



ENVIRONMENTAL RESOURCE INVENTORY

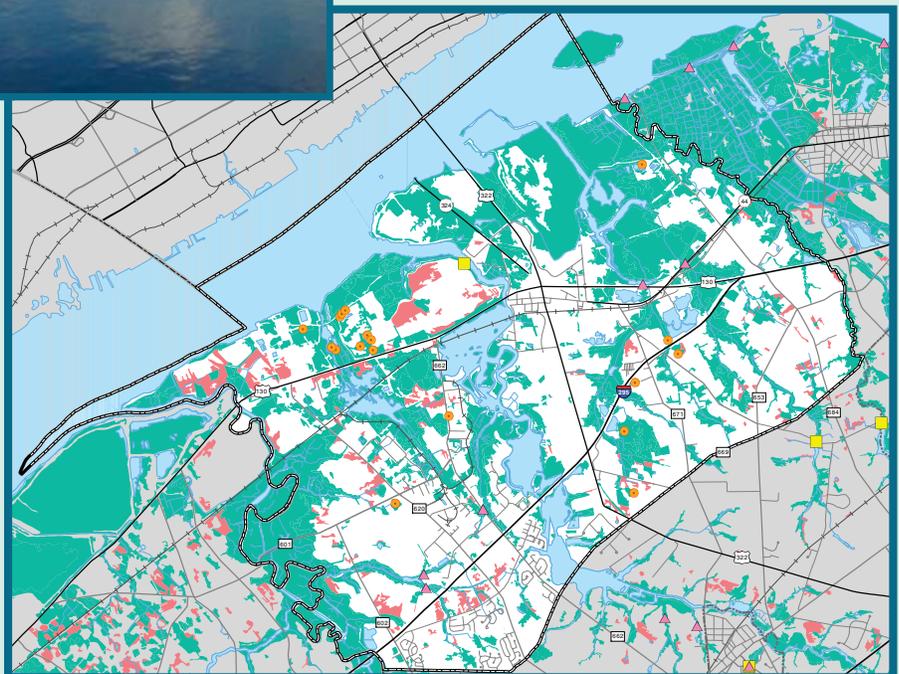


for the **TOWNSHIP** of



LOGAN

GLOUCESTER COUNTY, NEW JERSEY



prepared by:



Delaware Valley
Regional Planning
Commission

with:

The Environmental
Commission of
Logan Township

MAY 2004



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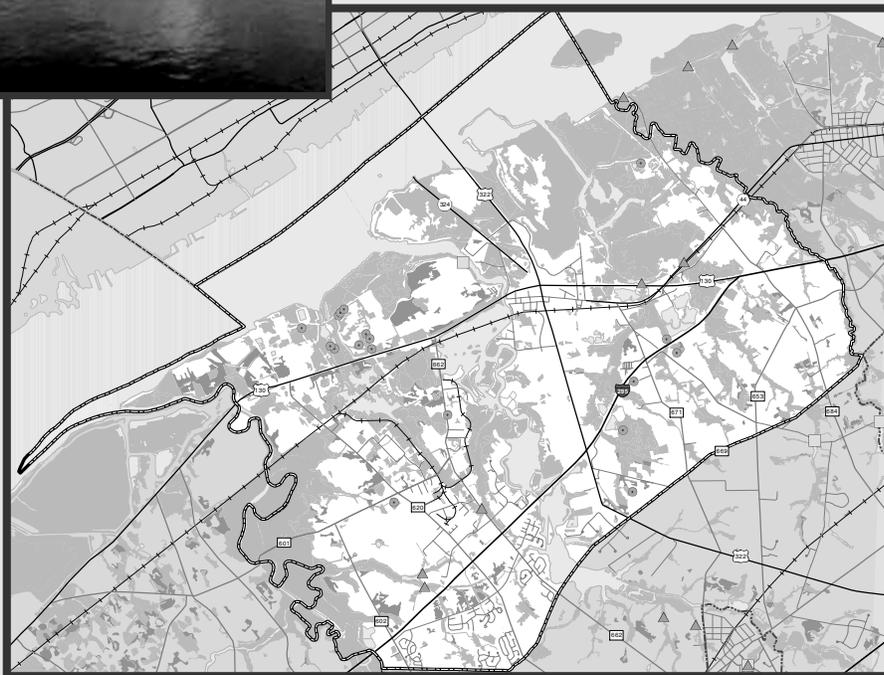


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Created in 1965, the Delaware Valley Regional Planning Commission (DVRPC) is an interstate, intercounty and intercity agency that provides continuing, comprehensive and coordinated planning to shape a vision for the future growth of the Delaware Valley region. The region includes Bucks, Chester, Delaware, and Montgomery counties, as well as the City of Philadelphia, in Pennsylvania; and Burlington, Camden, Gloucester and Mercer counties in New Jersey. DVRPC provides technical assistance and services; conducts high priority studies that respond to the requests and demands of member state and local governments; fosters cooperation among various constituents to forge a consensus on diverse regional issues; determines and meets the needs of the private sector; and practices public outreach efforts to promote two-way communication and public awareness of regional issues and the Commission.



Our logo is adapted from the official DVRPC seal, and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole, while the diagonal bar signifies the Delaware River. The two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey.

This report was funded by the Association of Environmental Commissions (ANJEC) Smart Growth Assistance Grant Program, funded by the Geraldine R. Dodge Foundation, and by the Township of Logan. Funding was also provided by the Delaware Valley Regional Planning Commission's Open Space and Greenways Program. The authors are solely responsible for the report's findings and conclusions, which may not represent the official views or policies of the funding agencies.

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- The Association of Environmental Commissions (ANJEC) Smart Growth Assistance Grant Program, funded by the Geraldine R. Dodge Foundation
- The Delaware Valley Regional Planning Commission's Open Space and Greenways Program
- The Township of Logan

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

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Tony Spadaccini

In fashioning the Logan Township Inventory, the *Environmental Resource Inventory of the Township of Franklin* (Gloucester County) served as a model. Joseph Arsenault, Chairman of the Franklin Township Environmental Commission and principle author of that *Inventory*, was especially helpful in reviewing plant and fish data on Logan, and in granting permission for adaptation of some of the Franklin *Inventory* text. DVRPC interns Alison Hastings and Stephanie Potts gave invaluable help by gathering and compiling data. Members of the Logan Township Environmental Commission, the Open Space Committee, Township Administrator David Fanslau, and other Township staff members all provided information for this inventory.

INTRODUCTION

The purpose of an Environmental Resource Inventory is to identify and describe the natural resources of a community. A community's natural resources – its soil, water, air, forests, fields, and waterways – are fundamental to its character. They are the foundation for its economic success and its quality of life. The protection and wise use of those resources is essential to the public health, safety, and welfare of current and future residents. The Environmental Resource Inventory provides the basis for the development of methods and steps to preserve, conserve, and utilize those resources.

Logan Township's natural resources have made it an agricultural community in the past. Its position along the Delaware River and the growth of the transportation network that crosses Logan made it an important industrial and commercial center in the latter half of the 20th century. As residential development in this part of Gloucester County increases, the character of Logan Township is also undergoing change. Documentation of its resources has become a necessity, especially if it is to support residents of the future. Logan's surface waters and groundwater resources will become increasingly important to its population and to that of neighboring communities. Its extensive wetlands and tidal marshes, which provide significant habitat for endangered and threatened plants and animals, will be vital to the continued health of the community and the enjoyment of its citizenry.

Preparing an Environmental Resource Inventory requires gathering all the existing information that can be found about those resources, and presenting it in a form that is usable by a broad audience. The Inventory reflects a particular moment in time, and it is assumed that it will be updated as new data becomes available.

Several documents and reports were utilized in preparing the *Environmental Resource Inventory for Logan Township*, including the Logan Township *Master Plan* from 1990, along with a number of reference works. These are listed at the end of this document. The maps and data relating to Logan Township's natural resources are derived from the New Jersey Department of Environmental Protection Geographic Information System mapping, and from *The Landscape Project* produced by the Endangered and Nongame Species Program of the New Jersey Fish and Wildlife Division.

BRIEF TOWNSHIP HISTORY

Logan Township was incorporated on March 13, 1877 as West Woolwich Township. A year later the name was changed to Logan in honor of John Alexander Logan (1826–1886), a Civil War general and U.S. Senator who was a major supporter of equal rights for former slaves after the Civil War, a leading architect of veterans legislation, and the “father” of the Memorial Day holiday.

The Township was originally part of the Civil Organization of West Jersey, established in 1676, and was within Greenwich Township, one of the four incorporated jurisdictions in what is now Gloucester County. In 1750 "South Greenwich Township" was formed from Greenwich Township. It encompassed an area of 40,000 acres and included the area of Logan Township as well as Woolwich and what is today part of Franklin and all of Harrison Townships. In 1767 the name was changed to Woolwich Township when the Township was formally incorporated. Subsequent secessions from Woolwich reduced the land area, with Franklin Township being formed from Greenwich and Woolwich in 1820, Harrison Township in 1844, and West Woolwich (Logan) in 1877.

Recent archaeological finds show that humans have been present on the land within township boundaries for approximately 10,000 years. Early Native American communities relied on the township's natural resources until the arrival of Europeans. Most pre-European settlements were associated with stream corridors. Indian villages are known to have existed beside both the Raccoon and Oldmans Creeks. The Narraticons lived in the vicinity of the Raccoon. Their name, which means "raccoon," survives in the name of the Raccoon Creek. The Kagkakaini Sakins lived along the Mosackas Creek, now called Oldmans Creek. Oldmans is a variation on the name "Aldermans," given to the creek by the Dutch. A famous Native American archaeological site, the Raccoon Point Site, southwest of Bridgeport, uncovered numerous and important artifacts in the 1950s.

In 1638 Swedish settlement came to the Delaware Valley and a colony was established on the east side of the Delaware River in what is now Logan Township that was referred to as "New Stockholm" (also "New Sweden"). This began to grow when the land was purchased by the Swedes from the Indians in 1641. Swedish and Finnish inhabitants moved into the area and created homesteads. It is they who gave shelter to the passengers of the first English ship to arrive in 1677, which docked at the Raccoon Creek.

With English settlement in the region, Swedish place names began to be replaced with English names. Early settlers raised grain, fruit and vegetables, and tended stock. Peter Kalm, a Finnish botanist and one of the most famous recorders of botany in the colonies, traveled in the region between 1748 and 1751. He began his stay in Swedesboro and explored the surrounding area, including a visit in May 1749 to Repaupo, a village that had been settled by Swedes. In his important account, *Travels in North America*, Kalm reported on all kinds of fruit-growing on local farms and "peaches so thick on the ground that one could hardly miss stepping on them."

Waterways were important to Logan from its earliest days. Bridgeport, founded in the mid 1700s, was a shipping point. Farm products, as well as timber from the rich forests, were

conveyed to market along the wide tidal Raccoon and Oldmans Creeks. In the 19th century, the Philadelphia and Bridgeport Steamboat Company operated boats along the Raccoon Creek from the wharves at Bridgeport to Philadelphia.

Travel on roads was nearly impossible during the 18th and early 19th centuries. Road quality was exceedingly poor and bridges were frequently in disrepair or nonexistent. A bridge did exist at Bridgeport, however. The Colonial Legislature by the Act of 1765 had authorized the building of a drawbridge over Raccoon Creek and the town was originally called Raccoon Lower Bridge. It was not until 1836 that town residents voted to change the name to Bridgeport.

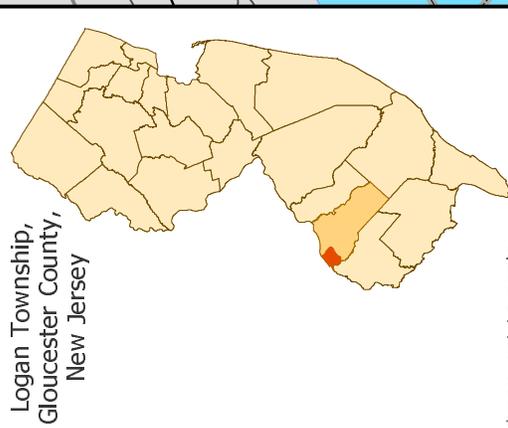
Railroads became an important means of travel and transport of goods, especially farm produce, in the latter half of the 19th century. The railroad served new processing plants that were established in Gloucester County in the late 19th century. These plants handled the vegetable crops that were a staple of Gloucester County farming. Tomatoes were an especially important crop and research on tomato varieties was carried out locally by farmers such as Willard B. Kille whose farm was located where the Ferro (Monsanto) Chemical Plant is now located. The development of an important commercial variety of tomato occurred on this farm.

Highways and trucking began to replace railroad transport of both goods and people after World War II. In the 1950's the New Jersey Turnpike was built and in the 1960s the construction of Interstate 295 began to bring major changes to Logan. In the early 1970s a planned industrial development was established in Logan as the Pureland Industrial Park. This 3200-acre environmentally sensitive industrial complex occupies a large area between Raccoon and Oldmans Creeks and is home to over 150 companies in more than 100 buildings. Pureland, along with the Northeast Business Center, which is a part of the complex, form the largest industrial park on the east coast of the U.S.

With the establishment of the Logan Municipal Utilities Authority, which provides sewer service to industry and residences in the western half of the Township, additional industrial sites were established along the Delaware River in Logan. Also in the 1970s, a major residential development called Beckett was planned for Logan and Woolwich Townships. Construction began in 1978 and approximately 1500 homes were built in the Logan portion of the planned unit development. An additional 4500 units are slated to be built in neighboring Woolwich, where the development is now called Weatherby. Beckett's location along Center Square Road has transformed this roadway into a major artery for both Logan and Woolwich Townships.

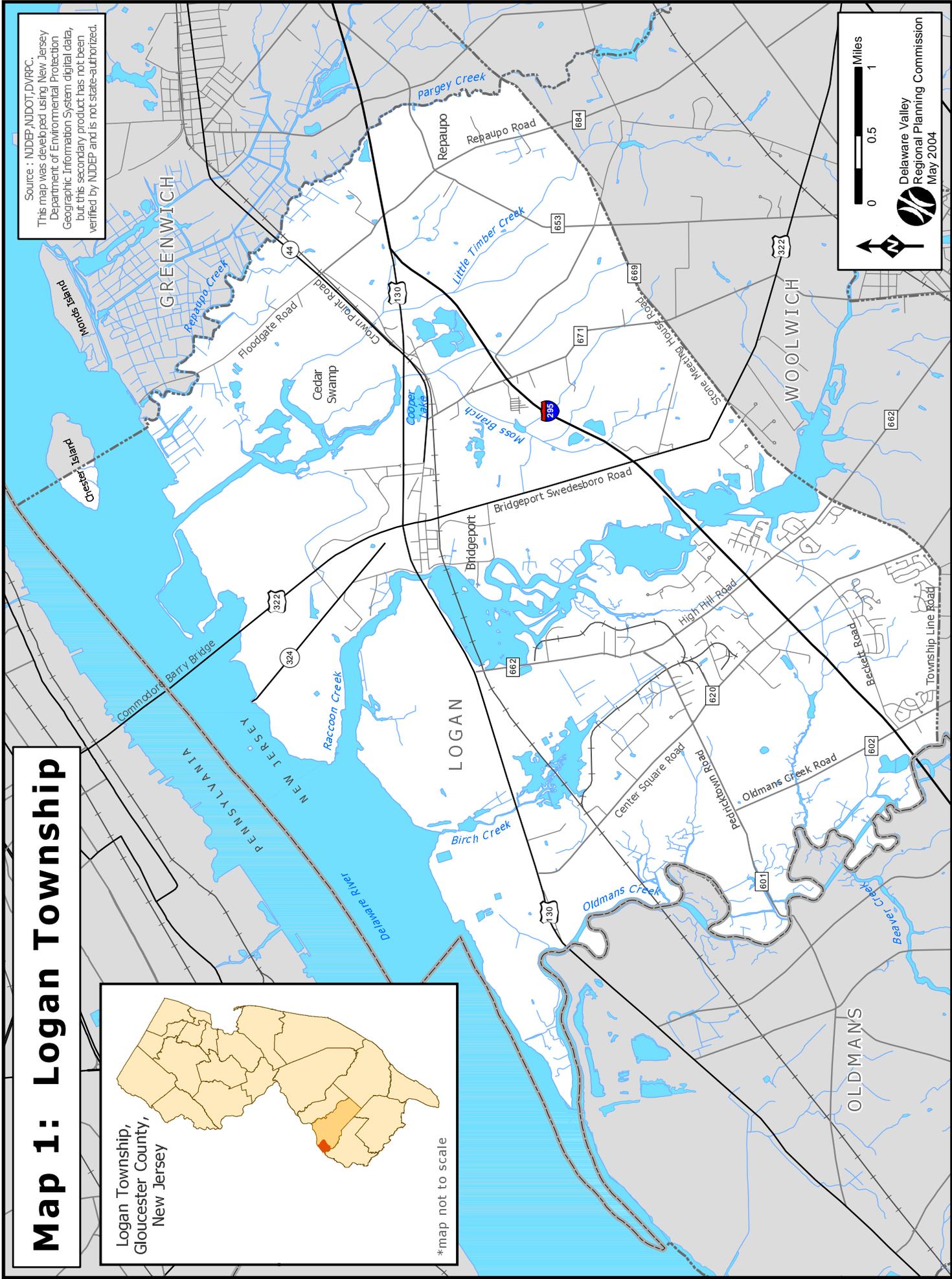
Today, Logan Township is home to a wide array of people from many ethnic and social backgrounds, with a diverse set of occupations reflecting today's 21st century service and light manufacturing economies. Automobile transportation corridors provide the framework for land uses today. Pureland businesses provide employment to many township residents while other residents commute throughout the tri-state region for employment. Logan has become a community with a substantial mix of industrial, commercial, and residential uses. However, the Township still has an active farming community in its northeastern section. Logan's landscape is also still dominated by the water that was so much a part of its early history – its Delaware riverfront, its three major stream corridors, and the acres of wetland and marshes surrounding them.

Map 1: Logan Township



*map not to scale

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



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May 2004

LOGAN TOWNSHIP LOCATION, SIZE, AND LAND USE

Logan is an incorporated Township located in the northwest corner of Gloucester County, New Jersey. The township is bounded within Gloucester County by two communities: Greenwich Township to the northeast, and Woolwich Township to the south/southeast. The southwestern boundary is the Oldmans Creek, which forms the dividing line between Gloucester and Salem Counties. Oldmans Township is the neighboring community on the Salem side. Logan's 6-mile northwestern boundary is the Delaware River.

Logan Township occupies 14,990 acres or 23.4 square miles situated on the coastal plain of New Jersey. It is in an area that is still quite rural, although the township has a large amount of land occupied by industrial and commercial facilities that have developed, in part, because of Logan's proximity to the Philadelphia-Camden and Wilmington metropolitan areas and easy access to major highways. Residential development in the last two decades has been concentrated primarily in the southeast corner of the township, but the expanding suburbanized perimeter of the region's urban centers is now reaching to Logan Township.

**Table 1: Logan Township General Land Use & Land Cover Classes
(1995/97 updated to 2000)**

General Land Classes	Acres	%
Agriculture	3,789	25.27
Barren Land	1,911	12.75
Forest	965	5.66
Developed	2,486	16.58
Water	1,203	8.03
Wetlands	5,086	33.92
Total	14,990	100.00

Source; NJDEP

Table 2: Logan Township Specific Land Use (1995/97)

Land Use Categories	Acres	Percent
Cropland and pastureland	3,621.97	24.16
Deciduous wooded wetlands	1,996.56	13.32
Altered lands	1,293.68	8.63
Freshwater tidal marshes	1,131.75	7.55
Tidal rivers, inland bays, and other tidal waters	918.23	6.13
Other urban or built-up land	725.88	4.84
Disturbed wetlands (modified)	635.52	4.24
Old field (< 25% brush covered)	508.21	3.39
Industrial	505.55	3.37
Agricultural wetlands (modified)	487.97	3.26
Transportation/communications/utilities	406.43	2.71
Deciduous scrub/shrub wetlands	335.97	2.24
Residential, single unit, medium density	323.48	2.16
Herbaceous wetlands	310.09	2.07
Artificial lakes	276.44	1.84
Residential, rural, single unit	200.73	1.34

Land Use Categories	Acres	Percent
Deciduous forest (>50% crown closure)	186.04	1.24
Former agricultural wetland (becoming shrubby, not built-up)	139.71	0.93
Orchards/vineyards/nurseries/horticultural areas	118.37	0.79
Deciduous brush/shrubland	113.26	0.76
Residential, single unit, low density	110.13	0.73
Transitional areas	98.52	0.66
Commercial/services	94.27	0.63
Mixed deciduous/coniferous brush/shrubland	91.10	0.61
Extractive mining	68.47	0.46
Residential, high density, multiple dwelling	60.70	0.40
Recreational land	49.11	0.33
Other agriculture	48.76	0.33
Deciduous forest (10-50% crown closure)	30.35	0.20
Managed wetland in maintained lawn greenspace	24.69	0.16
Coniferous forest (>50% crown closure)	18.06	0.12
Wetland rights-of-way (modified)	14.56	0.10
Coniferous brush/shrubland	11.09	0.07
Athletic fields (schools)	10.55	0.07
Natural lakes	8.35	0.06
Coniferous forest (10-50% crown closure)	5.44	0.04
Mixed scrub/shrub wetlands (deciduous dom.)	4.56	0.03
Mixed forested wetlands (deciduous dom.)	3.45	0.02
Mixed forest (>50% deciduous with >50% crown closure)	1.05	0.01
Managed wetland in built-up maintained rec area	0.96	0.01
Total	14,990.00	100.00

Source: NJDEP



Photo by John Molner

Historic Bridgeport

Map 2: Land Use

Rivers and Streams

- Lakes

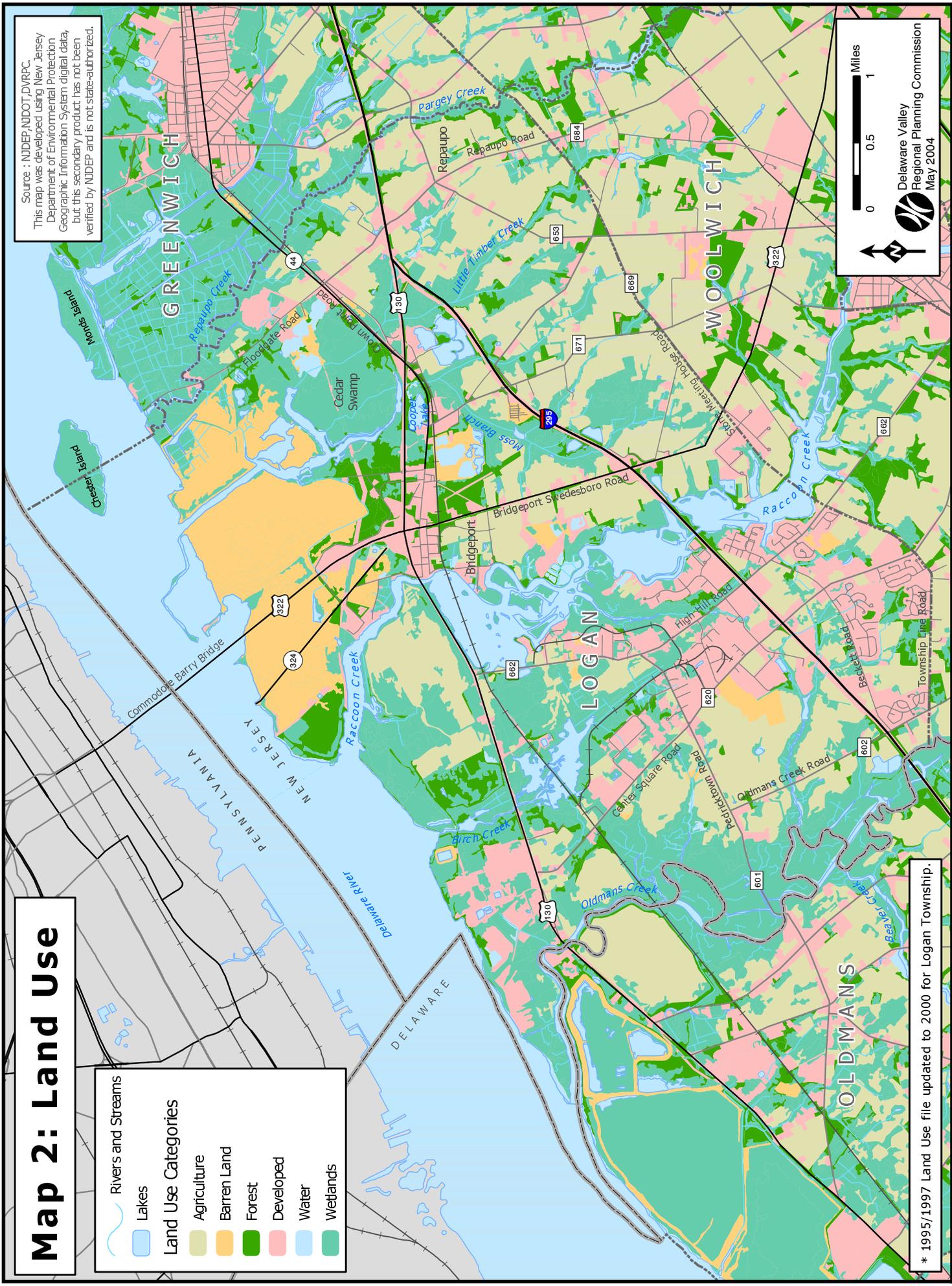
Land Use Categories

- Agriculture
- Barren Land
- Forest
- Developed
- Water
- Wetlands

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

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Delaware Valley
 Regional Planning Commission
 May 2004



* 1995/1997 Land Use file updated to 2000 for Logan Township.

NATURAL RESOURCES

PHYSIOGRAPHY

Physiography is the study of a location in relation to its underlying geology. New Jersey is characterized by four physiographic provinces. The rocky terrain of the Appalachian Province is at one extreme and the sands of the coast are at the other. Logan Township is located in the Atlantic Coastal Plain, the most southerly of these four provinces in New Jersey.

The Atlantic Coastal Plain landscape extends from Massachusetts to Texas and is divided into Inner and Outer sections. In New Jersey the Inner Coastal Plain is made up of inter-bedded sand and clay. Deposits originating in the breakdown of Appalachian and Catskill sedimentary, metamorphic, and igneous rocks are interbedded with layers formed by oceanic (marine) deposition, which occurred as the ocean shoreline advanced and receded over geologic time. The Inner Plain layers date from the Cretaceous Period, 135 to 65 million years ago. Soils of the Inner Coastal Plain are quite fertile.

The Outer Coastal Plain was formed more recently than the Inner Coastal Plain. It was laid down by the ocean and developed during the mid-to-late part of the Cenozoic Period, 65 million years ago to the present. Outer Coastal Plain soils are less fertile than those of the Inner Plain and don't hold water as well.

The dividing line between the two segments of the Coastal Plain is a belt of low hills, which runs northeast and southwest through the southern half of New Jersey. These hills are the youngest of the Cretaceous formations and are largely made up of sand and marl formations. The hills taper to fairly low elevations in Gloucester County but can be identified in the Mullica Hill area. The Inner Coastal Plain lies to the west of the band of hills, with most of its surface waters draining toward the Delaware River. The Outer Coastal Plain slopes more gradually to the east, with drainage generally toward the Atlantic Ocean. Logan Township sits to the west of this boundary and is entirely on the Inner Coastal Plain.

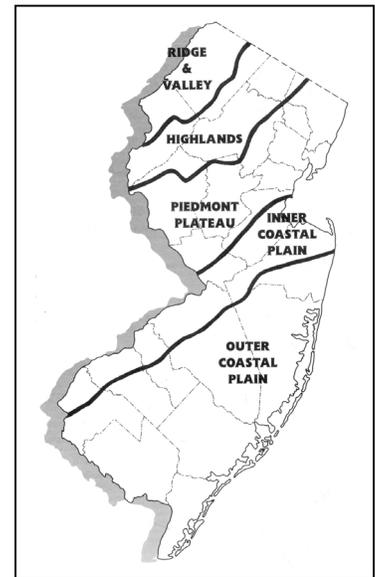


Fig. 1: The Physiographic Regions of New Jersey

TOPOGRAPHY AND SURFACE LANDSCAPES

Logan Township's position along the Delaware River has given it a divided character. The landscape is heavily dominated by wetlands in the part of the township along the riverfront, where the Delaware is met by the major streams that cross Logan. In its eastern or southeastern half, Logan Township occupies a gradually rising upland that straddles the watershed divides between the streams. These divides occur between the main channels of the Raccoon and

Oldmans Creeks at one end of the Township, between the Raccoon and the Cedar Swamp/Little Timber Creek in the center, and between the Cedar Swamp/Little Timber Creek and the Pargey–Repaupo Creek channel on Logan’s northeastern end.

The upland area is characterized by rich soils that once supported extensive beech-oak forests. Along the river valleys are extensive freshwater tidal marshes, and wet forests of sweet gum and red maple. The streams are relatively flat, as in all of southern New Jersey, with muddy and/or sandy bottoms. Smaller streams flowing to the larger channels form connecting networks of wetland marsh. Along the Delaware are large areas that hold dredge spoils from both the deepening and maintenance dredging of the Delaware River.

The highest elevation within the township is approximately 50 feet Mean Sea Level at two points along the township boundary with Woolwich, one near Center Square Road and the other near Swedesboro–Paulsboro Road. The lowest elevation is 0 feet at the mouth of the Repaupo Creek.

SOILS

Soil is the foundation for all land uses. A region’s soil defines what vegetation is possible, influencing agricultural uses. It also determines how land can be developed for other purposes. Soil is also a natural resource that cannot be replenished on the human time scale.

Logan Township soils consist of 20 series types and 40 variations within those series (excluding Water) as identified by the US Department of Agriculture’s Natural Resources Conservation Service. These are listed in *Table 4: Logan Township Soils* and shown on **Map 3: Soils**.

Logan’s soils are rich in agricultural value. Fourteen percent (14%) of the soils in Logan Township are considered Prime Farmlands (P-1). Prime Farmlands are lands that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. They can sustain high yields of crops when managed with correct farming methods. Prime Farmlands are not excessively erodible or saturated with water for long periods of time and do not flood frequently.

The most abundant of all soils in Logan Township are those classified as Farmlands of Statewide Importance (S-1), which occupy 41% of the land surface. These soils are close in quality to Prime Farmland and can sustain high yields of crops when correctly managed with favorable conditions. Of the remaining two classifications, 8% of Logan’s farmland is classified as Farmland of Local Importance (L-1), which are soils that can support the production of high value, regional crops like horticultural crops or indigenous foods. Seven percent (7%) are Unique Farmlands (U-1), which can support specialized crops such as cranberries and blueberries.

See *Table 3: Agricultural Values for Logan Soils*¹ on the next page for the acreage of each of these categories of farmland.

¹ See New Jersey Soils of Statewide Importance, New Jersey Natural Resources Conservation Service, September 24, 1990, available online at www.nj.nrcs.usda.gov/technical/soils/njfarmindex.html.

Table 3: Agricultural Values for Logan Soils

Designation	Type	Area (In Acres)	Percent
P-1	Prime Farmland	2,106	14
S-1	Statewide Importance	6,114	41
L-1	Local Importance	1,253	8
U-1	Unique Farmland	999	7
Other Soil	Wet soils, pits, steep slopes, Made land, etc.	3,220	22
Water	Water	1,208	8
Totals		14,900	100

Source; NJ Farmlands Inventory, NJ Natural Resources Conservation Service

Soil Series

Several soil series appear more frequently in Logan Township than others, and are briefly described below.¹

Sassafras Series

Sassafras soils are the most abundant in Logan Township and are found on sandy flats along the Delaware River. Slopes can range from nearly level to very steep. These soils can support vegetation consisting of mixed oaks and scattered pines. They are considered farmland of statewide importance and have clay in their subsoil. Sassafras soils are easy to work, have a low natural fertility, and respond to fertilization. (Capability Units I, II, and III, depending on variation)

Tidal Marsh

Fifteen percent of all soils in Logan Township are classified as Tidal Marsh. This land lies near sea level and tides cover it daily. Tidal marsh is found near the Delaware River, but extends inland along Raccoon, Birch, and Oldmans Creeks. These tidal marshes, though mixing with brackish saltwater, remain mostly freshwater, due to Gloucester County's location upstream on the Delaware. Tidal marsh is composed of rich organic matter and minerals and in some spots, peat can be found. Generally, the marsh is 3 to 10 feet deep but in some areas it is only 24 inches thick. By the 1930's, much of this land had been diked or ditched for cultivation, but this practice has been abandoned in most areas. While tidal marsh is rich in fertility, it is often not a good agricultural soil because of its extreme acidity and the constant subsidence of the land. (Capability Unit VIII).

¹ Soil Conservation Service. *Soil Survey of Burlington County New Jersey*, USDA and New Jersey Agricultural Experiment Station, October 1971.

Woodstown Series

Variations of the Woodstown Series make up over 5% of all land in Logan Township. Historically, these soils have supported oak, beech, poplar, and pitch pine forests. This series is closely associated with Aura, Downer, Freehold and other soils, except that Woodstown is not well drained. These soils occur on terraces along large streams and in beds of gravel. Cultivation is hampered by wetness. (Capability Unit II)

Downer Series

Downer soils are considered to be soils typical of New Jersey agriculture and are listed as Prime Farmland and Farmland of Statewide Importance. These soils are moderately permeable, have a low available water capacity, warm early in the calendar year, and are easily worked. While natural fertility is low and added fertilizers leach into soil, Downer soils can support high value crops with proper management and irrigation. (Capability Units II and III depending on variation)

Fallsington Series

Fallsington soils are scattered throughout Gloucester County and found in circular depressions adjacent to streams. They are poorly drained and wet, almost to the surface. When used for agricultural land, open ditches must be employed to drain these soils. Fallsington supports many tree types, including pin oak, willow oak, sweetgum, red maple, pitch pine, and other shrubs and briars. (Capability Units III)

Muck

Muck consists of black, finely decomposed, saturated organic matter, generally over sand and gravel. Muck forms in nearly level areas at the headwaters of streams. Muck can support wetland species such as Atlantic white cedar. The water table is usually right below the surface throughout the year. Muck is moderately fertile but lacks minerals. Its organic layer is very unstable and cannot support building foundations. (Capability Unit VII)

Capability Units¹

- I** – Soils have few limitations that restrict their use.
- II** – Soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
- III** – Soils have severe limitations that reduce the choice of plants, require very careful management, or both.
- IV** – Soils have very severe limitations that reduce the choice of plants, require very careful management, or both.
- V** – Soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, woodland, or wildlife habitat.
- VI** – Soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, woodland, or wildlife habitat.
- VII** – Soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, woodland, or wildlife habitat.
- VIII** – Soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or to aesthetic purposes.

Made Land

This type of land was formed by the actions of people pumping material from the channel of the river into diked areas and is very common along the coast of the Delaware River, especially in Logan Township. The fill material may be as deep as 20 feet or more in some areas near Bridgeport. Drainage occurs through artificial drainage pipes. This type of soil ranges from strongly acidic to medium acidic and is moderately fertile, but extremely low in phosphorus. This soil is not classified for building and use capabilities.

Freehold Series

Fifty percent of Logan soils are a variation of the Freehold series. These soils formed from sandy marine deposits, are mostly gently sloping, and are well drained. Around stream beds, these soils may be steeply sloping. Freehold soils occur in close association with Collington, Colts Neck, Marlton, Westphalia, Woodstown, and Dragston soils. Freehold soils are easily worked for agricultural production and have low to moderate natural fertility. Different variations of these soils will support upland forests of oaks and poplar and provide high quality wildlife habitat. These soils are well suited to many different vegetable crops and can support various seasonal crops because the variations of soils warm at different times of the year. (Capability Units I, II, and IV depending on slope)

Table 4: Logan Township Soils

Soil Code	Soil Name	Logan Acres	Percentage of all Soils (%)	Designation*
Ad	Alluvial land	140	1	NA
ArB	Aura sandy loam, 0–5 percent slopes	1	0.0	P–1
AsB	Aura–Sassafras loamy sands, 0–5 percent slopes	34	0.2	P–1
Ba	Bayboro loam	83	0.6	S–1
DoB	Downer loamy sand, 0–5 percent slopes	1,457	10	S–1
Ek	Elkton loam	213	1.4	S–1
Fa	Fallsington loam	210	1	S–1
Fd	Fallsington sandy loam	1,050	7	S–1
FhB	Freehold loamy sand, 0–5 percent slopes	376	3	P–1
Fhc	Freehold loamy sand, 5–10 percent slopes	51	0	S–1
FnB	Freehold sand, thick surface variant, 0–10 percent slopes	2	0	S–1
FoA	Freehold sandy loam, 0–2 percent slopes	28	0	P–1
FoB	Freehold sandy loam, 2–5 percent slopes	93	1	P–1
FoC	Freehold sandy loam, 5–10 percent slopes	11	0	S–1
FsD	Freehold soils, 10–15 percent slopes	9	0	NA
FtE	Freehold, Colts Neck, and Collington soils, 15–25 percent slopes	15	0	NA
FtF	Freehold, Colts Neck, Collington soils, 25–40 percent slopes	11	0	NA
KpB	Keyport sandy loam, 0–5 percent slopes	180	1	P–1
KpC3	Keyport sandy loam, 5–10 percent slopes, severely	32	0	L–1
LdB	Lakeland sand, 0–10 percent slopes	53	0.4	L–1
LkA	Lenoir and Keyport loams, 0–5 percent slopes	122	0.8	S–1
Mc	Made land, coarse materials	1,151	7.7	L–1

Soil Code	Soil Name	Logan Acres	Percentage of all Soils (%)	Designation*
Mf	Made land, fine materials	616	4.1	L-1
Mu	Muck	999	6.7	U-1
Pg	Pits	260	1.7	NA
Po	Pocomoke loam	262	2	S-1
Ps	Pocomoke sandy loam	19	0	S-1
SfB	Sassafras loamy sand, 0-5 percent slopes	1,168	8	S-1
SfC	Sassafras loamy sand, 5-10 percent slopes	416	3	S-1
SrA	Sassafras sandy loam, 0-2 percent slopes	310	2	P-1
SrB	Sassafras sandy loam, 2-5 percent slopes	172	1.2	P-1
SrC	Sassafras sandy loam, 5-10 percent slopes	25	0.2	S-1
SsD	Sassafras soils, 10-15 percent slopes	61	0.4	S-1
SsD3	Sassafras soils, 10-15 percent slopes, severely eroded	6	0.0	NA
SsE	Sassafras soils, 15-40 percent slopes	32	0.2	NA
Tm	Tidal marsh	2,148	14	NA
W	Water	1,208	8	NA
WnA	Woodstown and Dragston loams, 0-2 percent slopes	24	0.2	P-1
WoB	Woodstown and Dragston loamy sands, 0-5 percent slopes	75	1	P-1
WsB	Woodstown and Dragston sandy loams, 0-5 percent slopes	814	5	P-1
WtB	Woodstown and Klej loamy sands, 0-5 percent slopes	966	6.5	S-1
Total Acreage		14,900	100	
Total Farmland Acreage		11,016		
Total Non-Farmland Acreage		3,884		
Steep Slopes (15%+ Slopes)		58		

Source: NJDEP (based on Soil Survey of Gloucester County)

***Explanation of Designations**

P-1	Prime Farmland
S-1	Statewide Importance
L-1	Local Importance
U-1	Unique Farmland
NA	Land not appropriate for farming, e.g. eroded, very steep slopes, pits permanently wet soils, water, etc.

Soil characteristics can severely restrict the use of sites for construction and development. *Table 5: Soil Limitations for Development* records the soils and their possible limitations for building foundations and septic systems. As indicated in the table, the Township has some soils that are severely limited for on-site septic systems. Septic systems require soils that have a low water

table, below five feet, and slow permeability to allow for proper drainage of wastewater. High water tables, five feet or less from the surface, create a potential for erosion, wet basements, alteration of plant life, and early frost for agricultural crops.

Table 5: Soil Limitations for Development

Soil Series	Soil Codes	Acreage	Building with Basement	Building without Basement	Septic Systems	Limitations
Sassafras	SfB, SfC, SrA, SrB, SrC, SsD, SsD3, SsE	2,190	A	A	A	
Tidal marsh	Tm	2,148	C	C	C	1, 2
Woodstown	WnA, WoB, WsB, WtB	1,879	B	A	A	
Downer	DoB	1,457	A	A	A	
Fallsington	Fa, Fd	1,260	A	A	B	
Water	WATER	1,208	NA	NA	NA	NA
Made land	Mc, Mf	1,767	B	B	B	1, 3
Muck	Mu	999	C	C	C	1, 2, 3
Freehold	FhB, FhC, FnB, FoA, FoB, FoC, FsD	570	A	A	A	
Pocomoke	Ps	281	B	B	B	
Pits	Pg	260	A	A	A	3
Elkton	Ek	213	C	C	C	
Keyport	KpB, KpC3	212	B	B	C	1
Alluvial land	Ad	140	C	C	C	1, 2
Lenoir and Keyport	LkA	122	A	A	B	
Bayboro	Ba	83	C	B	C	
Lakeland	LdB	53	A	A	A	
Aura–Sassafras	AsB	34	A	A	A	3
Freehold, Colts Neck, and Collington	FtE, FtF	26	C	C	C	3
Aura	ArB	1	A	A	A	
Total		14,903				

<i>Key to Land Use Implications</i>	<i>Key to Limitations</i>
<p>A = Slight. Little or no limitation(s) or easily corrected by use of normal equipment and design techniques.</p> <p>B = Moderate. Presence of some limitation which normally can be overcome by careful design and management at somewhat greater cost.</p> <p>C = Severe. Limitations which, normally, cannot be overcome without exceptional, complex, or costly measures.</p>	<p>1: High water table (0 to 3 feet)</p> <p>2: Shallow depth to bedrock (less than 5 feet)</p> <p>3: Strongly sloping (15% or over)</p>

Source: *Soil Survey of Gloucester County*



Photo by John Molner

Farmland, Logan Township

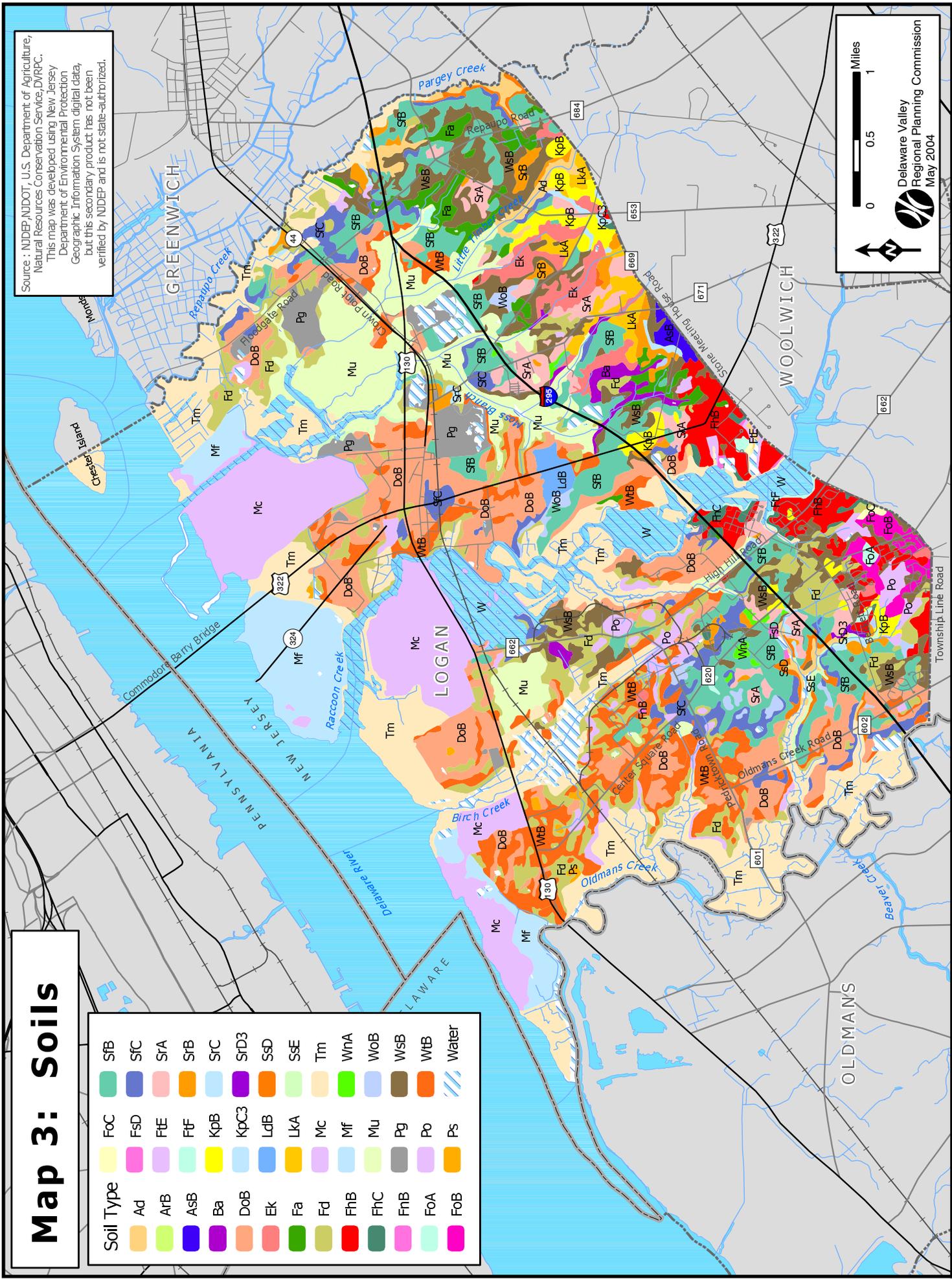
Map 3: Soils

Soil Type	FoC	FsD	FfE	FfF	KpB	KpC3	LdB	LkA	Mc	Mf	Mu	Pg	Po	Ps	SfB	SfC	SfA	SfB	SfC	SfD3	SsD	SsE	Tm	WnA	WoB	Wsb	WtB	Water
	[Color]																											

Source: NIDEP, NJDOT, U.S. Department of Agriculture, Natural Resources Conservation Service, DVRPC. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NIDEP and is not state-authorized.

Miles
0 0.5 1

Delaware Valley Regional Planning Commission
May 2004



WATER RESOURCES

SURFACE WATERS

All of Logan's land drains to the Delaware River by way of three main stream systems – the Repaupo Creek system on the northeastern end of the township, the Raccoon Creek across the center, and the Oldmans Creek on the southwestern end. The start of the main channel of each of these streams lies outside of Logan, in the townships to the east and southeast, although there are some tributaries that are wholly within Logan's boundaries.

Watersheds

A watershed is all the land that drains to a particular waterway such as a river, stream, lake, or wetland. The boundaries of a watershed are defined by the high points in the terrain, such as hills and ridges. A watershed includes not only the water body or waterway itself, but also the entire land area that drains to it. Large watersheds are made up of smaller ones, down to the catchment level of a local site. So, for example, the Delaware River watershed is made up of many smaller watersheds, such as the Raccoon Creek. The Raccoon watershed, in turn, is formed of several subwatersheds, consisting of the land that drains to a major section or branch of the creek or to a large, branching tributary. These subwatersheds can be further subdivided into smaller ones, each surrounding the smaller tributaries that flow to the larger channel, and so on down to the catchment level. Watersheds are natural ecological units, where soil, water, air, plants, and animals interact in a complex relationship. The percentage of Logan Township land that is within each of the three watersheds is listed in the following table. See also **Map 4: Watersheds** and **Map 5: Surface Water, Wetlands, and Vernal Ponds**.

Table 6: Watersheds in Logan Township

<i>Watershed</i>	<i>USGS Watershed Code (HUC 11 Number)¹</i>	<i>Stream classification</i>	<i>Acreage within Logan</i>	<i>% of Logan land</i>	<i>Subwatersheds (HUC 14 Numbers) within Logan</i>
Repaupo Creek/ Cedar Swamp/ Little Timber Creek	02040202140	FW2-NT/SE2 (Logan Pond segment is C1 ²)	6708	44.75	02040202140030 02040202140040 02040202140050
Raccoon/Birch Creeks	02040202150	SE2	5114	34.11	02040202150060
Oldmans Creek	02040202160	SE1	3168	21.13	02040202160050 02040202160060

Source: NJDEP

¹ “HUC” stands for Hydrological Unit Code, which is a numerical identification number given to every drainage system in the United States by the U.S. Geological Survey. HUC-11 codes are the 11-digit numbers applied to a part of a drainage area that is approximately 40 square miles in size. In the case of the Repaupo, Raccoon, and Oldmans watersheds, the entire watershed is the HUC-11 area. HUC-11 areas are further subdivided into HUC-14 subwatersheds, with the identification number for each one having 14 digits.

² “C1” = Category one waters” – those waters designated as requiring a higher standard of protection. Includes streams that flow through protected state land.

Repaupo Creek Watershed

The Repaupo watershed is a complex of streams that drain a total of 41 square miles of land. In Logan, this watershed occupies 6,708 acres, consisting of the drainage to both Pargey Creek (which becomes the Repaupo west of Route 130), and to the Cedar Swamp/Little Timber Creek/Moss Branch subsystem.

The Pargey/Repaupo is the northern border between Logan and Greenwich Townships. Pargey Creek starts in Woolwich Township, and is joined by Rattling Run coming from Harrison and East Greenwich Townships. West of Route 130 it is met by Still Run and, from there, the creek is called the Repaupo. The main creek channel empties into the Delaware River just below Flood Gate Road (the westward extension of Repaupo Road). There is extensive ditching at the mouth end of the Repaupo and the creek's discharge point at the Delaware has a tidegate on it. This and other tidegates were established in order to prevent incoming tides from flooding the lands adjoining the Repaupo. Dikes and other mechanisms to drain the rich soils of marshy areas were built by Dutch and Swedish settlers as early as the 1700s and continued to be erected into the 20th century. Tidegates are a legacy of those land drainage practices.

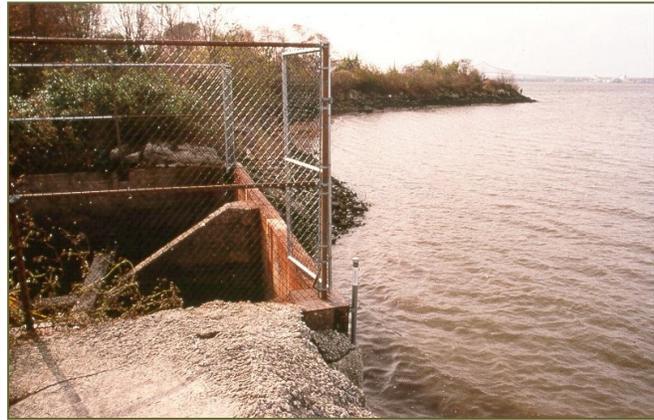


Photo by Michael A. Hogan

Tidegate on the Delaware at the Mouth of Repaupo Creek

The Little Timber Creek, which rises (starts) in Woolwich Township, is designated by the US Geological Service as part of the Repaupo watershed but is actually an independent stream. The Little Timber travels from Woolwich Township northwestward across Logan, until it enters the large Cedar Swamp. There it is joined by Moss Branch and an unnamed tributary, both of which start near the eastern edge of Logan Township. From Cedar Swamp these waters move to the Delaware River through some large channels that have been cut and straightened. The shape of the final passageway and its modern position differ from the stream depicted on 19th century maps. These channels have been used to facilitate the movement of dredge spoils from the Delaware River onto land that is almost a mile from the river edge.

Pargey Creek, Little Timber Creek, and Moss Branch are freshwater streams. Tidal movement occurs on the channelized portion of the Little Timber/Moss Branch outlet to the Delaware but the tides do not affect the streams beyond Cedar Swamp. The Pargey/Repaupo Creek is also not affected by tides, due to the presence of the tidegate at its mouth on the Delaware.

Raccoon Creek Watershed

The Raccoon Creek watershed contains approximately 40 square miles. The US Geological Survey delineation of the Raccoon Creek watershed includes Birch Creek within this watershed,

although this small creek is a separate stream. Birch Creek rises near Pedricktown Road and flows directly to the Delaware River. Below Route 130 there is a large area of open water surrounded by extensive marshland along this creek. This wetland area connects to the Raccoon system to the northeast and to the Oldmans system to the southwest. A railroad bed runs through the center of this large interconnected wetland area.

The Raccoon Creek itself is 19 miles long and flows from Elk and South Harrison Townships in the southeast, across Harrison, Woolwich, and Logan Townships, to the Delaware River. While there are several tributaries to the creek, the main one is the South Branch Raccoon Creek, which starts in Elk close to the western edge of the border between Elk and South Harrison Townships. It continues its northwestward flow into Harrison Township where it meets the main branch of the creek.



Raccoon Creek at Low Tide Source: DVRPC

The northern or main branch of the Raccoon also begins in Elk Township and flows north into Harrison Township where it bends to the west before being joined by the South Branch. From there the creek flows across Woolwich to Logan. Near the boundary of Woolwich and Logan, the stream widens and forms extensive tidal marshes in its travels across the center of Logan Township.

Raccoon Creek is tidal up to a point $\frac{3}{4}$ miles east of the New Jersey Turnpike in Woolwich. The creek was a major transportation corridor across Logan and as far up as Swedesboro throughout the 18th and 19th centuries. Bridgeport had docks for loading barges and small ships, and Swedesboro had wharves and docks along the length of the stream.

Oldmans Creek Watershed

Oldmans Creek drains an area of 44 square miles and is 20 miles long. The creek marks the boundary between Gloucester and Salem Counties. Tidal marshes exist at the mouth of the creek and for a distance along its length in Logan. The creek is tidal for its full length in Logan and up to a point on the eastern side of Woolwich Township.



Oldmans Creek Source: DVRPC

Oldmans Creek has one main channel without significant branching, but it has

several tributaries. The only sizeable tributary in Logan begins in the Beckett neighborhood east of Beckett Road and flows south to join the main channel. It is an unnamed stream.

The Oldmans corridor has wetlands along both sides for most of its length. Along its Logan extent, there is an extremely large wetland area, the Pedricktown Marsh, which is one of the premier bird areas in the state of New Jersey and which thus attracts many bird watchers from throughout the region as visitors. The water quality of Oldmans Creek was very high until about ten years ago when it began to deteriorate, as development in the watershed increased. This is a major concern because of the potential effects on the tidal marsh and on the very important habitat it provides for a great variety of wildlife.

Streams

In Logan Township, there are a total of 84 stream miles flowing across the land. A few of the streams, in all three of the watersheds within its boundaries, are considered to be headwater streams. That is, they are the initial sections of stream channels with no contributing tributaries (first order streams), or they are stream channels formed from only one branching section of tributaries above them (second order streams). The headwaters are where a stream is “born,” and actually begins to flow. In Logan Township, 56 miles of the total 84 miles of streams are first or second order streams, or headwaters.

These headwaters are of particular importance because they tend to contain a diversity of aquatic species and their condition affects the water quality found downstream. They are also the most vulnerable to human intrusion. They drain only a small area of land, usually no larger than one square mile (640 acres). First and second order streams are narrow and often shallow, and are characterized by relatively small base flows. This makes them subject to greater temperature fluctuations, especially when forested buffers on their banks are removed. They are also easily oversilted by sediment-laden runoff and their water quality can be rapidly degraded. In addition, first order streams are greatly affected by changes in the local water table because they are fed by groundwater sources. Headwaters are important sites for the aquatic life that is at the base of the food chain, and often serve as spawning or nursery areas for fish.

Table 7: Logan Township Streams

Stream Order	Miles
First Order streams (smallest)	39.97
Second Order streams	16.06
Third Order streams	15.69
Fourth Order streams (Raccoon Creek main channel)	8.06
Fifth Order streams (Oldmans Creek main channel)	3.83
Total	83.61

Source: NJDEP

Map 4: Watersheds

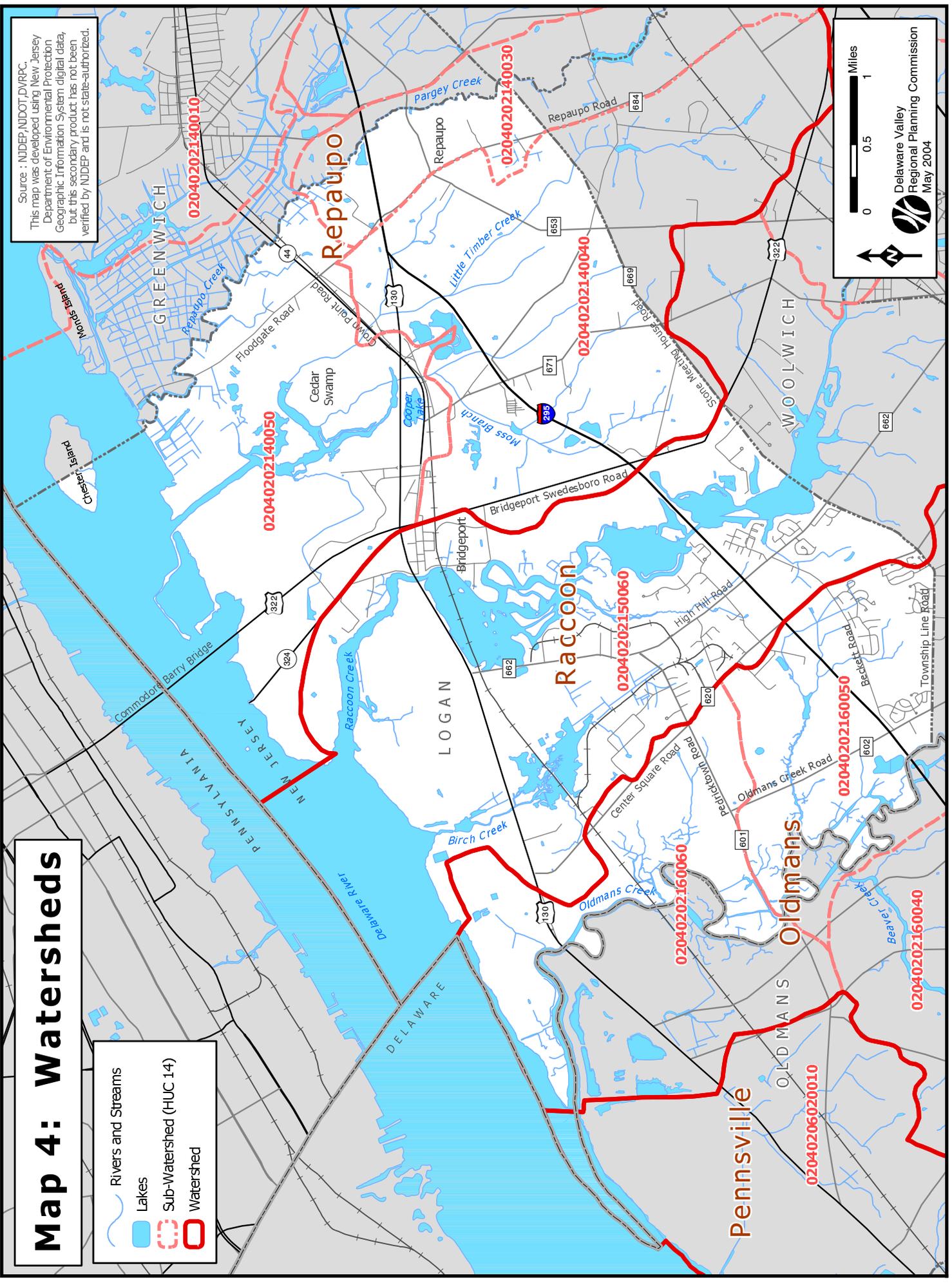
-  Rivers and Streams
-  Lakes
-  Sub-Watershed (HUC 14)
-  Watershed

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

0 0.5 1 Miles




Delaware Valley Regional Planning Commission
 May 2004



Logan Township is also characterized by tidal waters, on both the Raccoon/Birch Creeks and Oldmans Creek. Tidal flows bring Delaware River water into the streams twice a day. Tidal flows both help and hinder maintenance of good water quality in affected streams. The flood (incoming) tide carries and leaves nutrients that are beneficial to aquatic organisms, but it also limits the regular flushing out of silt and pollutant-laden waters coming from upstream. Silt deposition within a stream tends to increase during flood tides, although deposition is also a function of stream shape, the presence of specific flow barriers, and the quantity of silt (the load) being carried by the stream. See **Map 5: Surface Water, Wetlands, and Vernal Ponds**.

Lakes

There are two lakes in Logan Township: Cooper Lake and Logan Pond. These open bodies are permanent waters and were created by damming the streams. Although they are classified as true lakes by federal and state maps, both of these Logan lakes are man-made impoundments. True lakes do not exist in southern New Jersey. All existing South Jersey lakes were created by damming, in order to power grist or saw mills. This was an especially common practice in the 1800s. The dams have been replaced or rebuilt and thus are still present, although the mills are mostly gone throughout South Jersey.

Cooper Lake is 15 acres in size and Logan Pond is 4.6 acres. Neither lake is used much today for recreation, although Cooper Lake was once a thriving recreational park with picnic areas and swimming. Logan Pond is part of a New Jersey Department of Environmental Protection Wildlife Management Area, but there is no direct access to the pond from Logan Township. See **Map 5: Surface Water, Wetlands, and Vernal Ponds**.

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. Under normal circumstances, wetlands are those areas that support a prevalence of defined wetland plants on a wetland soil. The US Fish & Wildlife Service designates all large vascular plants as wetland (hydric), non-wetland (non-hydric) or in-between (facultative). Wetland soils, also known as hydric soils, are areas where the land is saturated for at least seven consecutive days during the growing season. The source of water for a wetland can be a stream or lake edge, as well as groundwater that rises close to the land surface.

New Jersey protects freshwater 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," can determine for sure if there are freshwater wetlands on a property. An LOI verifies the presence, absence, or boundaries of freshwater wetlands and transition areas on a site. Activities permitted to occur within wetlands

are very limited and permits are required for most of them. Additional information on wetlands rules and permits is available through NJDEP and on their website under “landuse.” See **Sources of Information**, page 79.

Logan Township is dominated by tidal freshwater marshes and there are also freshwater wetlands along its stream corridors. Wetlands of all types total 3,845 acres within the township, of which 2,056 acres are forested wetlands, 658 acres are low-growing emergent or scrub/shrub wetlands along riparian (streamside) corridors, and 1,131 acres are tidal marsh. See **Map 5: Surface Water, Wetlands, and Vernal Ponds**. A more detailed description of wetland areas is found in the Biological Resources section, under “Wetlands,” page 54.

Agricultural Wetlands

Another category of wetlands in Logan is that of agricultural wetlands, although they occupy only a modest amount of acreage (488 acres). These are found scattered as small sites throughout the township, with larger areas near the junction of the Delaware River with both the Raccoon and Oldmans Creeks. Agricultural wetlands are low-lying areas that once were wet but which were converted to agricultural use through drainage. See **Map 5: Surface Water, Wetlands, and Vernal Ponds**.

Draining fields for agriculture was done by laying perforated tile pipes in the soil below plow depth and linking them together into a network. Called "tile drainage," these systems lowered the water table and introduced more oxygen into the root zone, which resulted in better crop yields. Such drainage systems can be quite long-lived and require only the periodic maintenance of drainage ditches and outlets. They do tend, however, to convey nitrogen from the fields into local streams more efficiently than is desired, which can have negative effects on stream health.

The Natural Resources Conservation Service sponsors the Wetlands Reserve Program, a voluntary program that offers landowners a chance to receive payments for restoring and protecting wetlands on their property. This program provides technical and financial assistance to eligible landowners who can enroll eligible lands through permanent easements, 30-year easements, or restoration cost-share agreements.

Vernal Ponds (Vernal Pools)

Vernal ponds are bodies of water that appear following snow melt and during spring rains but which 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 who would consume the eggs and young.

Vernal ponds 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.

Map 5: Surface Water, Wetlands, and Vernal Ponds

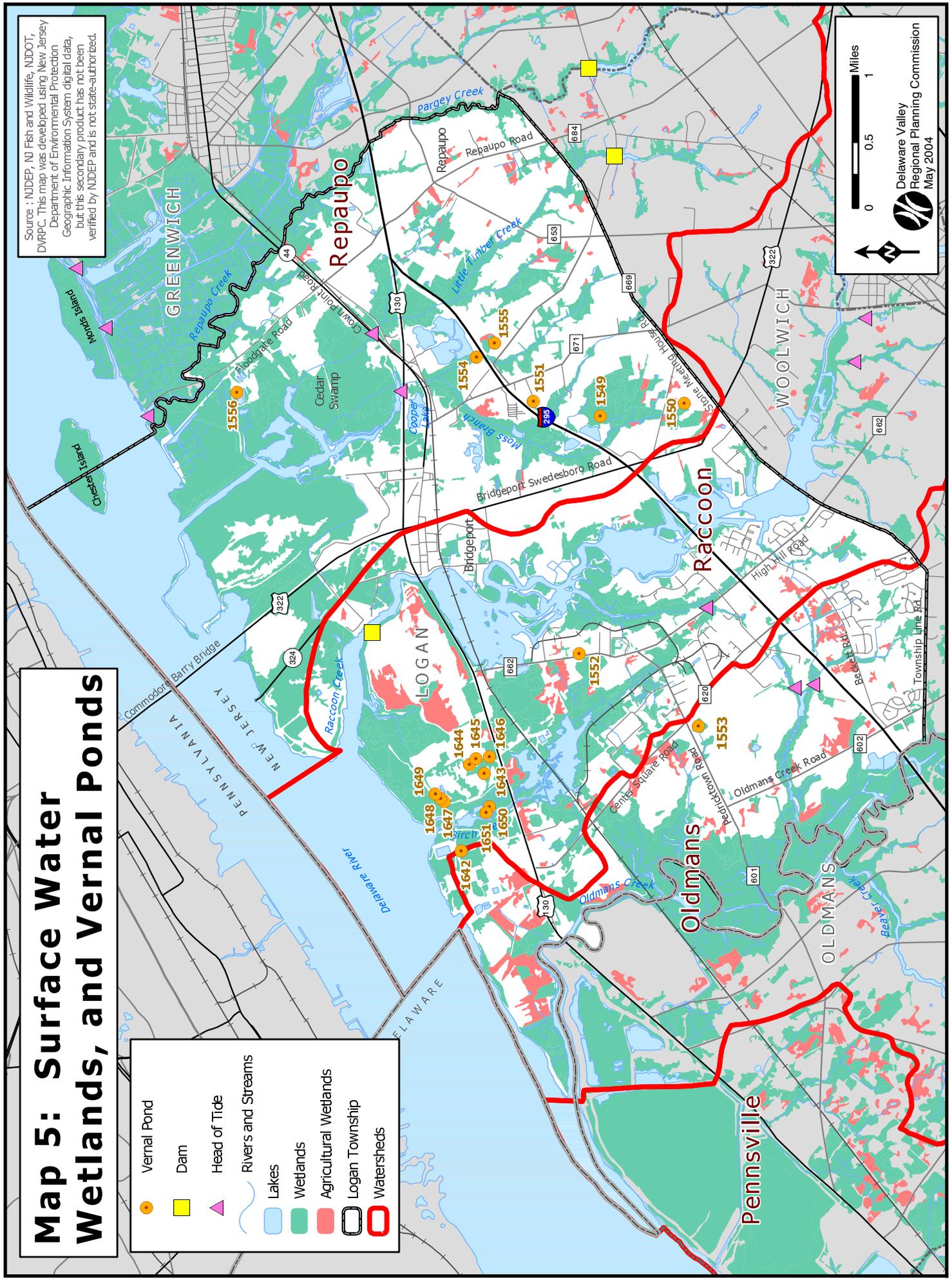
Source : NJDEP, NJ Fish and Wildlife, NJDOT, DVRPC. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

-  Vernal Pond
-  Dam
-  Head of Tide
-  Rivers and Streams
-  Lakes
-  Wetlands
-  Agricultural Wetlands
-  Logan Township
-  Watersheds

0 0.5 1 Miles




Delaware Valley Regional Planning Commission
May 2004



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 through the state. Once a vernal pond is certified, regulations require that a 75-foot buffer be maintained around the pond. NJDEP's Division of Land Use Regulation oversees this designation and restricts development around vernal ponds by denying construction permits. Local municipalities can provide additional protection by instituting restrictive zoning or negotiating conservation easements on the land surrounding the pond.

The state has identified 15 vernal ponds in Logan Township. Surveys of each pond are planned to determine what species are present and, indeed, if the pond is still in existence as a natural habitat. None of these sites had been surveyed by the end of 2003. See **Map 5: Surface Water, Wetlands, and Vernal Ponds**.

Flood Hazard Areas

Flood hazard areas are defined as the combination of the 100-year floodplains and the adjacent flood fringe areas that help to hold and carry excess water during overflow of the normal stream channel. The 100-year floodplains are defined as the land area that will be inundated by the overflow of water resulting from a 100-year flood (a flood which has a 1% chance of occurring in any given year).

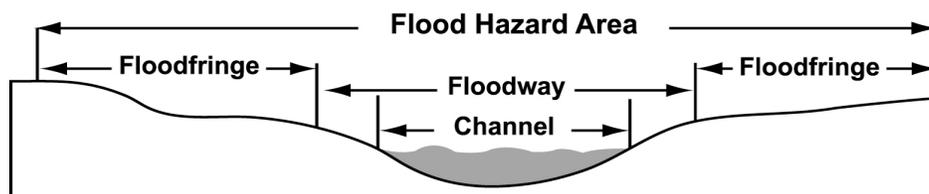


Fig. 2: Parts of a Flood Hazard Area

Flood hazard areas require protection in order to prevent serious loss to residents. Equally important is the preservation of the environmentally sensitive aquatic communities that exist in these flood hazard areas, as well as in the stream corridors themselves. These communities are often the first link in the food chain of the aquatic ecosystem. In addition, floodplain areas 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 maintain these flood hazard areas will help to preserve the flood-carrying capacity of the 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 plain under the Flood Hazard Area Control Act, N.I.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 non-applicability from the NJDEP. Additional information on floodplain activities is available from NJDEP and from their website under "Landuse." See **Sources of Information**, page 79.

A very high percentage (73%) of Logan Township’s land is characterized as flood hazard area, principally because the marshes surrounding the Raccoon, Birch, and Oldmans Creeks are so extensive and so close together. In addition, the Repaupo drainage, including Cedar Swamp, Moss Creek, and Little Timber Creek, is a low-lying region potentially subject to flooding from the Delaware River as well as from the streams themselves. See **Map 6: Flood Hazard Areas**.

Table 8: Flood Hazard Area Acreage

Category	Acres
A – An area inundated by 100-year flooding for which no base flood elevations have been determined	138
AE – An area inundated by 100-year flooding, for which base flood elevations have been determined	8,375
X500 – An area inundated by 500-year flooding, or an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile, or an area protected by levees from 100-year flooding	2,396

Source: Federal Emergency Management Agency (FEMA)



Photo by Michael A. Hogan

Raccoon Creek at High Tide

Map 6: Flood Hazard Areas

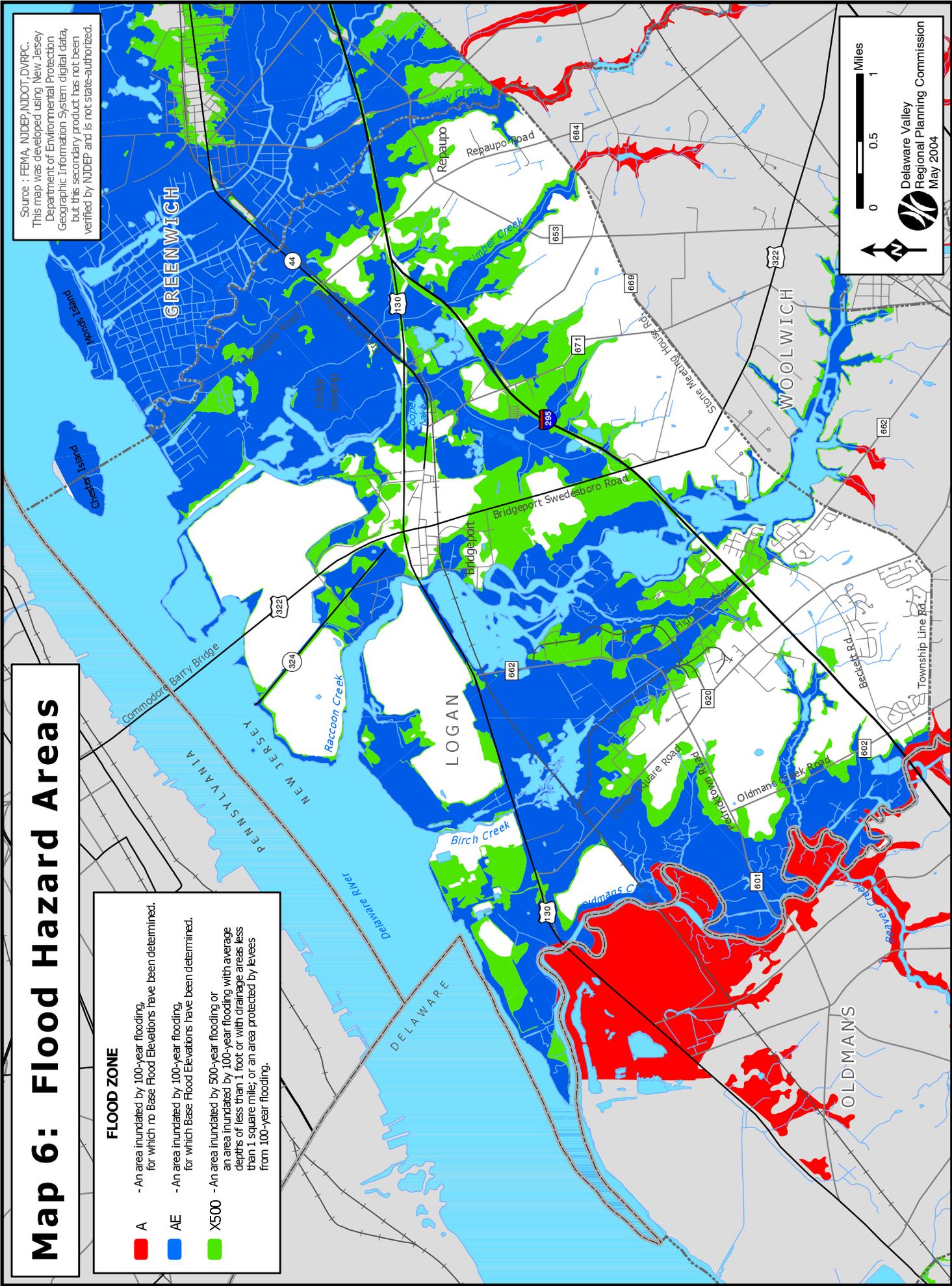
FLOOD ZONE

- A - An area inundated by 100-year flooding, for which no Base Flood Elevations have been determined.
- AE - An area inundated by 100-year flooding, for which Base Flood Elevations have been determined.
- X500 - An area inundated by 500-year flooding or an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 100-year flooding.

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

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Surface Water Quality

Water quality standards are established by Federal and State governments to ensure that water is suitable for its intended use. Standards are specific to water use and differ for surface water, groundwater, and marine waters. In New Jersey, all water is classified according to its designated use: swimming, boating, shellfish harvesting, water supply, maintaining a fish population, and supporting fish reproduction. The Federal Clean Water Act (P.L. 95-217) requires that wherever possible the water-quality standards provide water suitable for fish, shellfish, and wildlife to thrive and reproduce and for people to swim and boat. Some classes of waters, such as freshwater streams (FW), are further subdivided into trout-producing, trout-maintenance, and non-trout waters (NT waters). Each classification has a corresponding set of water-quality criteria, or numerical concentration values, that must be met.

Designated use	Classification	Example Criterion: pH
Primary or Secondary Recreation	FW - 1	No changes from natural conditions (non-degradation)
	FW - 2	6.5 - 8.5
	SE - 1	6.5 - 8.5
	SC	Natural conditions prevail
	PL	3.5 - 5.5

Fig. 3: **Example of NJDEP Water-Quality Standards, Classifications, and Criteria.¹**

Designated water uses include primary (swimming), secondary (boating), maintaining fish, supporting fish reproduction, and potable public water supply. Classifications are FW - 1 & 2 = Freshwater; SE-1 = Saline estuaries; SC = Saline coastal; PL = Pinelands. Each classification except FW-1 has a specific set of criteria, or numerical guidelines, that must be met. pH is one of these and is shown in this example. The pH criteria for FW-2 and SE-1 are the same but the pH criteria for SC and PL are different.

All freshwaters of New Jersey are assigned designated uses that reflect the national clean water goals. However, some tidal and estuarine saline waters of the state are classified for lesser goals because the national goals are not currently believed to be attainable. Tidal waters within the estuarine (and potentially saline) portion of the Delaware basin between Woodbury Creek and Raccoon Creek are classified as SE-2 waters and only have to meet water quality criteria for secondary contact recreation (boating and fishing). Thus, the tidal portion of Raccoon Creek is classified as SE-2. However, the tidal Oldmans Creek is SE-1, a classification with more stringent criteria.

¹ From: Martha k. Watt, *A Hydrogeologic Primer for New Jersey Watershed Management*. U.S. Geological Survey in cooperation with the NJ Dept. of Environmental Protection. West Trenton, NJ, 2000.

All of Pargey/Repaupo and Little Timber Creeks are classified as FW2–NT, which means that they are general freshwater streams that are not trout producing or trout maintenance waters (“non trout”). Waters with FW–2 classification, and SE-1 waters such as Oldmans Creek, must provide aquatic life support – healthy habitat for aquatic wildlife – and must meet the designated human uses of primary recreation (swimming) and secondary recreation (boating and similar activities.)

Table 9: Water Quality Classifications of Streams in Logan Township

Streams	Classification
Repaupo (Pargey & Little Timber Creeks)	FW 2 – NT
Raccoon and Birch Creeks	SE 2
Oldmans Creek	SE-1

Source: NJDEP

Each classification is associated with a specific set of criteria that impose limits on what is allowable in discharges to the waters. If there are documented exceedances of the human use criteria limits for a particular stream segment or lake, or if the segment/lake fails to meet the (lesser) criteria for support of aquatic life use, it must be included on a list of impaired waters – the 303d list. This, in turn, generates a requirement that the state develop a plan of action to improve the water quality.

Logan Township Stream Water Quality

The Repaupo – Pargey stream system, including the main channel and all tributaries, is listed on the 2002 Impaired Waters List – the 303d list. Most of the impairments on the 303D list are for insufficient aquatic life support. That is, the streams are listed as not meeting stream health criteria to maintain diverse populations of aquatic organisms. This is based on very limited assessment of water quality in Logan. The New Jersey Department of Environmental Protection conducted biological monitoring at two sites between 1992 and 1996 and again between 1997 and 2000. One is located on the Little Timber Creek and the other is on Pargey Creek at the township “four corners” – the corner where Logan meets Woolwich, Greenwich, and East Greenwich.

Thus there are a total of two state monitoring locations in Logan. Results of this monitoring indicate that water quality at both stations is currently moderately impaired and has stayed substantially the same since the previous monitoring. There are also six other biological monitoring sites close to Logan, spread across the Repaupo, Raccoon, and Oldmans Creeks. A USGS/NJDEP fixed monitoring station, where physical and chemical monitoring is conducted, is also located on each of the streams, but they are relatively far upstream from Logan. However, all these stations are listed in *Table 10: Water Quality of Nontidal Waters in the Region* and are depicted on **Map 7: Water Quality – Nontidal Waters**.

Tidal sections of streams are not included in the 303D listing, so there is no official designation of the condition of the Raccoon/Birch or Oldman Creeks within Logan. However, the nontidal

Map 7: Water Quality - Nontidal Waters

NJDEP Ambient Biomonitoring Network (AMNET) 2000
 1st Round of Sampling 2nd Round of Sampling

- Non-Impaired
- Moderately Impaired
- Severely Impaired
- Non-Impaired
- Moderately Impaired
- Severely Impaired

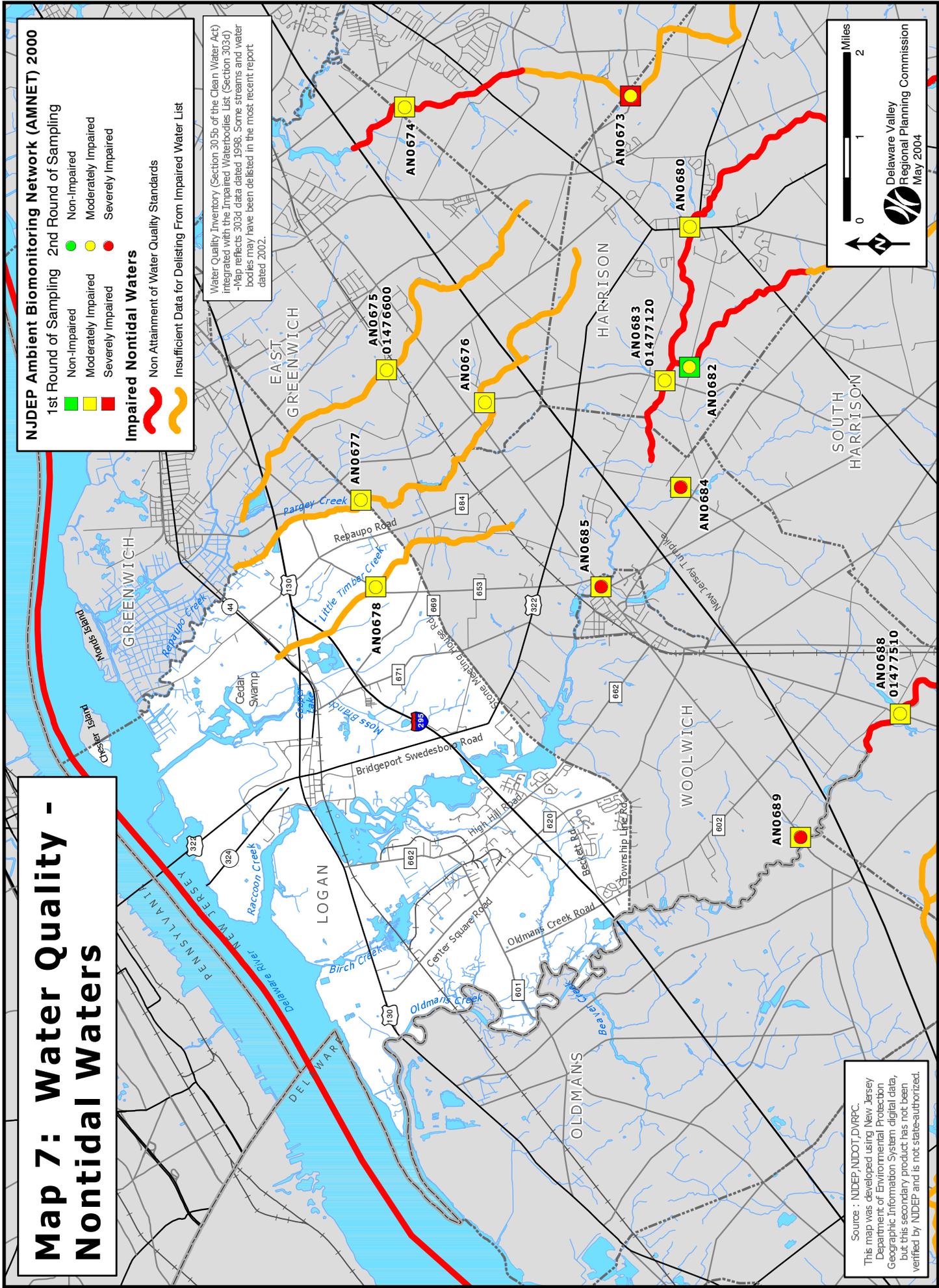
Impaired Nontidal Waters

- Non Attainment of Water Quality Standards
- Insufficient Data for Delisting From Impaired Water List

Water Quality Inventory (Section 303b of the Clean Water Act) integrated with the Impaired Waterbodies List (Section 303d)
 -Map reflects 303d data dated 1998. Some streams and water bodies may have been delisted in the most recent report dated 2002.

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

sections of Raccoon and Oldmans (the upstream FW-2 segments) are listed as impaired. This means that the water entering Logan from upstream sources is of reduced water quality. In addition, the Delaware River has been designated as impaired, throughout its length along Logan Township.

**Table 10: Water Quality of Nontidal Waters in the Region
(2002 Impaired Waters listed on the 303D List)**

Watershed	Station/ Site ID	Station Name	Township	Parameters tested	Data Source	Nonattaining or Insufficient data to delist
Repaupo Creek	AN0677	Pargey Creek at Swedesboro–Paulsboro Rd	Logan/ Woolwich	Aquatic Life	AMNET	Insufficient data
Repaupo Creek	AN0678	Little Timber Creek at Paulsboro Rd.	Logan	Aquatic Life	AMNET	Insufficient data
Repaupo Creek	01476600	Still Run near Mickleton	E. Greenwich	Fecal Coliform (FC)	USGS/ NJDEP	Nonattaining
Repaupo Creek	AN0676	Rattling Run at Tomlin Station Rd	East Greenwich	Aquatic Life	AMNET	Insufficient data
Raccoon Creek	AN0685	At Kings Hwy	Woolwich	Aquatic Life	AMNET	Not assessed, tidal
Raccoon Creek	01477120	Raccoon Creek near Swedesboro	Woolwich	Total Phosphorus (TP), Fecal Coliform (FC)	USGS/ NJDEP	Nonattaining
Oldmans Creek	AN0689	At Kings Hwy (Porches Mill)	Woolwich	Aquatic Life	AMNET	Insufficient data
Oldmans Creek	01477510	At Kings Hwy (Porches Mill)	Woolwich	Total Phosphorus (TP), Fecal Coliform (FC), pH	USGS/ NJDEP	Attaining – pH Nonattaining – TP, FC

Source: NJDEP

Causes of Water Quality Impairments

Stormwater Runoff

Stormwater runoff and other non-point source pollution (pollution coming from a wide variety of sources rather than from a single point such as a discharge pipe) have the largest effect on the water quality and channel health of streams in Logan. These sources are also the most difficult to identify and remediate because they are diffuse, widespread, and cumulative in their effect. Most non-point source pollution in the three watersheds is known to derive from stormwater drainage off paved surfaces such as streets, commercial/industrial areas, and residential sites (with and without detention basins), and from agricultural fields that lack adequate vegetative buffers. Some of this runoff comes to the waterways from similar sources in upstream townships and some of it derives from Logan land uses.

The volume of runoff that is carried to a stream also impacts stream channel condition. Increased volume usually results from increased impervious surface within a subwatershed. As an area becomes developed, more stormwater is directed to the streams from neighborhood storm drains, residential and commercial stormwater facilities, and road drainage. In general, scientists have found that levels of impervious cover of 10% or more within a subwatershed are directly linked to increased stormwater runoff, enlargement of stream channels, increased streambank erosion, lower dry weather flows, high stream temperatures, lower water quality, and declines in aquatic wildlife diversity. When impervious cover reaches 25% to 30%, streams are found to be

severely degraded. The general land use data for Logan Township identifies over 16% of the Township as developed, although not all of that area will be impervious.

Knowing the actual condition of streams and stream banks, and planning for their improvement, requires fuller surveys and more frequent monitoring than the state can provide. The state only monitors main channels and only does biological assessments on a five-year cycle. Stream surveys by local organizations are much needed, along with regular monitoring of water quality on all of a community's waterways.

Inadequate Stream Buffers

The stream buffer is the region immediately beyond the banks of a stream that serves to limit the entrance of sediment, pollutants, and nutrients into the stream itself. Stream buffers are quite effective at filtering substances washing off the land. The vegetation of the buffer traps sediment and can actually utilize (uptake) a percentage of the nutrients flowing from lawns and farm fields. When forested, a stream buffer promotes bank stability and serves as a major control of water temperature. The buffer region also serves as a green corridor for wildlife to move between larger forested habitat areas. This greenway can be utilized for recreation by residents as well, through trails, bikeways, and access points to the water for fishing and canoe/kayak launching.

The importance of a healthy, intact buffer zone (also referred to as a "riparian corridor") has been well documented scientifically over the past 20 years, especially for headwater streams. There is less agreement and much continuing research on the appropriate minimum width of a buffer. In literature on this issue, a recommended minimum buffer width of 100 feet is most common, with differing activities permitted in each of three zones within the buffer. Buffers of up to 300 feet are recommended for wildlife corridors and potential passive recreational use, such as walking trails.

The New Jersey Freshwater Wetlands Protection Act incorporates buffer requirements into its wetland protection regulations. The width of the "transition zone" extending beyond a wetland is determined by the value of the wetland, based on its current use and on the documented presence/absence of threatened or endangered species. Municipalities may not establish buffers on wetlands that exceed those required by the state statute. However, the municipality can make certain that those limits are accurate through its review of the wetlands delineation process, and it can also monitor use of the land within the transition area and take action against encroachments.

Restoration of stream buffers on agricultural lands is supported by various programs of the US Department of Agriculture and the New Jersey Department of Agriculture, such as the Conservation Reserve Program (CRP), administered by the USDA's Farm Service Agency (FSA). This program compensates farming landowners for the loss of land being converted to a buffer or other habitat. It also funds or directly creates new buffers where they are absent. Programs such as the Environmental Quality Incentive Program (EQIP), administered by the Natural Resources Conservation Service (NRCS) of USDA, encourage the "due care" management of agricultural lands, involving the proper levels of fertilizer and pesticide

applications to farmland. It funds up to 75% of the costs of eligible conservation practices. These are all programs in which individual landowners volunteer to take part.

Point Sources of Pollution

Point source pollution of waterways, which comes from single sources or a "point" such as an industrial pipe discharge, are controlled by the New Jersey Department of Environmental Protection through the New Jersey Pollution Discharge Elimination System (NJPDES), where permits regulate the discharges. In Logan there are 11 permits for discharges to surface water from six facilities. These are included in *Table 11: New Jersey Pollution Discharge Elimination Permit System (NJPDES) Permits*, below. Also listed there are another eight active facilities and two, which are inactive, located in Greenwich and Oldmans Townships but close to Logan's borders. See also **Map 13: Approved Sewer Service Areas & NJPDES Permit Sites** on page 67 for the locations of these permitted facilities.

Table 11: New Jersey Pollution Discharge Elimination Permit System (NJPDES) Permits

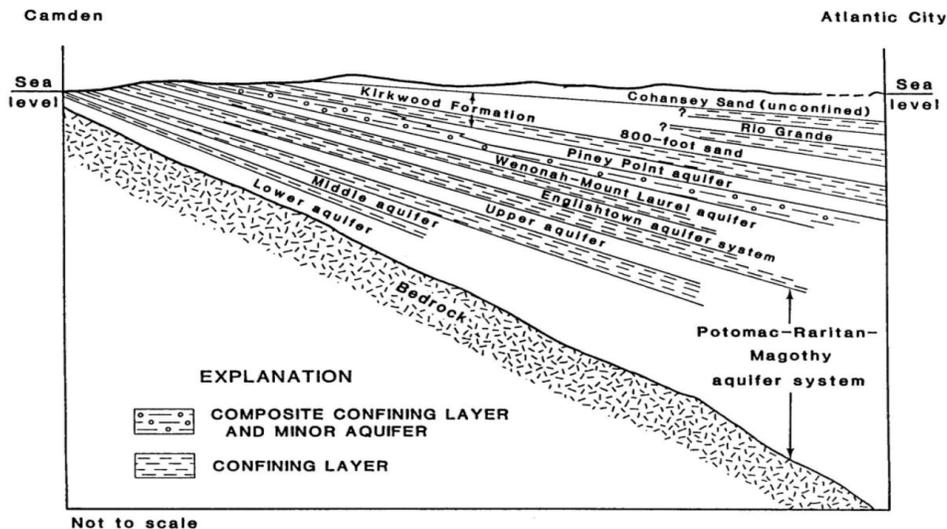
NJPDES ID	Facility Name	Municipality	Pipe Category	Type of Discharge	Receiving Waters
NJ0005240.001A	Safety-kleen Inc - Bridgeport	Logan	Industrial	Industrial Major	Raccoon Creek via diffuser
NJ0005240.001B	Safety-kleen Inc - Bridgeport	Logan	Industrial	Industrial Major	Raccoon Creek via flume
NJ0005240.002A	Safety-kleen Inc - Bridgeport	Logan	Industrial	Industrial Major	Raccoon Creek via unnamed trib
NJ0005240.003A	Safety-kleen Inc - Bridgeport	Logan	Industrial	Industrial Major	Raccoon Creek via storm sewer
NJ0005240.004A	Safety-kleen Inc - Bridgeport	Logan	Industrial	Industrial Major	Raccoon Creek via unnamed trib
NJ0023299.001A GPS	Pureland Treatment Plant	Logan	Industrial	Industrial Minor	Raccoon Creek via unnamed trib
NJ0027545.001A	Logan Township MUA	Logan	Sanitary	Municipal Major	Delaware River/Estuary
NJ0076872.001B	Logan Generating Company	Logan	Industrial	Industrial Minor	Delaware River Zone 5
NJ0076872.003B	Logan Generating Company	Logan	Industrial	Industrial Minor	Oldmans Creek via unnamed trib
NJ0105589.001A	Chemical Leaman Tank Lines Inc	Logan	Industrial	Industrial Minor	Delaware River
NJ0106861.001A, 2A	Container Recycling Alliance	Logan	Storm water	Industrial Minor	Raccoon Creek via storm sewer
NJ0030333.001A	Greenwich Twp MUA - Gibbstown	Greenwich	Sanitary	Municipal Minor	Delaware River (Zone 4)
NJ0004219.001A	E I Dupont - Rapauno Works	Greenwich	Industrial	Industrial Major	Aunt Debs Ditch
NJ0004219.002A, 2B, 7A, 8A	E I Dupont - Rapauno Works	Greenwich	Industrial	Industrial Major	Delaware River (Zone 4)
NJ0004219.007B	E I Dupont - Rapauno Works	Greenwich	Industrial	Industrial Major	Aunt Debs Ditch via Sand Ditch
NJ0005134.001A	Hercules Inc - Gibbstown	Greenwich	Industrial	Industrial Major	Delaware River (Zone 4)
NJ0004286.001A	The Geon Company	Oldmans	Industrial	Industrial Major	Delaware River (Zone 5)
NJ0004286.002A, 3A, 4A, 5A, 6A	The Geon Company	Oldmans	Industrial	Industrial Major	Delaware River (Zone 5) via unnamed trib
NJ0005045.001A, 2A	Solutia Inc - Delaware River Plant	Delaware R.	Industrial	Industrial Major	Delaware River (Zone 4)
NJ0071340.001A	Pandrol Inc	Logan	Cooling water	Revoked	Raccoon Creek via storm sewer
NJ0030406.001A	Exxon Chemicals Co - Tomah	Oldmans	Industrial	Revoked	Delaware R. (Zone 5) via unnamed trib

Source: NJDEP

GROUNDWATER

The geology of the New Jersey Coastal Plain can be visualized as a tilted layer cake, with its “layers” or strata formed of gravels, sands, silts, and clays. The saturated gravel and sand layers, with their large pore spaces, are the aquifers from which water is drawn. The silt and clay layers, which impede the movement of water, are called confining beds.

A cross section across southern New Jersey from west to east would show that the aquifers are not horizontal but tilt toward the southeast, getting deeper as they cross the state toward the Atlantic Ocean. Because of this tilting, each aquifer emerges on the land surface in a sequential manner. The deepest strata emerge on the surface near the Delaware River. Where a layer emerges is its “outcrop” area. The Potomac–Raritan–Magothy (PRM) formation, the deepest and most abundant aquifer, is a major water source for Inner Coastal Plain communities and provides all of Logan Township's water. Other smaller aquifers on top of the PRM are the Englishtown and the Mt. Laurel – Wenonah. The two thick layers that overlie these older formations, beginning east of the inner/outer coastal plain divide, are the Kirkwood (lower) and the Cohanse (on top), which are so similar to each other that they are usually referred to by a combined, hyphenated name.



Source: U.S. Geological Survey

Fig. 4: Aquifers of Southern New Jersey along a Line from Camden to Atlantic City

Aquifers

Potomac-Raritan-Magothy Aquifers (PRM)

The Potomac-Raritan-Magothy (PRM) is the principal formation underlying Logan Township. This multiple aquifer is actually a large series of formations that have been combined and

described as a single unit because the individual formations – the Potomac group and the Raritan and Magothy Formations – are lithologically indistinguishable from one another over large areas of the Coastal Plain. That is, they are composed of materials of like kind and size laid down by both an advancing and retreating sea across southern New Jersey and by deposits of material that came from the breakdown and erosion of the Appalachian and Catskill Mountains beginning in the Cretaceous Period (150 to 60 million years ago).

In the Delaware Valley, three aquifers have been distinguished within the PRM system, designated as lower, middle, and upper, and there are two confining units or layers between the three water-bearing strata. The aquifers themselves are made up largely of sands and gravels, locally interbedded with silt and clay. The lower aquifer sits on the bedrock surface. Confining beds between the aquifers are composed primarily of very fine-grained silt and clay sediments that are less permeable and thus reduce the movement of water between the aquifers. They also help to slow the entry of any contaminants on the surface down into the groundwater.

The PRM is the primary source of drinking water to New Jersey residents from Burlington to Salem Counties, as well as to communities across the river in Delaware. Because of such large usage, there has been a decline in PRM aquifer water levels. This became so serious that the New Jersey Department of Environmental Protection established Water Supply critical Area #2 in 1986. All water supply companies within Critical Area #2 were given annual limits on water withdrawals in the PRM. Usage from the PRM was cut back by over 20% and no increases in pumping were allowed. Piping of treated Delaware River water filled the gap in much of the region.

Logan Township is outside the boundary of the Critical Area, but close to it. There is increased concern that additional pumpage from the aquifer in the borderline areas will necessitate the expansion of the Critical Area boundaries. Thus, water supply companies in southwestern Gloucester and northwestern Salem County have and will continue to have difficulty getting approvals from the New Jersey Department of Environmental Protection for any additional water allocations from the PRM.

In Gloucester County, use of the lower PRM aquifer for drinking water is limited, due to high chloride concentrations (salt water intrusion). This is thought to be either very ancient seawater within the lower aquifer, or the result of movement into it from its eastern side, which is in contact with ocean water. Whatever the cause, the lower aquifer is not usable for drinking supply in much of its extent.

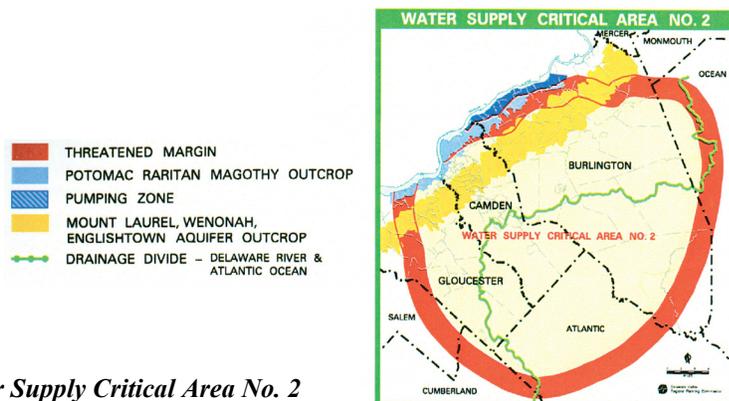


Fig. 5: Water Supply Critical Area No. 2

Source: DVRPC

Outcrops

The outcrop area of the PRM, where it tilts upward to the surface, is under and immediately beside the Delaware River and river water actually enters and recharges the upper and middle PRM aquifers. The majority of Logan's land is within the PRM outcrop area. Because an outcrop is the area where the aquifer emerges on the land surface, preventing contamination of the land in outcrop areas is extremely important in order to maintain a safe drinking water supply. The Englishtown formation, which sits atop the PRM, crops out to the east of the PRM outcrop, on the eastern edge of Logan. This aquifer is too shallow for residents of Logan to utilize but it is a drinking water supply to county residents living to the east of Logan. See **Map 8: Aquifer Outcrops** for a visual depiction of these areas.

Wellhead Protection Areas and Water Supply Wells

All public wells in Logan draw on the PRM aquifer. Most private wells probably do so, too. There is no comprehensive inventory of private wells – their depth or condition – available to municipalities. Well permits are held by the County Health Department, but there are many gaps in the records due to various factors, including well age. The recently enacted (2002) Private Well Testing Act requires state-certified laboratory water testing in order to sell a residential property. This will not identify what aquifers are being drawn upon by private wells, but it will eventually provide better documentation of the quality of drinking water from private wells in an area.

As part of its Well Head Protection Program Plan, issued in 1991, the New Jersey Department of Environmental Protection has delineated Well Head Protection Areas (WHPAs) around all community wells. A WHPA is the area from which a well draws its water within a specified time frame. Once delineated, these areas become a priority for efforts to prevent and clean up groundwater contamination. Other components of the Well Head 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 owners or municipalities, in relation to the tier locations. Protection of land and restrictions 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 in wellhead areas.

Delineating a Wellhead Protection Area (WHPA)

A WHPA consists of three tiers, each based on time of travel to the well:

Tier 1 = two years

Tier 2 = five years

Tier 3 = twelve years

Calculation of the tier boundaries is based on findings of how long specific contaminants can survive in groundwater, how much time would be required for specific remedies to be undertaken, and on the likelihood of natural dilution over distance. The tiers are shown as rings around a well, with the groundwater direction of travel factored in to create plume-like shapes.

Map 8: Aquifer Outcrops

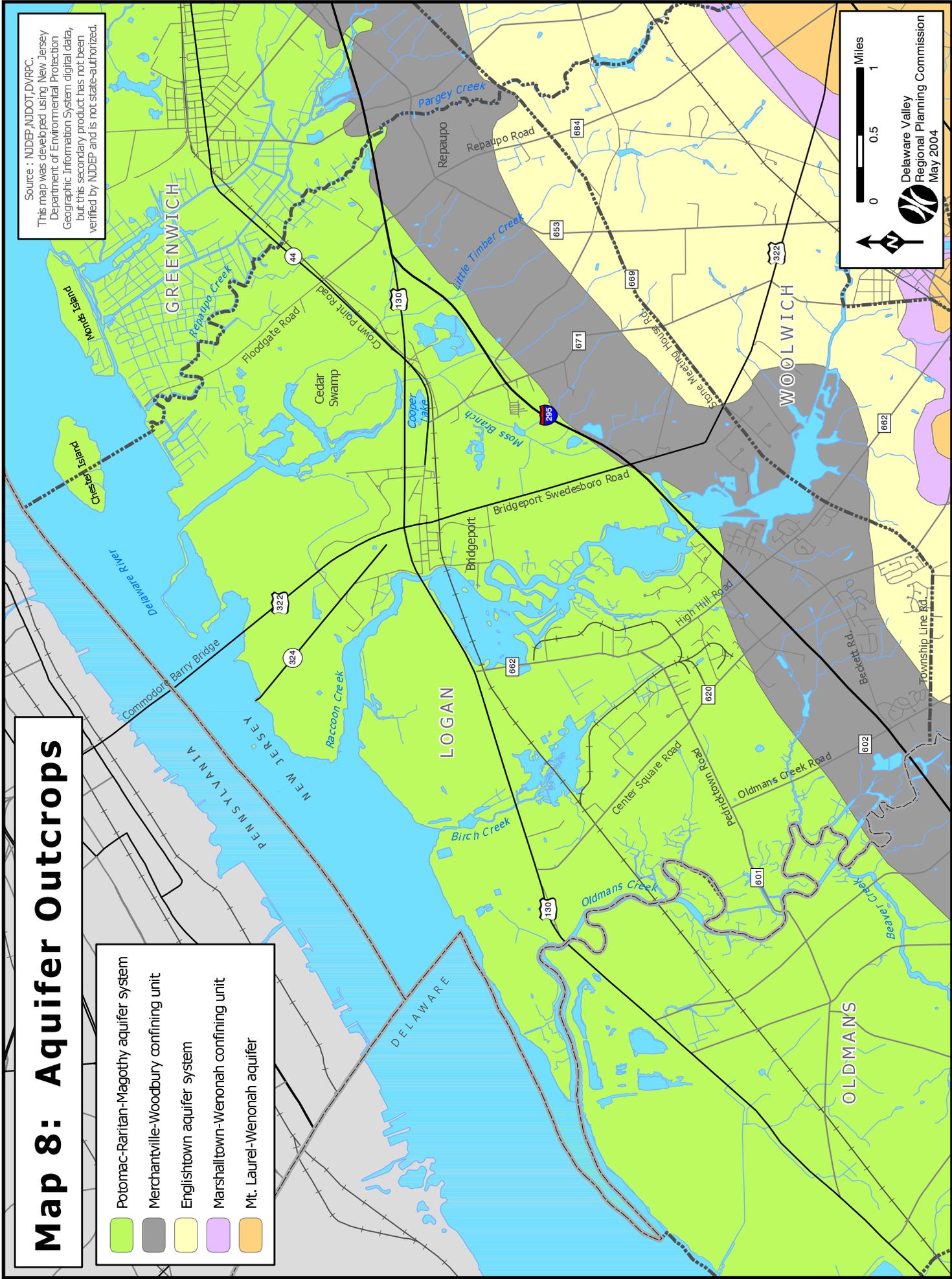
- Potomac-Raritan-Magothy aquifer system
- Merchantville-Woodbury confining unit
- Englishtown aquifer system
- Marshalltown-Wenonah confining unit
- Mt. Laurel-Wenonah aquifer

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

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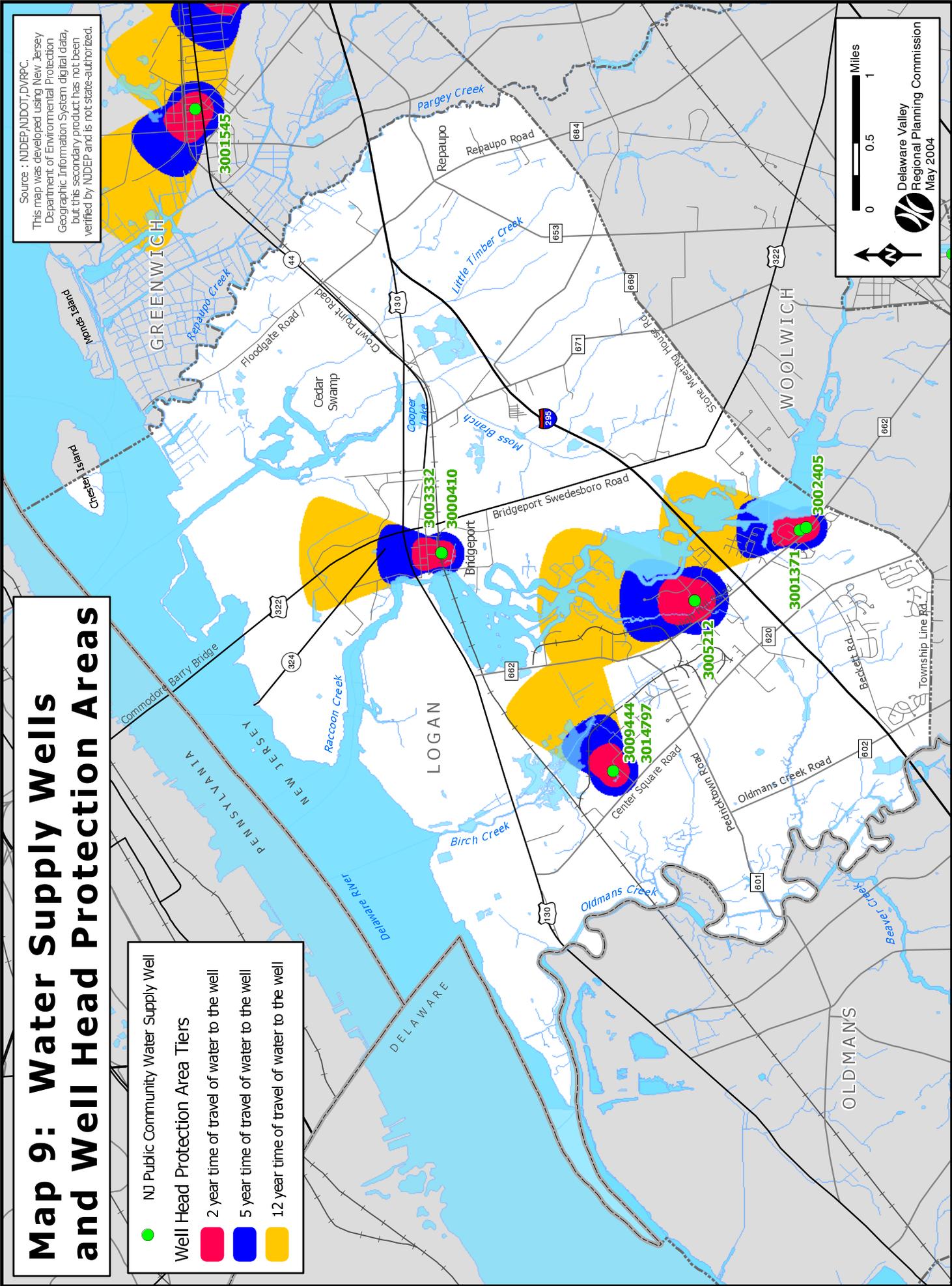
Map 9: Water Supply Wells and Well Head Protection Areas

- NJ Public Community Water Supply Well
- Well Head Protection Area Tiers**
- 2 year time of travel of water to the well
- 5 year time of travel of water to the well
- 12 year time of travel of water to the well

Source : NJDEP, NJDOT, DVRPC.
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There are seven active wells at four well sites in Logan Township, as listed in *Table 12: Public Water Supply Wells* below. Another well located in Greenwich Township and operated by the Greenwich Township Water Department is close to Logan Township’s borders. All have Well Head Protection Areas that have been delineated by the state. Both these areas and the location of the wells are shown on **Map 9: Water Supply Wells and Wellhead Protection Areas**.

Table 12: Public Water Supply Wells

Well ID #	Original Owner	Aquifer	Depth to Top of Well Screen (feet)	Depth to Bottom of Well Screen (feet)
30-01371	NJ American Water Co Logan System	Middle PRM	158	208
30-02405	NJ American Water Co Logan System	Middle PRM	161	201
30-05212	NJ American Water Co Logan System	Middle PRM	121	155
30-09444	NJ American Water Co Logan System	Middle PRM	56	91
30-14797	NJ American Water Co Logan System	Middle PRM (probable)	unknown	unknown
30-00410	Penns Grove Water Supply Co (South Jersey Water Co.)	Middle PRM	65	85
30-03332	Penns Grove Water Supply Co (South Jersey Water Co.)	Middle PRM	69	84
30-01545	Greenwich Twp Water Dept (in Greenwich Twp)	Middle PRM	82	117
30-01370	NJ American Water Co Logan System	Middle PRM	Abandoned Dec. 1988 but still on NJDEP active well database	

Source: NJDEP

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 dependent 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. The New Jersey Department of Environmental Protection 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 Logan, lands with recharge of 11 to 15 inches per year, the highest in the township, are found in scattered patches, with the greatest concentration in areas along Route 322 and adjacent to Bridgeport. Other high recharge land is within sections of the Pureland/Northeast Business Park and on upland sites to the west of Route 130. In the case of Logan, the recharge is to the upper PRM aquifer. See **Map 10: Groundwater Recharge**.

On these 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 on 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 2 to 4 acres are often needed for proper nitrate dilution from septic systems in areas having 10 or more inches per year of groundwater recharge.

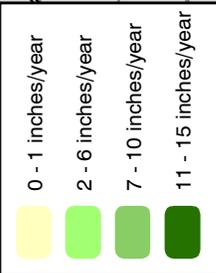


Source: DVRPC

A field in Logan.

Agricultural lands as well as forests are prime sites for groundwater recharge.

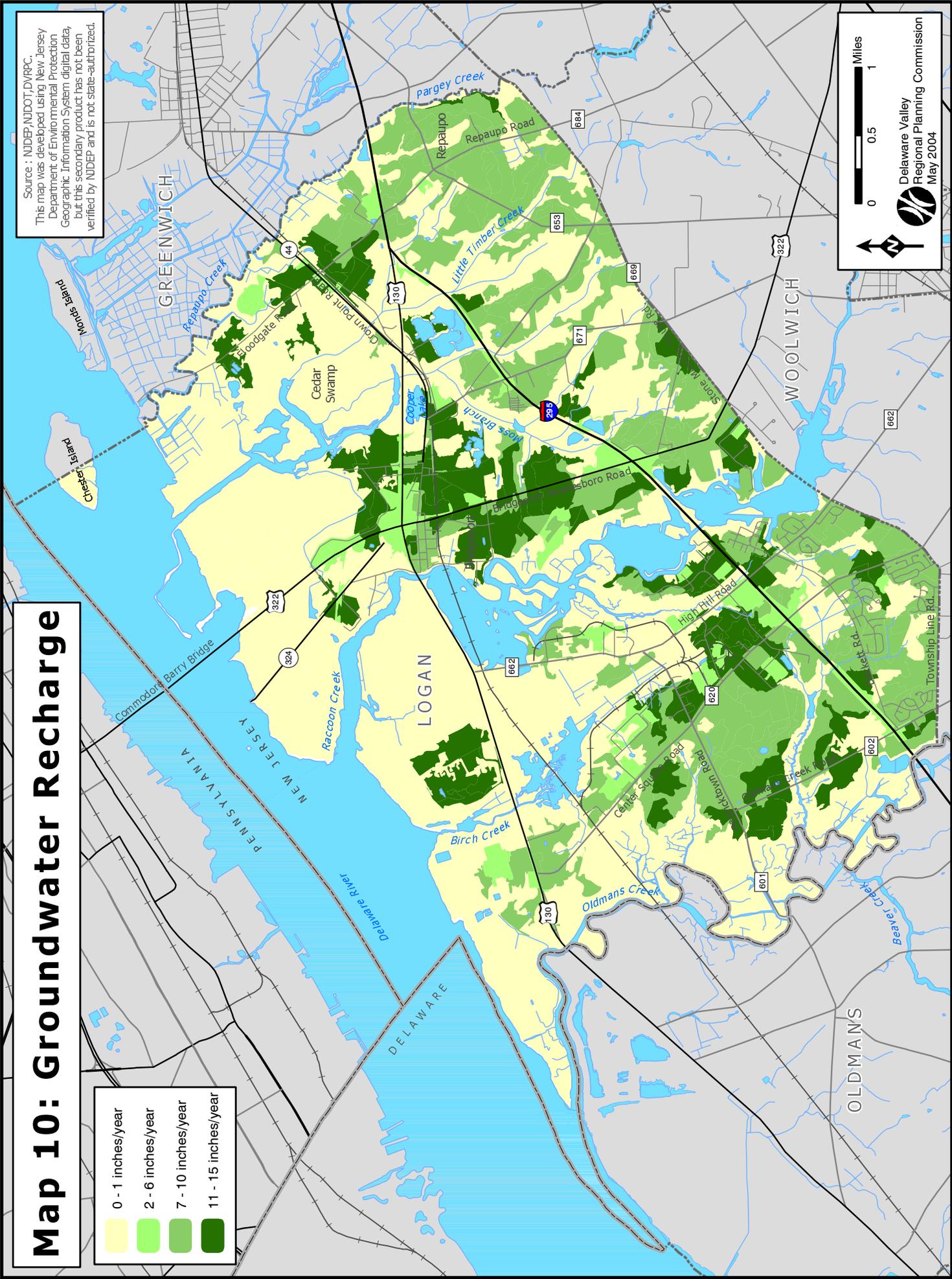
Map 10: Groundwater Recharge



Source : NJDEP, NJDOT, DVRPC.
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BIOLOGICAL RESOURCES

VEGETATION

Vegetation is controlled by many factors, the most important of which are climate and soils. Logan's climate is a cool temperate type, with rainfall in the region averaging 44 inches per year.

Table 13: Logan Township Vegetation

Type of Vegetation	Acres	% of Total Land Area
Brush/Shrubland	124.35	2.08
Brush/Shrubland - Oldfield	599.31	10.04
Lakes	309.48	5.18
Tidal Marshes - Freshwater	1,131.75	18.95
Tidal Waters	918.23	15.38
Upland Forest - Coniferous	23.50	0.39
Upland Forest - Deciduous	216.39	3.62
Upland Forest - Mixed (Deciduous- dominated)	1.05	0.02
Wetlands - Herbaceous	310.09	5.19
Wetlands - Scrub/Shrub	340.53	5.70
Wetlands - Wooded - Deciduous	1,996.56	33.44
Total	5,971.24	100.00

Source: NJDEP (1995/97 Land Cover)

See **Map 11: Natural Vegetation (1995/97)**.

Lower Plants and Microscopic Life

Algae, mosses, liverworts and other lower organisms (bacteria, fungi) form the base of a food web that affects the entire local ecosystem. These small plants are common in all environments in Logan. The many species at this level are not well known and there are almost no specific records of them for the area. Also unknown are the microscopic animals that feed upon them. Together they form the backbone of the living community.

Submerged Communities

The stream corridors and lakes within the township support plants with distinct habitat requirements – the persistent presence of standing water. Light is also a limiting factor to this plant community and it is found only within the shallower parts of open, perennial lakes and streams that are not shaded by a forest canopy. Plants such as pondweeds, bladderworts and

other submerged plants are found in permanent standing water, such as lakes and ponds.¹ Forms of algae can also be abundant both in lakes and in tidal waters, although large algal mats are usually a sign of excessive nutrient inputs coming from the land.

Wetlands

The location and type of vegetation are key features for classifying wetlands. Virtually all wetlands in Logan Township are found in association with the major streams and their tributaries. The greatest extent of emergent wetlands are found as freshwater tidal marshes along the main channels of the Raccoon, Birch, and Oldmans Creeks. The largest and most significant area is the Pedricktown Marsh on Oldmans Creek. Some nontidal emergent wetlands are also found along the Moss and Little Timber Creeks that feed the Cedar Swamp.



Wild Rice

In the tidal marshes, wild rice (*Zizania aquatica*) is perhaps the most distinctive native plant in these regions. This annual grass can grow to be 9 feet tall and is an important food source for migratory waterfowl. It is often found in association with broad-leaved cattail. Other plants that grow with it are water hemp, jewelweed, pickerelweed, arrow arum, nodding beggar-ticks, sneezeweed, and spatterdock.² A dominant plant surrounding the tidal marshes is the invasive *Phragmites*, which is quite extensive in some stretches.

Other wetlands in Logan are the extensive forested or shrubby wetlands located in the Cedar Swamp/Little Timber/Moss Branch region. These are also found to a lesser extent along the Pargey-Repauo Creek, and adjoining the tributaries of the Raccoon and Oldmans Creeks. These nontidal wetlands are “palustrine” wetlands (stream-associated, versus “lacustrine” or lake-associated) and are usually covered with deciduous trees or shrubs, although some evergreen trees or shrubs may be present.

Logan's wet forests are of three main types. Those on tidal floodplains are dominated by green ash, red maple, silver maple, and sycamore. River Birch may also be present. Along smaller stream corridors are found forested wetlands dominated by red maple, green ash, and black gum. On hydric soils on upland terraces are wooded areas dominated by sweet gum, with red maple also associated.³ Pin oak, swamp white oak, white oak, willow oak, tulip tree, and sweet bay magnolia may also be found in these forests, primarily in the nontidal regions. American Holly is frequently present as an understory tree. In some areas, pitch pine or American pine is also found among the larger trees. Atlantic White Cedar is still present within Logan's Cedar Swamp and was once present in great abundance in many parts of the Township. As in much of South Jersey, it was depleted for use as roofing and other building material because of its superior water-resistant characteristics.

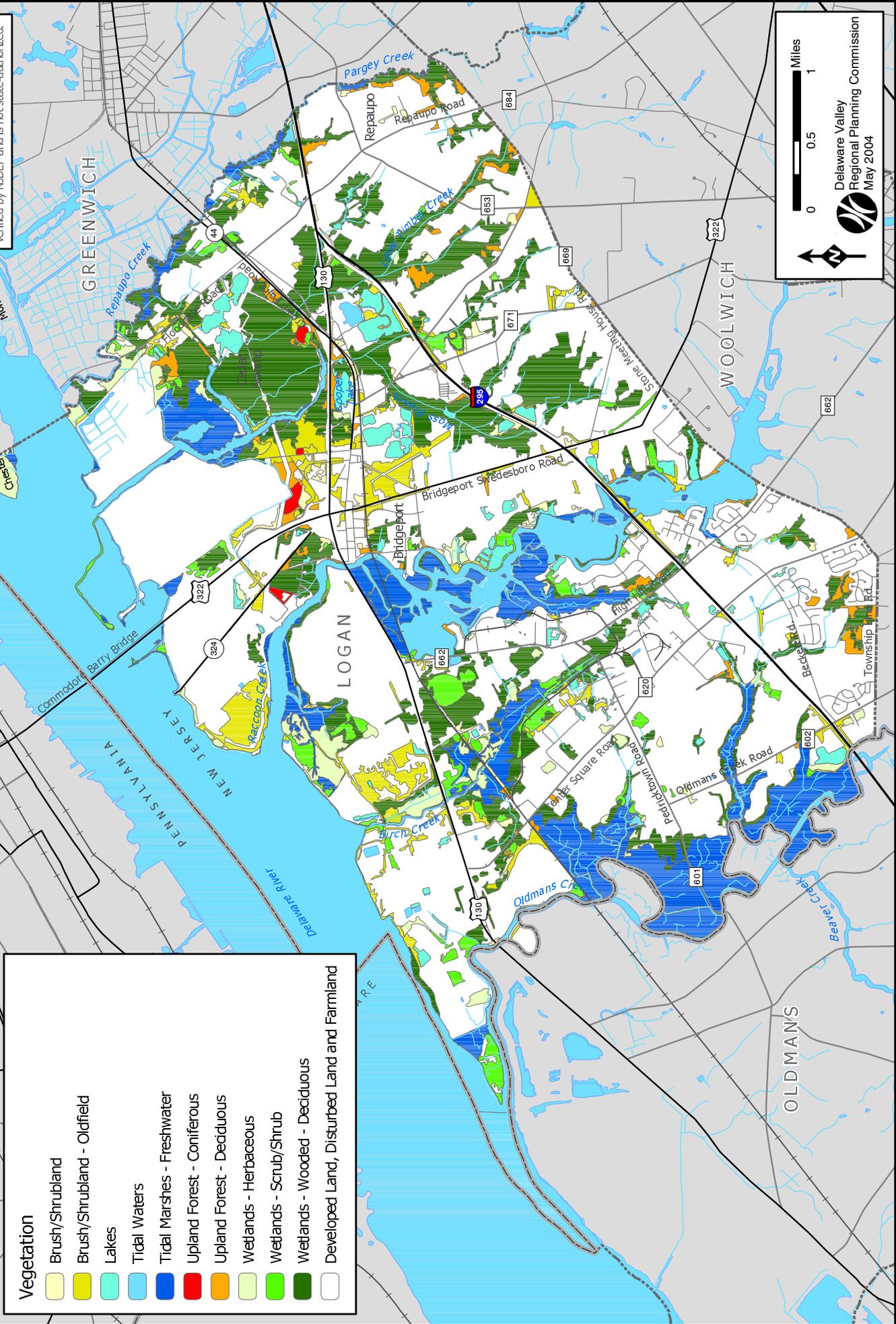
¹ Franklin Township Environmental Commission, *Environmental Resource Inventory of Franklin Township*, February 4, 2002, [Franklin Township, New Jersey].

² Collins, Beryl Robichaud & Karl H. Anderson, *Plant Communities of New Jersey. A Study in Landscape Diversity*, Rutgers University Press, New Brunswick NJ, 1994.

³ Joseph Arsenault, personal communication.

Map 11: Natural Vegetation (1995/1997)

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



Vegetation	
	Brush/Shrubland
	Brush/Shrubland - Oldfield
	Lakes
	Tidal Waters
	Tidal Marshes - Freshwater
	Upland Forest - Coniferous
	Upland Forest - Deciduous
	Wetlands - Herbaceous
	Wetlands - Scrub/Shrub
	Wetlands - Wooded - Deciduous
	Developed Land, Disturbed Land and Farmland

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Shrubs in the more mature wet forests include arrowwood, spicebush, highbush blueberry, and sweet pepperbush. Poison ivy and Japanese honeysuckle are often abundant and form dense thickets. Shrubs are also the dominant plants where wetlands are recovering from past impacts. See **Map 5: Surface Water, Wetlands, and Vernal Ponds**, on page 29.

Upland Forests

Upland areas are those locations without water at or near the soil surface. Upland forests are located on drainage divides, terraces and slopes where water is not the controlling factor. Almost all of Logan's upland forests have been cleared and converted to farms or residential or commercial development. The remaining uplands are relegated to a few remnants along stream corridors, or are patchy woodlands associated with large farms and areas with less desirable soils.¹

Approximately 15% or 2,249 acres of Logan is forested and, of this, just over 10% or 241 acres is upland forest, according to the 1995/97 land cover analysis prepared by the New Jersey Department of Environmental Protection. This data is the most recent available based on infrared aerial photography. See **Map 11: Natural Vegetation (1995/97)**.

The composition of upland forests in the township is largely one of mixed oaks – white, black, red, chestnut, and scarlet oaks – joined by beech, pignut and mockernut hickories, black walnut, tulip tree, and red maple. Virginia pine can also be present. The understory is dominated by flowering dogwood, black cherry, ironwood, and sassafras. Vines are common, including Virginia creeper, wild grapes, Japanese honeysuckle, and poison ivy. Spicebush, arrowwood, and black haw are common shrubs in moister locations.

Grasslands (Open Habitat and Agricultural Lands)

A small percentage of Logan consists of brush or shrubland, principally in the form of fallow fields, pasture, and old fields. Old fields are lands that were cleared or disturbed at one time and then abandoned. Following abandonment, perennial herbs and grasses succeed to become the dominant species for a length of time from 3 to 20 years. Later, woody plants begin to take over. This habitat is visible especially along wood edges, roadsides, and in landscapes where mowing is infrequent and where woody plants are not yet the dominant vegetation.² This habitat, along with agricultural cropland, constitutes "grassland" habitat utilized by species that forage or nest on open land.

¹ & ² Franklin Township Environmental Commission, *Environmental Resource Inventory of Franklin Township*, February 4, 2002, [Franklin Township, New Jersey].

In Logan, 600 acres or 10% of the natural vegetation is classed as old fields, as of the 1995/97 land cover analysis by NJDEP. An additional 124 acres or 2% of uncultivated and undeveloped areas of the township are brush or shrubland. See **Map 11: Natural Vegetation (1995/97)**.

LANDSCAPE PROJECT PRIORITY HABITATS

The Landscape Project, developed by the Endangered and Nongame Species Program of the NJDEP Division of Fish & Wildlife, documents the value of various types of habitats within New Jersey. It then ranks these habitats as to their importance. The highest ranking goes to habitat areas where there has been a documented occurrence of one or more species that are on either the federal or the state Threatened and Endangered Species lists and where there is a sufficient amount of habitat type to sustain these species (“critical habitat”). A second category includes habitats that have documented occurrences of species of special concern in New Jersey. Another rank consists of lands with habitat deemed suitable for species that are included in the higher categories but for which there are no documented occurrences or sightings (“suitable habitat”).

Landscape Project data for Logan Township identifies locations with the most important habitats for wildlife and categorizes them as either “critical habitat” (the highest) or as “suitable habitat.” It is important to preserve both levels of habitat, in order to maintain the diversity of species that still exists in the township. The rankings in Logan are primarily a result of the habitat being either critical or suitable for bald eagle nesting or foraging or for other rare bird species. Included in this list are peregrine falcon, Cooper’s hawk, pied-billed grebe, and red-headed woodpecker.

See **Map 12: Landscape Project Habitat Priorities**.

Table 14: Landscape Project Habitat Rankings – Acreage in Logan Township

Category	Rank	Acres	Subtotals by category	% of Total
Emergent Wetlands	Critical Habitat (5)	3,376.15	3,594.51	27.60
	Suitable Habitat (1)	218.36		1.78
Forested Wetlands	Critical Habitat (5)	1,837.42	2,646.52	15.02
	Suitable Habitat (1)	809.1		6.61
Upland Forest	Critical Habitat (5)	2,262.36	2,385.64	18.49
	Suitable Habitat (1)	123.28		1.01
Grasslands	Critical Habitat (5)	1,475.96	3,607.95	12.06
	Suitable Habitat (1)	2,131.99		17.43
Total		12,234.62	12,234.62	100.00

Source: NJDEP

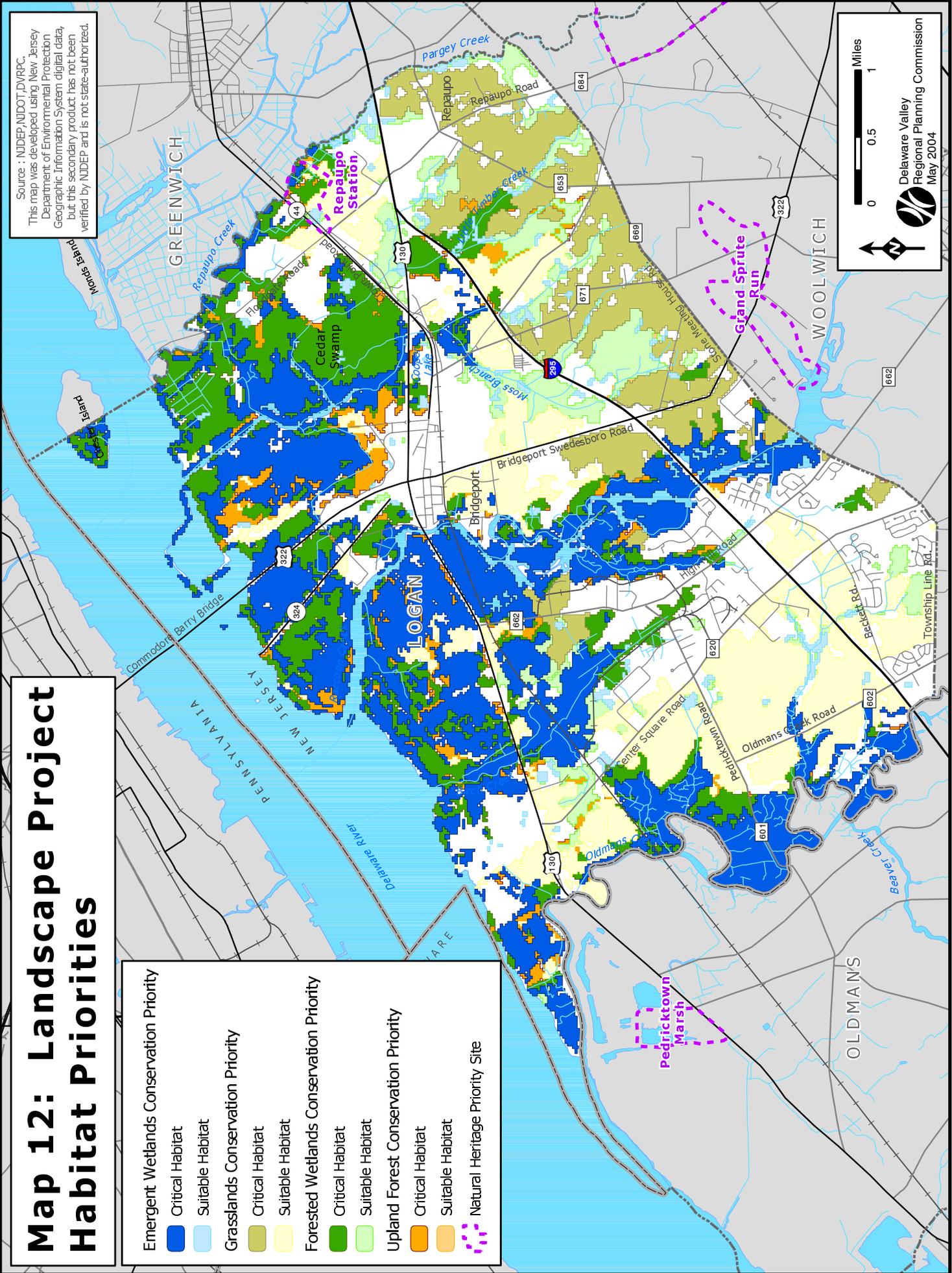
Map 12: Landscape Project Habitat Priorities

- Emergent Wetlands Conservation Priority**
 - Critical Habitat
 - Suitable Habitat
- Grasslands Conservation Priority**
 - Critical Habitat
 - Suitable Habitat
- Forested Wetlands Conservation Priority**
 - Critical Habitat
 - Suitable Habitat
- Upland Forest Conservation Priority**
 - Critical Habitat
 - Suitable Habitat
- Natural Heritage Priority Site**
 - ⋯ Natural Heritage Priority Site

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

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Landscape Project Data on Wetland Habitat

The Landscape Project divides wetland habitats into two types – forested and emergent wetlands. Forested wetlands support species such as warblers and foraging bald eagles that nest along Logan's creeks. They can also be home to various rare amphibians (frogs and salamanders). Emergent wetlands are marshy areas characterized by low-growing shrubs and herbaceous plants in standing water, usually. They can be tidal or nontidal. Animal species that can be found there include endangered turtles, rare fish, mollusks, crustaceans, and insects.

About 55% of the wetland acreage in Logan that is ranked as critical (the highest value) is emergent wetland (3,376 acres). All of Logan's tidal wetlands fall into the critical category, primarily due to the nesting and foraging needs of bald eagles, which range widely over these areas. In addition, dredge spoil sites adjoining these wetlands are classed as critical. Forested wetlands make up the other 45% of wetlands ranked at the highest level (1,837 acres). These include the Cedar Swamp and lands adjoining it, plus scattered pockets within the Raccoon, Birch, and Oldmans drainages. Little Timber Creek and Pargey-Repaupo Creek are both classed as critical for part of their length. Emergent wetlands ranked at the suitable habitat level (218 acres) are found along Pargey Creek on its eastern half and on one tributary to Oldmans Creek. Forested wetlands ranked at the suitable habitat level (809 acres) are prevalent along the upstream half of Little Timber Creek, all along Moss Branch and its unnamed tributary, and in small pockets along Birch Creek.

Landscape Project Data on Upland Forest Habitat

The Landscape Project has ranked upland forests in the same manner as wetlands. Logan's highest ranked "critical habitat" upland forests are found in a few larger patches northeast of Bridgeport and in tiny parcels scattered throughout the township. They constitute 2,262 acres. The red-headed woodpecker, a state threatened species, is documented in this habitat in Logan. Only 126 acres are ranked at the suitable level.

Landscape Project Data on Grassland Species Habitat

Nearly all of Logan's farmland to the east of I-295 and north of Route 322 is ranked as critical habitat for grassland-dependent species (1,476 acres). Land rated at the lower level, as "suitable habitat," (2,132 acres) is located in that part of the township west of Center Square Road to Oldmans Creek. This area includes the Pureland and Northeast Business Parks and other lands zoned for commercial development. Other "suitable" grassland sites are the open fields south of Bridgeport, and the former Logan Airport site.

Examples of grassland-dependent species that use this kind of habitat for nesting or feeding include Grasshopper Sparrow, Vesper Sparrow, and some species of butterflies and moths. In Logan, foraging Bald Eagles are documented as relying on this habitat, along with other non-endangered raptors such as red-tailed and marsh hawks.

ANIMAL COMMUNITIES

The fauna of Logan Township includes both invertebrates and vertebrates. Invertebrates are more numerous and consist of insects (beetles, butterflies, moths, ants, termites, bees, wasps, and others), arachnids (spiders, ticks and mites), crustaceans (crayfish, microscopic copepods), mollusks (mussels, clams, snails and slugs), and worms.

Although there is no inventory of these groups, even at the state level, some types have been investigated to a greater degree in the Raccoon Creek and in Oldmans Creek. Most notable are the freshwater mussels found at points in the upstream reaches of those streams. Several of these organisms are endangered species. Once abundant and a source of food for native Americans and early settlers as well as for wildlife, these animals have declined with the 20th century drop in water quality of many freshwater streams. Freshwater mussels have also been affected, in part, by declines in fish species. Mussels are sedentary creatures and at one stage of their life cycle they depend on fish for transport to areas with higher mating potential.

Vertebrates are less numerous than invertebrates but their larger size makes them much more visible, and thus better studied and recorded. Fish species are fairly well documented, as are mammals. Birds that nest in the township are known, but migrants that depend on Logan's wet forests as stopover sites in which to rest and feed are not as thoroughly inventoried.

Reptiles can be quite elusive when surveys attempt to document them. Some species, such as the endangered bog turtle, have been well documented in adjoining Woolwich Township and may be present in Logan, although no documented sightings have yet been reported. The bog turtle's very specific habitat requirements (boggy, muddy farm fields) limit their adaptability to the changing land uses that are occurring throughout New Jersey. Amphibians of some types are abundant, such as bullfrogs. Other species are rare because they depend on vernal ponds, as was discussed in the Surface Waters – Vernal Ponds section of this document (page 28).

The Bald Eagles that nest along the Raccoon Creek also forage along its length in Logan, as well as in the Oldmans Creek drainage, along the Delaware River, and over large portions of the Repaupo drainage. Eagles prefer fairly open waterways with adjoining forested habitat in which they can sit and watch for prey. They use such habitat throughout the year, provided it stays ice-free for most of the winter. The tributaries to the Delaware River, and the river itself, meet these requirements. Bald Eagles are sighted in many parts of Logan throughout the year. See **Appendix A** for a complete list of *Vertebrate Animals Known or Probable in Logan Township*.

Red-headed woodpecker



*Image courtesy of the Nova Scotia
Museum of Natural History Website*

NJ HERITAGE DATABASE AND HERITAGE PRIORITY SITES

Natural Heritage Priority (NHP) Sites are areas designated by the New Jersey Division of Parks and Forestry's Office of Natural Lands Management as critically important remaining habitat for rare species and as exemplary natural communities within the state. These areas are to be considered as top priorities for the preservation of biological diversity in New Jersey.

Designation as a Natural Heritage Priority site does not carry any specific requirements or restrictions on the land. Rather, the designation is made because of the high value of a site from a biological and diversity standpoint. Owners of NHP Sites are encouraged to become informed stewards of the property and to consider working with the local community or nonprofit groups to preserve the land permanently.

NHP designations are based on the records of the Natural Heritage Database, which lists documented sightings of endangered and threatened species. Information on particular sites may also be provided by the Nature Conservancy or by the NJDEP Endangered and Nongame Species Program, especially through the latter agency's Landscape Project.

Logan Township has within its borders one of only 410 NHP Sites in the state of New Jersey. This is the **Repaupo Station NHP Site** located along the Repaupo stream corridor on the northeastern side of the township. The Repaupo Station site is a cleared pipeline easement along a roadside, Route 44, with associated wetlands at Repaupo Creek. The site contains a population of a State-Listed endangered plant species, and a plant species of special concern. It has a biodiversity rating of B5, meaning that the area is of general biodiversity interest, which is a ranking of state significance.

The site is near, but not adjoining, the Logan Pond State Wildlife Management Area, which is the one state-protected site in the township. Farmed land runs between these two sites.

See **Map 12: Landscape Project Habitat Priorities** for the location of the NHP site.

The Natural Heritage Database also lists for Logan several species of threatened and endangered plants and animals, or rare natural communities, that have been found in other parts of the township. The sighting records for the plants (only) are shown on topographic maps. These indicate where the sightings occurred, although the map information is deliberately nonspecific. The principal locations with the most rare plant or community records are wide areas along the Raccoon and Oldmans wetland corridors, and in a cluster around Bridgeport. Natural Heritage individual records of animals have been incorporated into the Landscape Project, but plant listings are not a basis for that modeling.

It is important to note that the Natural Heritage Database lists primarily those sightings that have been submitted to it, along with some ecological community data. It incorporates both historically and recently documented sightings. Areas without sightings may never have been surveyed. Conversely, land use in areas with sightings may have changed considerably over recent years, and the species once found there may be gone. Local surveys to update the

database, and regular consultation of records before any development is approved, are two measures that would help to increase threatened and endangered species' protections.

See **Appendix B** for a list of *Rare Plant Species and Natural Communities Presently Recorded in the New Jersey Natural Heritage Database*.



Source: DVRPC

Cooper Lake

THE BUILT ENVIRONMENT

POPULATION

The 1990 US Census listed a population of 5,147 residents for Logan Township. By 1997 this had increased to 5,829 and by the 2000 Census it had grown to 6,032. The 2000 population was a growth of 17% over the 1990 figures but it did not quite reach the population projections for the township that had been issued by the Delaware Valley Regional Planning Commission. Population was projected to be 6,400 residents by 2000.

DVRPC projections for the future forecast 7000 residents for Logan Township by 2005 and 7,350 by 2010.

The majority of Logan's population lives in single-family homes (76%) in the town of Bridgeport, scattered on individual lots, or in the Beckett subdivisions.

TRANSPORTATION

Logan has always been at the center of good transportation, in comparison to many communities in southern New Jersey. Its transportation, especially commercial transport, has utilized every significant mode, from the days of water travel as the only practical conveyance, to the construction of rail lines (still in operation), to the 20th century's modern highways.

The modern transportation corridors that serve Logan have also fostered much of its past and current growth. These corridors include US highway Route 130, formerly the principal northeast-southwest highway close to the Delaware River, and US highway Route 322 which crosses Logan from north to south. At one time Route 322 led to a ferry service across the Delaware River. This ceased to operate when the Commodore Barry Bridge was completed in 1975, which connects directly to Route 322. Route 322 runs from the Delaware River all the way to Atlantic City, connecting with Route 55 along the way. Because this is a direct route to shore points, traffic congestion on this road is a serious problem east of Logan, in Harrison Township, where this two-lane road must pass through Mullica Hill and the restricted intersections beyond.

In 1951 the state completed the New Jersey Turnpike, which was a major addition to the transportation network. This road crosses Woolwich Township, rather than Logan, but is within 3.5 miles of Logan's boundary, with Turnpike Interchange #2 connecting to Route 322. During the 1960s, Interstate 295 was built, which crosses Logan on a northeast-southwest path. I-295 has three interchanges within the township, and connects directly to Rte 130 and the Commodore Barry Bridge.

A state highway within the Township is Crown Point Road, Route 44, which runs from West Deptford Township to Logan, ending in Bridgeport. County roads within the township include Routes 601, 602, 620, 653, 662, 669, 671, and 684. These provide access and connections within the township and county and are remnants of past land uses that connected farming centers of activity. The majority of them run toward Swedesboro, which was a primary center for commerce in the region. Smaller roads in the township are a mixture of old rural lanes and newer subdivision thoroughfares.

TOWNSHIP UTILITIES AND SERVICES

Drinking Water

Residences in the more developed sections of Logan, including Beckett and the businesses within the business parks, are supplied with public drinking water by the New Jersey-American Water Company. Bridgeport and Repaupo are also served with public water through the South Jersey Water Company. Township residents that live in less developed areas, including the perimeter of Repaupo, rely on private wells.



Photo by John Molner

A list of drinking water wells that serve the public in Logan Township is shown in Table 12, on page 49 in the Groundwater – Wellhead Protection section. **Map 9: Water Supply Wells and Wellhead Protection Areas** on page 47 shows the location of community wells.

Sewer

As with public water, sewer service is provided to the more developed sections of Logan, including Beckett, Bridgeport, and the three business parks. Residents in the immediate vicinity of Repaupo are within an approved sewer service area but do not have sewer service as yet. In all, about two-thirds of Logan is approved for sewer service, although not all the piping has been laid within the service area. All sewer is provided through the Logan Township Municipal Utility Authority, which operates a treatment plant located near Birch Creek, with discharge to the Delaware River. Residents in more agricultural areas rely on private septic systems for the disposal of sewage.

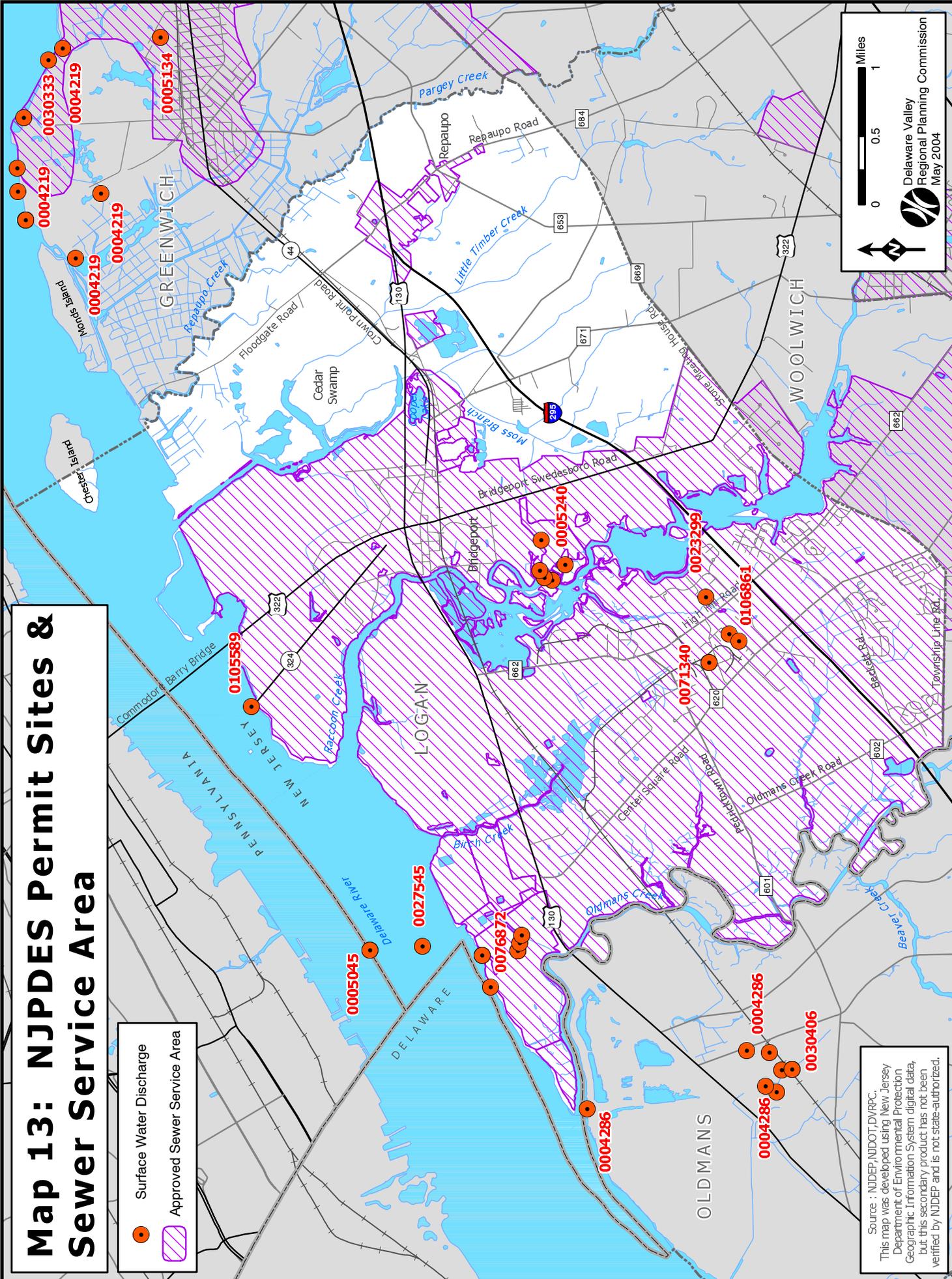
See **Map 13: NJPDES Permit Sites & Approved Sewer Service Areas** for the location of the currently approved sewer service area. (The NJPDES Permit Sites shown on this map are listed in Table 11 on page 41.)

Electric Power

Electric service is supplied by the regional public power utility, Conectiv Power Services, Inc. This is a relatively new company created through a merger between Atlantic City Electric, Delmarva Power and Light, and Baltimore Power and Light. This company provides amplified electric power via road front, overhead power lines. These aboveground lines tap the regional

Map 13: NJPDES Permit Sites & Sewer Service Area

 Surface Water Discharge
 Approved Sewer Service Area



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







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electric resources generated and provided by Public Service Utility's Artificial Island power plant located in Lower Alloways Creek Township, Salem County, and connect to the power grid that links power providers throughout the northeast United States.

Natural Gas

South Jersey Gas Company provides natural gas services to Logan Township. Most of the community has gas pipelines in roadways, for current or future service, although areas that are still farmland-dominated may not have piping. The South Jersey Gas Company obtains its product via transmission lines coming from the west, under the Delaware River, with the supply originating at points as distant as Texas, Oklahoma, and even Canada. The company maintains a gate station just south of Swedesboro where gas is transferred from the supplier's lines to company lines. Transmission lines transect the landscape and can run across private property. The gas company holds easements on such properties in order to maintain a 50'-wide right-of-way along the lines.

Communications

Land-based voice and data transmission is provided by aboveground, road-frontage lines owned by Bell Atlantic Telephone Company, now called Verizon. This system reaches all parts of the township, providing a minimum link to the surrounding electronic world. Cellular or non-land-based systems that rely on satellite/microwave radio transmissions rather than wire utilize seven satellite/microwave towers in a diversity of locations, giving comprehensive service throughout the township.

Township Services

Fire and Emergency

Medical emergencies in Logan Township are handled by the Logan Emergency Medical Services (Logan EMS) and the Logan Township Ambulance Association. The Logan EMS has 4 full time and 5 part time emergency medical technicians to provide services 24 hours a day Sunday to Saturday.



Source: DVRPC

Two volunteer fire companies serve Logan Township, working together to assist each other in all areas of Logan Township. They are the Repaupo Fire Company and the Bridgeport Fire Company. The Repaupo Fire Company, located at the intersection of Repaupo Station and Paulsboro Roads, includes 33 volunteer firemen, 6 of whom are also trained EMTs, and has a fleet of 4 fire trucks and a car. The Bridgeport Volunteer Fire Company has two stations. The main station is located off Main Street in Bridgeport and the other station is located on Beckett Road across from the Old Orchard development. These two stations have 25 volunteers, 6 pieces of equipment, and 1 marine unit.

Police

The Logan Township Police Department employs 19 officers, which includes the chief, 5 sergeants, a detective, and 12 patrolmen. The Police Department also employs a secretary and 7 crossing guards. The station is located in the Municipal building in Bridgeport.

Trash/Recycling

In Logan Township, trash and recycling, including vegetation (brush and leaves), are picked up on a weekly basis. The township accepts commingled glass, cans and plastics (numbers 1,2, and 3 only) as well as mixed paper. On the 3rd Friday of every month, large metal appliances are collected. Motor oil, batteries, and tires may be brought to the public works building by appointment. The Public Works facilities are located behind the municipal building in Bridgeport.

Education

Logan Township has its own elementary schools. The Center Square School, located on Peachwood Drive, educates children in Kindergarten and First grade and also handles pre-K students. Logan Elementary School comprises students from 2nd to 8th grades and is located on School Lane.



Source: DVRPC

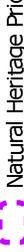
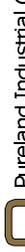
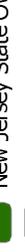
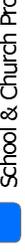
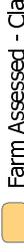
Kingsway Regional High School, located in Woolwich Township, serves the children of Logan Township for grades 9 through 12. Kingsway also serves Woolwich, South Harrison, and East Greenwich Townships, and the Borough of Swedesboro, all of which are constituent members. Logan Township students attend Kingsway Regional on a tuition basis. Construction of a new Kingsway Middle School has recently been approved by voters of the other townships, since their 7th and 8th grade students are currently served at the high school facility.

Parks and Recreation

The Parks and Recreation Committee of Logan Township provides a wide variety of recreational activities, along with the sports programs offered at the 65-acre township facility on Township Line Road. Little League baseball, softball, basketball, soccer, and football are all conducted at the site. A skate park, tennis courts, a concession stand, a picnic pavilion, and a playground are also located there. In addition, the Municipal Building in Bridgeport has basketball courts and a roller hockey rink, and there is another small playground area on Main Street in Bridgeport. Kingsway High School also has playing fields that can be utilized by the township when use allows.

See **Map 14: Existing Open Space 2003**, which is included in this document for easy reference. For additional details on Logan's open space and recreation needs and plans, see the *Open Space & Recreation Plan for the Township of Logan*.

Map 14: Existing Open Space

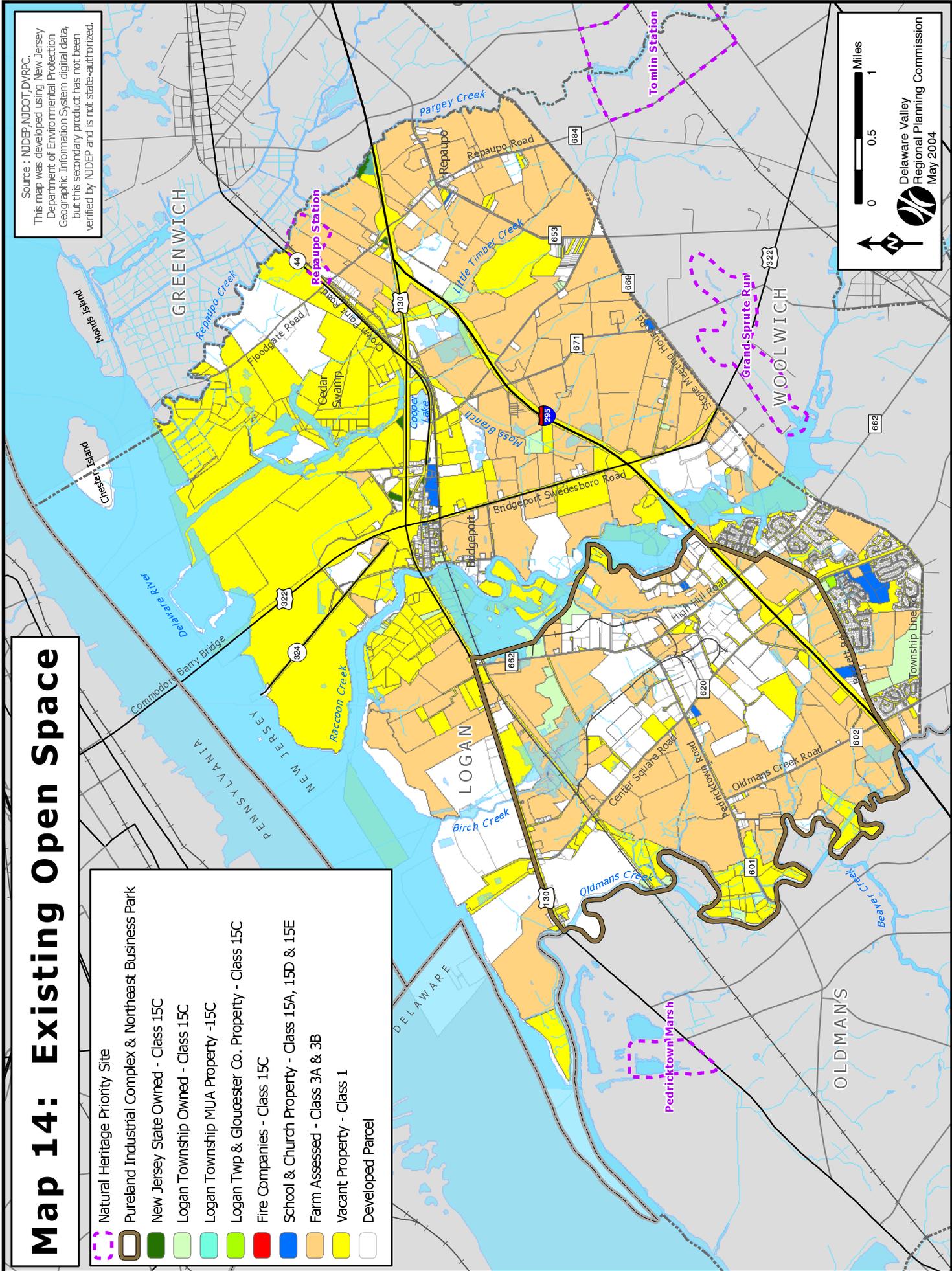
-  Natural Heritage Priority Site
-  Pureland Industrial Complex & Northeast Business Park
-  New Jersey State Owned - Class 15C
-  Logan Township Owned - Class 15C
-  Logan Township MUA Property -15C
-  Logan Twp & Gloucester Co. Property - Class 15C
-  Fire Companies - Class 15C
-  School & Church Property - Class 15A, 15D & 15E
-  Farm Assessed - Class 3A & 3B
-  Vacant Property - Class 1
-  Developed Parcel

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

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ENVIRONMENTAL ISSUES

KNOWN CONTAMINATED SITES

There are 296 contaminated sites in Gloucester County. Twenty of these sites are located in Logan Township. There are also four sites in Greenwich Township, one in Woolwich Township, and eight in Oldmans Township (Salem County) that are close to Logan's borders. See *Table 15: Known Contaminated Sites in Logan Township & Region* on the following page. See also **Map 15: Known Contaminated Sites**.

The New Jersey *Known Contaminated Sites List* includes former factory sites, landfills, locations of current or former leaking underground storage tanks, sites where chemicals or wastes were once routinely discharged, and places where accidents have resulted in spills and pollution. Contamination may have affected soil, groundwater, surface water, or a combination of site conditions. The most dangerous sites, from a human health standpoint, can be listed as Superfund sites, which makes them eligible for federal cleanup funds. Other sites are handled by state or individual programs, or through private funds.

There are 27 Superfund sites in Gloucester County. Two of them are in Logan. These are the Chemical Leaman Tank Lines site and the Bridgeport Rental & Oil Service (BROS) facility. Both are on the National Priority List (Superfund list) and thus have been receiving federal funding for their cleanup. See *Appendix C. A Description of Superfund Sites in Logan Township*.

A third site, the Rollins Environmental Services (Safety-Kleen) site, is not on the Superfund list, although it has the same remedial level as the two Superfund sites. Rollins is on the Resource Conservation & Recovery Act (RCRA) list, which includes sites that are still operational but which require cleanup to federal standards. The cleanup of RCRA sites is with private funding, rather than federal funds. Superfund site cleanup, using federal dollars, applies to sites with serious contamination that are no longer in operation, or where more than one funding source exists for the cleanup. There is extensive public information available about Superfund sites. Information on RCRA list sites is available, but not quite as easily obtained.

Underground Storage Tanks

There are a number of private residences in Logan Township that still have underground storage tanks, used primarily to hold home heating oil. As these tanks age and rust they often begin to leak, which becomes a serious threat to the groundwater below them. Each month, approximately three such tank leakages are reported in the Township but they are not normally listed on the Known Contaminated Sites list. The Logan Township Environmental Commission has been tracking this problem and has assisted homeowners to get these tanks removed. It will continue to provide monitoring and assistance until these storage tanks are eliminated in the community.

Table 15: Known Contaminated Sites in Logan Township & Region

Site ID	Name	Address	Town	Status	Lead Agency*	Remedial Level*
NJL860001254	Bridgeport Airport	Route 322	Logan	Pending	BFO-S	NA
NJD047321443	Chemical Leaman Tank Lines Inc.	Cedar Swamp Rd	Logan	Active	BCM	D
NJD053292652	Bridgeport Rental & Oil Services, Inc	Rte 130 & Cedar Swamp Rd	Logan	Active	BCM	D
NJD980529697	Red Kole Farm	High Hill Rd	Logan	NFA-A	BFO-S	C1
NJD087098455	Logan Circuits Inc	208 Center Square Rd	Logan	Active	BFO-S	C2
NJD986619070	Monsanto Co.	Route 130	Logan	Active	BCM	C2
NJL860000942	Residence	Hendrickson Mill Rd	Logan	Active	BSM	C2
NJL000054684	Bridgeport Maintenance Facility	Route 130	Logan	Active	BFO-S	C2
NJL000060186	Residence	Applewood Dr	Logan	Pending	BFO-S	C1
NJD981489933	Delaware River Port Authority	Bridge Plaza	Logan	Active	BFO-S	C2
NJL900000779	Logan Twp Sanitary Landfill	Route 44	Logan	Pending	BFO-CA	C3
NJD053288239	Rollins Environmental Services Inc	Route 322	Logan	Active	BCM	D
NJL800396327	Texaco Service Station, Logan Twp	Center Square Rd & Route 295	Logan	Active	BUST	ND
NJL600253868	Harper packing	503 Heron Dr	Logan	Pending	BFO-IN	ND
NJL800537623	Residence	Applewood Dr	Logan	Active	BFO-S	ND
NJL800545485	Residence	Madison St	Logan	Active	BFO-S	ND
NJL800557118	Residence	Madison St	Logan	Active	BFO-S	ND
NJL800559205	Residence	Buttonwood Place	Logan	Active	BFO-S	ND
NJL800600116	Residence	Dogwood Place	Logan	Active	BFO-S	ND
NJL800614331	Residence	Harvest Rd	Logan	Active	BFO-S	ND
NJL800533770	Residence	Dogwood Place	Logan	Active	BFO-S	ND
NJL900000563	Greenwich Twp Sanitary Landfill	Broad St.	Greenwich	Pending	BFO-CA	C3
NJD002349058	Hercules Inc	Market St. N	Greenwich	Active	BCM	D
NJD002373819	E I Dupont De Nemours & Co	Repaupo Ave	Greenwich	Active	BCM	D
NJL800477689	Distefanos Service Station	601 Broad St W	Greenwich	Active	BUST	B
NJL500048178	Chemical Leaman Tank Lines Inc.	8 Route 130	Oldmans	Active	BEECRA	C1
NJD048585269	B F Goodrich Chemical Group	Porcupine Rd & Route 130	Oldmans	Active	BEECRA	C2
NJD061843249	NL Industries Inc	Penns Grove Pedricktown Rd	Oldmans	Active	BCM	D
NJD000554659	Browning Ferris Industries	Porcupine Rd	Oldmans	Active	BEECRA	C3
NJP000904607	Pickens Auto Service Inc	10 W Mill St	Oldmans	Pending	BFMCR	C2
NJD980771778	Tomah Products Inc	Penns Grove Pedricktown Rd	Oldmans	Active	BFO-S	C2
NJD076956234	Maintech International	Porcupine Rd	Oldmans	Active	BEECRA	B
NJL800376345	Pedricktown Post Office	13 Mill St W	Oldmans	Active	BFO-S	ND
NJL800544454	Rustic Inn Truck Stop & Rest	87 Route 130	Oldmans	Active	BUST	ND
NJD043584101	Matlack Inc	Route 322	Woolwich	Active	BCM	D

Source: NJDEP

* See next page for explanations of Status, Lead Agencies, and Remedial Level

Lead Agencies

Status	
Code	Meaning
NFA-A	No further action for a partial area of a site

Initials	Full Name
BCM	Bureau of Case Management
BEECRA	Bureau of Environmental Evaluation, Cleanup and Responsibility Assessment
BFCM	Bureau of Federal Case Management
BFO	Bureau of Field Operations
BFO-CA	Bur. of Field Operations – Case Assignment Section
BFO-S	Bur. of Field Operations – Southern
BUST	Bureau of Underground Storage Tanks

Explanation of Remedial Levels

Remedial Level	Explanation of Site Complexity
B	A single-phase remedial action in emergency response; simple removal activities of contaminants; usually no impact to soil or groundwater.
C1	A remedial action with simple sites; one or two contaminants localized to soil and the immediate spill or discharge area.
C2	A remedial action with more complicated contaminant discharges; multiple site spills and discharges; more than one contaminant, with both soil and groundwater impacted or threatened.
C3	A multi-phase remedial action with high complexity and threatening sites. Multiple contaminants some at high concentrations with unknown sources continuing to impact soils, groundwater, and possibly surface waters and potable water resources. Dangerous for direct contact with contaminated soils.
D	Same conditions as C3 except that D levels are also usually designated federal “Superfund Sites.”
ND	Not designated

A case manager is assigned to every *Known Contaminated Site* case and can provide further information on each site. The Case Manager can be reached by contacting NJDEP’s Site Remediation Program’s lead agency, which is listed in the table for each site. Go to <http://www.state.nj.us/dep/srp/kcs-nj/gloucester/> for contact information.

PIPELINES IN LOGAN TOWNSHIP

Logan Township has at least two major distribution pipelines crossing its territory. One is owned and operated by Colonial Pipeline Inc. and carries petroleum products, including gasoline, kerosene, home heating oils, diesel fuels, and national defense fuels. The other is a gas pipeline operated by Transcontinental Gas Pipeline Co., called Transco, which is a subsidiary of The Williams Companies. Both pipelines cross under the Delaware River and enter Logan near Birch Creek. They travel in a northeast direction across the center of the township, on their way to refineries and distribution points north of Logan, both within and outside of Gloucester County.

The Colonial Pipeline is part of a 5,519-mile system coming from Texas, Mississippi, and Alabama to marketing centers in the southeastern U.S. and the eastern seaboard. The product moves within the pipeline at a speed of 3 to 5 miles per hour, depending on quantity. Transco's pipeline is part of a 10,500-mile system originating in the gulf states and traveling to destinations in the southeast and up into New England.

The only other known pipeline crossing Logan is a Sun Oil pipeline to the distribution center in Gibbstown.

DELAWARE RIVER DREDGE SPOILS

Logan Township has been the recipient of many tons of sediments dredged from the bottom of the Delaware River. These “spoils” have been deposited along almost the full length of the municipality’s waterfront, with the largest concentration northeast of Raccoon Creek. Dredge spoils are the consequence of past deepening of the river bottom to make it more accessible by ever-larger freight vessels, and of ongoing maintenance of the current 40-foot depth of the main channel.

Delaware River dredging is conducted under the auspices of the U.S. Army Corps of Engineers, which generally subcontracts to private companies such as the Marine Weeks Corporation, which owns much of the Logan land northeast of Raccoon Creek and southeast as far inland as 1.3 miles.

In 1982 Congress authorized the Army Corps of Engineers to deepen the Delaware from its current 40' to 45' in order to accommodate larger ships and oil tankers that could no longer dock at the Philadelphia port or at refinery wharves. Spoils from the deepening were slated to be deposited in Gloucester and Salem Counties. In Logan Township these were to go on sites at the mouths of both the Raccoon and Oldmans Creeks. Initial studies and other delays postponed the dredging plan until the mid-1990's, by which time activist groups in New Jersey and Delaware began to oppose the deepening. Fears were expressed that toxins now held in the Delaware sediments would be released into groundwater beneath dredge spoil sites or into surface waters. Opposition to using the New Jersey shoreline as a dumping ground led to questions about the economic feasibility of the deepening. County, State and Congressional leaders began calling for a review of the project's economic benefit projections as well as its environmental impact.

In June 2003, the U.S. Office of Management and Budget issued conclusions from their review of the project, finding that the economic forecasts were indeed flawed and did not justify the deepening. Although the deepening project is currently in abeyance, it is likely to be revived. Logan Township will continue to be a potential destination for the spoils. A potential dredge spoil area, at the mouth of the Raccoon Creek west of Route 130, has been identified by Gloucester County as the desired location for a new County Park. Part of the justification for the development of the park at this site was to remove it as a future dredge spoil deposit location.

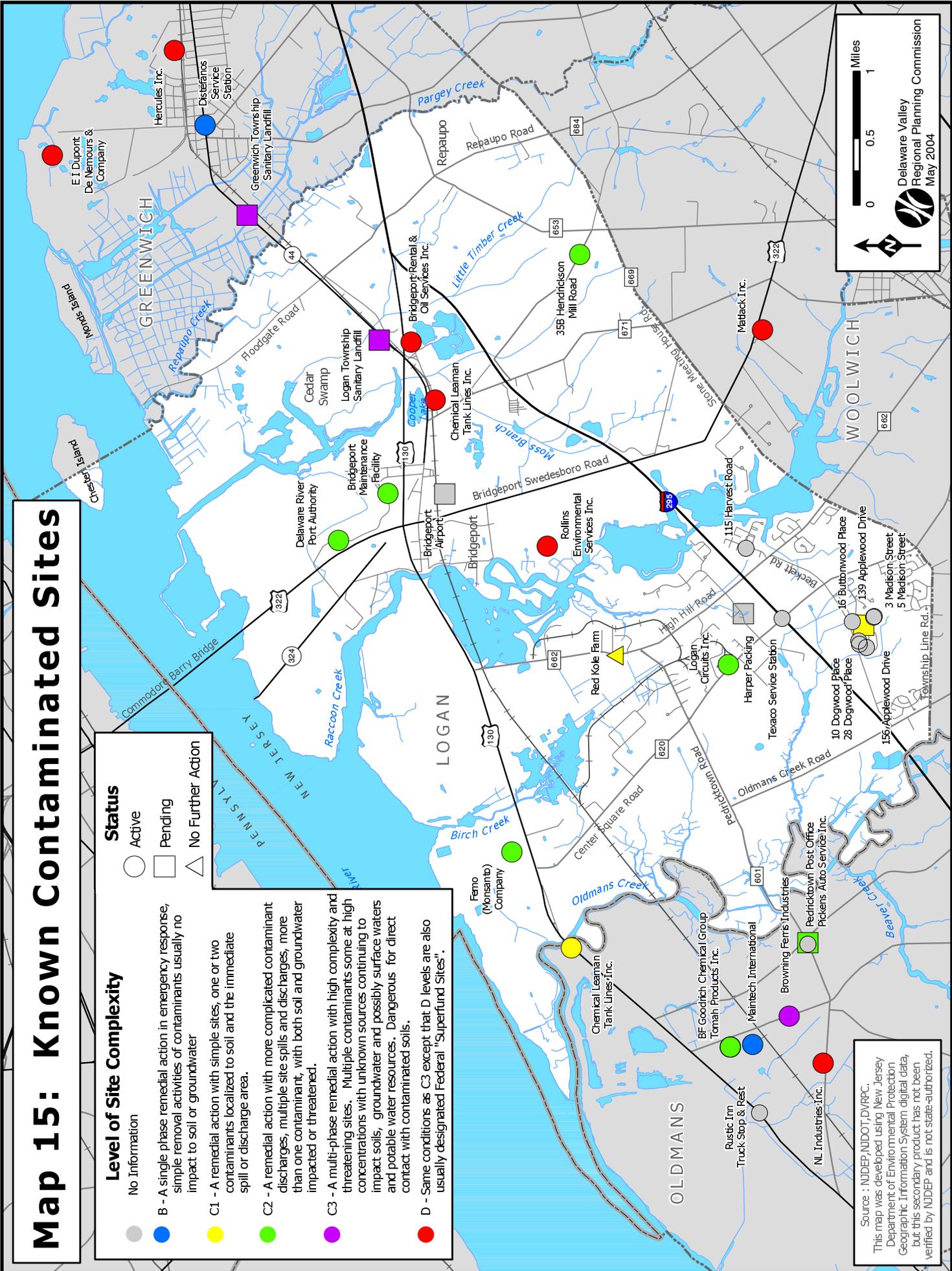
*Delaware River looking south
toward the Commodore
Barry Bridge*



Photo by John Molner

Map 15: Known Contaminated Sites

Level of Site Complexity		Status	
●	No Information	○	Active
●	B - A single phase remedial action in emergency response, simple removal activities of contaminants usually no impact to soil or groundwater	□	Pending
●	C1 - A remedial action with simple sites, one or two contaminants localized to soil and the immediate spill or discharge area.	△	No Further Action
●	C2 - A remedial action with more complicated contaminant discharges, multiple site spills and discharges, more than one contaminant, with both soil and groundwater impacted or threatened.		
●	C3 - A multi-phase remedial action with high complexity and threatening sites. Multiple contaminants some at high concentrations with unknown sources continuing to impact soils, groundwater and possibly surface waters and potable water resources. Dangerous for direct contact with contaminated soils.		
●	D - Same conditions as C3 except that D levels are also usually designated Federal "Superfund Sites".		



Delaware Valley Regional Planning Commission

 May 2004

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

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www.sjwatersheds.org

NJ Department of Environmental Protection

- www.state.nj.us/dep/gis – For Geographic Information System maps and table data.
- www.state.nj.us/dep/landuse – For information on wetlands and flood hazard area regulations and permits.
- www.state.nj.us/dep/srp/kcs-nj/gloucester/ – To check the Known Contaminated Site List pertaining to the Township for periodic updates.
- www.state.nj.us/dep/srp/contacts – To reach the case manager for a Known Contaminated Site.
- www.dbcrrsa.rutgers.edu/ims/vernal – For mapping and data on Vernal Pools.

- www.state.nj.us/dep/dwq – To reach the Division of Water Quality.
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**APPENDIX A: VERTEBRATE ANIMALS KNOWN OR PROBABLE IN THE
TOWNSHIP OF LOGAN**

Species	General Habitat	Township Locations
<i>Mammals</i>		
Opossum	All Habitats	Throughout
Short-tailed Shrew	Woodlands	Throughout
Eastern Mole	Uplands	Throughout
Star-nosed Mole	Uplands	Throughout, Occasional
Little Brown Bat	Uplands	Throughout
Eastern Pipistrel	Uplands	Throughout
Eastern Cottontail	All Habitats	Throughout, Common
Eastern Chipmunk	Woodlands	Throughout
Woodchuck	Woodlands and Fields	Throughout
Gray Squirrel	Woodlands	Throughout
White-footed Mouse	Woodlands	Throughout
Jumping Mouse	Fields	Throughout
Meadow Vole	Open Fields	Throughout
Red-backed Vole	Woodlands	Throughout
Muskrat	Wetlands	Throughout
Brown Rat	Wetlands, Homes, Farms	Throughout
House Mouse	Homes and Villages	Throughout
Red Fox	All habitats	Throughout
Raccoon	All Habitats	Throughout
Long-tailed Weasel	Wetlands	Throughout
Striped Skunk	Uplands	Throughout
River Otter	Large Streams	Oldmans and Raccoon
White-tailed Deer	All Habitats	Throughout
Mink	Wetlands	Throughout
Coyote	Woodlands and Fields	Throughout
<i>Birds</i>		
Pied-billed Grebe	Open Water	Lakes and Ponds, Tidal waters
Double-crested Cormorant	Open Water	Lakes and ponds, Tidal waters
Great Blue Heron	Open Marsh, Lake Edges	Throughout
Great Egret	Open Marsh, Lake Edges	Throughout
Snowy Egret	Open Marsh, Lake Edges	Throughout
Green-backed Heron	Open Marsh, Lake Edges	Throughout
Mute Swan	Open Water	Large Lakes
Snow Goose	Winter Migrant in Fields	Open farms
Canada Goose	Open Water, Fields	Throughout
Wood Duck	Forested Wetlands	Throughout
Green-winged Teal	Wetlands	Winter Migrant
Black Duck	Marsh, Lakes	Throughout
Mallard	Wetlands	Throughout
Gadwall	Open Water	Winter Migrant
Blue-winged Teal	Wetlands	Winter Migrant
Northern Shoveler Duck	Open Water	Winter Migrant
Ring-necked Duck	Open Water	Winter Migrant
Greater & Lesser Scaup	Open Water	Winter Migrant
Bufflehead	Open Water	Winter Migrant

Species	General Habitat	Township Locations
Hooded Merganser	Open Water	Winter Migrant
Ruddy Duck	Open Water	Winter Migrant
Black Vulture	Open fields	Throughout
Turkey Vulture	All Habitats	Throughout
Osprey	Open Water	Lakes and ponds, Tidal waters
Bald Eagle	Open Water	Stream Corridors
Peregrine Falcon	Open Water near Commodore Barry Bridge	Endangered; Documented
Northern harrier	Open Fields	Throughout
Sharp-shinned Hawk	Woodlands	Throughout
Cooper's Hawk	Woodlands	Throughout
Red-Shouldered Hawk	Woodlands	Throughout
Broad-winged Hawk	Woodlands	Throughout
Red-tailed Hawk	All Habitats	Throughout
American Kestrel	Open Fields	Throughout
Ringed-neck Pheasant	Old Fields, Farms	Released; Throughout
Wild Turkey	Woodlands	Throughout
Bobwhite	Old Field, Woodlands	Throughout
Killdeer	Bare Ground, Lake Edges	Throughout
Lesser Yellowlegs	Lake edges	Throughout
Solitary Sandpiper	Lake edges	Throughout
Spotted Sandpiper	Lake Edges	Throughout
American Woodcock	Wetland Forests	Throughout
Laughing Gull	Open Water, Parking Lots	Summer Visitor
Ring-billed Gull	Open Water, Parking Lots	Throughout
Herring Gull	Open Water, Dumps	Winter Visitor
Common Tern	Open Water	Summer; Delaware River
Rock Dove	Houses and Bridges	Villages
Mourning Dove	Woodlands	Throughout
Black-billed Cuckoo	Woodlands	Occasional
Yellow-billed Cuckoo	Woodlands	Throughout
Barn Owl	Farmland	Throughout
Eastern Screech Owl	Woodlands	Throughout
Great Horned Owl	Woodlands	Throughout
Barred Owl	Wetland Forests	Wooded Wetlands
Saw-whet Owl	Wetland Forests	Wooded Wetlands
Common Nighthawk	Upland Woodlands	Summer Night Sky
Chimney Swift	Bridges, House Chimneys	Villages
Ruby-throated Hummingbird	Woodlands and Fields	Throughout; Common
Belted Kingfisher	Wetlands	Throughout
Red-headed Woodpecker	Upland Forest	Endangered; Documented
Red-bellied Woodpecker	Woodlands	Throughout
Yellow-bellied Sapsucker	Woodlands	Fall Migrant
Downy Woodpecker	Woodlands	Throughout; Common
Hairy Woodpecker	Woodlands	Throughout
Northern Flicker	Woodlands	Throughout; Common
Wood Pee-wee	Woodlands	Upland Woods
Eastern Phoebe	Woodlands	Throughout
Great Crested Flycatcher	Woodlands	Upland Woods

Species	General Habitat	Township Locations
Eastern Kingbird	Fields, Farmland	Throughout
Purple Martin	Open Fields, Wetlands	Villages
Tree Swallow	Wetlands	Throughout
Barn Swallow	Buildings, Bridges	Throughout
Blue Jay	Woodland	Throughout; Common
American Crow	All Habitats	Throughout, Common
Carolina Chickadee	Woodlands	Throughout, Common
Eastern Tufted Titmouse	Woodlands	Throughout, Common
White Breasted Nuthatch	Woodlands	Throughout
Brown Creeper	Woodlands	Throughout
Carolina Wren	Edges, Yards	Throughout
House Wren	Villages, Edges	Throughout
Golden and Ruby crowned Kinglets	Woodlands	Winter Migrant
Eastern Bluebird	Edges	Throughout
Wood Thrush	Woodlands	Throughout
American Robin	All Habitats	Throughout, Common
Catbird	Woodlands, Edges	Throughout
Mockingbird	Hedgerows, Yards	Throughout, Common
Brown Thrasher	Woodlands	Throughout
Cedar Waxwing	Old Fields, Young Woodlands	Throughout
Starling	Villages	Throughout; Pest
White Eyed Vireo	Woodlands	Throughout
Philadelphia Vireo	Woodlands	Migrant
Red eyed Vireo	Woodlands	Wetland Forests
Marsh Wren	Tidal Marsh	Raccoon and Oldmans
Yellow Warbler	Upland Forest	Throughout
Chestnut-side Warbler	Woodlands	Migrant
Black-throated Blue Warbler	Woodlands	Migrant
Yellow-rumped Warbler	Woodlands	Throughout
Pine Warbler	Woodlands	Throughout
Prairie Warbler	Shrubby Areas	Throughout
Palm Warbler	Pine Woodlands	Throughout
Black and White Warbler	Pine Woodlands	Migrant
American Redstart	Rich Woodlands	Throughout
Ovenbird	Woodlands	Throughout
Yellowthroat	Shrubby Areas	Throughout
Scarlet Tanager	Woodlands	Throughout
Cardinal	Edges	Throughout; Common
Indigo Bunting	Edges, Old Fields	Throughout
Rufus sided Towhee	Pine Woodlands	Throughout
Chipping Sparrow	Woodlands	Throughout
Field Sparrow	Old Fields	Throughout
Song Sparrow	Old Fields	Throughout
White-throated Sparrow	Woodlands	Winter Migrant
Dark-eyed Junco	Woodlands	Winter Migrant
Red-winged Black Bird	Open Wetlands, Marsh	Throughout
Common Grackle	All Habitats	Throughout; Common
Brown-headed Cowbird	Open Areas	Throughout; Pest

Species	General Habitat	Township Locations
Orioles: Orchard and Baltimore	Woodlands	Throughout
House Finch	Open Areas	Throughout
Red Crossbill	Pine Woodlands	Winter Migrant
Pine Siskin	Woodlands	Winter Migrant
American Goldfinch	Open Areas, Old Fields	Throughout
House Sparrow	Villages, Old Fields	Throughout; Common
<i>Reptiles</i>		
Bog Turtle	Muddy Agricultural Fields/Wetlands	Endangered
Common Snapping Turtle	Ponds and Lakes	Throughout
Stinkpot Turtle	Wetlands	Throughout
Spotted Turtle	Freshwater Wetlands and Ponds	Throughout
Eastern Box Turtle	Uplands	Throughout
Red-bellied Turtle	Lakes and Ponds	Throughout
Eastern Painted Turtle	Lakes and Ponds	Throughout
Northern Fence Lizard	Uplands	Throughout
Northern Water Snake	Wetlands	Throughout
Garter Snake	All Habitats	Throughout
Eastern Ribbon Snake	Wetlands	Throughout
Southern Ring neck Snake	Woodlands	Throughout
Northern Black Racer	Edges	Throughout
Rough Green Snake	Woodlands	Throughout
Black Rat Snake	All Habitats	Throughout
<i>Amphibians</i>		
Red-backed Salamander	Woodlands	Throughout
Fowlers Toad	Uplands	Throughout
Spring Peeper	Wetlands	Throughout
Bull Frog	Lakes and Ponds	Throughout
Green Frogs	Wetlands	Throughout
Wood Frog	Woodlands	Throughout
Southern Leopard Frog	Wetlands	Throughout
<i>Fish</i>		
Chain Pickerel	Lakes and Streams	Throughout
Eastern Mudminnow	Streams	Throughout
Golden Shiner	Streams	Throughout
White Sucker	Streams	Throughout
Creek Chub-sucker	Streams	Throughout
Brown Bullhead	River, Lakes and Streams	Throughout
Yellow Bullhead	River, Lakes and Streams	Possible
Channel Catfish	River and Tidal Streams	Throughout
Tadpole Madtom	Lakes and Streams	Throughout
American Eel	All waters	Throughout
Pirate Perch	Streams	Throughout
Mud sunfish	Streams and Swamps	Probable
Bluegill	All Waters	Throughout
Pumpkinseed	All Waters	Throughout
Yellow Perch	Streams	Probable

Species	General Habitat	Township Locations
Tessellated Johnny Darter	Streams	Probable
Swamp Darter	Swamps	Probable
Large mouth bass	Lakes, ponds	Throughout
Black Crappie	Lakes, ponds	Throughout
Common Carp	All Waters	Probable
Striped Bass-White Perch hybrid	Tidal Waters	Probable
Tiger Muskellunge	Tidal waters	Probable
Mummichog	Tidal waters	Probable
Alewife	Tidal waters	Probable
Blueback herring	Tidal waters	Probable
Striped Bass	Tidal waters	Probable
Hogchoker (Sole)	Tidal waters	Probable
Shad	Delaware River	Seasonal
Short-nosed Sturgeon	Delaware River	Seasonal
Atlantic Sturgeon	Delaware River	Seasonal; Rare

Source: Modified version of Table 11 of the *Environmental Resource Inventory for Franklin Township, Gloucester County New Jersey*.

**APPENDIX B: RARE PLANT SPECIES AND NATURAL COMMUNITIES
PRESENTLY RECORDED IN THE NJ NATURAL HERITAGE DATABASE
FOR LOGAN TOWNSHIP**

Scientific name	Common Name	Federal Status	NJ Status	State Rank*
Ecosystems				
Freshwater tidal marsh complex				S3
Freshwater tidal marsh complex				S3
Vascular Plants				
<i>Aeschynomene virginica</i>	Sensitive joint-vetch	LT	E	S1
<i>Bidens bidentoides</i>	Estuary burr-marigold			S2
<i>Cyperus engelmannii</i>	Engelmann's flat sedge			S2
<i>Cyperus lancastriensis</i>	Lancaster flat sedge		E	S1
<i>Elephantopus carolinianus</i>	Carolina elephant-foot		E	S1
<i>Epilobium angustifolium ssp</i>	Narrow-leaf fireweed			S1
<i>Eriocaulon parkeri</i>	Parker's pipewort			S2
<i>Gymnopogon brevifolius</i>	Short-leaf skeleton grass		E	S1
<i>Heteranthera multiflora</i>	Bouquet mud-plantain			S2
<i>Pinus serotina</i>	Pond pine			S2
<i>Platanthera ciliaris</i>	Yellow-fringed Orchid			S2
<i>Polygala mariana</i>	Maryland milkwort			S2
<i>Ranunculus ambigens</i>	Water-plantain spearwort			S2
<i>Rhynchospora inundata</i>	Slender horned-rush			S2
<i>Sagittaria subulata</i>	Awl-leaf arrowhead			S2
<i>Spiranthes laciniata</i>	Lace-lip ladies' tresses		E	S1
<i>Stachys tenuifolia</i>	Smooth hedge-nettle			S3
<i>Utricularia gibba</i>	Humped bladderwort			S3

*** Key to Federal and State Status Codes**

Lt	Taxa formally listed as threatened
E	Endangered species – one whose prospects for survival within the state are in immediate danger due to one or many factors.
S1	Critically imperiled in NJ because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres).
S2	Imperiled in NJ because of rarity (6 to 20 occurrences).
S3	Rare in state with 21 to 50 occurrences. Includes elements which are widely distributed but with small populations/acreage, or with restricted distribution but locally abundant.

CAUTIONS AND RESTRICTIONS ON NATURAL HERITAGE DATA

The quantity and quality of data collected by the Natural Heritage Program is dependent on the research and observations of many individuals and organizations. Not all of this information is the result of comprehensive or site-specific field surveys. Some natural areas in New Jersey have never been thoroughly surveyed. As a result, new locations for plant and animal species are continuously added to the database. Since data acquisition is a dynamic, ongoing process, the Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of New Jersey. Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The attached data is provided as one source of information to assist others in the preservation of natural diversity.

This office cannot provide a letter of interpretation or a statement addressing the classification of wetlands as defined by the Freshwater Wetlands Act. Requests for such determination should be sent to the DEP Land Use Regulation Program, P.O. Box 401, Trenton, NJ 08625-0401.

The Landscape Project was developed by the Division of Fish & Wildlife, Endangered and Nongame Species Program to map critical habitat for rare animal species. Some of the rare species data in the Landscape Project is in the Natural Heritage Database, while other records were obtained from other sources. Natural Heritage Database response letters will list all species (if any) found during a search of the Landscape Project. However, any reports that are included with the response letter will only reference specific records if they are in the Natural Heritage Database. This office cannot answer any inquiries about the Landscape Project. All questions should be directed to the DEP Division of Fish and Wildlife, Endangered and Nongame Species Program, P.O. Box 400, Trenton, NJ 08625-0400.

This cautions and restrictions notice must be included whenever information provided by the Natural Heritage Database is published.



NJ Department of Environmental Protection
Division of Parks and Forestry
Natural Lands Management

APPENDIX C: A DESCRIPTION OF SUPERFUND SITES IN LOGAN TOWNSHIP

Bridgeport Rental and Oil Services

The Bridgeport Rental and Oil Services site, also known as BROS, is a 30-acre parcel of land, formerly used as a waste oil storage and recovery facility, located in Logan Township 2 miles southeast of the Delaware River. The property consists of a 100-vessel tank farm and 13-acre waste oil and wastewater lagoon. The lagoon was used for waste disposal between the 1960s and up to 1981. The lagoon became a “toxic soup” of waste material and spills and leaks from the facility have contaminated groundwater and adjacent wetlands.

National attention focused on BROS when in 1977 a welder’s torch ignited an accumulation of chemicals at the waste storage facility, causing a large explosion. Fires raged for over 10 hours, sending a torrent of black smoke up into the sky. Six people died and 35 people were hospitalized in the accident as storage cylinders exploded, flying hundreds of feet through the air. Many environmental advocates, policy analysts, and historians see this event and several other similar events throughout the country as inspiring federal Superfund legislation.

The US EPA became involved when the lagoon’s dike was breached in the early 1970s, contaminating 3 acres of private land with waste oils. In 1981, the liquid level rose and threatened to overflow the dike. The U.S. Coast Guard increased the height of the dike by 5 feet. In 1982 and 1983, the liquid again threatened to overflow the dike and EPA began emergency response actions. The liquid levels were reduced by pumping wastewater through a filter system and discharging into a nearby stream. In late 1983 and 1984, pumping wastewater through a more sophisticated separation-sedimentation-filtration-adsorption system reduced liquid levels. EPA tested and found groundwater contamination around the site.

In 1983, the BROS site was placed on the National Priorities List. EPA authorized the first phase of remediation and cleanup in 1984, which consisted of determining the nature and extent of soil contamination and evaluating the remedial alternatives. In 1988, EPA initiated the second phase to determine the extent of groundwater contamination but never completed it, due to ongoing negotiations between the federal agency and the Potentially Responsible Parties.

Based on the results of the soil testing, EPA designed a remediation plan to excavate and incinerate contaminated sludge, sediment, soil, debris, and oil from the lagoon and tank farm. From 1991 to 1996, on-site incineration was carried out. During this period EPA discovered many contaminants at the BROS site such as polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and metals.

While cleanup, demobilization and stabilization efforts were completed in 1996, the second phase of testing groundwater and remediation has yet to be initiated. In 1996, EPA, with the aid of the U.S. Department of Justice and the State of New Jersey, reached a settlement with 90 companies and governmental agencies that had contributed waste to the BROS site. These 90 entities will pay over \$221.5 million to help cover expended

and future clean-up costs. The agreement states that the parties will contribute \$115.5 million to EPA and NJDEP as reimbursement for past clean-up costs. The rest of the monies will fund a complete study of the groundwater and wetlands contamination. EPA and NJDEP will share groundwater cleanup costs with the settling parties if they exceed the agreed-upon amount.

BROS has proven to be the most expensive and technically challenging Superfund site in the history of EPA's cleanup program. From 1992 to 1996, more than 172,000 tons of hazardous waste was excavated from the toxic lagoon. Over 190 million gallons of contaminated water was treated and 10,000 tons of contaminated debris was disposed off-site. One benefit arose from the BROS site: the EPA and NJDEP did obtain a great amount of knowledge from their efforts at BROS as they employed new technologies and improved techniques for remediating environmental damage.

Chemical Leaman Tank Lines Incorporated

Beginning in 1961, Chemical Leaman Tank Lines, Inc (CLTL) operated a tank-washing facility in Logan Township. The CLTL facility is located on 34 acres surrounded by fallow farmland and wetlands, one mile from Bridgeport and 2000 feet from the BROS Superfund site. The wetlands are named Cedar Swamp and are fed by Moss Branch and another unnamed creek.

Before the advent of federal and state environmental regulations, CLTL used impounded settling and aeration lagoons to dispose of chemical wastes and residues. In 1975, the New Jersey Department of Environmental Protection (NJDEP) restricted the use of unlined waste lagoons and required CLTL to install an upgraded rinse water containment system. Since then, the NJDEP routinely monitors the disposal practices of CLTL and periodically requires remediation and restitution.

In 1977, CLTL drained remaining liquid in the settling and aeration lagoons into Cedar Swamp. They removed accumulated sludge from the settling lagoons to an off-site disposal facility, but did not remove sludge from the aeration lagoons. All the settling and aeration lagoons were covered with clean fill. In 1982, CLTL removed visible sludge and contaminated soil and filled in areas with clean sand.

In 1985, the CLTL site was listed on the National Priorities List as a Superfund site because of potential human risk. At least 10 private residences reported groundwater contamination and CLTL was required to provide alternative sources for potable water. Because CLTL is a financially solvent business, the US EPA entered an Administrative Consent Order in which CLTL is compelled to complete remedial investigations and feasibility studies. After CLTL completed its first study of site conditions, the EPA found it to be unacceptable and conducted its own studies, which were completed in 1990. The mishandling of wastewater and chemical materials on the CLTL site has resulted in organic and inorganic contamination of soil, of private residences' groundwater reserves, and of adjacent wetlands area. Groundwater is contaminated with volatile organic compounds (VOCs) including trichloroethene, benzene, and vinyl chloride, and heavy metals including arsenic, chromium, and zinc.

The EPA authored a site remediation plan divided into three phrases, referred to as Operable Units. The first operable unit addressed groundwater contamination. In 1987 and 1993, affected residents were connected to township water supply. In early 2000, CLTL proposed a pump-and-treat remedial program that includes innovative in-situ (“in original position”) technology, which scientists believe is less disruptive and ecologically sensitive. Complete designs for this component of remediation were scheduled for late 2002, with approval and commencement in 2003.

The second operable unit addresses the source of pollution and soil contamination. Despite CLTL’s voluntary and compelled remediation efforts in the 1970s, contaminated soils still remain on site and exceed ecological health standards and *may* exceed human health risk standards. A final Human Health Risk Assessment was completed in October 2002. A remediation recommendation proposal was due in 2003, with approval pending in 2004.

The third operable unit addresses the remediation of the surrounding wetlands and surface waters. After initial evaluation, two endangered species – barred owl and bog turtle - and several indicator species – green heron, bullfrog, snapping turtle, vole, sunfish, and earthworm - were sighted in Cedar Swamp. Plans for remediation include disposition of the 7.3 acres of contaminated sediments and soils and restoring the wetlands to their original functional value. Action is scheduled to commence in 2004. The estimated cost of this phase is \$7,232,391.

CLTL still maintains an active tank terminal that dispatches, stores, and cleans tractors and tank trailers on this site. Because CLTL is a lawful and operating corporation, it must act as the Responsible Party and is accountable for most of the costs incurred during the investigation and remediation phases. Recently, CLTL brought suit against its insurance company to defray the multi-million dollar costs of remediation and was awarded part of its claims (see *Chemical Leaman Tank Lines, Inc. v. The Aetna Casualty and Surety Company* 1996 U.S. App. LEXS 14887). Additionally, CLTL agreed to a legal settlement paying \$3.7 million in environmental damages to affected parties, including nearby municipalities. State authorities have already authorized use of some of these monies to preserve a 98-acre eagle habitat along the Raccoon Creek in Woolwich Township.

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DELAWARE VALLEY REGIONAL PLANNING COMMISSION

Publication Abstract

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for Logan Township,
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ABSTRACT

This publication documents the natural and community resources of Logan Township, Gloucester County, New Jersey. The natural resource information includes descriptions, tables and maps of land use; soils; steep slopes; drinking water aquifers and wells; surface waters including watersheds, streams, lakes, wetlands, and floodplains; impacts on water resources; vegetation including forests and grasslands; animal communities; threatened and endangered species; Heritage Priority Sites; and known contaminated sites. Community resources that are briefly described include population, transportation, township utilities and services, and protected open space. A short history of the community is also included.

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for the **TOWNSHIP** of



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