

# ENVIRONMENTAL RESOURCE INVENTORY



*Submitted To:*  
**Barnegat Township  
Environmental Commission**



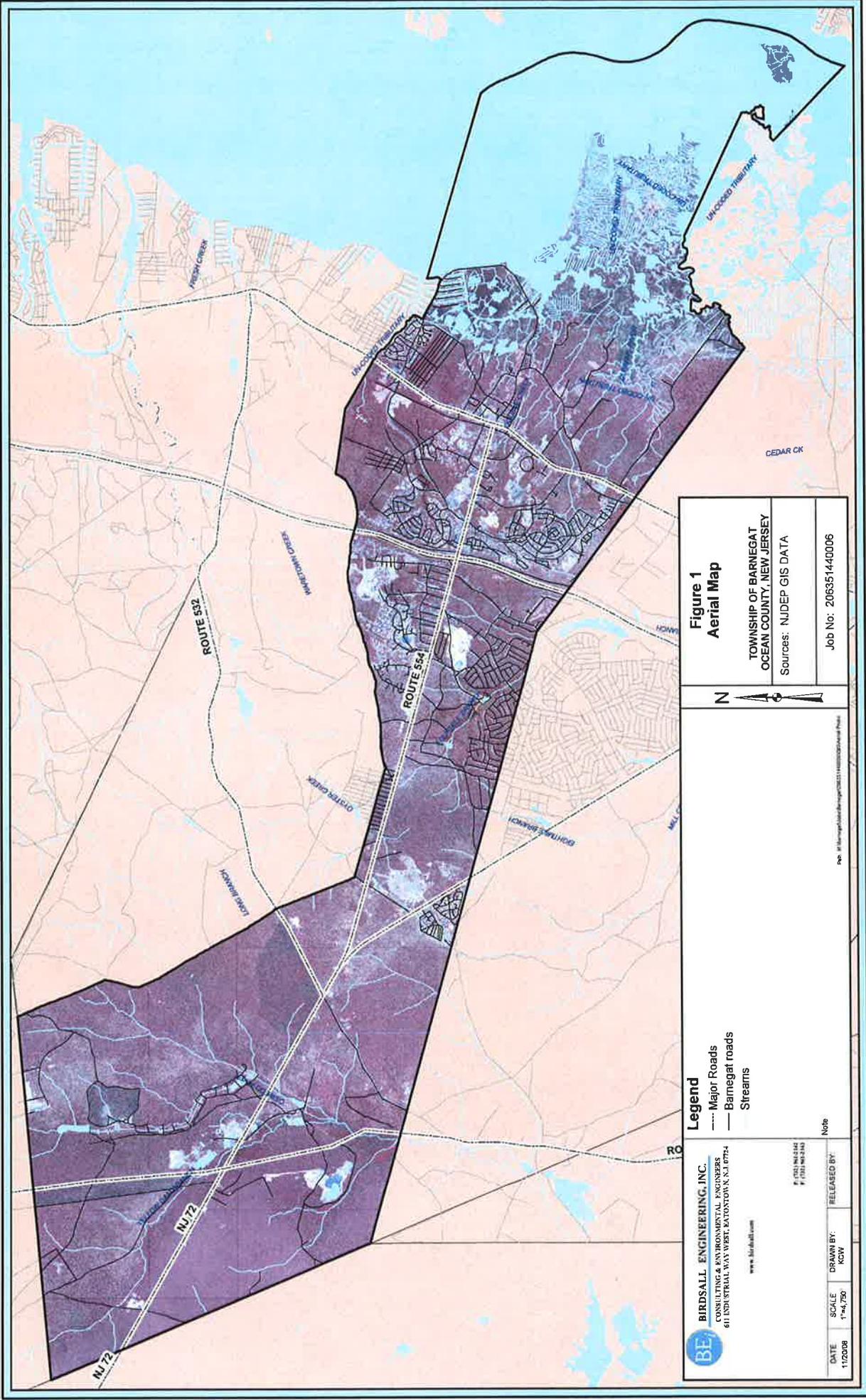
*Submitted By:*  
**Birdsall Engineering, Inc.**

*March 2009*



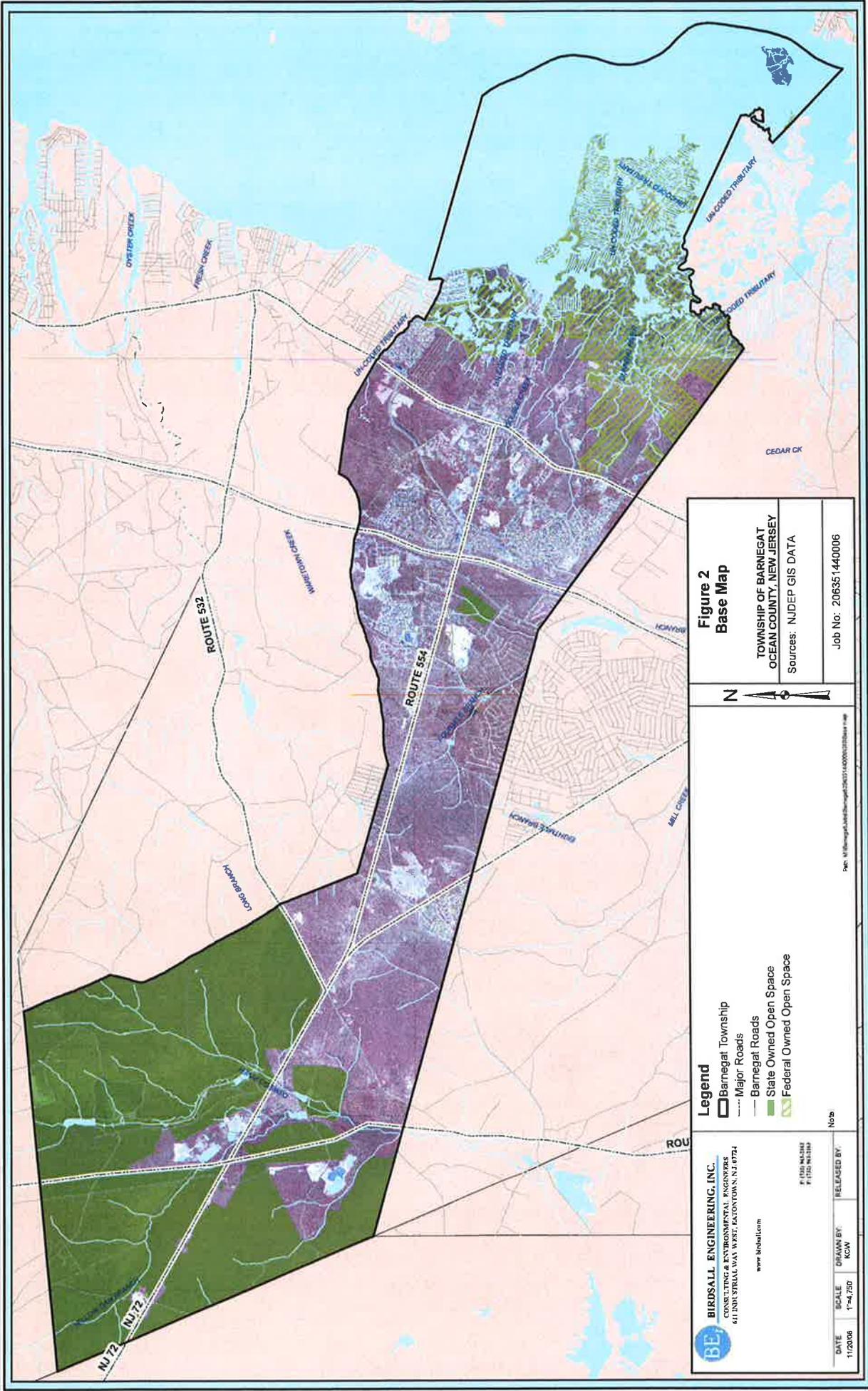
# Barnegat Township

## Figure 1: Aerial Photo (2002)



**Figure 2: Base Map**

**Barnegat Township**

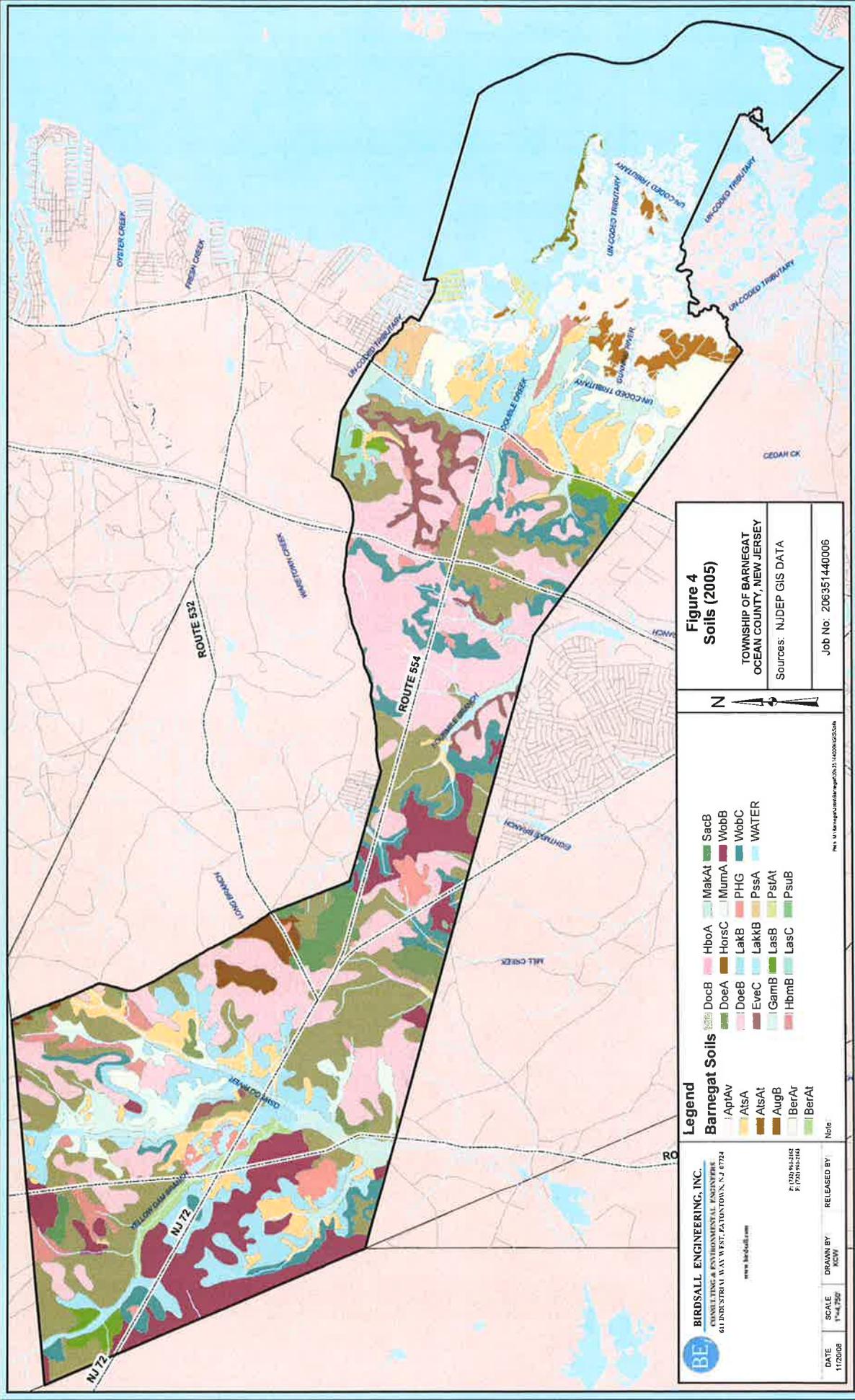


	<p><b>Legend</b></p> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black; margin-right: 5px;"></span> Barnegat Township</li> <li><span style="display: inline-block; width: 15px; border-bottom: 1px solid black; margin-right: 5px;"></span> Major Roads</li> <li><span style="display: inline-block; width: 15px; border-bottom: 1px dashed black; margin-right: 5px;"></span> Barnegat Roads</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #90EE90; margin-right: 5px;"></span> State Owned Open Space</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #ADD8E6; margin-right: 5px;"></span> Federal Owned Open Space</li> </ul>		<p><b>Figure 2</b> <b>Base Map</b></p> <p>TOWNSHIP OF BARNEGAT OCEAN COUNTY, NEW JERSEY Sources: NJDEP GIS DATA</p>
	<p>DATE: 11/2008</p> <p>SCALE: 1"=4,750'</p> <p>DRAWN BY: KCV</p> <p>RELEASED BY:</p>	<p>Job No: 206351440006</p>	<p>Page: 11   Barnegat Township   11/20/08 10:58 AM</p>

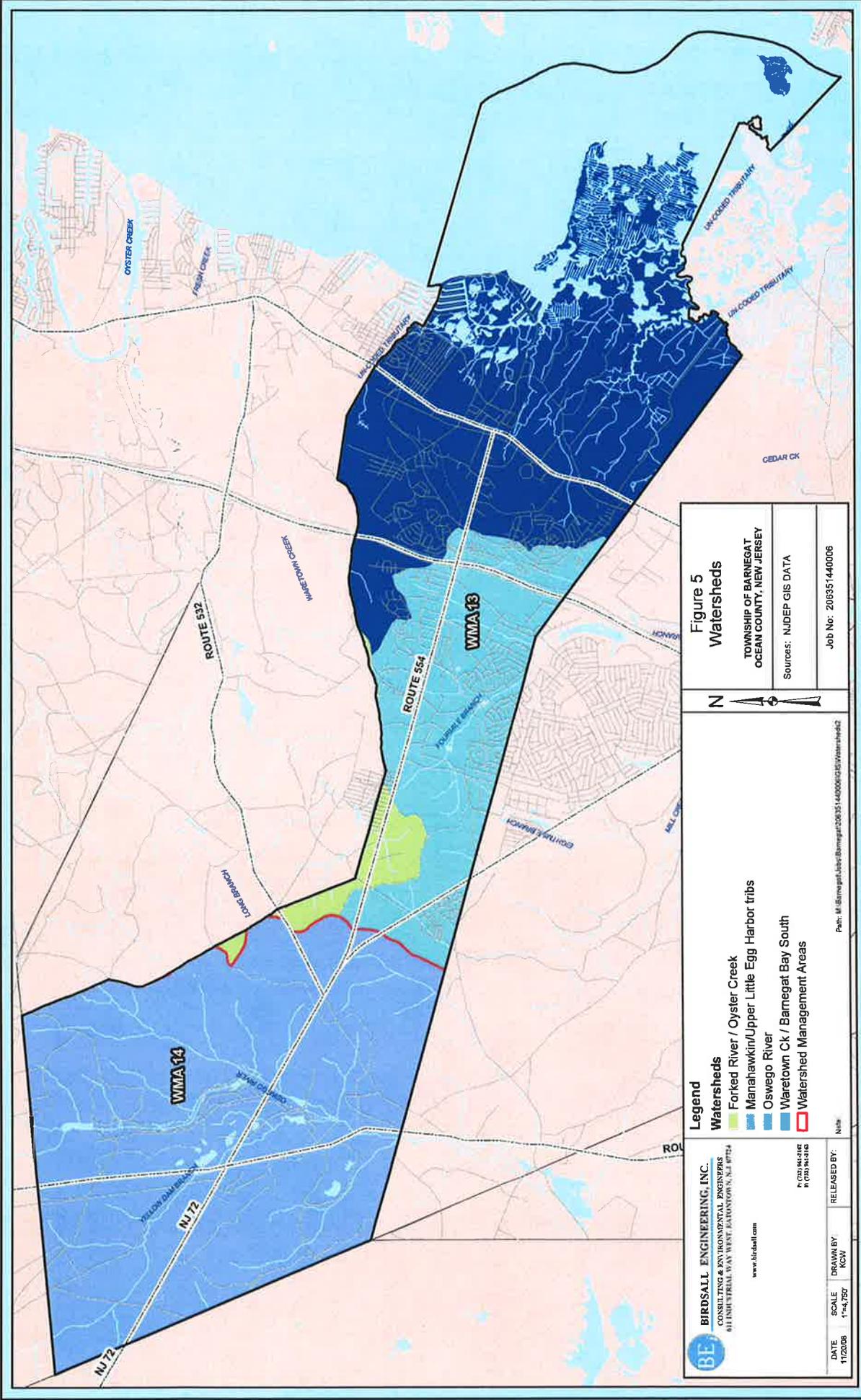


**Barnegat Township**

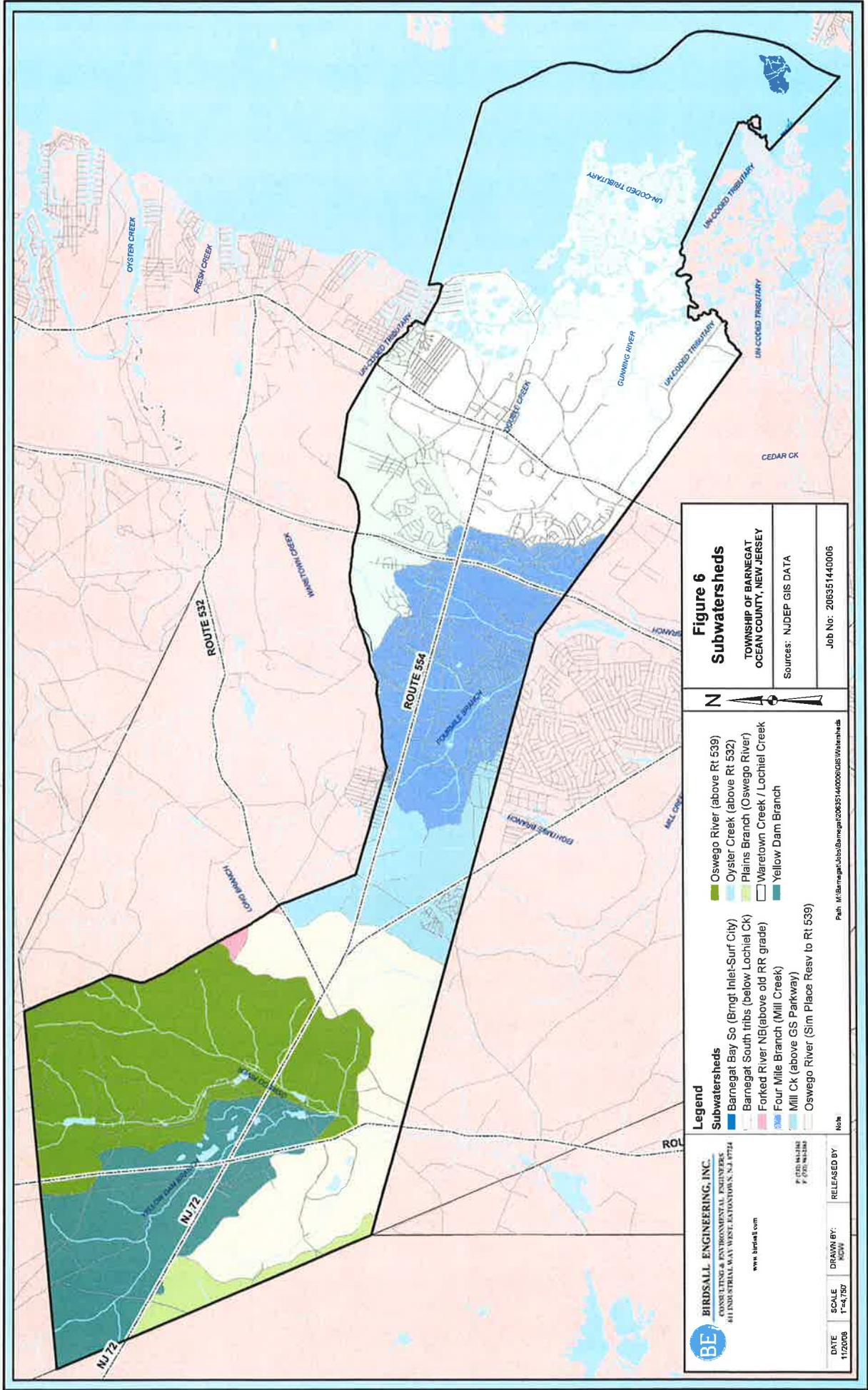
**Figure 4: Soils (2005)**



<p><b>BIRDSALL ENGINEERING, INC.</b> CONSULTING &amp; ENVIRONMENTAL ENGINEERS 61 INDUSTRIAL WAY WEST PATON TOWNSHIP, NJ 07724 www.birdsall.com</p>		<p><b>Figure 4</b> <b>Soils (2005)</b> TOWNSHIP OF BARNEGAT OCEAN COUNTY, NEW JERSEY Sources: NJDEP GIS DATA</p>	
<p>DATE: 11/20/08</p>		<p>Job No.: 206351440006</p>	
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<p>DRAWN BY: MCW</p>		<p>Per: M:\Barnegat\Soils\fig4_05_1100000250a</p>	



	<b>Legend</b> <b>Watersheds</b> Forked River / Oyster Creek Manahawkin/Upper Little Egg Harbor Oswego River Waretown Ck / Barnegat Bay South Watershed Management Areas	<b>Figure 5</b> <b>Watersheds</b> TOWNSHIP OF BARNEGAT OCEAN COUNTY, NEW JERSEY Sources: NJDEP GIS DATA	Job No: 206351440006
	DATE: 11/20/08 SCALE: 1"=4,352' DRAWN BY: KCV RELEASED BY:	Path: M:\Barnegat\Barnegat\206351440006\GIS\Watershed2	N 



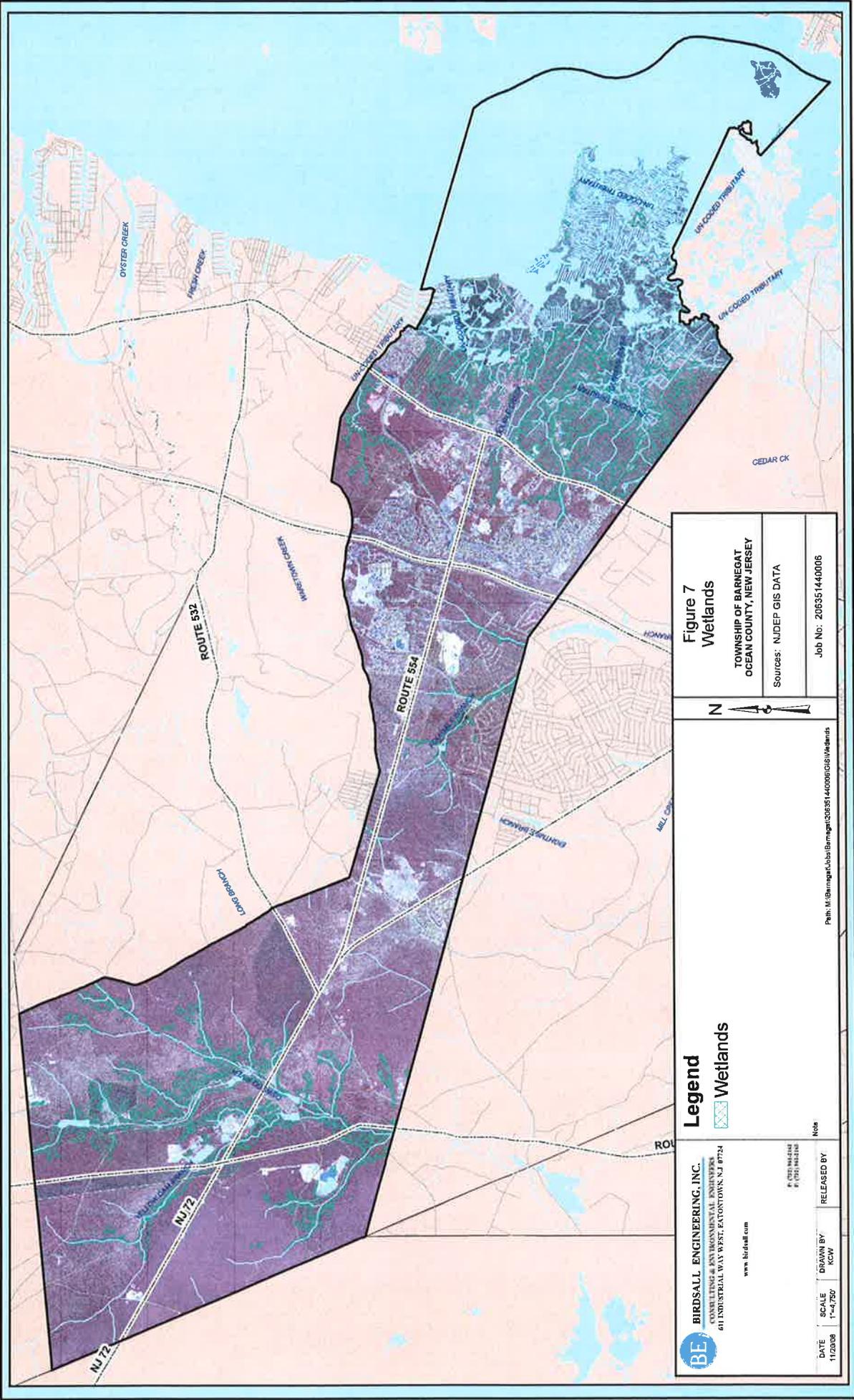
**Figure 6  
Subwatersheds**  
TOWNSHIP OF BARNEGAT  
OCEAN COUNTY, NEW JERSEY  
Sources: NJDEP GIS DATA  
Job No: 206351440006

**Legend**  
**Subwatersheds**  
 ■ Oswego River (above Rt 539)  
 ■ Oyster Creek (above Rt 532)  
 ■ Plains Branch (Oswego River)  
 ■ Waretown Creek / Lochiel Creek  
 ■ Yellow Dam Branch  
 ■ Barnegat Bay So (Brngt Inlet-Surf City)  
 ■ Barnegat South tribs (below Lochiel Ck)  
 ■ Forked River NB (above old RR grade)  
 ■ Four Mile Branch (Mill Creek)  
 ■ Mill Ck (above GS Parkway)  
 ■ Oswego River (Sim Place Resv to Rt 539)

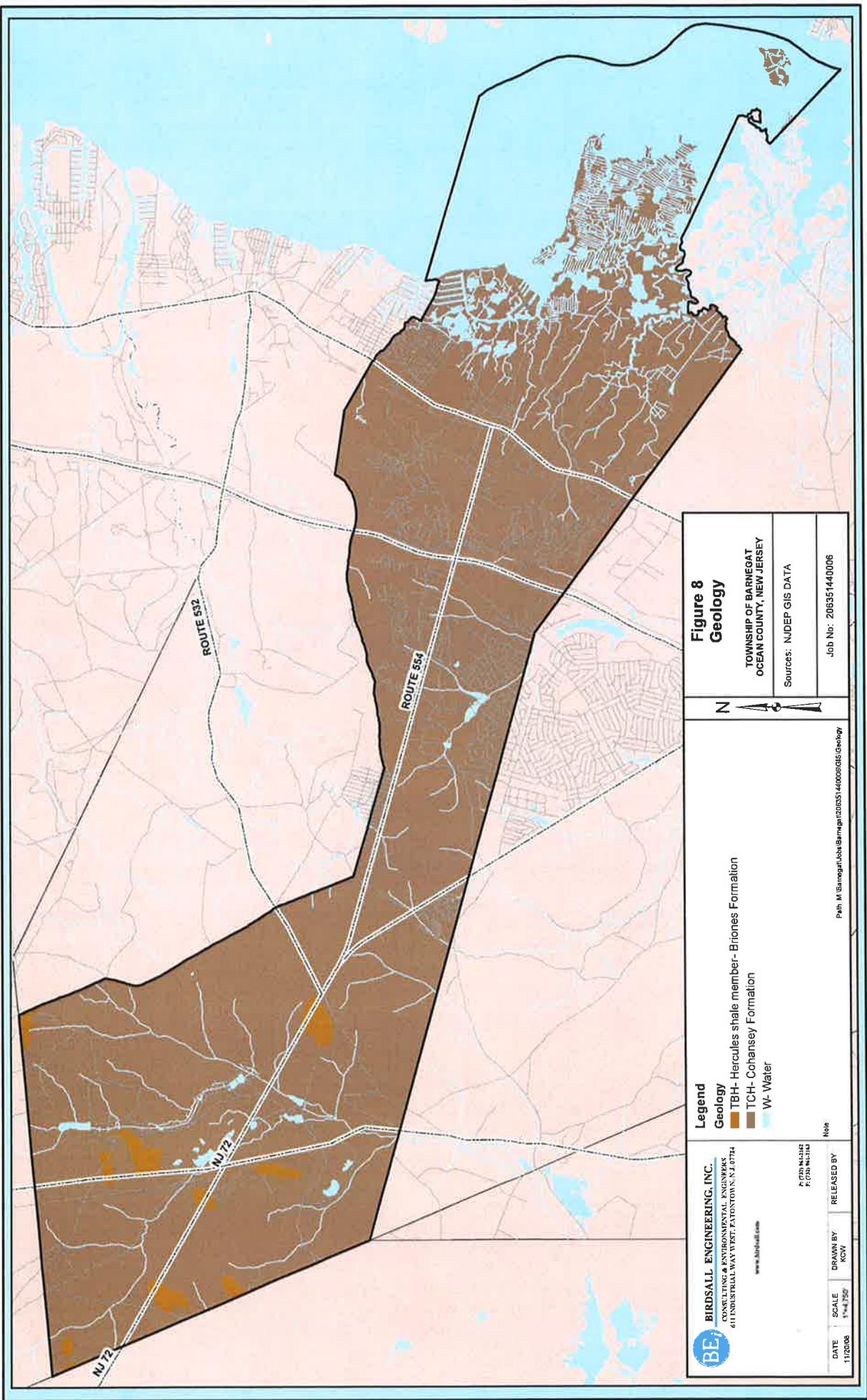
**BIRDSALL ENGINEERING, INC.**  
CONSULTING & ENVIRONMENTAL ENGINEERS  
411 INDUSTRIAL WAY WEST, EATONTOWN, NJ 07724  
www.birdsall.com  
P: 732.341.1818  
F: 732.341.2444

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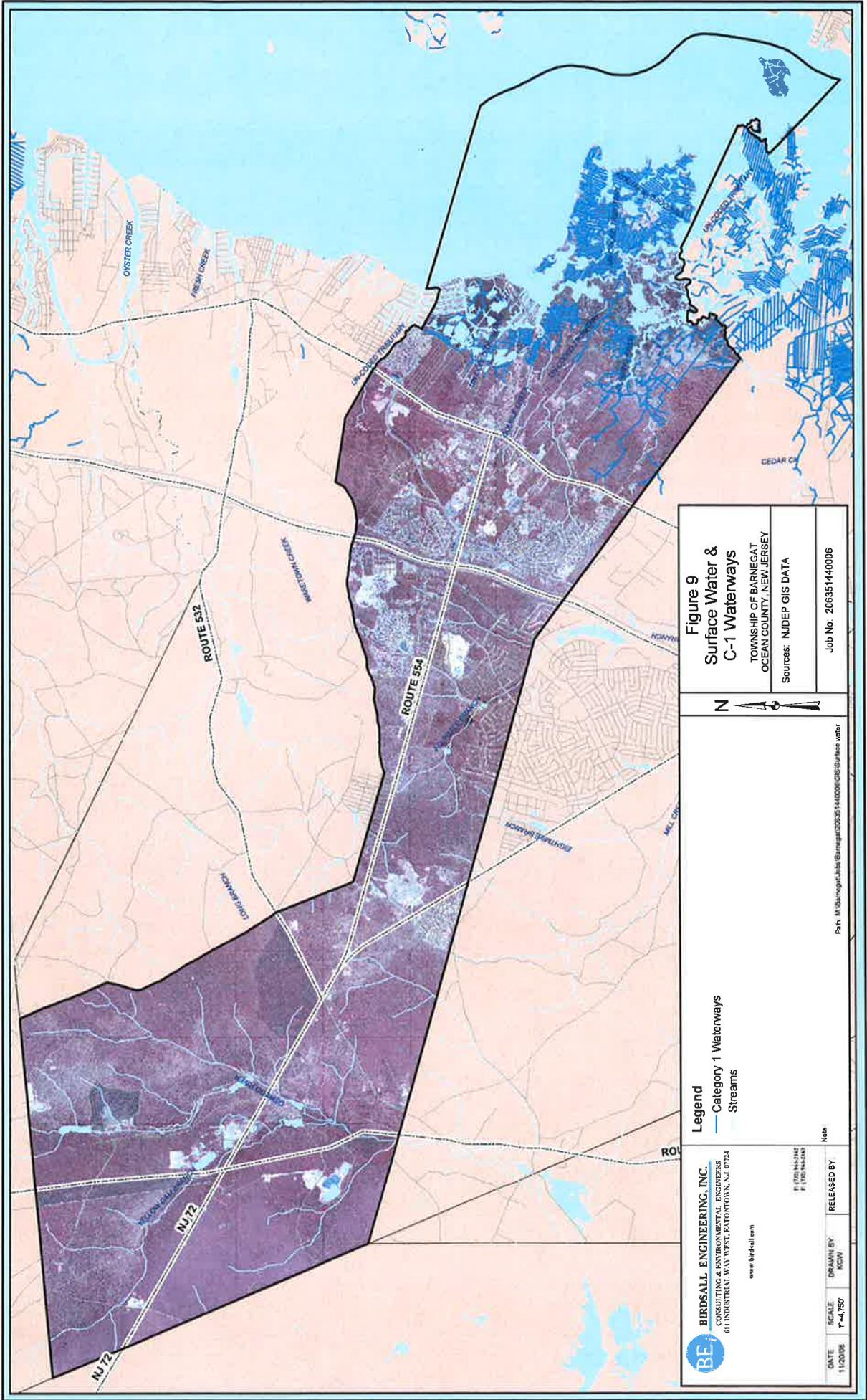


<b>BIRDSALL ENGINEERING, INC.</b> CONSULTING AND MANAGEMENT SERVICES 611 INDUSTRIAL WAY WEST, EATONTOWN, NJ 07724 www.birdsall.com	<b>Legend</b> Wetlands	<b>Figure 7</b> <b>Wetlands</b> TOWNSHIP OF BARNEGAT OCEAN COUNTY, NEW JERSEY Sources: NJDEP GIS DATA		Job No: 206351440006
		DATE 11/20/08	SCALE 1"=4,750'	DRAWN BY KCW

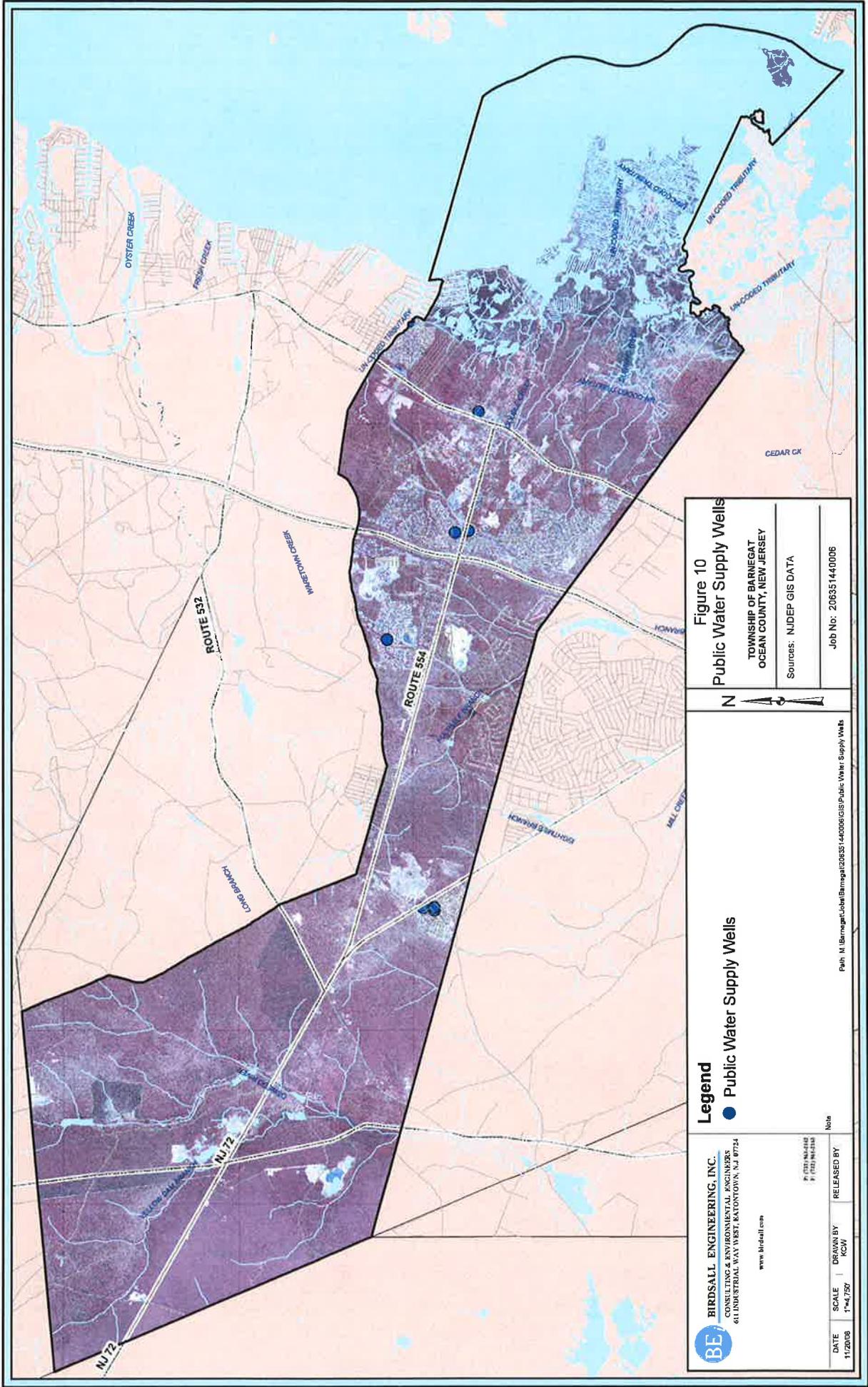


# Barnegat Township

# Figure 9: Surface Water & C-1 Waterways



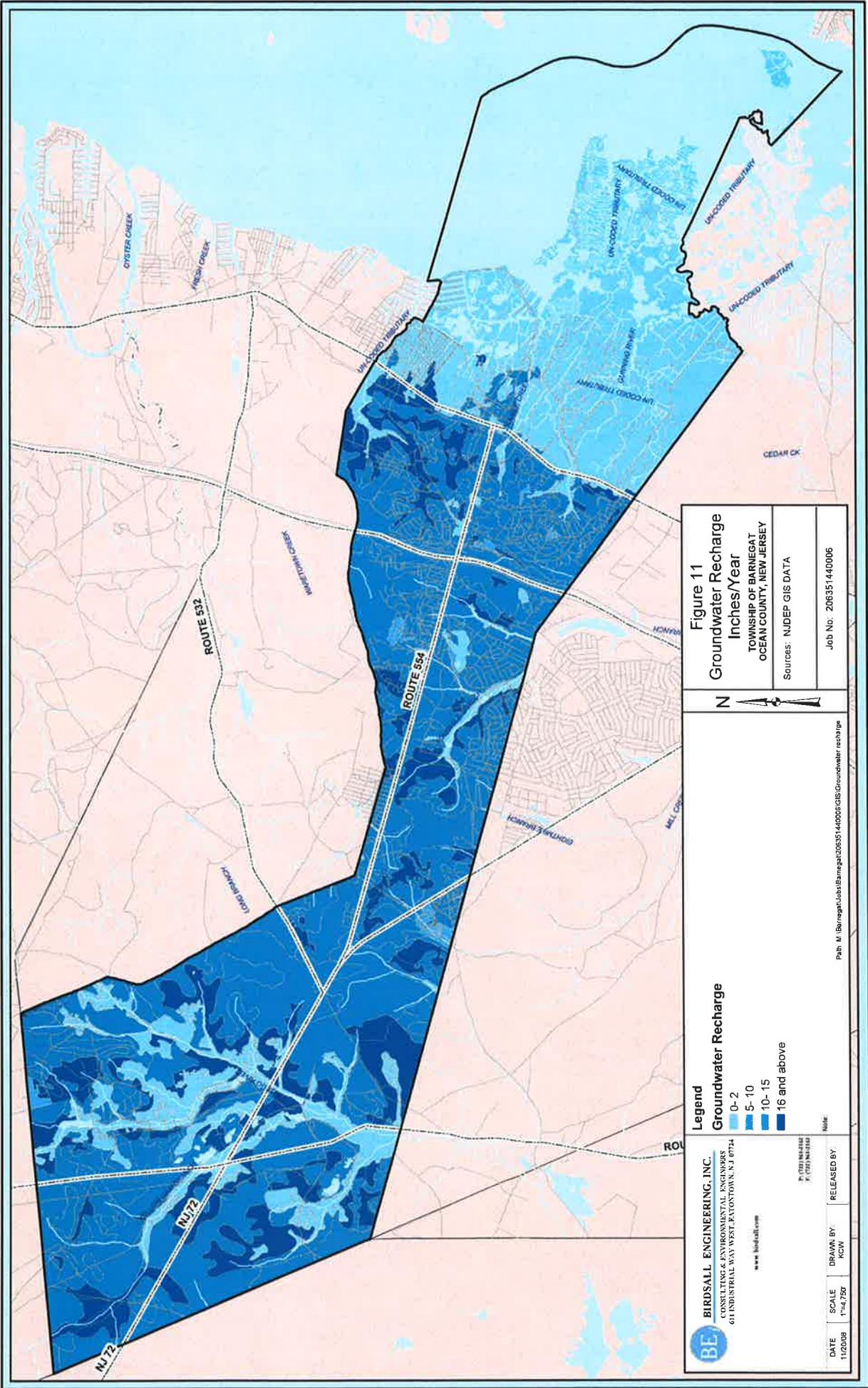
<p><b>BIRDSALL ENGINEERING, INC.</b> CONSULTING &amp; ENVIRONMENTAL ENGINEERS 601 INDUSTRIAL WAY WEST, PATONSPRING, NJ 07124</p> <p>www.birdsall.com</p> <p>P: (973) 944-2444 F: (973) 944-2440</p>	<p><b>Legend</b></p> <ul style="list-style-type: none"> <li>Category 1 Waterways</li> <li>Streams</li> </ul>	<p><b>Figure 9</b> <b>Surface Water &amp; C-1 Waterways</b></p> <p>TOWNSHIP OF BARNEGAT OCEAN COUNTY, NEW JERSEY</p> <p>Sources: NJDEP GIS DATA</p> <p>Job No. 206351440006</p>
	<p>DATE: 11/20/06</p> <p>SCALE: 1"=1/4"=250'</p> <p>DRAWN BY: KCM</p> <p>RELEASED BY:</p>	<p>North Arrow</p> <p>Path: M:\Storage\Jobs\Barnegat\206351440006\GIS\Surface Water</p>



<b>BIRDSALL ENGINEERING, INC.</b> CONSULTING & ENVIRONMENTAL ENGINEERS 611 INDUSTRIAL WAY WEST, KANTON TOWN, NJ 07724 www.birdsall.com	<b>Legend</b> ● Public Water Supply Wells	<b>Figure 10</b> <b>Public Water Supply Wells</b> TOWNSHIP OF BARNEGAT OCEAN COUNTY, NEW JERSEY Sources: NJDEP GIS DATA Job No.: 206351440006
	DATE: 11/20/08 SCALE: 1"=4,750' DRAWN BY: KOW RELEASED BY:	Note: Path: H:\Barnegat\Label\Barnegat\20851440006\GIS\Public Water Supply Wells

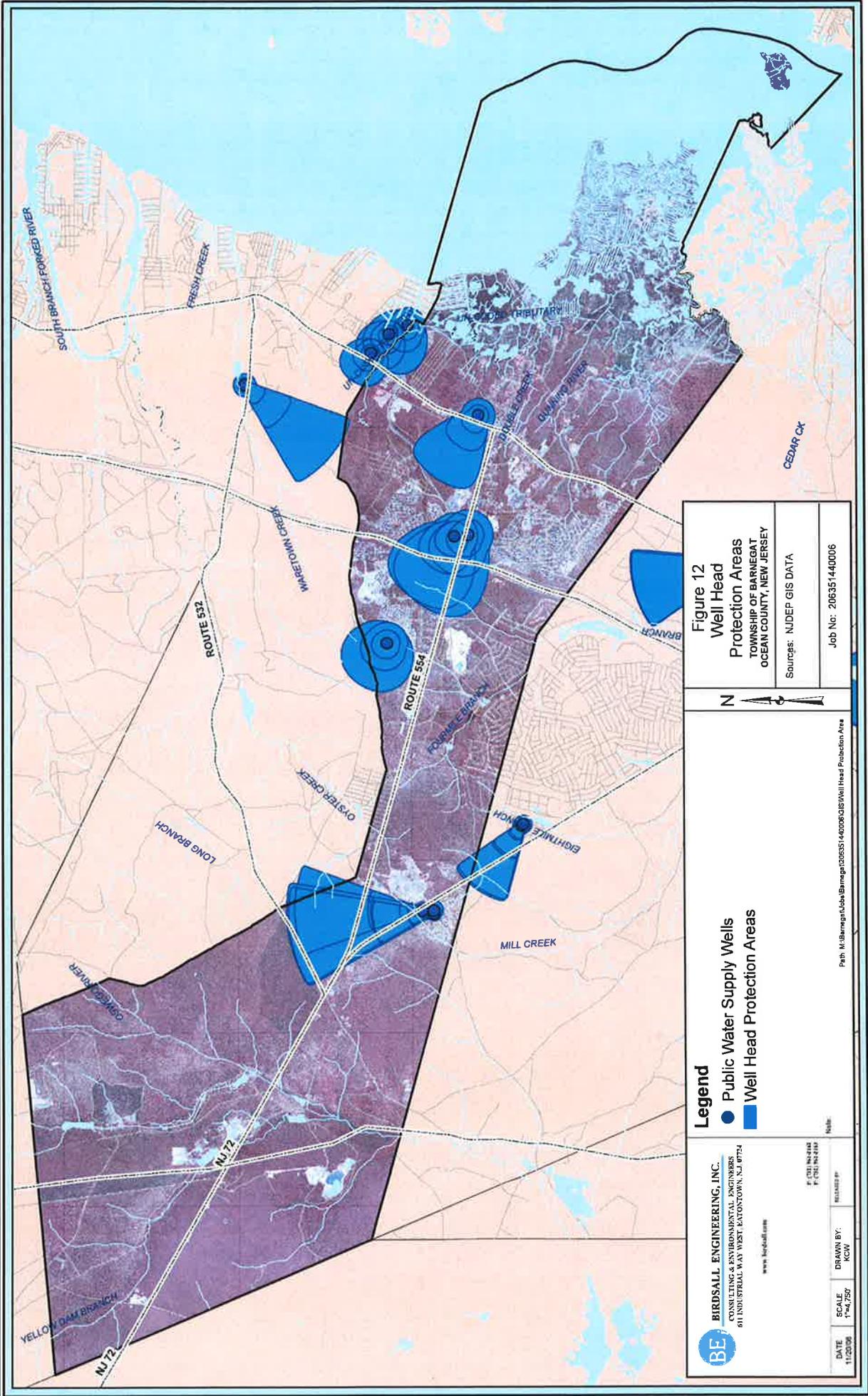
**Figure 11: Groundwater Recharge (Inches/year)**

**Barnegat Township**



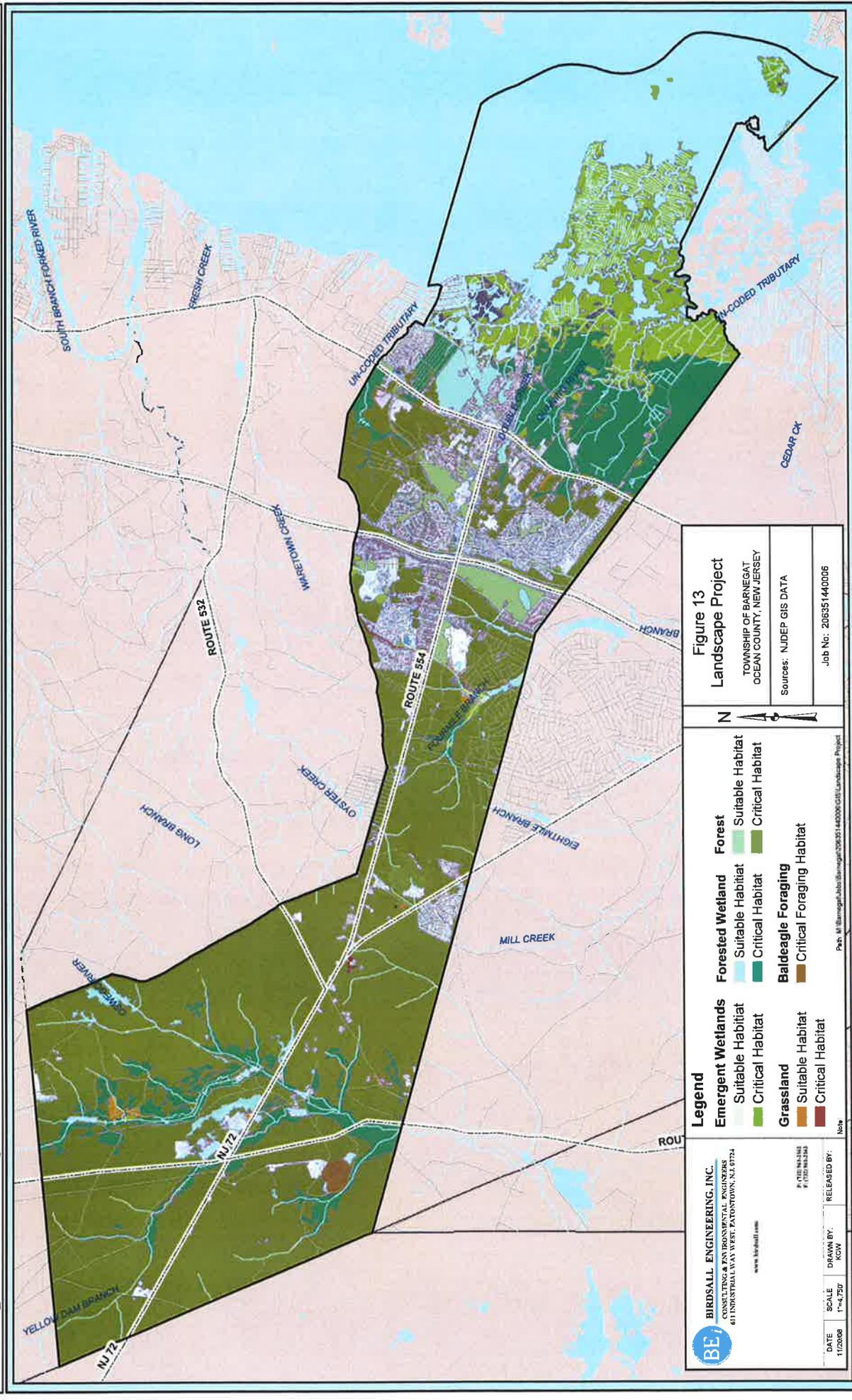
# Barneгат Township

## Figure 12: Well Head Protection Areas



**Figure 13: Landscape Project**

**Barnegat Township**

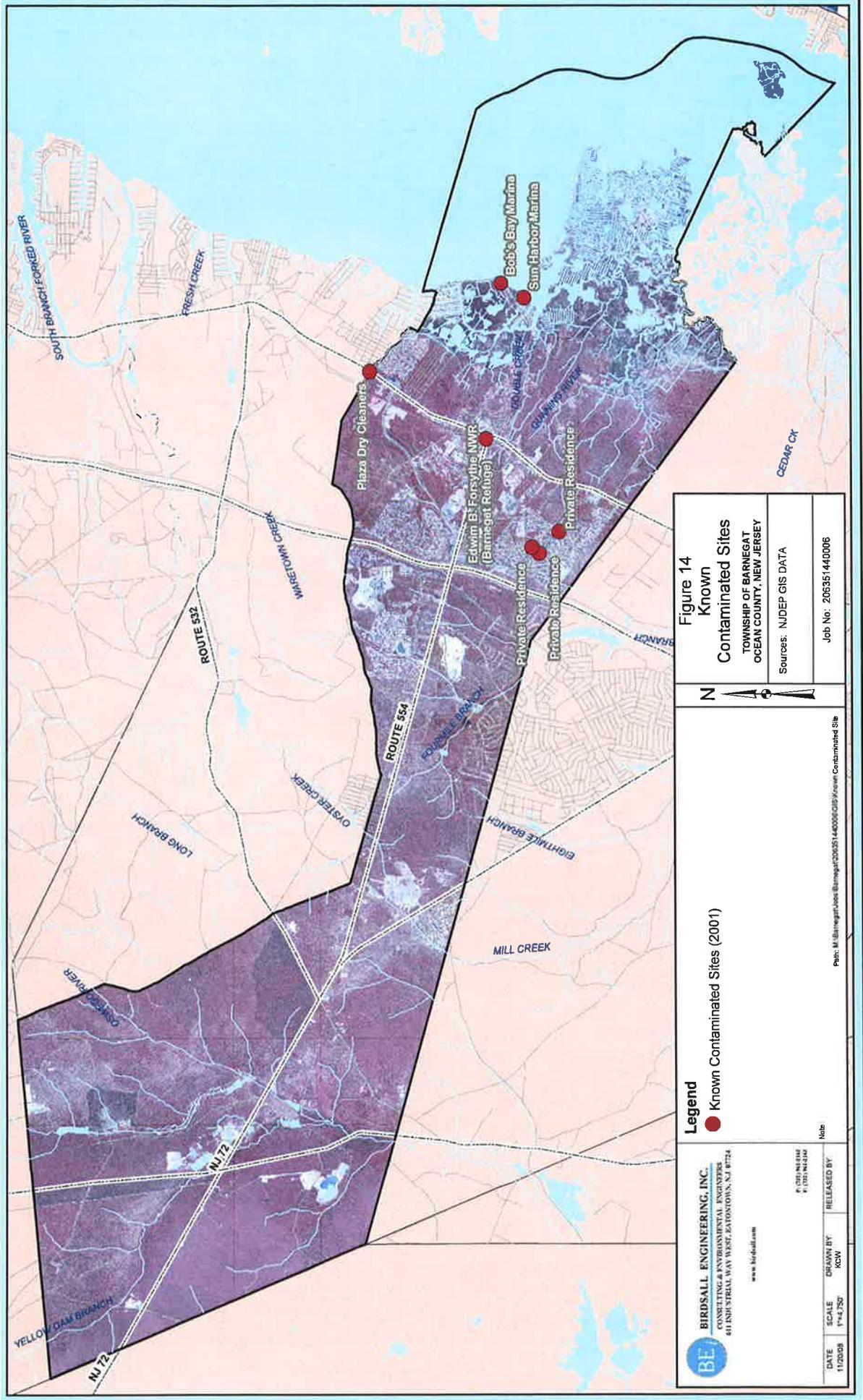


<p><b>BIRDSALL ENGINEERING, INC.</b> CONSULTING ENVIRONMENTAL ENGINEERS 41 INDUSTRIAL WAY WEST, PATON TOWN, N.J. 0724 www.birdsall.com</p>	<p><b>Legend</b></p> <table border="0"> <tr> <td> Emergent Wetlands</td> <td> Forested Wetland</td> <td> Forest</td> </tr> <tr> <td> Suitable Habitat</td> <td> Suitable Habitat</td> <td> Suitable Habitat</td> </tr> <tr> <td> Critical Habitat</td> <td> Critical Habitat</td> <td> Critical Habitat</td> </tr> <tr> <td> Grassland</td> <td> Baldeagle Foraging</td> <td> Baldeagle Foraging Habitat</td> </tr> <tr> <td> Suitable Habitat</td> <td> Critical Foraging Habitat</td> <td> Critical Foraging Habitat</td> </tr> <tr> <td> Critical Habitat</td> <td></td> <td></td> </tr> </table>		Emergent Wetlands	Forested Wetland	Forest	Suitable Habitat	Suitable Habitat	Suitable Habitat	Critical Habitat	Critical Habitat	Critical Habitat	Grassland	Baldeagle Foraging	Baldeagle Foraging Habitat	Suitable Habitat	Critical Foraging Habitat	Critical Foraging Habitat	Critical Habitat		
	Emergent Wetlands	Forested Wetland	Forest																	
Suitable Habitat	Suitable Habitat	Suitable Habitat																		
Critical Habitat	Critical Habitat	Critical Habitat																		
Grassland	Baldeagle Foraging	Baldeagle Foraging Habitat																		
Suitable Habitat	Critical Foraging Habitat	Critical Foraging Habitat																		
Critical Habitat																				
<p>DATE: 11/20/08 SCALE: 1"=4,750' DRAWN BY: ACW RELEASED BY:</p>	<p>Figure 13 Landscape Project TOWNSHIP OF BARNEGAT OCEAN COUNTY, NEW JERSEY Sources: NJDEP GIS DATA Job No: 206351440006</p>																			

Part of Barnegat Township Landscape Project  
Job No: 206351440006

**Barnegat Township**

**Figure 14: Known Contaminated Sites**



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Job No: 206351440006

**Legend**  
 ● Known Contaminated Sites (2001)

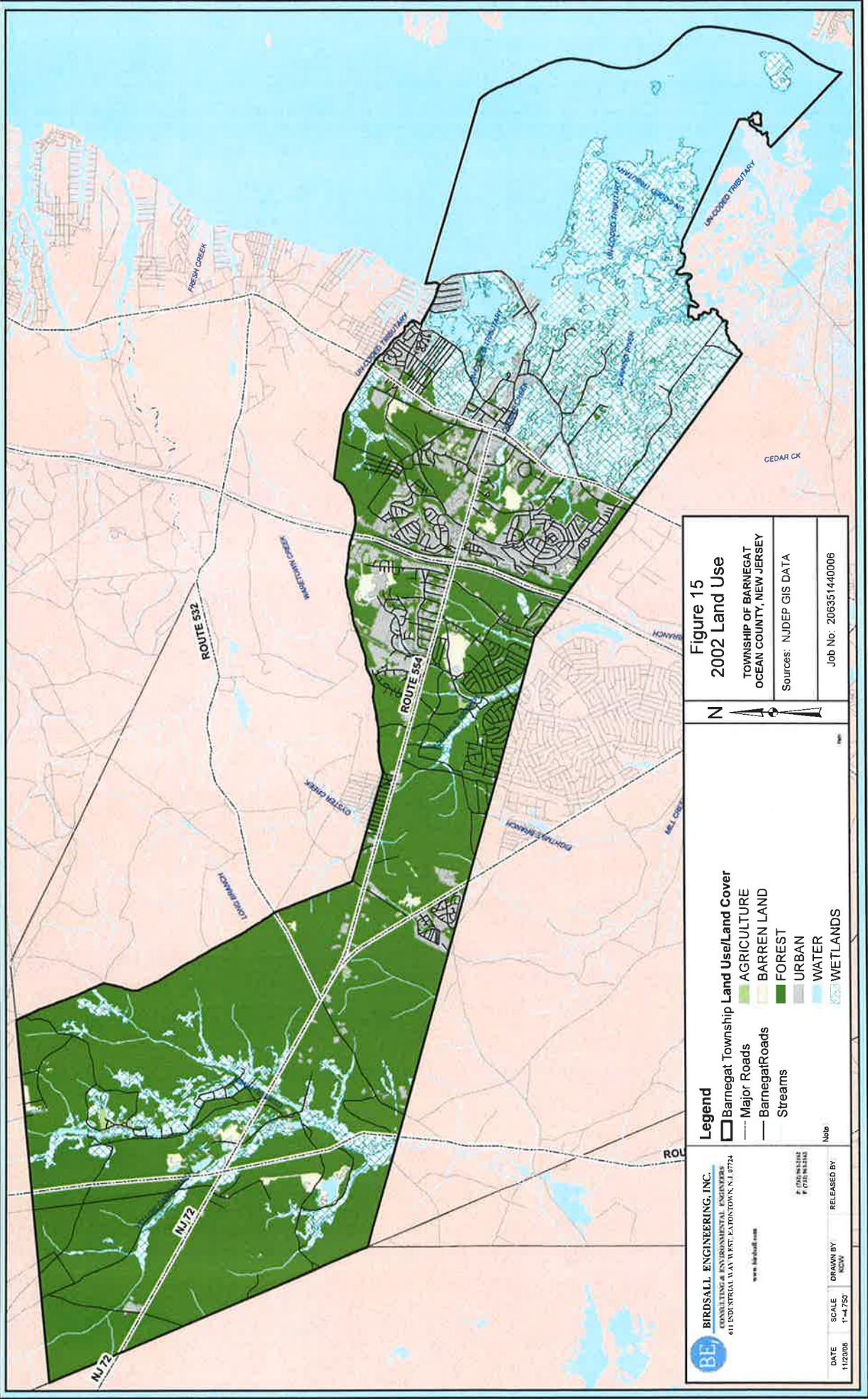
Path: M:\Barnegat\Jobs\Barnegat\2008\1440006\GIS\Known Contaminated Site

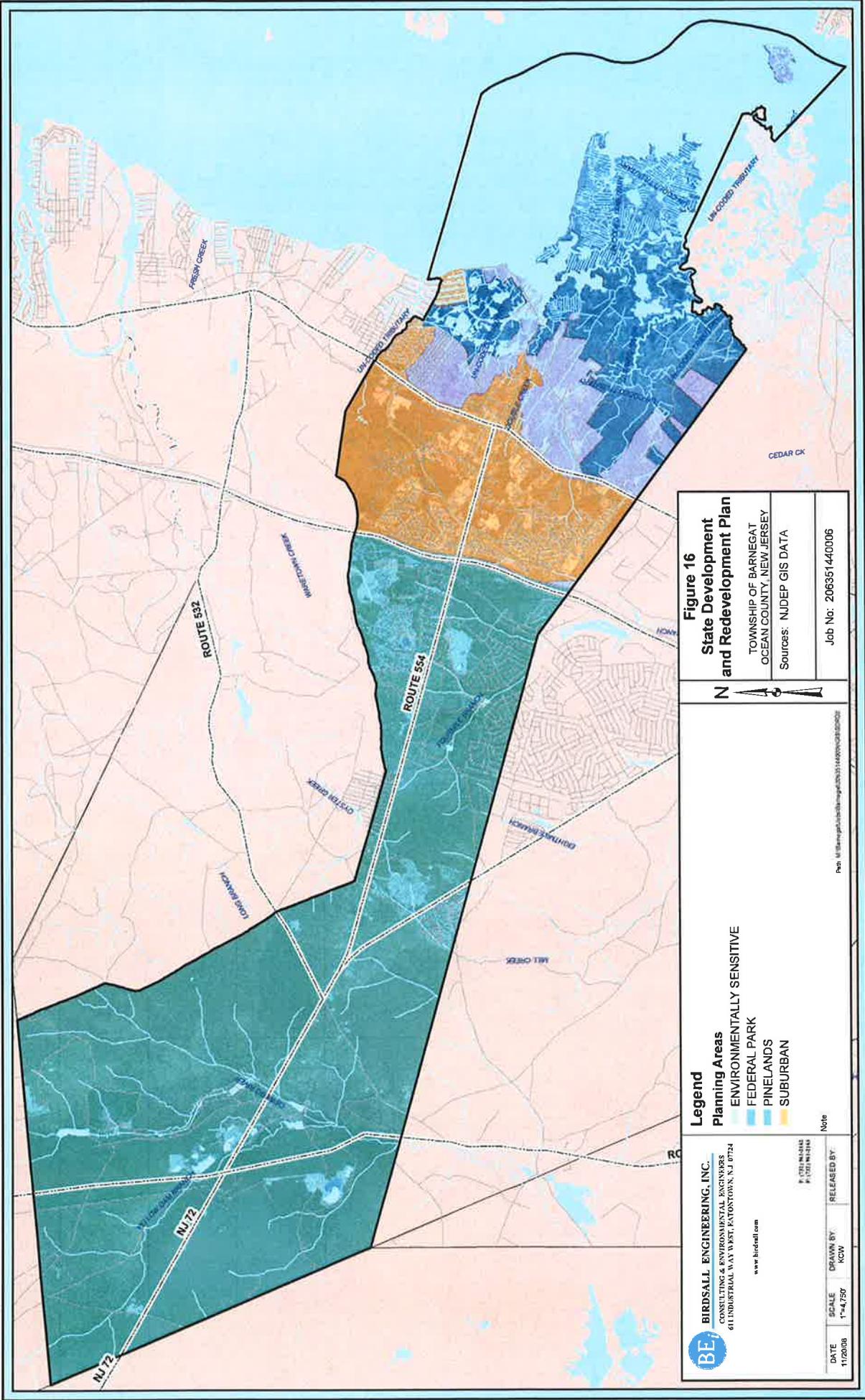
**Figure 14**  
**Known Contaminated Sites**  
 TOWNSHIP OF BARNEGAT  
 OCEAN COUNTY, NEW JERSEY  
 Sources: NJDEP GIS DATA

Job No: 206351440006

# Barnegat Township

## Figure 15: Land Use (2002)





**Figure 16**  
**State Development and Redevelopment Plan**  
 TOWNSHIP OF BARNEGAT  
 OCEAN COUNTY, NEW JERSEY  
 Sources: NJDEP GIS DATA  
 Job No: 206351440006

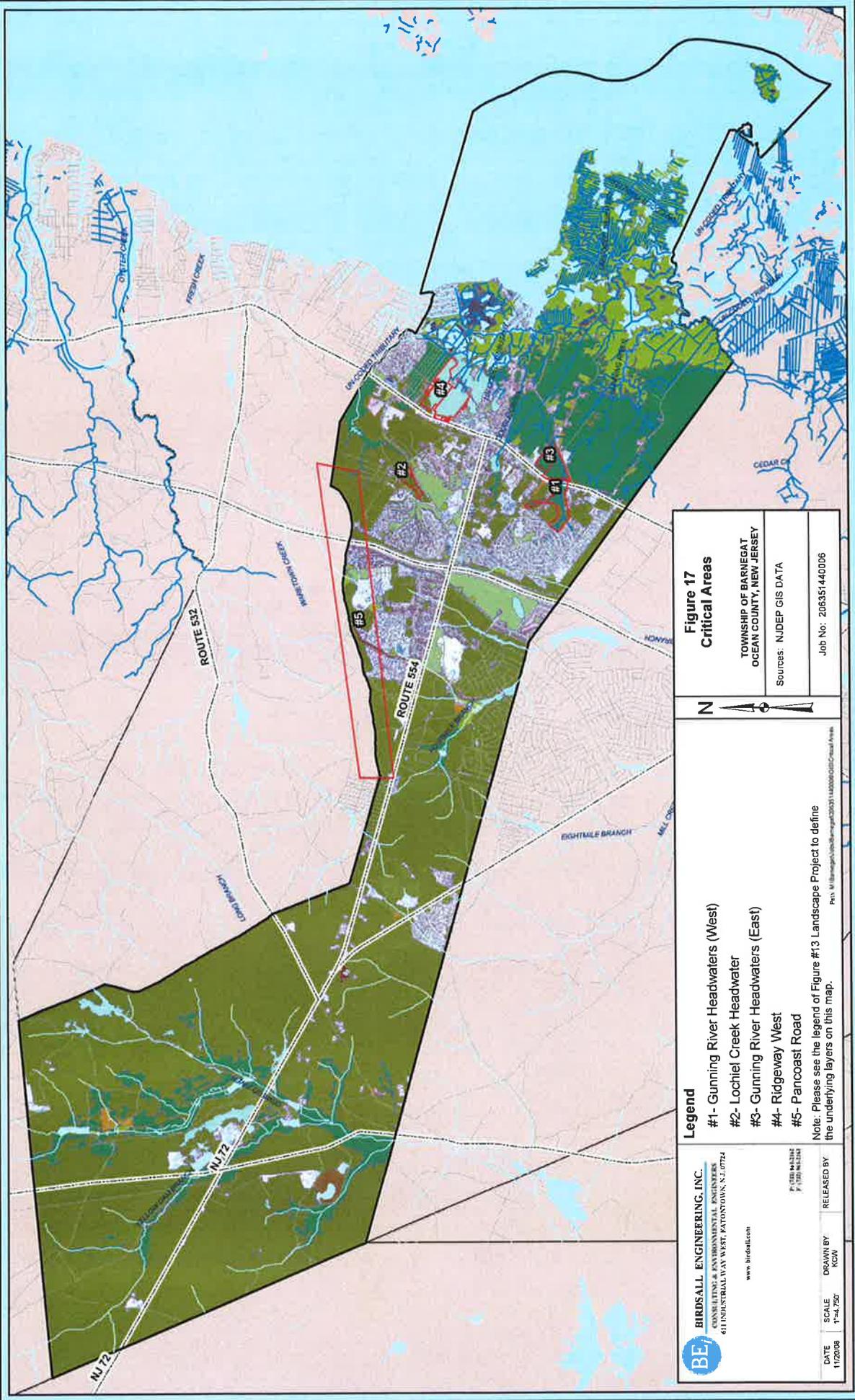
**Legend**  
**Planning Areas**  
 ENVIRONMENTALLY SENSITIVE  
 FEDERAL PARK  
 PINELANDS  
 SUBURBAN

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 61 LYONS DRIVE, SUITE 100, WEST FORT LEE, NEW JERSEY 07641  
 www.birdsell.com  
 P: 201.861.8100  
 F: 201.861.8104

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 Note: PER NJDEP GIS DATA

# Barnegat Township

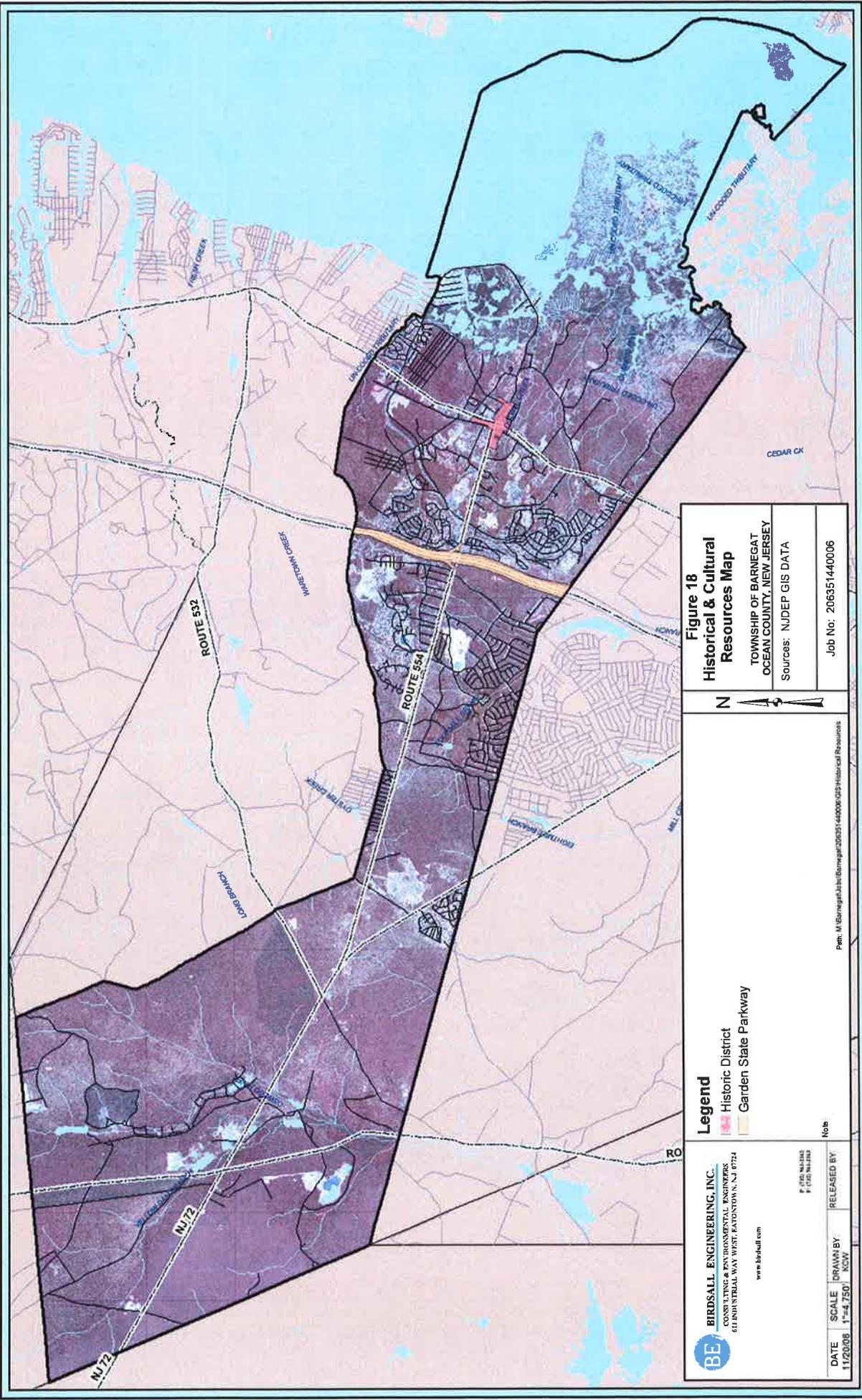
## Figure 17: Critical Areas



<b>BIRDSALL ENGINEERING, INC.</b> CONSULTING & ENVIRONMENTAL ENGINEERS 611 INDUSTRIAL WAY WEST, PATON TOWNSHIP, NJ 07724 www.birdsall.com	<b>Legend</b> #1- Gunning River Headwaters (West) #2- Lochiel Creek Headwater #3- Gunning River Headwaters (East) #4- Ridge Way West #5- Pancoast Road Note: Please see the legend of Figure #13 Landscape Project to define the underlying layers on this map.	<b>Figure 17</b> <b>Critical Areas</b> TOWNSHIP OF BARNEGAT OCEAN COUNTY, NEW JERSEY Sources: NJDEP GIS DATA	Job No.: 206351440006
		DATE: 11/2008 SCALE: 1"=4,750' DRAWN BY: KGW RELEASED BY:	

**Barnegat Township**

**Figure 18: Historic & Cultural Resources**



**Figure 18**  
**Historic & Cultural Resources Map**  
 TOWNSHIP OF BARNEGAT  
 OCEAN COUNTY, NEW JERSEY  
 Sources: NJDEP GIS DATA  
 Job No: 206351440006

**Legend**  
 Historic District  
 Garden State Parkway

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# **Barnegat Township**

## **ACKNOWLEDGEMENTS**

Many thanks are due to the organizations that provided funding for this *Environmental Resource inventory for the Township of Barnegat*. They are:

- The Association of New Jersey Environmental Commissions (ANJEC) Smart Growth Assistance Grant Program, funded by the Geraldine R. Dodge Foundation
- The Township of Barnegat

### **Barnegat Township Committee**

Mayor Jeffrey Melchiondo  
Deputy Mayor Alfonso Cirulli  
Committeeman Martin Lisella  
Committeeman Leonard Morano  
Committeewoman Dorothy A. Ryan

The impetus for the creation of this document, and its guidance and review, came from the Barnegat Township Environmental Commission.

### **Barnegat Township Environmental Committee**

Barry Durham, Chairman  
Jerry Harper, Planning Board Representative  
Robert Bruno  
David Moore  
Martin Weber

Ms. Cynthia Rahn, Environmental Commission Secretary; Mr. David Breeden, Barnegat Township Administrator; Ocean County Department of Planning; and other township and county staff member, and various New Jersey state offices all provided information for this inventory. Members of the Environmental Commission and Historical Society, and the Ocean County Mosquito Commission graciously offered the use of their equipment and services for this publication.

The following BEI staff members made significant contributions to this report:  
Mark Muraczewski, PP/AICP – Associate/Senior Planner  
Kaitlyn Walsh – Staff Planner  
Mary Dender – Printing and Production

## **Introduction**

The Environmental Resource Inventory (ERI) is a compilation of information regarding all aspects of the municipality that may affect the use of land along with the protection of its natural resources. Natural resources prove economically significant, as well as extremely important for the vitality of the town for current and future generations. Through the use of a narrative, pictures, maps, and tables to convey the data a comprehensive report is created. It is not meant to be opinionated or unchanging. Rather, it should be objective and dynamic, changed and amended as the town's landscape changes. An ERI is a tool for town boards, including the environmental commission, planning board, and zoning board of adjustment, to use when creating the master plan, writing ordinances, or reviewing an application. It is important to consult an ERI because it is important to preserve, protect, and utilize natural resources wisely.

Barnegat Township's natural resources have been shaped largely by its diverse landscapes. With the Barnegat Bay to the east and the Pinelands to the west, there are many different habitats and niches, which are home to many threatened and endangered species, within the 34.9 square mile municipality. The people and the built environment have also affected Barnegat Township's natural resources. For these reasons, it is important know and understand the value of the environmental resources to make educated decisions about Barnegat Township's future. An aerial photo of the Township can be found in Figure 1 of this report.

## **Brief History**

Barnegat derives its name from the inlet, which was originally called "Barande-gat" by the first Dutch discoverers in 1664, which means an inlet with breakers. The English subsequently corrupted it from Bardegat to Barnegat.<sup>1</sup> Prior to the Europeans, the Lenape Indians were the earliest settlers who lived inland during the winter and ventured to the shore during the summer to gather clams, which they would dry in the sun to extract salt and for the meat to sustain them during the winter. New Jersey was seized by the English in 1664 and given by King Charles II to Lords Berkeley and Carteret, who sold their holdings to the Boards of Proprietors. Subsequently this land was divided into East and West Jersey. Berkeley and Carteret, in offering the land to New Jersey for sale, issued an injunction that the new owners should also purchase their land from the Native Americans who lived upon them. With the increase in settlement of the Europeans, the number of Indians in the state diminished. In fact when the settlers came into the Barnegat area, very few Native Americans made their summer journey, although there were a few scattered families who did not join the reservation and remained behind. The Proprietors continued placing this restriction upon all purchasers. The first settlers in Barnegat came into the area around 1720, and by 1750 several families were established on farmlands near and adjacent to the creeks and bays. These original settlers were Quakers who came to the area to create a separate community where they could practice

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<sup>1</sup> Salter, Edwin. 1890. *A History of Monmouth and Ocean Counties*. Bayonne, NJ: E. Gardner & Son: 237

their religious beliefs. Jonas Tow, one of the early settlers is known to have built a house as early as 1720.

The first land purchase, from the Proprietors, comprised of 500 acres along the present East Bay Avenue in the year 1759. In 1770, “one acre and half quarter of land” was deeded from this 500 acres tract. This included the Quaker Meeting House, which was constructed at a prior date, in 1767. It was damaged by a hurricane but restored to its original form in the 1800s. The back door of the building does not have steps or porch and was designed for women to dismount and mount their horses when traveling on horseback for meetings. This meetinghouse was located in an area that became the village center at a later date. That section of East Bay Avenue was once the hub of colonial trade and industry with taverns, shipyards, stores, blacksmith shop, and other enterprises that the early settlers deemed necessary for sustenance. In the early days Barnegat was a hamlet set in the midst of thickly wooded land and travel was mostly by boat and horseback.<sup>2</sup> In 1820 David Oliphant established the first inn, at the crossroads of Main Shore and Bay Avenue.<sup>3</sup> By 1834 Barnegat reported 50 dwellings, 3 taverns, and 4 stores making the town one of the largest in Ocean County, although a later report states that only 30 dwellings existed in 1844.<sup>4</sup>

Barnegat Township, formerly known as Union Township, was formed in 1846 from Dover and Stafford Township, which were all a part of Monmouth County. In 1850 the southern part of Monmouth County was seceded to form Ocean County. At that time Union Township included the entire area of the present Ocean and Lacey Townships. The legal boundaries, established on February 7, 1846, spanned across in the west to east direction from the Burlington County border to the Atlantic Ocean and traversed in the north to south direction from Cedar Creek to Gunning River. From 1871 to 1899 parts of Union Township seceded to form new municipalities like Lacey Township in 1871, Ocean Township in 1876, Harvey Cedars on Long Beach Island in 1894 and Long Beach Island Township in 1899.<sup>5</sup>

During the Revolutionary War, parties of both Refugees and Patriots, as they traversed along the Jersey shore, would stop at the houses of the Barnegat Quakers to demand victuals. There was very little participation in the War for Independence as most of the families were Quakers, who were ideologically committed to the principle of non-violence and also were geographically removed from the struggle for power and position in colonial affairs.<sup>6</sup> Although the residents of Barnegat were spared the direct impacts of the war, they suffered post war due to their principles against militia training and paying fines for non-attendance. As a result they were constantly harassed for non-compliance of

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<sup>2</sup> *Out of the Past: A Pictorial History of Barnegat, New Jersey*. Barnegat: Barnegat Historical Society, 1981

<sup>3</sup> *New Jersey Historic Sites Inventory-Ocean County: Union Township/Barnegat Township*. Toms River: Ocean County Cultural and Heritage Commission. 1981.

<sup>4</sup> *New Jersey Historic Sites Inventory-Ocean County: Union Township/Barnegat Township*. Toms River: Ocean County Cultural and Heritage Commission. 1981.

<sup>5</sup> Miller, Pauline S. 2000. *Ocean County Four Centuries in Making*. Ocean County Cultural & Heritage Commission Toms River, New Jersey: 212-215

<sup>6</sup> *Out of the Past: A Pictorial History of Barnegat, New Jersey*. Barnegat: Barnegat Historical Society, 1981

militia laws by lawsuits, arrests, fines and executions, and incarceration or properties sold for non-compliance with the militia laws.

According to the *New Jersey Historic Sites Inventory-Ocean County*, the Revolution brought new industry to Barnegat. Extensive salt works were carried on at Barnegat during the Revolution, on the meadows near the farm of one Mr. James Mills.<sup>7</sup> Apart from the salt works, shipping trade began in the area, due to its natural harbor and easy access to the sea. In the 18<sup>th</sup> century, the pine forests were opened to lumber, bog ore and other industries. Trade was conducted via sea to New York and as far as the West Indies. Shipbuilding commenced at this time as well. During the 1830s and 1840s Barnegat was an important port in South Jersey.

With the depletion of pine and cedar forests in the area, lumber trade and shipbuilding began to diminish in the nineteenth century and resulted in charcoal exports being Barnegat's major industry. This declined after the Civil War and in the post war era, the town became prosperous due to the numerous sea captains. By the 1870s the Town contained 100 dwellings, a Presbyterian and Methodist Church, a Quaker Meeting house, two schools, four to five stores, two hotels and a cranberry bog. In 1894 a glass company was founded, which remained until 1914. This supplied glass to many resort communities, including Ocean Grove. With the decline in natural resources as mentioned earlier in this paragraph, by 1900 the Township's residents reverted to occupations like fishing, oystering and clamming for sustaining their livelihoods. In addition, Barnegat exported cranberries, sphagnum moss and peat from the cedar swamps and bogs. Salt hay gathering was another popular occupation.<sup>8</sup> As Barnegat grew in the early 1900s, grocery stores, a bank, a dry good's store, a butcher, a shoemaker, a bakery, blacksmiths, two doctors, a lumberyard, and a coal yard were built. Most of the development was due to the railroad infrastructure; the Jersey Central and Tuckerton Railroads both ran through Barnegat with depots at Barnegat.<sup>9</sup>

With the advent of the automobile in the 20<sup>th</sup> Century, Main Street (State Highway 9) became Barnegat's major thoroughfare and developed into a commercial center. The importance of the downtown grew, as it became a location for summer tourists to stop en route to the ocean beaches. This changed with the construction of the Garden State Parkway, which bypassed Barnegat and the importance of Route 9 as a major shore route declined. Consequently, Barnegat's share of tourist dollars dropped as well.<sup>10</sup>

Today Barnegat Township covers an area 34.9 square miles. As indicated in Table 1 below, the population of Barnegat was 1,037 in 1930 and 1,045 in 1940. From 1940 to 1970, the population grew at an average rate of 165 persons per decade to 1,539 in 1970. There was a sharp increase in population between 1970 and 1980 with the population

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<sup>7</sup> Salter, Edwin. 1890. *A History of Monmouth and Ocean Counties*. Bayonne, NJ: E. Gardner & Son: 239-241

<sup>8</sup> *New Jersey Historic Sites Inventory-Ocean County: Union Township/Barnegat Township*. Toms River: Ocean County Cultural and Heritage Commission. 1981.

<sup>9</sup> <http://www.oceancountyhistory.org/OCHistory/barnegat.htm>. Accessed on July 13, 2007.

<sup>10</sup> *New Jersey Historic Sites Inventory-Ocean County: Union Township/Barnegat Township*. Toms River: Ocean County Cultural and Heritage Commission. 1981.

increasing to 8,702 in 1980, which was 7163 more than 1970. Between 1980 and 2000 there has been a steady increase at an average rate of 3284 persons per decade.<sup>11</sup> The estimated population in 2005 was 20,308.<sup>12</sup> Therefore, there has been a steady increase in the population of Barnegat Township since the early part of the 20<sup>th</sup> Century with a substantial increase over the past three (3) decades.

<b>Table 1</b>								
<b>Population Trends in Barnegat Township, 1930-2005</b>								
<b>1930</b>	<b>1940</b>	<b>1950</b>	<b>1960</b>	<b>1970</b>	<b>1980</b>	<b>1990</b>	<b>2000</b>	<b>2005*</b>
1,037	1,045	1,173	1,270	1,539	8,702	12,235	15,270	20,308
Source: Historic Population Trends in Ocean County by Municipality, 1930-2000. Ocean County Department of Planning website at <a href="http://www.planning.co.ocean.nj.us/databook/02POP30-00.htm">http://www.planning.co.ocean.nj.us/databook/02POP30-00.htm</a> . Accessed on August 13, 2007								
*2005 Population is an estimate obtained from the Annual Population Estimates by Municipality, Ocean County Department of Planning website at <a href="http://www.planning.co.ocean.nj.us/databook/03popest.xls">http://www.planning.co.ocean.nj.us/databook/03popest.xls</a> .								

Today the Township reflects a combination of suburban and rural character, with suburban development concentrated adjacent to the Garden State Parkway and Route 9. The rural portions are located in the surrounding environs, more specifically in the Pinelands. Residential land uses comprise the largest land use category within the Township. A Base Map of Barnegat Township is shown below in Figure 2.

<sup>11</sup> Historic Population Trends in Ocean County by Municipality, 1930-2000. Ocean County Department of Planning website at <http://www.planning.co.ocean.nj.us/databook/02POP30-00.htm>. Accessed on August 13, 2007

<sup>12</sup> Annual Population Estimates by Municipality. Ocean County Department of Planning website at <http://www.planning.co.ocean.nj.us/databook/03popest.xls>. Accessed on August 13, 2007.

## **NATURAL RESOURCES**

### ***PHYSIOGRAPHY***

Physiography is a study of a specific location in relation to underlying geology. New Jersey contains four (4) physiographic provinces. The Township of Barnegat is located in the Atlantic Coastal Plain.

The Atlantic Coastal Plain extends from Massachusetts to Texas and is divided into the Inner and Outer sections. The Township of Barnegat is located entirely within the outer Coastal Plain. The Outer Coastal Plain typically contains broad, level, sandy plains with occasional hills that rise above the surface. Physical features of this province include terraces, which are flat land formations adjoining older water bodies that curve to each lower level, and tidal marshes that border the areas near the Barnegat Bay. Based on the US Department of the Interior, Geological Survey, dated 1969, "the Coastal Plain sediments dip gently seaward (eastward), increasing in total thickness and down-dip from 1,000 to 4,000 feet in Barnegat Township."

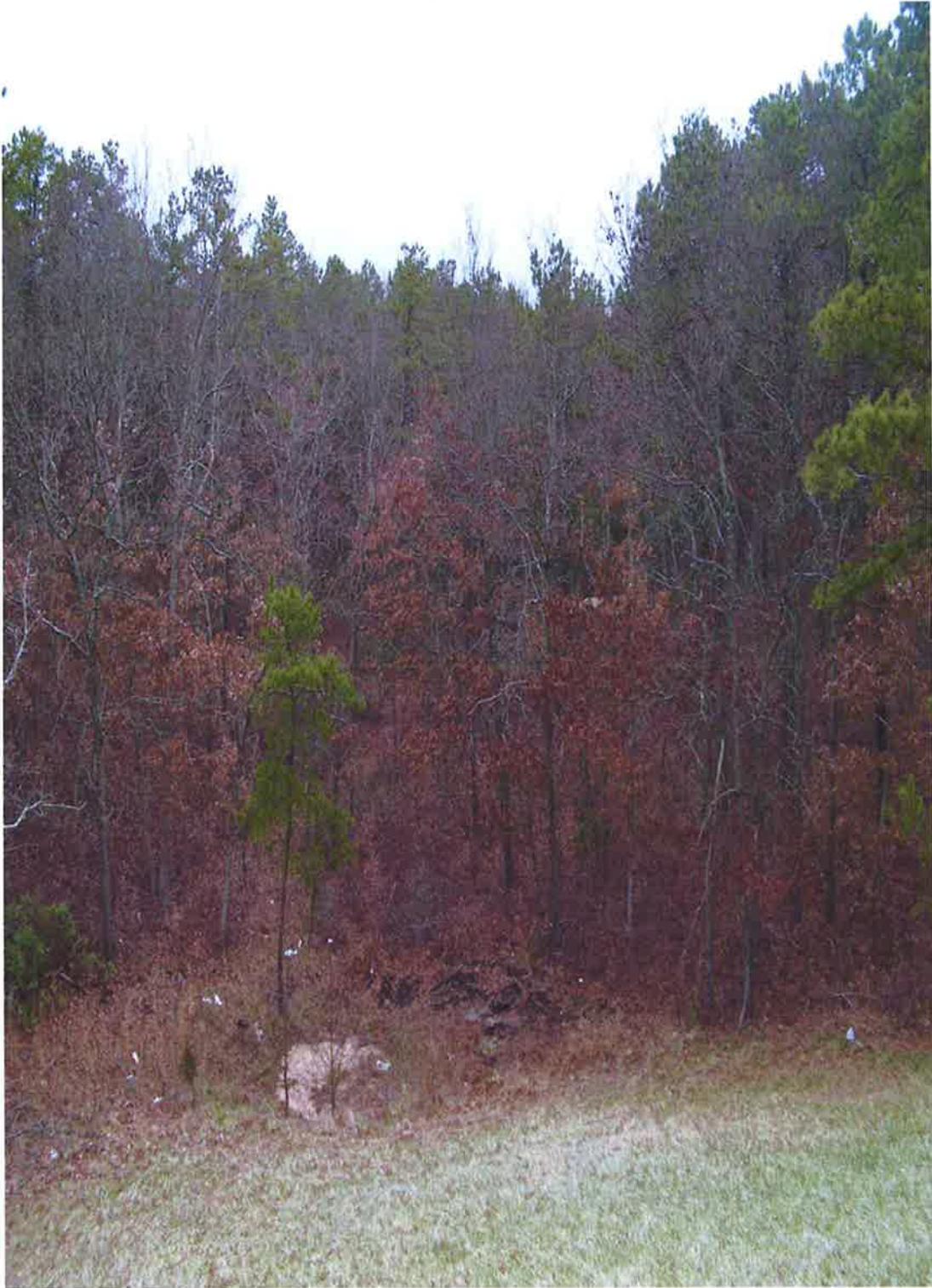
Coastal Plain sediments have been mined in the past for bog iron, glass, sand, foundry sand, ceramic and brick clay, the mineral glauconite for use in fertilizer and titanium from the mineral ilmenite that can be found in sand deposits. Today the Coastal Plain sediments continue to supply glass sand and are extensively mined for sand and gravel construction material. The sediments consist of layers of sand, silt and clay deposited alternatively in deltaic and marine environments, as sea level fluctuated during the Cretaceous and Tertiary time line. These layers of sediment outcrop are found in irregular bands that stretch northeast and to the southwest. Wide areas of the Outer Coastal Plain are covered by a thin veneer of late Tertiary and Quaternary sand and gravel that is deposited by rivers.

### ***TOPOGRAHY***

Barnegat Township is predominately level and gently sloping towards the Barnegat Bay. The western portion of the Township is characterized by the rolling hills of the Beacon Hill Formation and Bridgetown Formation. Both of these formations are at an elevation of 184 feet above sea level.

### ***STEEP SLOPES***

Slope is measured as the percentage of vertical rise to horizontal distance. Approximately 90% of Barnegat Township has slopes of 5% or less. Slopes between 15% and 20% are generally considered to be steep slopes and Barnegat has some areas with slopes of 20% or more. Contour elevations of the Township are shown below in Figure 3 USGS Quad Map.



Area containing steep slopes that is located at the Lochiel Creek headwaters and off of Barnegat Bay Boulevard.

Slopes between 0-5% can be found around the Barnegat Bay portion of the Township. Most of the Township contains slopes that are between 5-10% and suitable for development. There are some smaller areas that contain steep slopes and are located throughout the Township, particularly along side waterways. In general, the closer a contour line is located to each other, a steep slope can be expected. However, the further apart a contour line is located from another contour line, a lesser of a slope can be expected.

## **SOILS**

Soil is the foundation for all land uses. A region's soil determines the type of vegetation that can exist and prevail through a growing season. Also, a soil characteristic can determine to what extent the amount of development that can occur.

The soils in Barnegat Township range from well-drained Hammonton Loamy Sand to very poorly drained Manahawkin muck soils. A majority of the soils in the eastern portion of the Township are restricted from urban uses due to potential flooding. Downer soils are predominately located within developed areas of the Township and are located west of Route 9 and just west of the Garden State Parkway. Water table limitations are prevalent within areas that are located along the Barnegat Bay or adjacent to other water bodies.

The US Department of Agriculture Natural Resources Conservation Service (USDA NRCS) originally developed a soil survey for Ocean County in April 1980. Soil mapping was completed in order to detail soil characteristics into groups that have similar use and managements limitations.

The map units that are identified below on table 2 and shown on Figure 4 represent the soil types that are located in Barnegat Township. The map units and descriptions can be used to determine various characteristics and suitability of the soil for a potential use. The soil descriptions represent general facts about the soil as well as identifying various limitations that have to be considered in planning for specific uses.

**Table 2: Barnegat Township Soils**

<b>Soil Series</b>	<b>Soil Code</b>
Appoquinimink-Transquaking-Mispillion Complex, 0-1% slopes, very frequent	AptAv
Atsion sand, 0-2% slopes	AtsA
Aura sandy loam, 2-5% slopes	AugB
Berryland sand, 0-2% slopes, rarely flooded	BerAr
Downer sandy loam, 0-2% slopes	DoeA
Downer loamy sand, 0-5% slopes	DocB
Downer sandy loam, 2-5% slopes	DoeB
Evesboro sand, 5-10% slopes	EveC
Hammonton loamy sand, 0-5% slopes	HbmB
Hammonton sandy loam, 0-2% slopes	HboA
Hooksan fine sand, 2-10% slopes	HorsC
Lakehurst sand, 0-5% slopes	LakB
Lakewood sand, 0-5% slopes	LasB
Lakewood sand, 5-10% slopes	LasC
Manahawkin muck, 0-2% slopes, frequently flooded	MakAt
Pits, sand and gravel	PHG
Psamments, 0-3% slopes	PssA
Psamments, sulfidic substratum 0-3% slopes, frequently flooded	PstAt
Psamments, waste substratum, 0-8% slopes	PsuB
Sassafras sandy loam, 2-5% slopes	SacB
Woodmansie sand, 0-5% slopes	WobB
Woodmansie sand, 5-10% slopes	WobC

According to the Soil Survey Geographic 2003 (SSURGO) Database for Ocean County, New Jersey compiled by the USDA NRCS, there are twenty-two (22) mapped soil units within Barnegat Township as follows:

**AptAv – Appoquinimink**

This soil unit is poorly drained and found in estuarine salt marsh areas. This soil unit is formed within the salt marsh areas of the Outer Coastal Plain and experience permanent flooding. The water table is located at the surface for this soil type.

**AtsA – Atsion Sand**

This soil unit is poorly drained and found within depressions and broad flats. This soil unit is formed with sandy Coastal Plain sediment and can experience flooding when adjacent to streams. The water table typically is at the surface in the winter and has a depth of five feet (5') below surface grade in June.

**AugB – Aura Sandy Loam**

This soil unit is well drained and formed in acid, loamy Coastal Plain sediments. This soil series is typically found on divides and side slopes that are at high topographic elevations. The water table for this soil is typically found at a depth of six feet (6') below surface grade or greater.

**BerAv – Berryland Sand**

This soil unit is very poorly drained and is found within depressions and broad flats that are at the lowest topographical elevation on the landscape. The soils in this series are subject to rare to frequent flooding. The water table can be found at a depth of 0 to 0.5 feet below surface grade during the months June through March.

**DoeA – Downer Sandy Loam, 0-2% Slopes**

This soil series is well drained and can be found on divides. Generally, this soil series is formed in acid loamy Coastal Plain sediments, and found within woodland areas. The water table can be found at a depth of more than six feet (6') below surface grade.

**DocB – Downer Loamy Sand, 0-5% Slopes**

This soil series is well drained and can be found on divides and side slopes. Typically, this soil series is formed in acid loamy Coastal Plain sediments and found within woodland areas. The water table can be found at a depth of more than six feet (6') below surface grade.

**DoeB – Downer Sandy Loam, 2-5% Slopes**

This soil series is well drained and can be found on divides and side slopes. Typically, this soil series is formed in acid loamy Coastal Plain sediments and typically found within woodland areas. The water table can be found at a depth of more than six feet (6') below surface grade.

**EveC – Evesboro Sand**

This soil series is excessively drained and can be found on side slopes. Typically, this soil series is formed in acid sandy Coastal Plain sediments and can be found within woodland areas. The water table can be found at a depth of more than six feet (6') below surface grade.

**HbmB – Hammonton Loamy Sand**

This soil unit is nearly level to gently sloping and moderately well drained. Soil of this type can be found in slightly depressed areas and on low divides. Typically, this soil series is formed in acid loamy Coastal Plain sediments and can be found within depressional areas, low divides and on side slopes. From December to May the water table can be found at a depth of 1.5 to 4 feet below surface grade and five feet (5') below surface grade during the month of June.

**HboA – Hammonton Sandy Loam**

This soil unit is also nearly level to gently sloping and moderately well drained. HboA soils can be found in slightly depressed areas and on low divides. Typically this soil type is formed in acid loamy Coastal Plain sediment. During the months of December through May the water table can be found at a depth of 1.5 to 4 feet below surface grade and five feet (5') below surface grade during the month of June.

**HorsC – Hooksan Fine Sand**

This soil unit is excessively drained with slopes of 0 to 5%. Soils of this type are typically located within frequently flooded tidal wetland areas. The water table can be found at the surface for this soil series.

**LakB – Lakehurst Sand**

This nearly level soil series is moderately well drained to somewhat poorly drained. Soil of this type can be found in depressed areas and on low terraces. Typically this soil was formed in acid sandy Coastal Plain sediments. The water table during the months December through May can be found at a depth of 1.5 to 4 feet below surface grade and five feet (5') below surface grade during the month of June.

**LasB – Lakewood Sand, 0-5% Slopes**

This soil unit is an excessively drained soil and can be found on divides and side slopes. Soil of this type was formed in acid Coastal Plain sediments. The water table for this soil series is typically found at depth of greater than six feet (6') below surface grade.

**LasC – Lakewood Sand, 5-10% Slopes**

This soil unit is an excessively drained soil and can be found on side slopes. The soil was formed in acid sandy Coastal Plain sediments. The water table during the months of December through May can be found at a depth of 1.5 to 4 feet below surface grade and five feet (5') below surface grade during the month of June.

***MakT – Manahawkin Muck***

This soil unit is very poorly drained and subject to flooding when adjacent to stream corridors. Soil of this type can be found in depressed areas and broad flats. The MakT soil series was formed in acid organic material that included decayed plant material. The water table for this soil type is typically found at the surface. Some ponded areas with a depth of 1 to 2 feet below surface grade can be found during the months of January through March.

***PhG – Pits, Sand and Gravel***

This soil unit consists of deep, excessively drained to very poorly drained soil material. A majority of the soil is made up of borrow pit, sand pit, gravel pit or clay pit spoil material. In some cases, the spoils from the pits have been smoothed to form a uniform surface. The water table for this soil type can be found between the surface and a depth of greater than 5 feet (5') below surface grade.

***PssA, PstAt and PsuB – Psamments (Fill Material)***

This soil unit is well drained and typically placed over Sulfaquents and Sulfihemist soils. Psamment soils experience flooding during storm events.

***SacB – Sassafras Sandy Loam***

This soil unit is made up of fine loamy, siliceous, mesic Typic Hapludults. The SacB soils are well drained and formed in acid loamy Coastal Plain sediments. The water table for this soil series can be found at a depth of six feet (6') below surface grade or greater.

***WobB and WobC – Woodmansie Sand***

This soil unit is made up of coarse-loamy siliceous, mesic Typic Hapludults. These soils are well drained and formed in acid, loamy Coastal Plain sediments. WobB soils can be found on divides and side slopes. The water table for the WobB and Wobc soils can be found at a depth of six feet (6') or greater below surface grade.

***SOIL LIMITATIONS***

Soil characteristics can severely restrict the amount of construction or development that can occur on a site. Table 3: Soil Limitations for Development records the soils and possible limitations for building foundations and septic systems. There are some locations within the Township that may not be suitable for on-site septic systems. Septic systems require soils that have a low water table five feet (5') or greater below surface grade) and a high permeability rate to allow for proper drainage of wastewater. Soils with high water tables (grade to five feet (5') below surface grade) create a potential for

erosion, wet basements, and low permeability, often allowing wastewater to collect near the surface.

**Table 3: Soil Limitations for Development**

Soil Series	Soil Code	Land Use Implications		
		Building without Basement	Building with Basement	Septic Systems
Appoquinimink	AptAv	N/A	N/A	N/A
Atsion	AtsA	C	C	C
Aura	AugB	A	A	A
Berryland	BevAv	C	C	C
Downer	DoeA, DocB, DoeB	A	A	C
Evesboro	EveC	A/B	A/B	C
Hammonton	HbmA, HboA	A	C	C
Hooksan	HorC	N/A	N/A	N/A
Lakehurst	LakB	A	C	C
Lakewood	LasB, LasC	A	A	C
Manahawkin	MakAt	C	C	C
Pits, Sand, Gravel	PhG	N/A	N/A	N/A
Psamments	PssA, PstAt	N/A	N/A	N/A
Sassafras	SacB	A	A/B	C
Woodmansie	WobB, WobC	A	A	A

Source: US Department of Agriculture, Natural Resource Conservation Service

Key to Land Use Implications	
<b>A=Slight.</b>	Little or no limitation(s) or easily corrected by use of normal equipment and design techniques.
<b>B=Moderate.</b>	Presence of some limitations that normally can be overcome by careful design and management at somewhat greater cost.
<b>C=Severe.</b>	Limitations that normally cannot be overcome without exceptional, complex, or costly measures.

### ***HYDRIC SOILS***

Some areas within Barnegat Township contain hydric soils. This type of soil can be found within wetland areas, salt marshes, bog areas and adjacent to streams, rivers and creeks. Hydric soils, as defined by the National Technical Committee of Hydric Soils, are soils that are created by saturation, flooding, or ponding long enough during the growing season to develop an aerobic condition in their subsurface and support the development of hydrophytic vegetation. Hydric soils have unique soil properties and they are an important element to wetland areas. If a soil is classified as “hydric”, land use may be restricted due to the relationship of hydric soils to the definition of wetlands and laws regarding wetland preservation. More detailed descriptions of Barnegat’s

wetland areas are found in this report, under wetlands and located within the vegetation section, on pages 18, 44-45.

## **CLIMATE**

New Jersey is located just about halfway between the Equator and the North Pole, which allows for a highly variable climate. Whether wet, dry, hot, or cold, New Jersey experiences the full spectrum of weather. The “prevailing westerlies” is the dominant atmospheric circulation across North America. During the summer months this flow of air is pushed north by warmer air coming up from the south. For New Jersey this means our climate from May through September is dominated by moist, tropical air from the Gulf of Mexico. But during the winter months the air current gains strength and pushes south, keeping the warmer weather closer to the equator, bringing cold, dry air from Canada to New Jersey.

Within the State there are five (5) very different climate regions. These five (5) regions are: Northern, Central, Pine Barrens, Southwest, and Coastal, and each are different based on geography and distance from the ocean. Barnegat Township is located in the Coastal Zone. In this zone the dominant determinant of the weather is the interaction between continental and coastal air. The waters high heat capacity drives their interaction. It creates a warmer wind, usually seaward, during the winter months, and a cooler, inland breeze when water is cooler than the land, most common in the spring and summer. As a result of this phenomenon there is less fluctuation in seasonal temperatures. Coastal storms are also a major part of the Coastal Zone climate. These storms, also known as Nor’easters, occur most during October through April and can take place as little as once a year or as many as five to ten times in a year.

The National Climate Data Center database collects monthly data on precipitation and the maximum and minimum temperatures from stations throughout the state. There are four stations within Ocean County. The closest station to Barnegat Township is located in Tuckerton. According to monthly data gathered at the Tuckerton Station from 1898 through 2007, the annual mean maximum temperature is 63.6°F, the annual mean minimum temperature is 43.4°F, and the annual mean rainfall is about 45 inches.

<http://climate.rutgers.edu/stateclim/>

[http://climate.rutgers.edu/stateclim\\_v1/monthlydata/index.html](http://climate.rutgers.edu/stateclim_v1/monthlydata/index.html)

## **SURFACE WATER RESOURCES**

### ***WATERSHEDS***

A watershed contains all the land that drains to a particular waterway, such as a river, stream, lake, or wetland. The high points in the terrain, such as hills and ridges, define the boundaries of a watershed. Large watersheds are made up of a succession of smaller ones, and smaller ones are made up of the smallest area – the catchment area of a local site. The land drains to the body of water for which each sub watershed is named. These sub watersheds can be further subdivided into smaller areas, each surrounding smaller tributaries that flow to a larger channel, and so on down to the catchment level. Each watershed corresponds to a hydrological unit code, or HUC, as delineated by the United States Geological Survey (USGS). A HUC-11 watershed (identified by an 11-digit code) contains a number of HUC-14 sub watersheds (identified by a 14-digit code). The State of New Jersey has 152 HUC-11 watersheds and over 900 HUC-14 sub watersheds.

#### *Watershed Management Areas 13 and 14*

NJDEP manages natural resources on a watershed basis. The State has been divided into twenty (20) Watershed Management Areas (WMAs). Barnegat Township contains watershed management areas 13 and 14. The Oyster Creek/Forked River, Manahawkin/Upper Egg Harbor tributaries and Lochiel Brook/Waretown Creek are located within the WMA 13, “Barnegat Bay”. WMA 13 is very large, covering the southwesterly portion of Barnegat Township and extending into Burlington County. It includes sub watersheds that drain directly to the Bay. Watershed Management Area 14, “Mullica River”, is one of the key drainage areas for the Pinelands and one of its major tributaries is the Oswego River.

There are four (4) watersheds and ten (10) sub watersheds in the Township and they are briefly described below. Watersheds are shown in Figure 5 and sub watersheds are shown in Figure 6.

#### *Oswego River*

The Oswego River is the largest watershed in Barnegat Township. This watershed covers a total area of 15.43 square miles. Headwaters of this watershed rise in Barnegat Township and extend downstream to Little Egg Harbor and Bass River Townships. The Oswego River eventually runs in the Mullica River and empties into Great Bay. Approximately twenty (20) square miles of Pine Barrens are drained by several branches of this system and include, but not limited to, the Yellow Dam Branch, the Sykes branch and two (2) branches of the East Branch of the Oswego River.

There are several wetland areas and threatened or endangered species habitats located within the Oswego River watershed.

#### *Forked River/Oyster Creek*

The Forked River/Oyster Creek watershed covers a total area of .84 square miles. Headwaters of this watershed rise just west of the Four Mile Branch and is located near the Lacey Township boundary. No threatened or endangered species have been recorded from this area. The NJDEPGIS Landscape Project database confirms this area may be a suitable habitat for the pine snake.

#### *Manahawkin/Upper Little Egg Harbor Tributaries*

The Manahawkin/Upper Little Egg Harbor Tributaries watershed covers a total of 5.9 square miles. The Four Mile Branch of the Mill Creek Drainage System is located within this watershed. Headwaters of this stream are located south of Bay Avenue and west of the Garden State Parkway. A small eastern branch rises west of Lighthouse Drive, while the larger western branch rises a mile or more from Nautilus Drive.

It appears both branches contain a flood hazard area width of approximately 150 to 300 feet with steep banks that apparently are produced by erosion. A series of cranberry bogs can be found along the westerly portion of the western branch.

#### *Waretown Creek/Barnegat Bay South*

The Waretown Creek/Barnegat Bay South watershed covers a total of 12.38 square miles. This watershed includes Double Creek and Gunning River. Double Creek is located just east of US Route 9 and within the southerly portion of the Township. There are several wetland areas associated with Double Creek.

Gunning River and the Barnegat Bay are also located within this watershed. The freshwater wetlands and estuary associated with this watershed are documented foraging and nesting areas for several bird species.

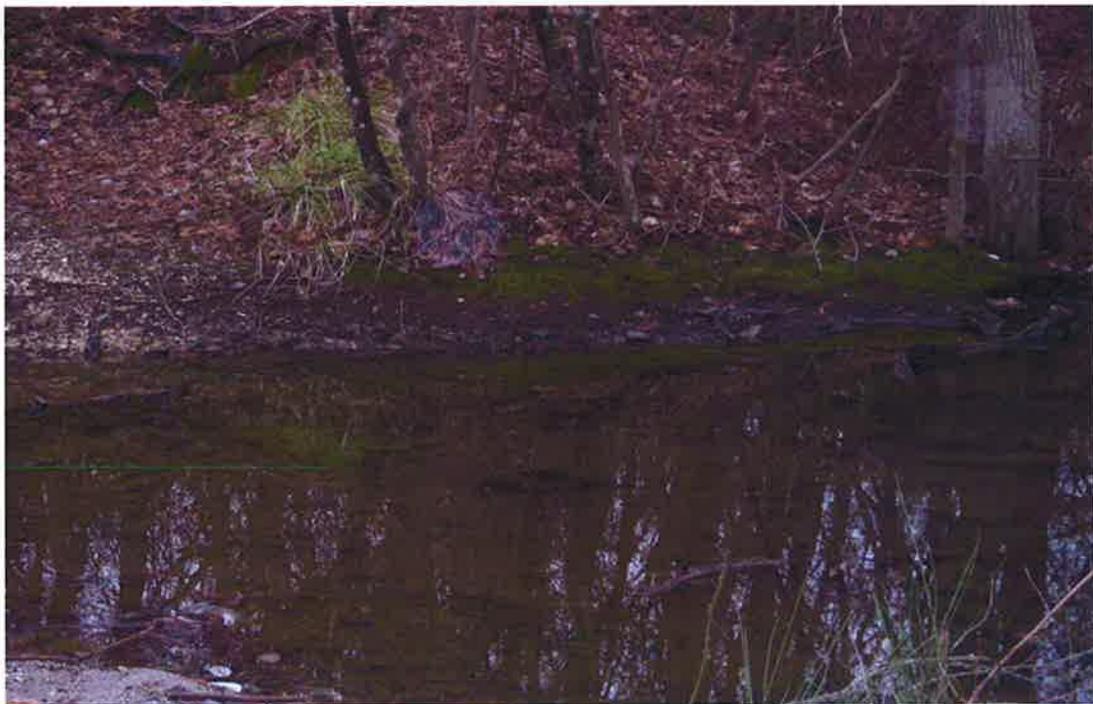
### ***SUB WATERSHEDS***

#### *Barnegat Bay South*

This sub watershed covers a total of 5.65 square miles and is located southeast of the Barnegat Township coast line and northwest of Barnegat Light. The NJDEP GIS database layer depicts this area to contain foraging and nesting bird species.

*Barnegat Bay South Tributaries*

This sub watershed covers a total of 9.76 square miles. Double Creek and Gunning River are located within this watershed and are discussed briefly above in the Waretown Creek/Barnegat Bay South Watershed section.



Area of former water treatment plant and looking in a southerly direction towards the west branch of Gunning River.



Location of Barnegat Township Municipal Dock Complex, which fronts along the Barnegat Bay.

*Forked River North Branch*

This watershed covers a total of .065 square miles and is located just northwest of County Rt. 532. This area is under the jurisdiction of the Pinelands Commission Wetland areas and threatened and endangered species are present within the sub watershed.

*Four Mile Branch*

This sub watershed covers 4.53 square miles and is located just west of the Garden State Parkway. The headwaters of this stream are located south of Bay Avenue and west of the Garden State Parkway. An eastern and western tributary are connected to the Four Mile Branch. Both of these tributaries contain a flood hazard area width of 150-300 feet. Steep slope embankments are present and created by the eroding effect of the streams. A series of cranberry bogs can be found near the western tributary of the Four Mile Branch.

*Mill Creek*

This sub watershed covers 1.38 square miles and is located just south of the Rt. 72/Rt. 534 intersection. The Brighton at Barnegat Settlement is located to the north of this watershed. No threatened or endangered species are known from these headwaters; however, several species are documented downstream in Stafford Township.

*Oswego River (below and above Rt. 539 and Plains Branch)*

This sub watershed covers approximately 10.67 square miles. As previously discussed, the headwaters of this watershed rise in Barnegat Township and extend downstream to Little Egg Harbor and Bass River Townships. Approximately twenty (20) square miles of Pine Barrens are drained by several branches of this sub watershed and include, but not limited to, the Yellow Dam Branch, the Sykes Branch and two (2) branches of the East Branch of the Oswego River. There are several wetland areas and threatened or endangered species habitats located within this sub watershed.

*Oyster Creek*

This sub watershed covers .75 square miles and is located just west of the Four Mile Branch headwaters. Some of the drainage from Oyster Creek rises near the Lacey Township boundary. The NJDEP Landscape Project 2.1 depicted this area suitable habitat for the pine snake.

*Waretown Creek/Lochiel Creek*

This sub watershed covers 2.38 square miles and located between the Garden State Parkway and US Route. 9. The Lochiel Brook has two (2) steep-sided drainage valleys, one (1) branch extending near Barnegat Boulevard and the other branching out into Lincoln Heights sector that is located near Hamilton Road (unimproved). Both branches of the Lochiel Brook flow to the northeast towards an abandoned cranberry bog that is located close to the Township's northern boundary. The Lochiel Brook eventually enters the Barnegat Bay at the Pebble beach section of the Township.

*Yellow Dam Branch*

This sub watershed covers 4.11 square miles and located along the east and west side of Rt. 539. There are several rare plant species that are located within this sub watershed.

**WETLANDS**

Wetlands support unique communities that serve as natural water filters and as incubators for many beneficial species. The term "wetland" is applied to areas where water meets the soil surface and supports a particular biological community. The source of water for a wetland can be an estuary, river, stream, lake edge, or groundwater that rises close to the land surface. Under normal circumstances, wetlands are those areas that support a prevalence of defined wetland plants on a wetland soil. The US Fish and Wildlife Service designates all large vascular plants as wetland (hydric), nonwetland (nonhydric) or in between (facultative). Wetland soils, also known as hydric soils, are areas where the land is saturated for at least seven (7) consecutive days during the growing season. Wetlands are classified as either tidal (coastal) or nontidal (interior). Tidal wetlands can be either saline or freshwater. There are also special wetland categories to denote saturated areas that have been altered by human activities.

New Jersey protects freshwater (interior) wetlands under the New Jersey Freshwater Wetlands Protection Act Rules: N.J.A.C. A 7:7A. The law also protects transition areas, or “buffers”, around freshwater wetlands. The New Jersey freshwater wetlands maps provide guidance on where wetlands are found in New Jersey, but they are not the final word. Only an official determination from DEP, called a “letter of interpretation (LOI)”, can legally determine for certain if there are freshwater wetlands on a property. An LOI verifies the presence, absence, and boundaries of freshwater wetlands and transition areas on a site. Wetlands are delineated using a “three-parameter-approach”, three (3) biological indicators must be present. The area must have hydric soils (water inundated or saturated soils and rocks), a prevalence of hydrophytes (plant types adapted to living in saturated soil condition), and hydrology (ground or surface water for a significant part of the growing season, at least seven to ten days).

Under the Freshwater Wetlands Protection Act, wetlands are categorized as Exceptional, Intermediate, or Ordinary, and each type has slightly different protections. Exceptional wetlands are associated with FW-1 water and FW-2 “Trout Production” waters and their tributaries and have documented habitat or potential habitat for rare, threatened, or endangered species. These wetlands require a 150-foot transition area. Intermediate wetlands are those wetlands not defined as Exceptional or Ordinary; they require a transition area of 50 feet. Ordinary wetlands are those wetlands that are not exceptional wetlands and are typically isolated, and manmade stormwater facilities such as ditches, swales, and detention basins.

Activities permitted to occur within wetlands and their transition areas are very limited and most require permits. Additional information on wetlands rules and permits is available through NJDEP and on its web site under “land use”.

All of Barnegat Township’s wetlands are freshwater or coastal. Natural wetlands of all types total approximately 8889 acres within the township (34.87% of total land area), of which 3,335.18 acres are wooded wetlands and 460.84 acres are low-growing emergent, scrub/shrub or herbaceous wetlands. See Figure 7 Wetlands.

### ***VERNAL POOLS***

Vernal pools are bodies of water that appear following snowmelt and during spring rains, however they disappear or are dry during the rest of the year. They are highly important sites for certain rare species of amphibians. Particular types of frogs and salamanders will only breed in vernal ponds (obligate breeders), which provide their offspring with a measure of protection because the pond’s impermanence prevents residence by predators of the eggs and young.

Vernal pools are so intermittent that their existence as wetlands has frequently not been recognized. Consequently, many of them have disappeared from the landscape, or have been substantially damaged. This in turn is a principal cause of the decline of their obligate amphibian species.

The New Jersey Division of Fish and Wildlife has been conducting a Vernal Pool Survey project since 2001 to identify, map, and certify vernal ponds throughout the state. Once a vernal pond is certified, regulations require that a 75-foot buffer be maintained around the pond. Local municipalities can provide additional protection by negotiating conservation easements on the land surrounding the pond or by instituting restrictive zoning, such as passing a stream corridor protection overlay ordinance that specifically includes the vernal pools. A Township can also include the pools in its official map.

The NJDEP Land Scope Project did not depict any vernal pools or habitat within Barnegat Township. The NJDEP mapping is an arbitrary measurement. Although the NJDEP data base does not list the presence of any vernal ponds within the Township, a walking tour through roadless sections of an approximately 100 acre area within the northeasterly section of the Township identified several vernal ponds that were contained within cedar and sphagnum basins.

### ***FLOODPLAINS***

Areas naturally subject to flooding are called floodplains, or flood hazard areas. Floodplains encompass a floodway, which is the portion of a floodplain subject to high velocities of moving water, and the adjacent flood fringe, which helps to hold and carry excess water during overflow of the normal stream channel. The 100-year floodplain is defined as the land area that will be inundated by the overflow of water resulting from a 100-year flood (a flood that has a one percent (1%) chance of occurring in any given year).



A wetland area located along an easterly branch of Gunning River.

Although the terms “flood hazard area” and 100-year floodplain” denote similar concepts, NJDEP defines them in slightly different ways. New Jersey’s regulations define the flood hazard area as the area of the 100-year floodplain increased by 25%. This type of flood is called the “flood hazard area design flood” and is regulated by NJDEP.

Floodplains require protection in order to prevent loss to residents, especially within the boundaries of the floodway. Equally important is the preservation of the environmentally sensitive aquatic communities that exist in floodplains. These communities are often the first link in the food chain of the aquatic ecosystem. In addition, floodplains serve the function of removing and mitigating various pollutants through the uptake by their vegetation of excess chemical loads in the water and by the filtering of sediments generally. All efforts to keep development out of floodplains will help to preserve the flood-carrying capacity of streams and their water quality.

In New Jersey and throughout the country, building in areas subject to flooding is regulated to protect lives, property, and the environment. New Jersey regulates construction in the flood hazard area under the Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et seq., and its implementing rules at N.J.A.C. 7:13. Activities that are proposed to occur in a flood hazard area will require issuance of a stream encroachment permit or a letter of nonapplicability from NJDEP. Additional information on floodplain activities is available from NJDEP and from its web site under “Land Use”.

New Jersey’s flood hazard area maps are not available in digital form. Consequently, it is only possible to approximate the spatial extent of the flood hazard area in Barnegat by using the Federal Emergency Management Agency’s (FEMA’s) 100-year floodplain maps. Nearly all of Barnegat’s floodplain areas are located along waterways and their tributaries. Flood prone areas can also be found along the Barnegat Bay section of the Township.

### ***SURFACE WATER QUALITY***

Water quality standards are established by federal and state governments to ensure that water is suitable for its intended use. The federal Clean Water Act (P.L. 95-217) requires that wherever possible, water-quality standards provide water suitable for fish, shellfish, and wildlife to thrive and reproduce and for people to swim and boat.

All waterbodies in New Jersey are classified by NJDEP as either freshwater (FW), pinelands water (PL), saline estuarine water (SE), or saline coastal water (SC). Freshwater that originates and is wholly within federal or state parks, forests, or fish and wildlife lands (FW1) and all other freshwater (FW2). The water quality for each of these groups must be able to support designated uses that are assigned to each waterbody classification (see Surface Water Quality Standards N.J.A.C. 7:9B-1.12). In addition to being classified as FW1 and FW2, fresh waterbodies are classified as trout producing (TP), trout maintaining (TM) or nontrout waters (NT). Each of these classifications may also be subject to different water quality standards.

A majority of all the streams in Barnegat Township are freshwater streams. All streams that are located within the Township are non-trout maintaining. Gunning River and Double Creek are classified by NJDEP as FW2-NT/SE1), which means that they are freshwater and saline estuarine water that are not trout producing or trout maintaining. However, the Edwin B. Forsythe National Wildlife Refuge section of Double Creek and Gunning River are classified by NJDEP as FW-2NTC1/SE1 and is a Category (C-1) waterway. The Barnegat Bay is classified by NJDEP as SE1C1, which means it is a saline estuarine water and a Category (C-1) waterway. The Dry branch, Eight Mile Branch, Four Mile Branch, Fresh Creek, Lochiel Creek, Mill Creek, Oswego River, Oyster Creek and the Yellow Dam Branch are classified by NJDEP as a pinelands water (PL). Lochiel Creek is also classified by the NJDEP as a FW-2 NT/SE1, while Fresh Creek is classified as an FW2-NTC1/SE1 Category 1 waterway.

The Oswego River is the only waterbody in the Township that the NJDEP classified as FW1, which means that the freshwater originates and is located within federal or state parks, forests, or fish and wild life lands. All surface waters and C-1 waterways are shown in Figure 9. A listing of all waterways within Barnegat Township is listed below in Table 4.

A Category One (C-1) designation indicates an extra level of protection for waterbodies that “provide drinking water, habitat for Endangered and Threatened species, and popular recreational and/or commercial species, such as trout or shellfish”. Any exceptionally significant waterway can be designated C-1, whether that significance is ecological, recreational, or for drinking water quality. A C-1 waterway operates under more stringent stormwater regulations that emphasize groundwater recharge and also provide wider riparian buffers of 300 feet from the top of the bank on each side. These riparian buffers are required to remain in their natural state and the clearing or cutting of trees or brush is prohibited. The use of fertilizers, pesticides, or other chemicals is also prohibited within the buffer in order to protect water quality (Barnegat Township Municipal Stormwater Management Plan).

In addition to the stormwater buffer requirements of N.J.A.C. 7:8, a riparian buffer may be required pursuant to N.J.A.C. 7:13-4.1 of the Flood Hazard Control Act Rules.

A riparian zone exists along every regulated waterbody with the exception of the Atlantic Ocean, man-made lagoons, stormwater basins, oceanfront barrier islands or peninsulas. A riparian zone buffer of 300 feet wide extending from the top of bank is required for designated C-1 waterways, and all upstream tributaries that are situated within the same HUC-14 watershed.

A 150-foot wide riparian zone buffer extending from the top of bank is required for those waters that are trout production waters, trout maintenance waters and all upstream waters within one (1) linear mile as measured along the length of the regulated water, or any segmented of water flowing through an area containing documented habitat for a threatened or endangered species that is dependant on the regulated water for survival.

The riparian zone for all other waterways that are not mentioned above will contain a 50-foot wide long buffer extending from the top of bank and located on both sides of the waterway.

**Table 4: Water Quality Classifications of Streams in Barnegat Township**

<b>Name</b>	<b>Classification</b>
Barnegat Bay	SE1C1
Double Creek	FW2-NT/SE1, FW2-NTC1/SE1
Dry Branch	PL
Eight Mile Branch	PL
Four Mile Branch	PL FW2-NT/SE1
Fresh Creek	FW2-NTC1/SE1
Gunning River	FW2-NT1SE1 FW2-NTC1/SE1
Lochiel Creek	FW2-NT/SE1
Mill Creek	PL
Oswego River	PL, FW1
Oyster Creek	PL
Yellow Dam Branch	PL

According to NJDEP rules, FW2 (both trout maintaining and not) waters must provide for (1) the maintenance, migration, and propagation of the natural and established biota; (2) primary and secondary contact recreation (i.e., swimming and fishing); (3) industrial and agricultural water supply; (4) public potable water supply after conventional filtration and disinfection; and (5) any other reasonable uses.

The determination of whether or not water quality is sufficient to meet a waterbody's designated use(s) is based on whether or not the waterbody is within established limits for certain surface water quality parameters. Some examples of surface water quality parameters include fecal coliform, dissolved oxygen, pH, phosphorous, and toxic substances. NJDEP also evaluates water quality by examining the health of aquatic life in stream.

## **GROUNDWATER**

### ***GEOLOGY***

The geology of the New Jersey Atlantic Coastal Plain can be compared to a tilted layercake, with its "layers", or strata, formed of gravels, sands, silts and clays. The groundwater is drawn from the saturated gravel and sand that is present at each aquifer. Silt and clay layers impede the movement of water and are known as confining beds.

A cross section across southern New Jersey from west to east would show that the aquifers are not horizontal and tilt towards the southeast. The aquifers become deeper as they cross the State and head towards the Atlantic Ocean. As a result of tilting, each

aquifer emerges on the land surface in a sequential manner. The deepest strata emerge on the surface near the Delaware River.

The geological formations that underlay Barnegat Township consist of sand, silt, clay and gravel. These formations and deposits have been classified into three (3) geological time periods, which include the Cretaceous, Tertiary and Quaternary. The location of the geological formations in Barnegat Township can be found below in Figure 8.

The Cohansey Sand Formation is found at the surface throughout most of Barnegat Township. The Cohansey is capped in several places by Beacon Hill Gravel and Bridgeton Formations. The coastal area of Barnegat Township is overlain by the Cape May Formation.

Precipitation is the main source for groundwater recharge for Barnegat Township. Approximately 40% of all precipitation infiltrates through the permeable sandy soil and then extends to the zone of saturation.

Five (5) major water bearing units are present in Barnegat Township and included, but not limited to, the Raritan-Magothy Formation, Englishtown, Wenonah Formation and Mount Laurel Sand, Kirkwood Formation and the water table aquifer.

#### **Raritan - Magothy Formation**

This formation consists of fine-grained sands that are interbedded with clay. The Raritan-Magothy formation is the deepest and thickest aquifer in the County and has an average well yield of 525 gallons per minute with a minimum of 35 gpm and a maximum of 1,000 gpm. Water that is obtained from this aquifer is generally soft and may contain large amounts of iron. Saline water intrusion into the aquifer is typical within the easterly section of the Township.

#### **Englishtown Formation**

The Englishtown formation is an intense developed aquifer that consists of gray quartz sand and can be found within the northwesterly corner of Barnegat Township. Soft to moderately hard and alkaline water is present within this aquifer. The aquifer has a slight potential for further ground-water development.

#### **Wenonah – Formation and Mount Laurel Sand**

The Mount Laurel and Wenonah formations are hydraulically interconnected as a single aquifer. However, the southwest portion of the Wenonah formation does not out crop within Barnegat Township. Typical Mount Laurel Sand within Barnegat Township consists of fine-to course-grained quartz sand. Water within this aquifer typically yields up to 100 gpm in the northerly portion of Ocean County.

## **Kirkwood Formation**

This aquifer typically crops out in the westerly portion of Barnegat Township. This unit is comprised of a lower part and upper part. The lower part contains dark-brown fine-grained quartz sand. Meanwhile, the upper part contains a light gray fine-grained quartz sand. The Kirkwood Formation ranges in thickness from 50 feet in the out crop area to 800 feet near Atlantic City. This aquifer is the most developed aquifer in the County. The water in this aquifer is soft to moderately hard with some iron concentrations.

The Water Table Aquifer is the main water resource for Barnegat Township. This aquifer consists of Cohansey Sand, Beacon Hill Gravel, and the Bridgeton and Cape May Formations. A brief description of each formation are listed below:

- Cohansey Sand is exposed throughout Barnegat Township and most of Ocean County. This sand is characterized by a yellow brown, fine to very coarse-grained quartz sand. The primary recharge area for the Cohansey Formation consists of practically all groundwater that results from precipitation and is highly susceptible to any groundwater contaminants. The Cohansey thickens southward throughout Ocean County to a depth of 200 feet at Tuckerton.
- Beacon Hill Gravel exists as eroded remnants that cap hill top areas within the Township. The oldest, highest in altitude and coarsest of ground deposits are composed of quartz pebbles and sand. This formation can be found in the western portion of the Township.
- Bridgeton Formation typically can be found on several hilltops within the central and western sections of Barnegat Township with elevations greater than 150 feet. Franstone, cementing of particles, and soluble minerals loaded downward in the earth by chemical bonding of iron oxide can be found in this formation.
- Cape May Formation is typically formed from marine deposits of the West Plains. Marine deposits can be found at altitudes of less than 50 feet along the coast.

## ***WATER SUPPLY WELLS***

There are 7 active public community water supply wells serving Barnegat Township and they are listed below in Table 5. Public Water Supply Wells serving Barnegat Township are shown on Figure 10 **Public Water Supply Wells**. Barnegat public wells were completed in the Atlantic City “800-foot” sand aquifer (800-foot sand) of the Shiloh Marl member of the Kirkwood Formation.

<b>Table 5: Barnegat Township Water Supply Wells</b>				
<i>Well ID</i>	<b>Original Owner</b>	<i>Aquifer</i>	<b>Depth of Well</b>	<b>Permit #</b>
3	Barnegat Township	800-foot Sand	252	3300001429
4	Barnegat Township	800-foot Sand	172	3300002356
5	Barnegat Township	800-foot Sand	318	3300039718
7	Barnegat Township	800-foot Sand	260	3300029909
6	Barnegat Township	800-foot Sand	272	3300043141
9	Barnegat Township	800-foot Sand	295	3300043984
8	Barnegat Township	800-foot Sand	345	3337831



Well #3 located along West Bay Avenue.

Public non-community wells are another part of a public water system. Non-community water systems can be classified as either transient or non-transient, which refers to the type of populations that utilize them. A non-transient water system serves at least 25 of the same people daily at a minimum of 6 months per year. These water systems serve places, such as schools, factories, and office parks. On the other hand, a transient non-community water system serves at least 25 people daily, but the population changes each day. These systems are found at such places as rest stops, gas stations, and restaurants. Some non-community wells can be found in Barnegat Township.

### ***GROUNDWATER RECHARGE***

Recharge of groundwater is an important issue in southern New Jersey because of the dependence on aquifers for drinking supply and for agricultural use. The amount of rainwater that actually enters an aquifer is a function of many factors, including the nature and structure of the aquifer itself. The amount of precipitation that infiltrates the soil and reaches the saturated zone to become groundwater – the recharge of the aquifer – is also dependant on climatic conditions, the nature of the soil, and the vegetation of an area.

The New Jersey Geological Survey has developed a methodology for evaluating land areas for their ability to transmit water to the subsurface, using precipitation records, soil surveys, and land use/land cover data. NJDEP has used this methodology to map and rank land areas throughout the State as to groundwater potential. Recharge is equivalent to the amount of precipitation that will reach the water table in an area with a particular combination of soils and land use. It is expressed as inches per year.

In general, on high recharge lands, the amount of paving and other impervious cover has the most detrimental impact, although they are also usually the places that are most suitable for building because they are areas of well-drained soils. Conversely, these are also regions where the dilution of substances from septic systems, such as nitrates, may require a larger land area because the soils are usually more “porous”. For example, minimum average lot sizes of two to four acres are often needed for proper nitrate dilution from septic systems in areas having 10 or more inches per year of groundwater recharge. The Groundwater Recharge rate for Barnegat Township is shown below in Figure 11.

### ***WELLHEAD PROTECTION AREAS***

As part of its 1991 Wellhead Protection Program Plan, NJDEP has delineated Wellhead Protection Areas (WHPAs) around all community wells. A WHPA is the area from which a well draws its water within a specified time frame (tiers). Pollutants spilled directly on or near the wellhead will enter the water source within that time frame. Once delineated, these areas become a priority for efforts to prevent and clean up groundwater contamination. Other components of the Wellhead Protection Plan include implementing best management practices to protect groundwater, land use planning, and education to promote public awareness of groundwater resources.

Once WHPAs are delineated, potential pollution sources may be managed by landowners or municipalities in relation to tier locations. Protection of land and restriction on activities within wellhead zones relating to uses that generate contaminants, and to the storage, disposal, or handling of hazardous materials, are important for maintaining the quality of water within those zones.

There are seven (7) public community wells with wellhead protection areas in Barnegat, and are shown on Figure 12.

## **AIR QUALITY**

One of the most difficult environmental resources to measure is air quality. Pollution has many sources including industries, vehicles, fires, and dust. Also, the affects of the pollution can be felt far from its source. Increased public awareness about the problems air pollution can cause lead to the initial laws, the Air Pollution Control Act of 1955 and the Clean Air Act of 1963. Shortly after these were enacted, the Air Quality Act was passed in 1967, increasing the federal governments enforcement and lead to widespread air quality monitoring and inspections.

The next piece of legislation passed regarding air quality was the Clean Air Act of 1970. This caused a major change in the role of the federal government in pollution control. It allowed for federal and state governments to regulate emissions from both stationary and mobile sources. At about the same time as this law was passed the National Environmental Policy Act was created and from this came the U.S. Environmental Protection Agency (EPA), created to implement requirements of the Clean Air Act of 1970. The Clean Air Act was amended twice since 1970, the most recent being in 1990. This amendment created a program where industries bought and sold emission “allowances” or “credits”. It also made it mandatory for transportation projects to work within the state air quality guidelines and increased the number of pollutants regulated.

In New Jersey, the Department of Environmental Protection’s Bureau of Air Monitoring has 43 stations throughout the state. These monitoring stations continually monitor all or some of seven parameters set forth by the EPA in the National Ambient Air Quality Standards (NAAQS). These seven (7) parameters are carbon monoxide, nitrogen oxides, ozone, sulfur dioxide, smoke shade, particulate matter, and meteorological data. There are two (2) types of NAAQ Standards, the primary standard focuses on the effects on human health, and the secondary standard focuses on environmental and property damage.

The closest monitoring stations to Barnegat Township are located in Freehold, Colliers Mills, and Monmouth University. For the most recent tests, completed in 2005, carbon monoxide and smoke shade were measured at Freehold, while ozone was measured at Colliers Mills and Monmouth University. The test results from 2005 are as follows:

### *Carbon Monoxide*

There are two (2) main, health based, standards set forth by NAAQS for carbon monoxide. First is a one hour concentration of 35 parts per million (ppm), and the second

is an 8 hour average concentration of 9 ppm. These levels maybe not be exceeded more than once a year. In Freehold, the highest 8-hour concentration was 2 ppm, well below the health standard, and one of the lowest in New Jersey. The highest 1-hour concentration was 5.4 ppm, the second highest in the state.

*Ground-level Ozone*

There are also two (2) primary, health based, standards set forth by NAAQS for ground-level ozone. The first standard is a one-hour concentration of 0.12 ppm and, the second is an eight-hour average concentration of 0.08 ppm. Ground-level ozone also has secondary standards, which are the same as the primary for the national standards. However, New Jersey has tightened the one-hour concentration standard for the secondary effects to 0.08 ppm also. The results for both Colliers Mills and Monmouth University were above the state and national standards in the one-hour concentration monitoring with their highest averages both at 0.139 ppm. The 8-hour concentration averages were 0.109 ppm for Colliers Mills and 0.100 ppm for Monmouth University. Therefore, both also exceeded the primary and secondary standards for both the state and national standards.

<http://www.epa.gov/air/caa/>  
<http://www.state.nj.us/dep/airmon/reports.htm>

*Air Quality Index*

Air Quality Index (AQI) was created by the EPA to specify a region’s air quality by measuring levels of five (5) criteria pollutants: ground level ozone, particulate matter, carbon monoxide, nitrogen oxides, and sulfur dioxide. The AQI is used to determine the potential human health hazards caused by breathing unhealthy air. The scale that the AQI uses to measure ranges from 0 to 500 and is divided into six (6) color-coded categories and is shown below in Table 6.

Table: 6  
**Air Quality Index (AQI)**

Air Quality Index (AQI) Value	Level of Health Concern Rating	Color Code
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for sensitive groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very unhealthy	Purple
301 to 500	Hazardous	Maroon

Source: EPA, 2007 <http://airnow.gov/index.cfm?action=static.aqi>

A daily score is based off of the pollutant that scored the highest overall. For example, if particulate matter scored 100 and ozone scored 150, then the AQI for that day would be 150.

The monitoring sites for AQI are the same as the monitoring sites for carbon monoxide and ground-level ozone. For this monitoring region, Region 6, carbon monoxide, particulate matter, and ozone are the three pollutants tested. The most recent report, completed in 2005, stated that there were 312 good days, 37 moderate, 15 unhealthy for sensitive groups, 1 unhealthy, and no very unhealthy or hazardous days.

## **NOISE**

The Zoning Ordinance for the Township has specified that any sound level should comply with the American National Standards Institute and the American Standards Specifications for General Purpose Sound Level Meters. When being used it should be set to a weighted response scale, while the metering should be set to slow response. The measurements should be in compliance with the American Standard Method for the Physical Measurements of Sound.

The noise level restrictions are most stringent for residential zones. The maximum noise level permitted in residential zone is 55/dBA and should be measured on or beyond the neighboring use or lot line. Also within the residential zone, noise levels should not exceed 45 dBA between the hours of 9:00pm and 7:00am. Agricultural zones maximum noise level permitted is 60/dBA and should be measured from the same area as residential. All of the other districts have a permitted maximum noise level of 65/dBA and should be measured from the same distance as residential and agricultural districts. Also, wherever residential zones share a boundary with another district, the district with the maximum noise level will apply. (Ordinance.com)

## BIOLOGICAL RESOURCES

When a community protects wildlife and habitat, it is also protecting biodiversity, which is important for the health and productivity of the ecosystem and its inhabitants, including humans. Biodiversity refers to the variety of genetic material within a species population, the variety of natural communities within a given region. Biodiversity facilitates adaptation and evolution, improving a species' chance of survival as the environment changes. A diversity of plant and animal species is also necessary to maintain healthy human environments, working landscapes, and productive ecosystems. Lower organisms, many not well known, contribute to nutrient cycling, decomposition of organic matter, soil rehabilitation, pest and disease regulation, pollination, and water filtering. Once biodiversity declines, it is extremely hard for an ecosystem to recover or replace species.

Barnegat contains numerous types of habitats, all of which are important for maintaining biodiversity. Wooded wetlands and coastal are common natural ecosystem types that can be found in Barnegat. Upland forests occur where land is dry and undeveloped. The following sections will identify and describe in more detail the plant and animal communities that inhabit these unique ecosystems within Barnegat Township.

### *NAUTRAL VEGETATION*

#### *Vegetation*

Many factors, such as hydrology, climate, soil and slope affect the size and type of the vegetation communities that inhabit an area. The Township of Barnegat consists of various habitats including: upland forests, salt water tidal marsh, wetland areas including Atlantic white cedar swamps, and beaches. The following listed plant species can be found and observed within the Township of Barnegat.

\*Denotes edible or medicinal R - denotes rare or endangered species.

<u>Scientific Name</u>	<u>Common Name</u>
<b><u>FLOWERING PLANTS- Herbaceous</u></b>	
<i>Arethusa bulbosa</i>	Arethusa
<i>Peltandra virginica</i>	Arrow-arum
<i>Sagittaria latifolia</i>	Arrowhead, Broadleaved
<i>Sagittaria australis</i>	Arrowhead, Longbeaked
<i>Sagittaria teres</i>	Arrowhead, Slender
<i>Narthecium americanum</i>	Asphodel, Bog
<i>Tofieldia racemosa</i>	Asphodel, False
<i>Aster nemoralis</i>	Aster, Bog
<i>Aster dumosus</i>	Aster, Bushy
<i>Aster pilosus</i>	Aster, Eastern Silvery

<i>Chrysopsis falcate</i>	Aster, Golden
<i>Aster patens</i>	Aster, Late Purple
<i>Aster Novi-belgii</i>	Aster, New York
<i>Aster tenuifolius</i>	Aster, Salt Marsh
<i>Aster concolor</i>	Aster, Silvery
<i>Aster gracilis</i>	Aster, Slender
<i>Aster liniariifolius</i>	Aster, Stiff-leaved
<i>Aster vimineus</i>	Aster, Twiggy
<i>Aster undulatus</i>	Aster, Wavy-leaved
<i>Aster divaricatus</i>	Aster, Woodland
<i>Aster simplex</i>	Aster, White-panicked
<i>Sericocarpus asteroids</i>	Aster, White-top
<i>Bartonia virginica</i>	Bartonia, Upright
<i>Galium pilosum</i> var. <i>puncticulosum</i>	Bedstraw, Pine Barren
<i>Monarda fistulosa</i>	Bee Balm
<i>Bidens frondosa</i>	Beggarticks, Black
<i>Rudbeckia hirta</i>	Black-eyed Susan
<i>Utricularia fibrosa</i>	Bladderwort, Fibrous
<i>Utricularia cornute</i>	Bladderwort, Horned
<i>Utricularia olivacea</i>	Bladderwort, Minute
<i>Utricularia cleistogama</i>	Bladderwort, Pinlike
<i>Utricularia purpurea</i>	Bladderwort, Purple
<i>Utricularia juncea</i>	Bladderwort, Rush
<i>Utricularia inflata</i>	Bladderwort, Swollen
<i>Utricularia subulata</i>	Bladderwort, Zig-zag
<i>Liatris graminifolia</i> var. <i>lasia</i>	Blazing Star, Hairy
<i>Trichostema dichotomum</i>	Bluecurls
<i>Sisyrinchium atlanticum</i>	Blue-eyed Grass
<i>Eupatorium album</i>	Boneset, White
<i>Eupatorium scandens</i>	Boneset, Climbing
<i>Eupatorium resinosum</i>	Boneset, Sticky
<i>Saponaria officinalis</i>	Bouncing Bet (Soapwort)
<i>Lespedeza hirta</i> var. <i>longifolia</i>	Bush-clover, Hairy
<i>Lespedeza capitata</i>	Bush-clover, Round-headed
<i>Linaria vulgaris</i>	Butter-and-eggs
<i>Heterotheca subaxillaris</i>	Camphorweed
<i>Lychnis alba</i>	Campion, White
<i>Lobelia cardinalis</i>	Cardinal Flower
<i>Anthemis arvensis</i>	Chamomile, Corn
<i>Cinchorium intybus</i>	Chicory

<i>Stellaria media</i>	Chickweed, Common
<i>Cerastium vulgatum</i>	Chickweed, Mouse-ear
<i>Potentilla spp.</i>	Cinquefoil
<i>Trifolium arvense</i>	Clover, Rabbit Foot
<i>Aletris farinosa</i>	Colicroot
<i>Oxypolis rigidior longifolia</i>	Cowbane, Slender-leaved
<i>Melampyrum lineare</i>	Cow-wheat
<i>Krigia virginica</i>	Dandelion, Dwarf
<i>Taraxacum officinale</i>	Dandelion, Common
<i>Taraxacum erythrospermum</i>	Dandelion, Red-seeded
<i>Muhlenbergia uniflora</i>	Dropseed, Late flowering
<i>Oenothera</i>	Evening Primrose
<i>Antennaria neglecta</i>	Everlasting, Early
<i>Anaphalis margaritacea</i>	Everlasting, Pearly
<i>Anaphalis obtusifolium</i>	Everlasting, White
<i>Gerardia virginica</i>	False Foxglove, Downy
<i>Gerardia pedicularia</i>	False Foxglove, Fern-leaved
<i>Erigeron annuus</i>	Fleabane, Daisy
<i>Erigeron philadelphicus</i>	Fleabane, Philadelphia
<i>Pluchea purpurascens</i>	Fleabane, Marsh
<i>Helianthemum canadense</i>	Frostweed
<i>Gentiana saponaria</i>	Gentian, Closed
<i>Gentiana autumnalis</i>	Gentian, Pine Barrens
<i>Gerardia purpurea</i>	Gerardia, Purple
<i>Gerardia racemulosa</i>	Gerardia, Pine Barrens
<i>Gerardia setacea</i>	Gerardia, Bristle-leaved
<i>Gerardia maritima</i>	Gerardia, Seaside
<i>Gerardia tenuifolia</i>	Gerardia, Slender
<i>Tephrosia virginiana</i>	Goat's-rue
<i>Chrysopsis mariana</i>	Golden Aster, Maryland
<i>Lohpiola americana</i>	Golden-crest
<i>Orontium aquaticum</i>	Golden Club
<i>Gratiola aurea</i>	Golden-pert
<i>Solidago uliginosa</i>	Goldenrod, Bog
<i>Solidago puberula</i>	Goldenrod, Downy
<i>Solidago Elliottii</i>	Goldenrod, Elliot's
<i>Solidago graminifolia</i>	Goldenrod, Flat-topped
<i>Solidago erecta</i>	Goldenrod, Slender
<i>Solidago fistulosa</i>	Goldenrod, Pine Barrens
<i>Solidago sempervirens</i>	Goldenrod, seaside

<i>Solidago odora</i>	Goldenrod, Sweet-scented
<i>Solidago neglecta</i>	Goldenrod, Swamp
<i>Solidago altissima</i>	Goldenrod, Tall
<i>Solidago stricta</i>	Goldenrod, Wand-like
<i>Calopogon pulchellus</i>	Grass- pink
<i>Hieracium spp.</i>	Hawkweed
<i>Prunella vulgaris</i>	Heal-all
<i>Monarda punctata</i>	Horsemint
<i>Monotropa uniflora</i>	Indian-pipe
<i>Iris versicolor</i>	Iris, Large Blue
<i>Iris prismatica</i>	Iris, Slender Blue
<i>Veronia noveboracensis</i>	Ironweed
<i>Impatiens capensis</i>	Jewelweed
<i>Eupatorium dubim</i>	Joe-Pye-Weed
<i>Polygonella articulata</i>	Jointweed
<i>Scleranthus annuus</i>	Knawel
<i>Spiranthes praecox</i>	Ladies'-tresses, Little
<i>Spiranthes tuberosa</i>	Ladies'-tresses, Nodding
<i>Spiranthes cernua</i>	Ladies'-tresses, Southern Slender
<i>Spiranthes gracilis</i>	Lady's Slipper
<i>Lactuca graminifolia</i>	Lettuce, Grass-leaved*
<i>Lilium superbum</i>	Lily, Turk's-cap
<i>Lobelia Canbyi</i>	Lobelia, Canby's R
<i>Lobelia Boykinii</i>	Lobelia, boykin's R
<i>Lobelia Nuttallii</i>	Lobelia, Nuttall's
<i>Lysimachia terrestris</i>	Loosestrife, Ballbearing
<i>Lythrum salicaria</i>	Loosestrife, Purple
<i>Ludwigia sphaerocarpa</i>	Ludwigia, Globefruited
<i>Ludwigia hirtella</i>	Ludwigia, Hair
<i>Lupinus perennis</i>	Lupine
<i>Sabatia angularis</i>	Marsh Pink
<i>Sabatia stellaris</i>	Marsh Pink
<i>Sabatia dodecandra</i>	Marsh Pink, Large
<i>Kosteletskya virginica</i>	Mallow, Seashore*
<i>Hibiscus moscheutos</i>	Mallow, Crimson-eyed*
<i>Hibiscus palustris</i>	Mallow, Swamp Rose*
<i>Rhexia aristosa</i>	Meadow Beauty, Deergrass R
<i>Rhexia mariana</i>	Meadow Beauty, Maryland
<i>Rhexia virginica</i>	Meadow Beauty, Virginia
<i>Asclepias amplexicaulis</i>	Milkweed, Blundleaved*

<i>Asclepias syriaca</i>	Milkweed, Common*
<i>Asclepias tuberosa</i>	Milkweed, Orange
<i>Asclepias rubra</i>	Milkweed, Red
<i>Asclepias lanceolata</i>	Milkweed, Smooth Orange
<i>Asclepias incarnata</i>	Milkweed, Swamp
<i>Polygala cruciata</i>	Milkwort, Crossleaved
<i>Polygala lutea</i>	Milkwort, Orange
<i>Polygala polygama</i>	Milkwort, Racemed
<i>Polygala brevifolia</i>	Milkwort, Shortleaved
<i>Convolvulus spp.</i>	Morning-glory
<i>Brewerica Pickeringi</i>	Morning-glory Pickering's R var. caesariensis
<i>Verbascum thapsus</i>	Mullein, Common
<i>Verbascum Blattaria</i>	Mullein, Moth
<i>Solanum dulcamera</i>	Nightshade, Bittersweet
<i>Solanum nigrum</i>	Nightshade, Black
<i>Habenaria cristata</i>	Orchid, Crested Yellow R
<i>Habenaria clavellata</i>	Orchid, Green Woodland
<i>Habenaria integra</i>	Orchid, Southern Yellow R
<i>Habenaria blephariglottis</i>	Orchid, White Fringed
<i>Chrysanthemum Leucanthemum</i>	Ox-eye Daisy
<i>Cassia fasciculata</i>	Partridge Pea
<i>Stylosanthes biflora</i>	Pencil-flower, Hairy
<i>Stylosanthes riparia</i>	Pencil-flower, Sprawling
<i>Pontederia cordata</i>	Pickeralweed
<i>Sarothra gentianoides</i>	Pinweed, Orange Grass
<i>Lechea villosa</i>	Pinweed, Large
<i>Lechea racemulosa</i>	Pinweed, Oblong-fruited
<i>Lechea minor</i>	Pinweed, Thyme-leaved
<i>Eriocaulon compressum</i>	Pipewort, Flat
<i>Eriocaulon septangulare</i>	Pipewort, Seven-angled
<i>Eriocaulon decangulare</i>	Pipewort, Ten-angled
<i>Sarracenia purpurea</i>	Pitcher-plant
<i>Pogonia ophioglossoides</i>	Pogonia, Rose
<i>Cleistes divaricata</i>	Pogonia, Spreading R
<i>Phytolacca americana</i>	Pokeweed*
<i>Oenothera biennis</i>	Primrose, Evening
<i>Oenothera laciniata</i>	Primrose, Evening, Cut-leaved
<i>Daucus carota</i>	Queen Anne's Lace*
<i>Senecio tomentosus</i>	Ragwort, Wooly

<i>Eryngium yuccifolium</i>	Rattlesnake Master
<i>Goodyera</i> spp.	Rattlesnake Plantain
<i>Prenanthes trifoliolata</i>	Rattlesnake-root, Gall-of-the-earth
<i>Prenanthes autumnalis</i>	Rattlesnake-root
<i>Prenanthes serpentaria</i>	Pine Barrens R
<i>Lachnanthes tinctoria</i>	Rattlesnake-root, Lion's foot
<i>Sabatia difformis</i>	Redroot
<i>Salvia lyrata</i>	Sabatia, Lance-leaved
<i>Hypericum canadense</i>	Sage, Lyre-leaved*
<i>Hypericum denticulatum</i>	St. John's wort, Canada*
<i>Hypericum virginicum</i>	St. John's-wort, Coppery*
<i>Arenaria caroliniana</i>	St. John's-wort, Marsh
<i>Sclerolepis uniflora</i>	Sandwort, Pine Barrens
<i>Scutellaria integrifolia</i>	Sclerolepis
<i>Ludwigia alternifolia</i>	Skullcap, Hyssop*
<i>Helenium autumnale</i>	Seedbox
<i>Nuphar variegatum</i>	Sneezewood
<i>Bidens bipinnata</i>	Spatter-dock, Floating
<i>Veronica arvensis</i>	Spanish-needles
<i>Euphorbia cyparissias</i>	Speedwell, Corn
<i>Euphorbia ipecacuanhae</i>	Spurge, Cypress
<i>Trientalis borealis</i>	Spurge, Ipecac
<i>Drosera rotundifolia</i>	Star-flower
<i>Drosera intermedia</i>	Sundew, Round-leaved
<i>Drosera filiformis</i>	Sundew, Spatulate-leaved
<i>Oenothera perennis</i>	Sundew, Thread-leaved
<i>Oenothera fruticosa</i>	Sundrops, Dwarf
<i>Helianthus angustifolius</i>	Sundrops, Narrow-leaved
<i>Helonias bullata</i>	Sunflower, Narrow-leaved
<i>Tanacetum vulgare</i>	Swamp Pink
<i>Eupatorium pilosum</i>	Tansy, Bitter Buttons*
<i>Eupatorium hyssopifolium</i>	Thoroughwort, Common
<i>Eupatorium pilosum</i>	Thoroughwort, Hyssop-leaved
<i>Cirsium arvense</i>	Thoroughwort, Rough
<i>Cirsium horridulum</i>	Thistle, Canada*
<i>Bidens coronata</i>	Thistle, Yellow*
<i>Desmodium ciliare</i>	Tickseed-sunflower
<i>Desmodium rigidum</i>	Tick-trefoil, Hairy
<i>Desmodium strictum</i>	Tick-trefoil, Rigid
	Tick-trefoil, Stiff

<i>Comandra umbellata</i>	Toadflax, Bastard
<i>Xerophyllum asphodeloides</i>	Turkey-beard
<i>Liparis lilifolia</i>	Twayblade, Lily-leaved
<i>Liparis Lowselii</i>	Twayblade, Bog R
<i>Specularia perfoliata</i>	Venus' Looking-glass
<i>Verbena hastata</i>	Vervain, Blue*
<i>Viola pedata</i>	Violet, Birdfoot*
<i>Viola lanceolata</i>	Violet, Lance-leaved*
<i>Viola fimbriatula</i>	Violet, Ovate-leaved*
<i>Viola primulifolia</i>	Violet, Primrose-leaved*
<i>Nymphaea odorata</i>	Waterlily-Fragrant*
<i>Sium suave</i>	Water Parsnip
<i>Draba verna</i>	Whitlow-Grass
<i>Apios americana</i>	Wild Bean*
<i>Strophostyles umbellata</i>	Wild Bean, Pink*
<i>Strophostyles helvola</i>	Wild Bean, Trailing*
<i>Baptisia tinctoria</i>	Wild Indigo
<i>Cassia nictitans</i>	Wild Sensitive Plant
<i>Achillea millefolium</i>	Yarrow*
<i>Xyris caroliniana</i>	Yellow-eyed Grass, Carolina
<i>Xyris Congdoni</i>	Yellow-eyed Grass, Congdon's
<i>Xyris fimbriata</i>	Yellow-eyed Grass, Fringed
<i>Xyris torta</i>	Yellow-eyed Grass, Slender
<i>Xyris flexuosa</i>	Yellow-eyed Grass, Twisted
<b>Flowering Plants-Grasses, Reeds, Sedges</b>	
<i>Ammophila breviligulata</i>	Beach Grass
<i>Rhynchospora Kneiskerni</i>	Beaked Rush R
<i>Rhynchospora fusca</i>	Beaked Rush, Brown
<i>Rhynchospora cephalantha</i>	Beaked Rush, Capitata
<i>Rhynchospora glomerata</i>	Beaked Rush, Clustered
<i>Rhynchospora oligantha</i>	Beaked Rush, Few-flowered
<i>Rhynchospora gracilentia</i>	Beaked Rush, Slender
<i>Rhynchospora alba</i>	Beaked Rush, White
<i>Gymnopogon ambiguus</i>	Beardgrass R
<i>Agrostis altissima</i>	Bent Grass
<i>Andropogon scoparium</i>	Broomsedge
<i>Andropogon virginicus</i>	Broomsedge, Virginia
<i>Scirpus americanus</i>	Bulrush American*
<i>Scirpus Longii</i>	Bulrush, Long's R*
<i>Scirpus maritimus</i>	Bulrush, Saltmarsh* R

<i>Sparganium americanum</i>	Bur-reed, Slender*
<i>Typha latifolia</i>	Cat-tail, Broad-leaved*
<i>Typha angustifolia</i>	Cat-tail, Narrow-leaved*
<i>Scirpus subterminalis</i>	Club-rush, Water
<i>Eriophorum tenellum</i>	Cotton-grass, Tawny
<i>Digitaria sanguinalis</i>	Crab-grass
<i>Cyperus Grayii</i>	Cyperus, Gray's
<i>Cyperus filiculmis</i>	Cyperus, Slender
<i>Cyperus dentatus</i>	Cyperus, Toothed
<i>Cyperus brevifolius</i>	Cyperus, Umbrella R
<i>Zostera marina</i>	Eel-grass
<i>Limnanthemum lacunosum</i>	Floating Heart
<i>Salicornia europaea</i>	Glasswort*
<i>Deschampsia flexuosa</i>	Hairgrass, Common
<i>Glyceria obtusa</i>	Manna-grass, Blunt
<i>Distichlis spicate</i>	Marsh-grass
<i>Amphicarpum Purshii</i>	Millet Grass, Pinelands
<i>Muhlenbergia uniflora</i>	Muhly, One-Flowered
<i>Muhlenbergia Torreyana</i>	Muhly, Torrey's
<i>Scleria triglomerata</i>	Nut Rush
<i>Scleria nitida</i>	Nut Rush, Shining
<i>Scleria minor</i>	Nut Rush, Slender
<i>Panicum lucidum</i>	Panic Grass, Bog
<i>Panicum ensifolium</i>	Panic Grass, Britton's
<i>Panicum Hirstii</i>	Panic Grass, Hirst's R
<i>Panicum hemitomum</i>	Panic Grass, Narrow R
<i>Panicum verucosum</i>	Panic Grass, Warty
<i>Panicum cryptanthum</i>	Panic Grass, Sheathed
<i>Panicum trifolium</i>	Panic Grass, Three-leaf
<i>Panicum Wrightianum</i>	Panic Grass, Wright's
<i>Plantago lanceolata</i>	Plantain, Narrow-leaf*
<i>Plantago major</i>	Plantain, Broad-leaf*
<i>Plantago juncoides</i>	Plantain Seaside*
<i>Erianthus alopecuroides</i>	Plume Grass
<i>Aristida dichotoma</i>	Poverty Grass
<i>Ambrosia artemisii</i>	Ragweed, Low
<i>Phragmites communis</i>	Reed-Grass, Common
<i>Calamogrostis cinnoides</i>	Reed-Grass, Nuttall's
<i>Calamovilfa brevopilus</i>	Reed-Grass, Pine Barrens R
<i>Zizania aquatica</i>	Rice, Wild*

<i>Rosa palustris</i>	Rose, Marsh*
<i>Juncus militaris</i>	Rush, Bayonet
<i>Juncus effuses</i>	Rush, Common
<i>Juncus canadensis</i>	Rush, Canadian
<i>Juncus caesariensis</i>	Rush, New Jersey
<i>Juncus pelocarpus</i>	Rush, Mud
<i>Spartina alterniflora</i>	Salt Marsh Cord Grass
<i>Spartina patens</i>	Salt Meadow Grass
<i>Cenchrus longispinus</i>	Sandbur, Field
<i>Triplasis purpurea</i>	Sand grass
<i>Limonium spp.</i>	Sea Lavender
<i>Cakile edentula</i>	Sea Rocket*
<i>Carex Barrattii</i>	Sedge, Barratt's R
<i>Carex intumescens</i>	Sedge, Bladder
<i>Carex bullata</i>	Sedge, Button
<i>Carex exilis</i>	Sedge, Coast
<i>Carex vulpinoidea</i>	Sedge, Fox
<i>Carex Grayi</i>	Sedge, Gray's
<i>Carex albolutescens</i>	Sedge, Greenish-white
<i>Carex livida</i>	Sedge, Livid
<i>Carex folliculata</i>	Sedge, Long
<i>Carex trisperma</i>	Sedge, Northern, Three-fruited
<i>Carex cylindricus</i>	Sedge, Pine Barrens
<i>Carex stricta</i>	Sedge, Tussock
<i>Carex Walteriana</i>	Sedge, Walter's
<i>Eleocharis olivacea</i>	Spike-Rush, Green
<i>Eleocharis tuberculosa</i>	Spike-Rush, Tubercled
<i>Panicum virgatum</i>	Switchgrass
<i>Aristida tuberculosa</i>	Triple-awned Grass, Beach
<i>Aristida longispica</i>	Triple-awned Grass, Slender
<i>Cladium mariscoides</i>	Twig-Rush
<i>Ruppia maritima</i>	Widgeon-grass
<i>Danthonia spicata</i>	Wild Oat Grass*
<i>Danthonia sericea</i>	Wild Oat Grass, Silky*
<i>Danthonia epilis</i>	Wild Oat Grass, Smooth*
<i>Aristida stricta</i>	Wire Grass
<i>Scirpus Longii</i>	Wool-grass, Long's
<i>Scirpus rubricosus</i>	Wool-grass, Pedicelled
<b>Flowering Plants-Shrubs, Sub-shrubs, Woody Vines</b>	
<i>Alnus serrulata</i>	Alder, Common

<i>Viburnum dentatum</i>	Arrowwood, Toothed
<i>Rhododendron viscosum</i>	Azalea, Swamp
<i>Myrica pensylvanica</i>	Bayberry*
<i>Myrica heterophyllia</i>	Bayberry, Evergreen
<i>Arctostaphylos uva-ursi</i>	Bearberry*
<i>Rubus hispidus</i>	Blackberry, Running*
<i>Rubus cuneifolius</i>	Blackberry, Sand*
<i>Vaccinium atrococcum</i>	Blueberry, Black*
<i>Vaccinium corymbosum</i>	Blueberry, High Bush
<i>Vaccinium vacillans</i>	Blueberry, Low Bush*
<i>Vaccinium caesariense</i>	Blueberry, New Jersey*
<i>Corema Conradii</i>	Broom Crowberry R
<i>Cephalanthus occidentalis</i>	Buttonbush
<i>Opuntia humifusa</i>	Cactus, Prickly Pear*
<i>Aronia melanocarpa</i>	Chokeberry, Black
<i>Aronia arbutifolia</i>	Chokeberry, Red
<i>Xanthium echinatum</i>	Cocklebur
<i>Vaccinium macrocarpon</i>	Cranberry*
<i>Apocynum androsaemifolium</i>	Dogbane, Spreading
<i>Rubus flagellaris</i>	Dewberry*
<i>Sambucus canadensis</i>	Elderberry*
<i>Leucothoe racemosa</i>	Fetter-bush
<i>Vitis labrusca</i>	Grape-Fox*
<i>Vitis aestivalis</i>	Grape, Summer*
<i>Smilax rotundifolia</i>	Greenbriar, Common*
<i>Smilax Walteriana</i>	Greenbriar, Walter's
<i>Baccharis halimifolia</i>	Groundsel-Tree
<i>Lonicera japonica</i>	Honeysuckle, Japanese*
<i>Lonicera sempervirens</i>	Honeysuckle, Trumpet*
<i>Gaylussacia baccata</i>	Huckleberry, Black*
<i>Gaylussacia frondosa</i>	Huckleberry, Blue*
<i>Gaylussacia dumosa</i>	Huckleberry, Dwarf*
<i>Hudsonia ericoides</i>	Hudsonia, Heath-like
<i>Hudsonia tomentosa</i>	Hudsonia, Woolly
<i>Ilex glabra</i>	Inkberry*
<i>Rhus radicans</i>	Ivy, Poison
<i>Amelanchier obovalis</i>	Juneberry*
<i>Kalmia latifolia</i>	Laurel, Mountain
<i>Kalmia angustifolia</i>	Laurel, Sheep
<i>Chamaedaphne calyculata</i>	Leather-leaf, Cassandra