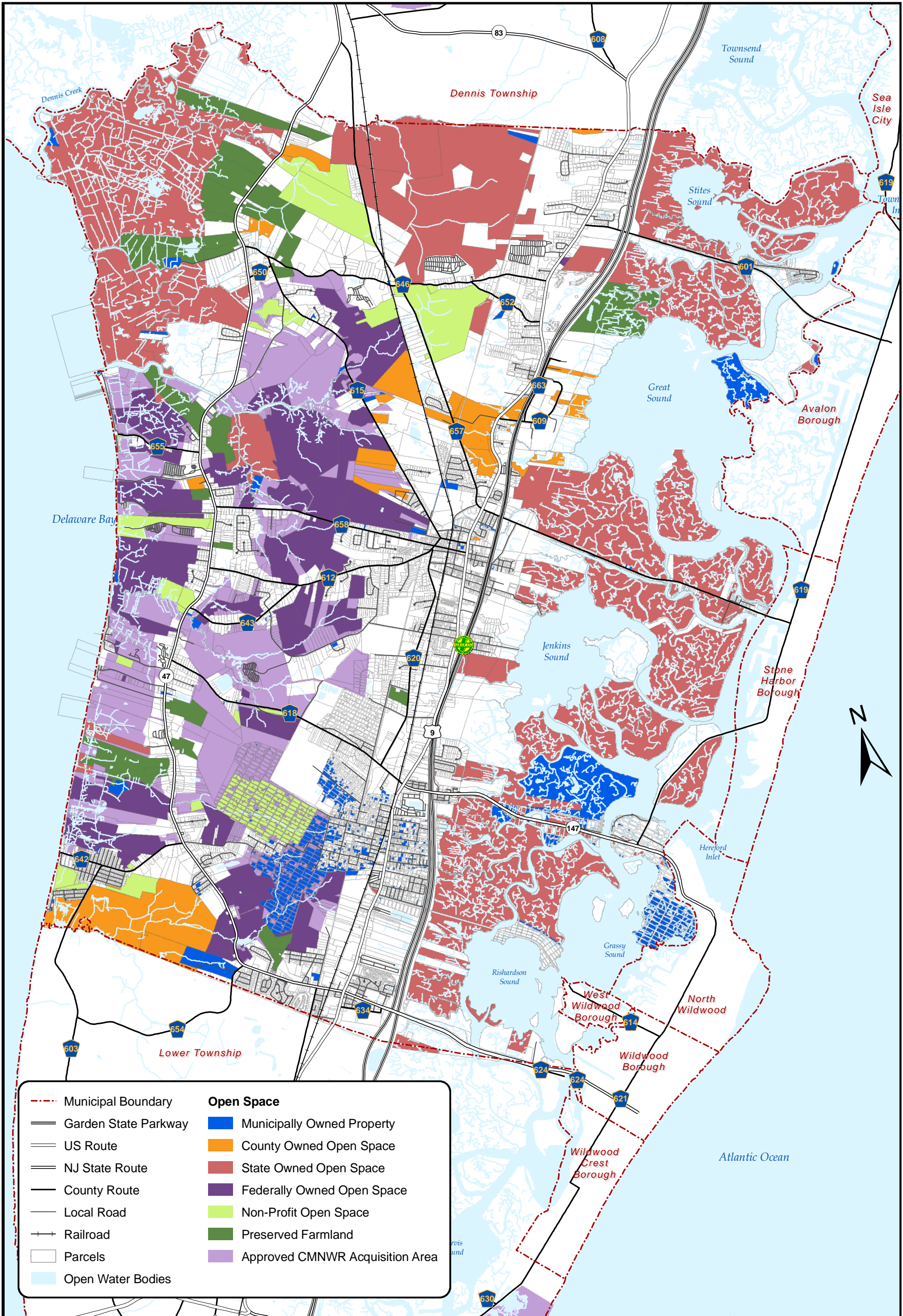
Table 41: State Lands in Middle Township	
Identifier	Acreage
Beaver Swamp	1,819.30
Cape May Wetlands	7,393.91
Dennis Creek	3,068.76
Frye Preserve	211.58
Great Sound	81.95
Lizard Tail Swamp	41.53
Shorebird	22.02
Other	13.12

In response to the National Wildlife Refuge System Administration Act of 1966 and subsequent National Wildlife Refuge System Improvement Act of 1997, the U.S. Fish & Wildlife Service (USFWS) adopted the *Cape May National Wildlife Refuge (CMNWR) Comprehensive Master Plan (CMP)* on June 16, 2004 in order to establish priorities and to ensure consistent and integrated management for the CMNWR. The Cape May National Wildlife Refuge (CMNWR) was established in January 1989 when the U.S. Fish and Wildlife Service acquired the Refuge's first (90-acre) parcel from the Nature Conservancy. Since then, the Refuge has grown to more than 11,000 acres as the Service continues to buy land. Ultimately the Refuge will protect over 21,200 acres of precious wildlife habitat in New Jersey's Cape May Peninsula. CMNWR's key location in the Atlantic Flyway makes it an important link in the vast nationwide network of National Wildlife Refuges administered by the U.S. Fish & Wildlife Service. The Delaware Bay wetlands are one of only 17 designated Wetlands of International Importance in the United States.



The Delaware Bay Division of the CMNWR is located within Middle Township along the Delaware Bay. Currently over 4,000 acres have been acquired within Middle Township. This area contains many important habitat types, such as salt marsh, forested uplands, forested wetlands and vernal pools, shrub/scrub, and grasslands. Each spring, the Delaware Bay hosts the second largest concentration of migrating shorebirds in North America. The Delaware Bay Division remains an exceptionally significant area for horseshoe crab spawning as well as shorebird feeding and roosting. The Delaware Bay Division also attracts large numbers of waterfowl, marsh birds, raptors songbirds, reptiles and amphibians. The approved acquisition area for the Delaware Bay Division encompasses over 9,900 acres of land in Middle Township.

The Open Space map shows the breakdown of existing open space areas located within Middle Township. This includes Federal, State, County and Municipal open space areas, as well as preserved farmland locations throughout the municipality. The majority of preserved open space consists of State-owned land.



- | | |
|----------------------|---------------------------------|
| Municipal Boundary | Open Space |
| Garden State Parkway | Municipally Owned Property |
| US Route | County Owned Open Space |
| NJ State Route | State Owned Open Space |
| County Route | Federally Owned Open Space |
| Local Road | Non-Profit Open Space |
| Railroad | Preserved Farmland |
| Parcels | Approved CMNWR Acquisition Area |
| Open Water Bodies | |

0 5,000 10,000 15,000

Feet

OPEN SPACE
TOWNSHIP OF MIDDLE
CAPE MAY COUNTY NEW JERSEY



MAY 2010

THIS MAP WAS DEVELOPED USING CAPE MAY COUNTY AND NJDEP DIGITAL DATA.
THIS SECONDARY PRODUCT HAS NOT BEEN VERIFIED AND IS NOT COUNTY OR STATE
AUTHORIZED.

Parks and Recreation Areas:

According to the NJDEP Green Acres Program Recreation and Open Space Database, multiple parks and recreation areas are located within the municipality. The 2003 Township Master Plan lists the following areas as recreational facilities within Middle Township:

Table 42: Recreational Areas within Middle Township (NJDEP Green Acres 2006)				
Block	Lot	Name	Acreage	Location
99.02	41, 42, 45.05	Cape May County Park	120	Route 9
77	6	Clarence Davies Sports Complex	55	626 Goshen Road
937	1-20, 22, 24-36, 38	Martin Luther King Center	3.6	207 West Main Street
1421	10.01	Rio Grande Park	2.6	North Railroad Avenue
0	0	Shellbay Waterfront Park	0.22	Shellbay Avenue
466.01	37.03	Fort Apache	81.6	Fulling Mill Road
0	0	Bidwells Jetty	0.5	Bidwells Creek
0	0	Goshen Mini Park	1	Route 47
0	0	Bike Path	3.5	Davies Sports Complex to County Park and 4H Grounds and to Church St.

The most famous of all the recreational areas is Cape May County Park and Zoo, which consists of over 200 acres with natural forests, picnics areas, biking and walking paths, fishing ponds, and playgrounds. Within these 200 acres is a nearly 80 acre zoo consisting of almost 550 different animals (with nearly 200 different animal species) (Cape May County website, 2001-2007).

The Township also operates and maintains additional recreational and park areas including multiple softball and baseball fields, tennis courts, playgrounds, soccer fields, volleyball courts, nature trails, basketball courts and hockey rinks (Master Plan, 2003). According to the National Recreation and Park Standards, the Township is currently meeting the majority of the recreational needs for a community of its size.

5.5 AESTHETIC RESOURCES

Both the natural and the constructed environmental are components of the aesthetic resources available in Middle Township. Intact historical buildings, with their varied architectural styles provide a human historic context. Such structures are numerous in Middle Township. Perhaps more striking is the natural setting of Middle Township. Separating the inland with the barrier island are marshes, bays and many protected lands with special habitats and great natural diversity. Protected lands, such as the Cape May Wetlands, lie within Middle Township. Other areas listed within the Natural Heritage Priority Sites are discussed previously in greater detail. These nearby special places provide environments to be shared by residents and visitors alike.

Scenic resources are present at many scales. Long distance vistas encompass ocean, beaches and dunes or extensive saltmarsh and bay views present an individual with an unstructured opportunity for peace and relaxation. The natural plant and animal populations, natural ecosystems, as intermittent ponds and fens provide for a smaller scale appreciation of beauty. These resources are valuable in their own right, but also have value because they are beautiful and provide a unique sense of place.

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