CHATHAM BOROUGH ENVIRONMENTAL RESOURCE INVENTORY

SUMMARY OF 2012 CHANGES

APRIL, 2012: ADOPTED BY CHATHAM BOROUGH ENVIRONMENTAL COMMISSION

MAY, 2012: ADOPTED INTO THE CHATHAM BOROUGH MASTER PLAN BY THE CHATHAM BOROUGH PLANNING BOARD

Cover Page – updated to reflect 2012 adoption by Environmental Commission and Planning Board

Chapter 1, page 1-1 – Updated per 2010 Census

Chapter 8, pages 8-6 – 8-9 – New pages, on Threatened and Endangered Species

Chapter 10, page 10-3, 2010 census population added

Chapter 11 – Regional Relationships – New Chapter

Chapter 12 – Land Use – New Chapter

CHATHAM BOROUGH ENVIRONMENTAL COMMISSION
54 FAIRMONT AVENUE
CHATHAM, NEW JERSEY 07928

CHATHAM BOROUGH

ENVIRONMENTAL RESOURCE INVENTORY

ADOPTED AS ELEMENT OF CHATHAM BOROUGH MASTER PLAN

SEPTEMBER, 2010

NEW SECTIONS ADOPTED INTO CHATHAM BOROUGH MASTER PLAN

MAY, 2012

WRITTEN: APRIL 1976

ALL SECTIONS UPDATED: FEBRUARY, 2008

REVISION: AUGUST, 2010

ADDITIONAL SECTIONS ADDED: APRIL, 2012

CHATHAM BOROUGH ENVIRONMENTAL RESOURCE INVENTORY

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Chatham Borough Environmental Resource Inventory – Introduction

This environmental resource inventory (ERI) is an update to the previous study and inventory prepared in April, 1976. At that time, according to the 1970 census, the population of Chatham Borough was 9,566 people, and median family income was $15,135. Since that time Chatham's population has decreased to 8,962 (according to the 2010 Census) but the average median family income, however, has skyrocketed to $164,805.

The ERI was updated and fully rewritten in 2008, updated again in 2010 and adopted as an element of the Chatham Borough Master Plan, and updated again in 2012 with new material and new sections on Regional Relationships and Land Use.

As in 1976, most of the land use area in Chatham Borough continues to be developed. Chatham remains primarily a residential community. Almost 80% of the housing units are owner-occupied.

Chatham Borough has train service directly to Manhattan, making it a convenient place in which to enjoy suburban living with an easy commute to the job opportunities of New York City. According to the US Census Bureau, 2002 Economic Census, the highest percentages of businesses within Chatham are professional, scientific and technical services, followed by retail establishments and health care and social assistance professionals.

All of these factors combine to make Chatham a pleasant and desirable community in which to live. In fact, Money Magazine named Chatham Borough as one of the top 10 places to live in the United States in its 2005 compilation. Contributing to its high quality of life are the environmental resources that enhance the character of the community. As interest in living in Chatham grows, pressure on the environmental resources increases. It is important to maintain and enhance these environmental resources so that future residents can enjoy the same quality of life that makes Chatham so attractive today. The Environmental Commission hopes that the inventory of environmental resources set forth here will help identify the resources that currently exist and allow for planning and preservation to protect and enhance them for the future.

Chatham Borough Environmental Inventory - Geology

Introduction

Past geological processes are directly responsible for today's drainage patterns and water supply in Chatham Borough. These same processes were responsible for sand and gravel deposits which were used for construction and clay deposits which were used for brick making. An appreciation of our geologic heritage enables better planning for building foundations, roads and stormwater systems and for planning recreation sites.

As schematically shown in Figure 1, Chatham Borough has only limited evidence of its past geologic history due to major periods of ancient erosion and/or non-disposition. However, evidence that is found in the Chatham Borough area testifies to a wide range of former climates and geologic activity. At one time, continental glaciation covered the Borough leaving an unconsolidated veneer of sediment. The bedrock beneath the glacial deposits contains evidence of former volcanic activity and an ancient, probably arid, environment in which dinosaurs roamed.

The most recent and significant geologic event for Chatham Borough, however, was the advance and retreat (less than 15,000 years ago) of the continental ice sheet. This ice sheet pushed south from Canada, terminated in the Chatham region, and is responsible for the present drainage pattern and unconsolidated clayey and sandy deposits directly underlying the Borough. Three separate surveys by Bonini (1965), Nichols (1968), and Vecchioli, et al (1967) describe pre-glacial topography and subsequent thick glacial fill in the Chatham Borough area. Figure 2 illustrates some of these features.

Geomorphology

The State of New Jersey is comprised of four physiographic provinces, as shown in Figure 3. Running roughly north to south they are: the Appalachian Valley and Ridge, the Highlands, the Piedmont Plateau, and the Coastal Plain. Chatham Borough lies within the Piedmont physiographic province. Sedimentary rocks underlying the Borough slope gently to the southeast as a part of the regional rolling plain which is interrupted by a resistant basaltic ridge (Long Hill) in the southwestern portion of the Borough lying roughly along Fairmount Avenue south of Watchung Avenue.

Surface drainage is controlled by the northeasterly flowing Passaic River and associated floodplain. The Passaic River generally cuts its way through glacial till, except for some southern portions of the Borough where it cut a channel into Triassic-age dark, brownish-red, sandy, shale bedrock.

Glacial sediments cover the predominately gentle slopes of Chatham Borough. Elevations within the Borough range from approximately 200 to over 400 feet above sea level. See Topography Discussion for more details. Dendrite streams drain surface water from the slopes.

Paleozoic Era

The Paleozoic Era occurred from 225 to 570 million years ago. It contains seven subdivisions (called periods), the first four of which are found in down-faulted northeast-southwest trending belts within the Highlands Province west of Chatham Borough. These Paleozoic rocks are fossiliferous limestones, shales and sandstones with structures and organisms indicating an alternating sequence of shallow to deep marine seas and terrestrial environments. Abundant life is indicated by the presence of fossil algae, corals, brachiopods, mollusks, ostracods and trilobites. Such conditions must also have existed in Chatham Borough during the early and middle Paleozoic. There are no upper Paleozoic rocks reported in New Jersey, probably due to a combination of erosion and non-deposition. This includes the period when the Appalachian Mountains evolved.

Mesozoic Era

The Mesozoic Era existed some 70 to 200 million years ago and contains three periods. Rock outcrops of the first period are visible in Chatham Borough. These Triassic Period rocks are made up of reddish shale and sandstones called the Brunswick Formation. Good exposures of this unit can be observed along the Passaic River where it cuts through the Brunswick beds just north of Summit Avenue/Chatham Road. The red color and presence of alluvial fans within the Brunswick Formation are possible indicators of an arid climate and torrential, seasonal rainfalls.

Some time during the latter part of the Triassic Period, regional earth movements caused the Highlands area to rise, and the Piedmont area directly southeast of the Highlands to sink into a series of discontinuous intermontane basins up and down the east coast, extending northward even to Nova Scotia.

Chatham Borough was located in one of these subsiding basins, flanking the uplifted Highlands covered with Paleozoic sediments. Red sand and clay flowed off the Highlands and were deposited as bedrock (Brunswick) sandstone and shale in the Chatham Borough area. The Triassic was a time when vertebrates were evolving, and fossils of many fish and reptiles, including dinosaurs, can be found associated with the Brunswick Formation in New Jersey.

During the late Triassic, three separate volcanic eruptions produced widespread sheets of basalt. One edge of the last of these produced the core of Long Hill in the Borough.

Regional faulting along a northeasterly-southwestern trend toward the end of the Triassic caused the Paleozoic rocks covering the Highlands to be downfaulted. Subsequent erosion has eliminated all evidence of this former Paleozoic cover except for the downfaulted remnants.

A long period of regional uplift and planation is the only other Mesozoic event known for New Jersey.

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Cenozoic Era

This last chapter in earth's history includes events from 70 million years ago to the present day. The Cenozoic Era is divided into two periods, the Tertiary and the Quaternary.

Tertiary Period

Evidence of geological activity during the Tertiary can be seen in the Schooley peneplain (a level surface of thousands of square miles which was developed by extensive steam erosion). During Schooley time, Chatham Borough was eroded down to the level of Long Hill. Post-Schooley erosion of the softer shales and sandstones surrounding Long Hill brought about dissected bedrock valleys and plains such as were present just before glaciation.

Quaternary Period

Regional studies indicate that three major ice advances (Kansas, Illinois, and Wisconsin) could have covered Chatham Borough during the last one million years of geologic history. Each ice advance was separated from the other by a warm interglacial epoch.

Evidence for the most recent (Wisconsin) ice advance to affect Chatham Borough is found in the glacial deposits which occur as a thin veneer to a thick (over 200 feet) blanket over bedrock.

Two main types of glacial deposits occur in the Borough: (1) glacial till - non-stratified clayey to sandy deposits which were scraped up, carried and dumped by action of the ice; and (2) glacial fluvial deposits - stratified gravel, sands and silts reworked by glacial meltwater streams. An example of these deposits is given by Vecchioli, et al, who describe 191 feet of alternating till and glacial fluvial deposits in a well drilled in Chatham as shown below:

Test Hole No. 14

Location - 700 feet north of Main Street and 35 feet east of North Passaic Avenue and Center Place, Chatham, New Jersey
Altitude - 215 feet

Depth, in feet	**Lithology**
0 - 38	Till, silty, sandy, pebbly, boulders from 0-20, brown
38 - 42	Sand, medium, well sorted
42 - 62	Clay, silty and silt, clayey, laminated, brown
62 - 73	Sand, medium, with some coarse, well sorted
73 - 76	Silt, clayey, brown
76 - 98	sand, medium and coarse with little fine gravel, well sorted in part
98 -110	Clay, silty, with some fine sand below 105, brown
110 - 120	Sand, very fine to very coarse, with fine gravel, poorly sorted
120 - 161	Sand, medium to coarse to fine gravel, poorly sorted in part, silty
161 - 191	Till(?), sandy, silty, pebbly, compact, brown
191 - 193	Sandstone, reddish-brown, unweathered
193 - 197	Shale, reddish-brown, unweathered

The western portion of Chatham Borough lies along the site of the Wisconsin age glacial terminal moraine. This moraine forms a belt of non-stratified glacial till, pushed and dumped in

front of a massive ice sheet. This terminal moraine averaging one mile wide, is particularly significant in Morris County, because it: (1) probably marks the farthest southern extent that the Wisconsin ice advanced: and (2) serves as a dividing line between ice contact features (kames, eskers, kame terraces) north of the moraine, and those types of glacial deposits not necessarily requiring contact with ice (such as outwash plains and extensive lake beds) south of the moraine. Route 124 (Main Street) in Chatham and Madison Boroughs runs close to or along the top of this terminal moraine.

One of the most significant events of the glacial age for Chatham Borough was the deposition of a series of glacial-fluvial deposits in a north-south trending belt from East Hanover south to Florham Park and Chatham. This series of porous glacial valley-fill beds today represent the source of groundwater for Chatham Borough. (See Hydrology chapter in this report.) The glacial age had a profound influence on the drainage topography and surficial cover of Chatham Borough. Regional studies have indicated that pre-glacial drainage was south through a gap in the Second Watchung Mountain at Short Hills. As the last Wisconsin ice advanced along a morainal front extending from Morristown to Chatham and Short Hills, the Short Hills outlet was plugged with glacial deposits. This blockage caused the water to back up, forming a large glacial lake called Lake Passaic. Meltwater caused the lake to rise until it found a southwesterly outlet at Moggy Hollow (Liberty Corner). As the Wisconsin glacier melted and the ice front moved northward, Lake Passaic covered an area (including Chatham) up to 30 miles long and 10 miles wide and is estimated to have been as deep as 240 feet. It extended roughly from present-day Far Hills to a point north of Paterson, following the western edge of the Watchung Mountains. See Figure 6.

Some of the thick layers of clay reported in the Chatham well in Figure 2 are of the type laid down in Lake Passaic. Long Hill ridge existed as an island in this glacial lake. As the ice continued to melt northward, lower outlets (at Little Falls and Paterson) in the Second and First Watchung Mountains were encountered. The level of Lake Passaic dropped until finally, approximately 10,000 years ago, only isolated ponds and swamps remained. The Great Swamp area in Chatham and Harding Townships is one of these remnant low lake regions with over 50 feet of glacial lake clay reported in its subsurface. Other large wetland remnants include: Black Meadows in Hanover, Hatfield Swamp in Roseland, Troy Meadows in Parsippany and Little Piece and Great Piece Meadows in Fairfield.

The most recent geologically significant events have been the drainage changes caused by the Passaic River and the local creeks and rivers that feed it.

Figure 1

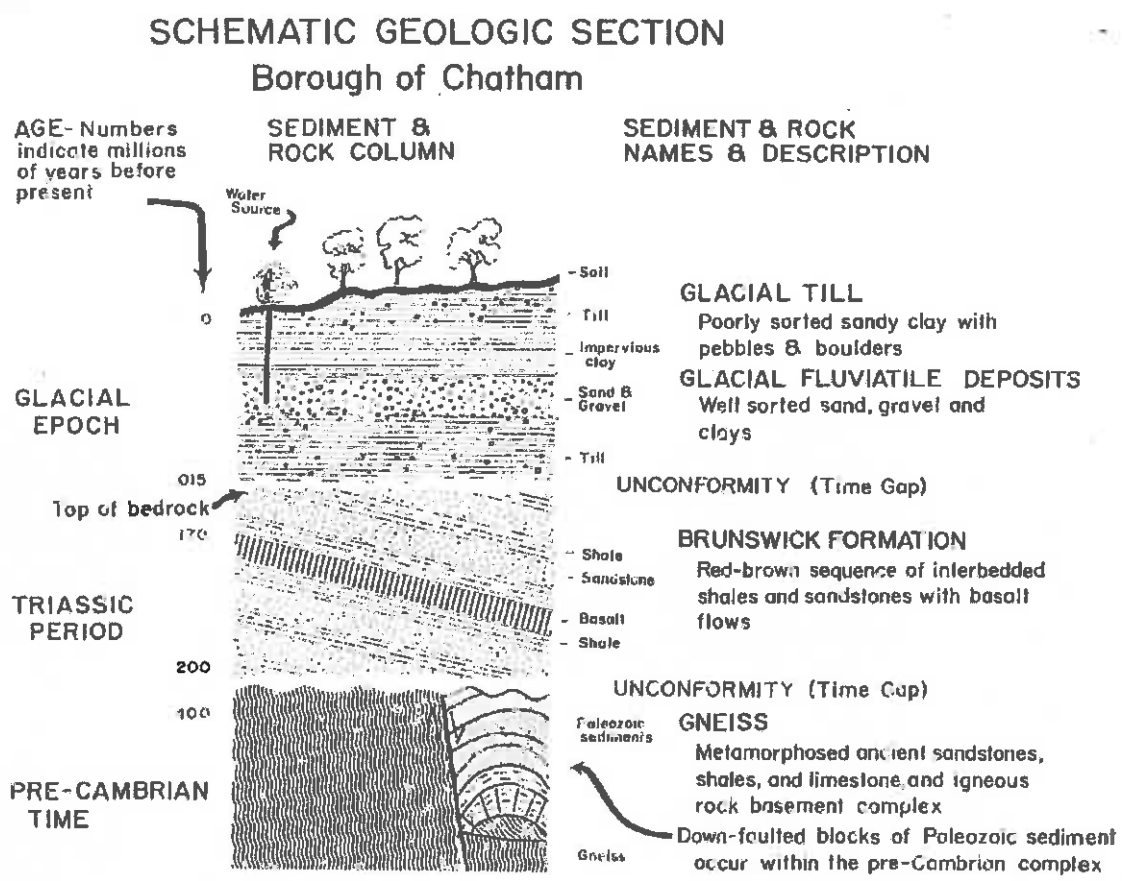
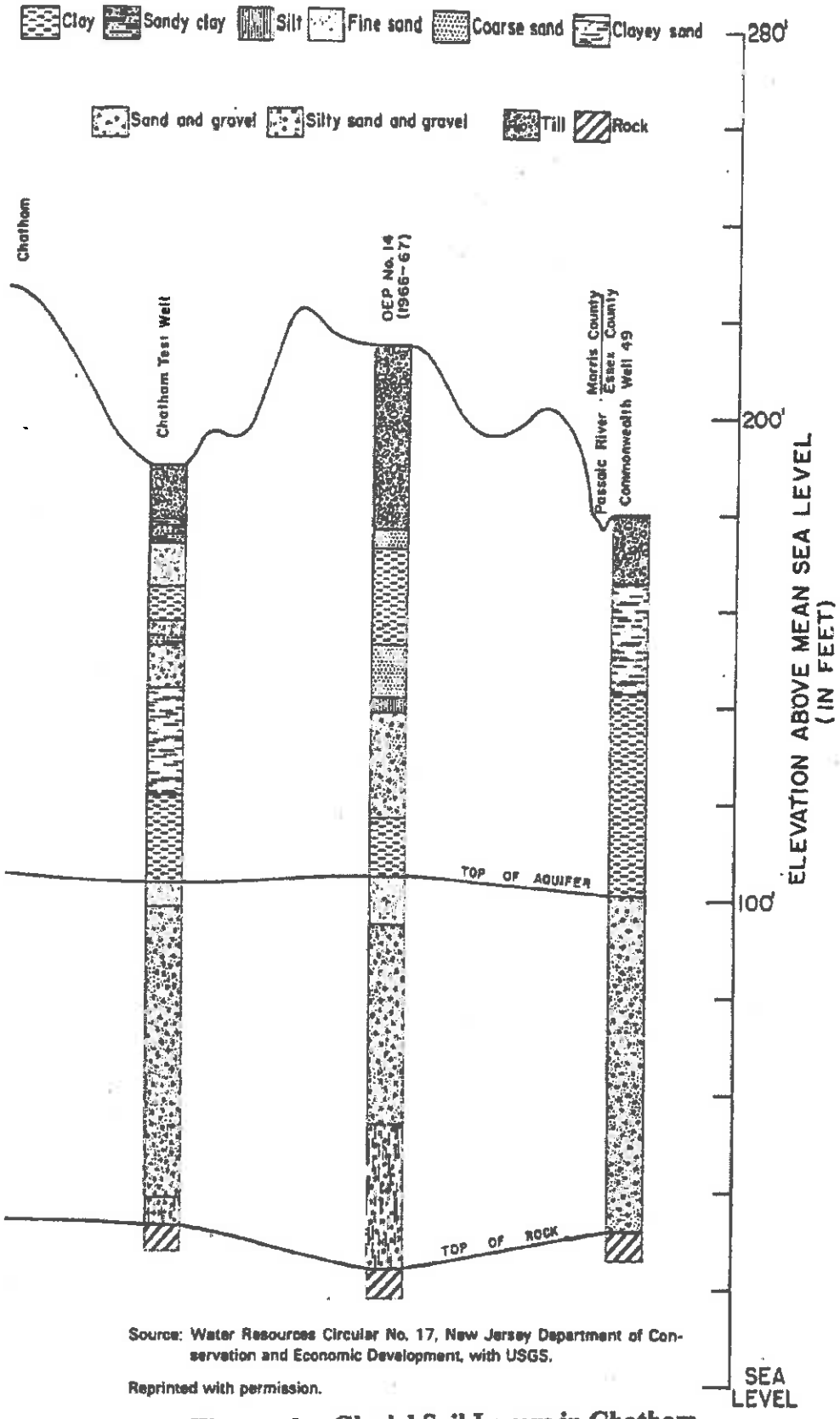


Figure 1 Geologic History of Chatham

Figure 2



Source: Water Resources Circular No. 17, New Jersey Department of Conservation and Economic Development, with USGS.

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Figure 2 Glacial Soil Layers in Chatham

Figure 3

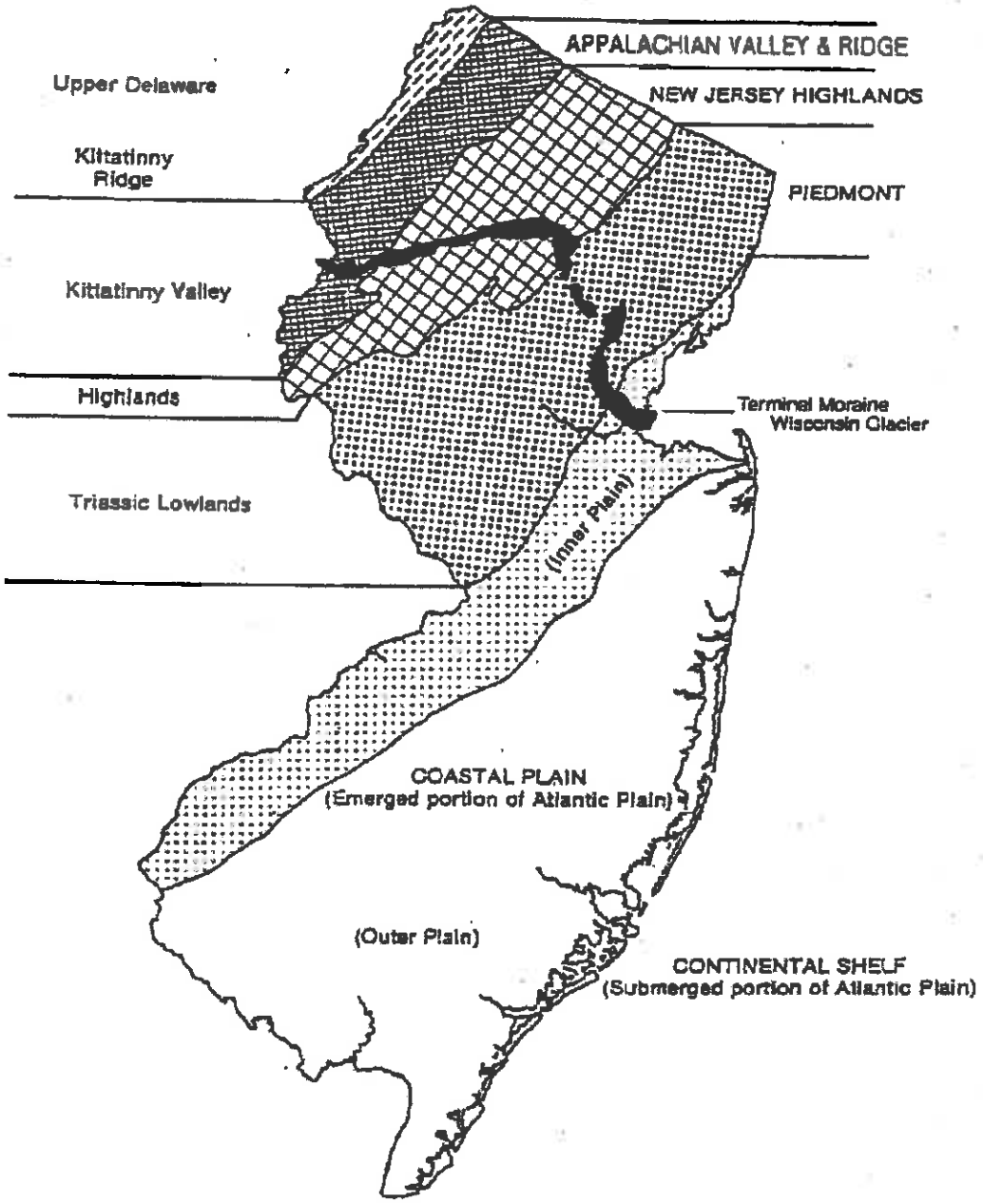

Figure 3 Physiographic Provinces of New Jersey

Table 1

Table 1 Geologic Time Scale

ERA	PERIOD		EPOCH	Millions of Years Ago	Associated Events
Cenozoic	Quaternary		Holocene Pleistocene	present - 0.01 0.01 - 1.6	Glaciers recede; Climate becomes temperate Glaciation Primitive humans; forests flourish
	Tertiary		Pliocene Miocene Oligocene	1.6 -5.3 5.3 - 23.7 23.7 - 36.6	Continents & seas assume present forms Seas recede European & Asian land masses join
Mesozoic	Cretaceous		Late Early	66.4 - 97.5 97.5 - 144	Extinction of dinosaurs Widespread swamps
	Jurassic		Late Middle Early	144 - 163 163 - 187 187 - 208	Dinosaurs thrive; first birds Sedimentation of Newark basin Lava flows from Watchung Mtn. Ridges Formation of Newark basin (Piedmont)
	Triassic		Late Middle Early	208 - 230 230 - 240 240 - 245	Continental drift resulting in rift basins First mammals Desert conditions dominate; then abate
Paleozoic	Permian		Late Early	245 - 258 258 - 286	Closure of Proto-Atlantic; formation of Pangea uplifting of Green Pond & Copperas Mountains. Alleghanian orogeny
	Carboniferous	Pennsylvanian Mississippian	Late Early	286 - 320 320 - 360	Evergreen forests flourish First reptiles
	Devonian		Late Middle Early	360 - 374 374 - 387 387 - 408	Seas advance First amphibians & insects Fish abound
	Silurian		Late Early	408 - 421 421 - 438	First leafless land plants
	Ordovician		Late Middle Early	438 - 458 458 - 478 478 - 505	First vertebrates Taconic orogeny
	Cambrian		Late Middle Early	505 - 523 523 - 540 540 - 570	Shallow seas advance & retreat Grenville Orogeny
Precambrian	Proterozoic Age		Late Middle Early	570 - 900 900 - 1600 1600 - 2500	Erosional sedimentation; volcanic activity Sea floor spreading forming "Proto-Atlantic"
	Archean Age		Late Middle Early	2500 - 3000 3000 - 3400 3400 - 3800?	

Sources: Cotterill, Rodney, Editor, The Cambridge Guide to the Material World, 1985
New Jersey Geological Survey, Information Circular 1, 1990
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Figure 4

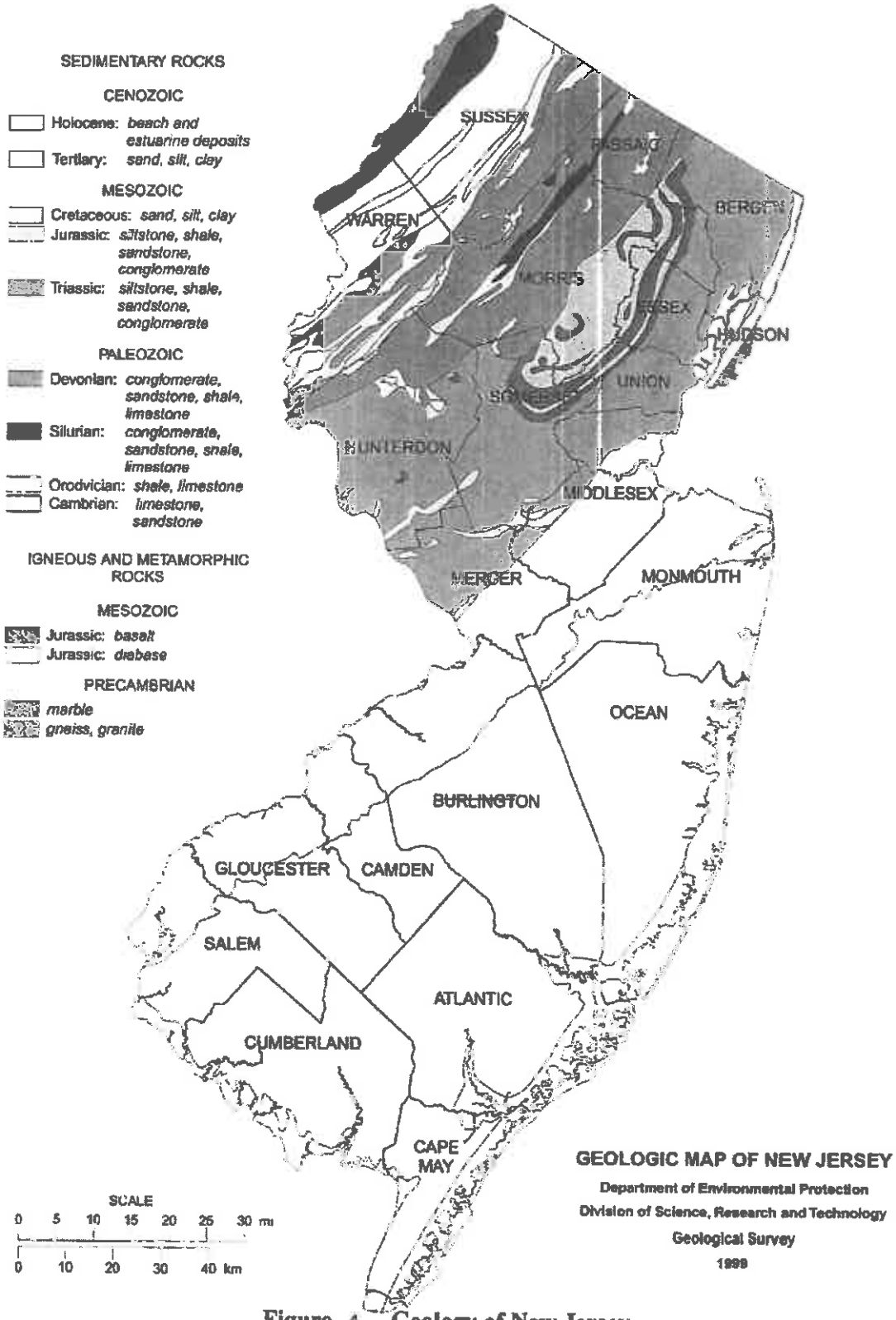

Figure 4 Geology of New Jersey

Figure 5

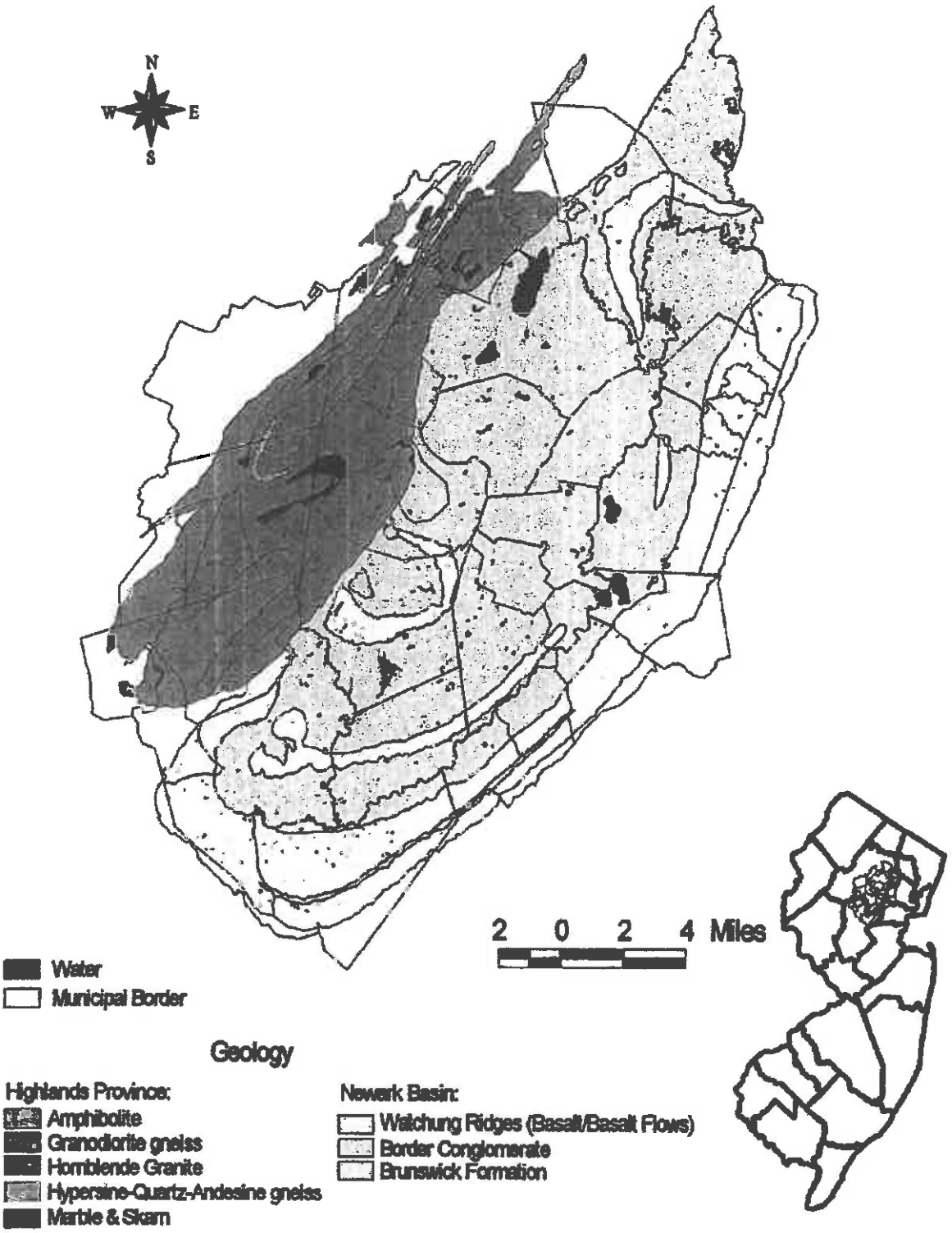

Figure 5 Geology of Upper Passaic River Basin

Figure 6

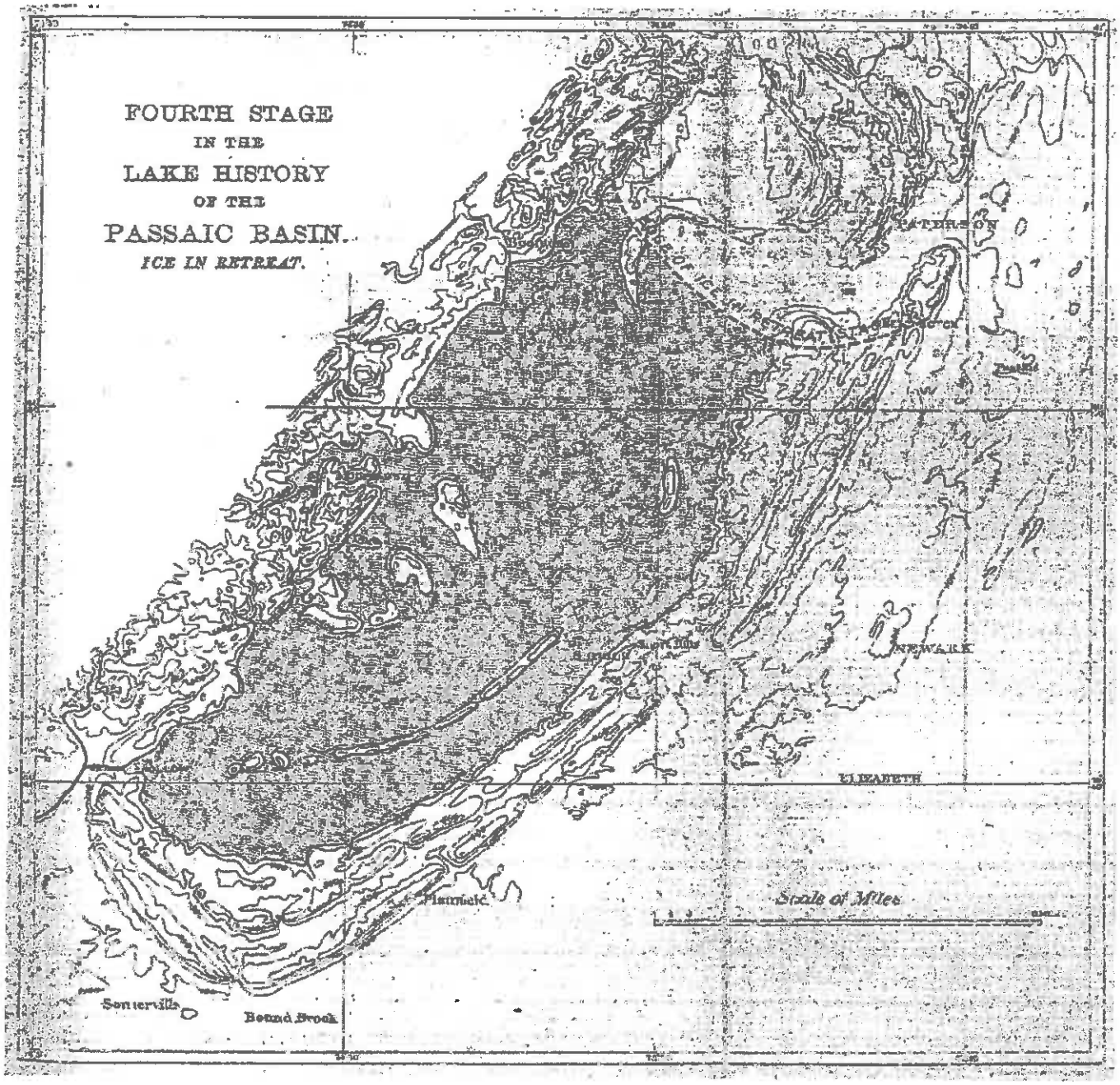

Figure 6 Glacial Lake Passaic

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Chatham Borough Environmental Inventory -Topography

Chatham's land elevation ranges from approximately 200 to over 400 feet above mean sea level and are reflected in Figure 7. The low sections of the Borough are near the Passaic River and at the Northern corner of the Borough. The area of highest elevation is to the West of the Passaic River, along Fairmount Avenue and at the Southwest corner of the Borough and is part of the Third Watchung Ridge, which extends through several neighboring municipalities.

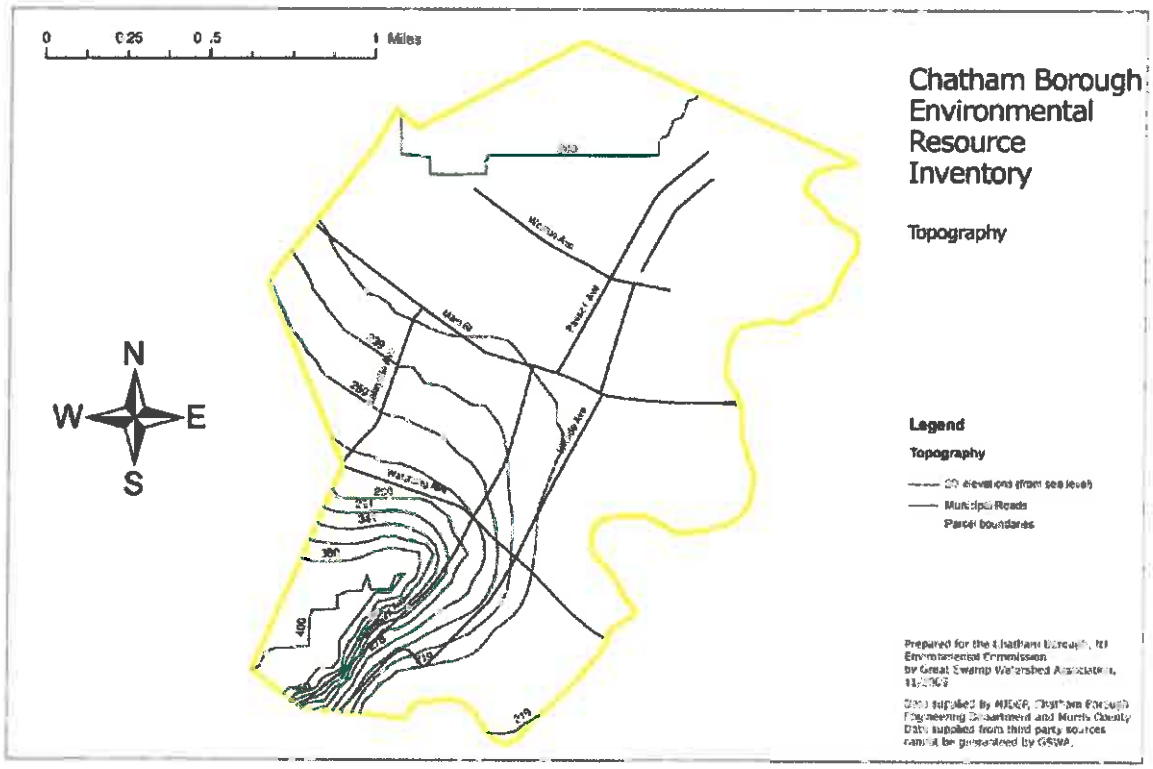
In the Northern portion of the Borough, the rise in elevation is gradual. For example, from the Northern portion of Passaic Avenue to Main Street, the rise in elevation is only nineteen feet over a distance of approximately three-quarters of a mile.

The rise in elevation is fairly dramatic in the Southern portion of the Borough, especially as one moves west from the Passaic River. For example, near the Southern end of Hillside Avenue, the elevation rises from 219 feet at Hillside Avenue to approximately 298 feet at Fairmount Avenue, or eighty feet in less than a quarter mile of distance.

The topography influences natural drainage patterns. Water flows naturally from the topographic high to the lower elevations to the East, toward the Passaic River, and to the North.

The rise in topography in the Southern portion of the Borough creates an area of steep slopes, with slopes of greater than 15%. Any construction in steep slope areas should be prohibited, limited or modified to manage storm water runoff, drainage and prevent erosion.

Figure 7



Chatham Borough Environmental Inventory - Climate and Air Quality

Chatham's climate, like locations elsewhere, is influenced by the interaction of wind velocity and direction, temperature variations and precipitation. All of these factors affect our vegetation, drainage and wildlife patterns.

Although New Jersey is one of the smallest states, meteorologists break up New Jersey into 5 distinct climate regions. See Figure 8. The geology, distances from the Atlantic Ocean and prevailing wind patterns help distinguish the climatic regions.

Chatham Borough is on the edge of two of these climate zones, the Northern and the Central. The Northern Zone covers one quarter of the State in the Northwest corner. The Central Zone runs in a Northeast to Southwest orientation from New York Harbor to the bend of the Delaware River near Trenton. The edge of the Northern and Central zones is often the dividing line between frozen and non-frozen precipitation during winter storms.

Temperature

New Jersey is about halfway between the equator and North Pole. Its weather is influenced by a mixture of wet, dry, hot and cold air streams, making the weather variable. The variable weather results in significant temperature differences from winter to summer. For example, average January temperatures are 28 degrees and average July temperatures are 73 degrees. This climate also displays relatively large daily and day-to-day temperature fluctuations. Cold winters and near-tropical summers result from the direction of the seasonal prevailing winds. Due to our latitudinal position, we are affected by Prevailing Westerlies.

In the winter, the prevailing winds are from the northwest, subjecting us to the regular invasion of cold air masses moving down from Canada. These outpourings of polar air are warmed slightly in their passage across the Mid-West and eastern mountains, but not enough to protect us from bone-chilling temperatures. January and February tend to be our coldest months. See Table 2.

In the summer, warm tropical masses move into our area from the Southwest and South. As a result, we have many hot, humid days that are uncomfortable. July and August tend to be our hottest months. See Table 2.

Precipitation

Our precipitation is usually above the national average. Chatham's annual rainfall ranges from 32-71 inches and averages 48. See Table 3. Rainfall is well distributed throughout the year but tends to be heavier in summer when thunderstorms unleash large quantities of water in a short time. See Table 3. In the winter months we can have snow from a few inches to a couple of feet. In the winter of 1995-96 Chatham had over 65 inches of snow. Chatham has a mean snowfall amount of 29.9 inches. See Table 4.

Drought

Periodically we will have a drought year. Chatham had little precipitation in 2001. See Table 3. Droughts can have a devastating effect on our water supply, soil, vegetation and wildlife. Because of our last drought, Chatham has put permanent water restrictions in place that require residents to water on odd or even days depending on their house number. Our water supply for the future is of great concern as more and more people draw from our aquifer. There is also concern about protecting the recharge areas for our aquifer.

Floods

Floods in our area can be caused in three ways. Our heaviest rains come from tropical storms that usually occur in the summer or early fall. Occasional hurricanes come up the East Coast to our area and can cause flooding and damage to our homes and environment. The last hurricane to cause problems for our area was Floyd in 1999. Low lying areas were flooded and many residents had water in their basements. Cloud bursts can also dump a lot of water in a short amount of time to cause flooding. Occasionally we have a Northeaster, a storm with strong northeast winds and rain. These storms usually last for a couple of days and also can cause flooding in low areas.

Air Quality

Weather and air quality are closely related. Just as Chatham's weather is influenced by regional weather patterns, so too its air quality is affected by pollutant sources in other locations whose contaminants are carried by wind and weather systems to Chatham. The Prevailing Westerlies carry pollutants and contaminants from sources in the Mid-West to New Jersey and other East Coast states. High temperature and bright sunlight, together with emissions of volatile organic compounds and nitrogen oxide emissions combine to increase concentrations of ground level ozone.

Chatham's air quality matches that of its surrounding area. Air quality generally is based on the concentration of air pollutants. Air pollutants are divided into two categories, criteria pollutants and air toxics.

Criteria pollutants consist of a group of six pollutants for which USEPA has set health based "National Ambient Air Quality Standards." These six criteria pollutants are ozone, sulfur dioxide, carbon monoxide, nitrogen dioxide, particulate matter and lead. Air toxics are other pollutants likely to be emitted into the air in quantities large enough to cause adverse health effects. In New Jersey, the NJDEP has focused on 14 toxic substances for specific regulation.

NJDEP has evaluated where most air pollution comes from. It has characterized these air pollution sources into groups of mobile sources, stationary major sources and area or other small sources. Mobile sources are either on road, such as cars, trucks and buses, or non-road, such as airplanes, trains, lawnmowers and construction vehicles. Stationary major sources emit either at least 10 tons per year of any hazardous air pollutant or at least 25 tons per year combined of all hazardous air pollutants. Area or other small sources are operations that do not qualify as a

stationary major source but do emit significant quantities of air contaminants. Such sources include dry cleaners, gasoline stations, and residential and commercial heating systems.

Some air pollution sources, other than industrial point sources, originate from the careless disposal of volatile chemicals or from leaf burning. These are under control by local regulation and information programs.

At least 68% of air toxics in New Jersey come from mobile sources. See Figure 9. The factors that make travel to and from Chatham so convenient -- numerous highways, trains and nearby Newark Liberty Airport -- combine to degrade air quality. Our well manicured lawns also come at a price, as emissions from mowers and equipment from landscapers, lawn services and homeowners are also a significant source of air contamination. See Figure 9 - off road mobile sources.

Morris County ranks 7th out of New Jersey's twenty-one counties for the amount of its toxic air emissions. See Figure 10. The make-up of the County's air emissions is consistent with the major stationary sources being a minor source of toxic emissions. See Figure 10. But, these relatively high emissions are based more on Morris County's large geographic area than the intensity of any particular emission source. Morris County's toxic air emissions per square mile are among the lowest in the State. See Figure 11.

What should not be lost in the details of air quality data is that Chatham's air quality is generally good for its location and there are no major sources present for release of toxic air contaminants. Those factors that have the most impact on Chatham's air quality are either regional air contamination issues or mobile sources that are a major part of our society and lifestyle. Solutions to emissions from these sources are more likely to come from technological advances and broader national policy decisions than any action that Chatham Borough itself may take.

Figure 8

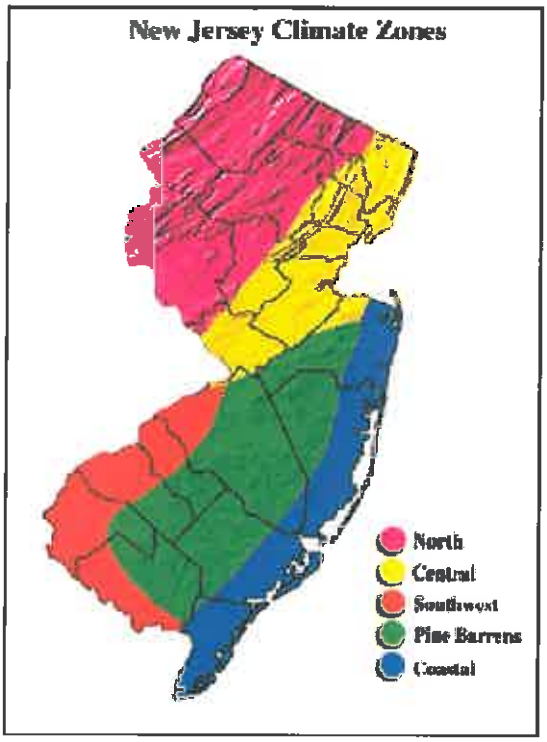

New Jersey Climate Zones
North
Central
Southwest
Pine Barrens
Coastal

Table 2

Monthly Mean Temperature

Monthly Mean Temperature

Station: Canoe Brook
COOP ID: 281935

Updated 9/2006

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1931	27.4	31.0	37.6	47.7	58.1	67.5	74.5	71.4	68.3	57.0	48.3	36.5
1932	40.4	33.3	34.9	46.4	58.9	66.6	70.5	70.6a	64.1	55.5	39.6	33.2
1933	35.5	31.6	36.6	48.9	61.2	68.2	71.7a	71.0	64.7e	51.1	38.6	29.2
1934	31.5	15.7	34.7	47.6	60.7	69.9	73.0	67.4	65.4a	50.6	45.0	31.0
1935	25.4	27.5	41.3	47.1	54.6	67.0	74.4	69.7	60.2	51.7	45.7	26.1
1936	23.0	20.4	42.5	45.5	59.9	66.0	71.0	71.4	64.3	52.9	38.6	34.5
1937	36.3	31.3	33.0	46.4	59.8a	67.2	71.7	73.2	60.3	52.0	40.3	29.7
1938	26.8	32.8	40.5	49.9	56.1	66.9	72.3	73.9	-999h	53.4	41.4a	31.1
1939	27.4	33.2	36.7	45.7	60.0	67.9	70.4	72.6	63.6	52.0	38.5	32.3
1940	20.0	29.4	32.5	43.9	57.4	66.7	71.4	66.0	60.9	47.8	40.8b	33.1b
1941	26.4	27.4	31.9	53.3	59.8	67.6	72.3	68.1	64.6	56.2	43.7	34.7
1942	25.2	27.5	39.4	50.2	61.0	65.9	71.7	68.8	62.3	53.7	40.7	26.4
1943	27.6	27.8	35.7	42.9	58.4	72.9	73.1	70.8	64.0	53.0	40.4	28.2
1944	30.4	29.8	35.5	46.2	64.3	69.3	75.3	74.9	65.3	49.6	40.9	27.8
1945	20.1	26.9	46.1	51.5	55.1	-999m	-999m	-999i	67.7	52.5	43.6	25.3
1946	-999r	-999y	45.5	48.1	58.8	67.1	72.5	68.4	65.7	57.5	46.5	33.7
1947	33.4	26.2	35.2	48.7	57.9	66.2	72.1	73.4	65.0	58.2a	39.8	29.5
1948	18.3	24.8a	39.1	49.1	58.5	67.3	73.4	71.6	64.7	51.5	47.7	31.3b
1949	34.6	33.9a	40.3	49.8a	59.8	71.0	75.9	73.6a	62.6	58.7	41.2a	33.8a
1950	36.7	29.1	34.0	46.1	57.1	67.1a	71.8x	-999g	59.6c	55.5	44.6	29.5
1951	32.0	32.1	39.5	48.9	59.6	66.6c	73.4	71.4	64.9	55.7	39.2	33.6
1952	32.7	32.7	37.6	51.7b	57.2	70.4	75.8	71.8	64.9	-999g	42.3	35.2
1953	34.1	36.5	41.7	50.8	62.4	70.7	75.3	72.1	-999e	-999x	44.4	36.5
1954	25.1	34.9	38.5	51.3	56.1	67.6	72.5	69.5	63.5	57.5	41.0	32.3
1955	26.6	28.9	38.6	50.9	61.5	65.2	70.4	75.9a	64.2b	56.2	-999z	26.6
1956	30.3	32.9	34.5	44.8	56.8	68.7b	71.0	70.3	62.2	53.3	44.2	37.2
1957	25.1	34.0	-999i	51.8	58.5	72.0	72.8u	68.9	65.5a	50.5	44.7	35.3
1958	28.6c	24.9	38.0	50.8	55.8	64.4	73.0	71.1a	64.0	51.1a	44.5	24.7c
1959	20.0b	28.5	37.6a	51.2	62.7	68.7	74.3a	74.5c	68.3	56.6	43.2	33.9
1960	30.5	33.9a	30.6c	53.8c	58.9	67.8a	71.3	71.9	64.6b	53.0a	44.6c	34.8c
1961	20.7a	31.1c	39.3d	45.6a	56.5b	68.9a	74.0d	72.1b	70.4	54.9	44.4a	31.2d
1962	27.3	26.4	37.1	49.3	60.0	69.0	69.4	69.0	60.1	53.0	38.3	27.5
1963	23.4	22.8	38.4	48.5	57.8	67.5	72.8	69.3	59.8	56.4	46.5	25.9
1964	29.1	27.9	39.3	47.4	61.0	66.2	73.0	68.3	65.5	50.8	44.9	31.9
1965	24.9	28.8	36.7	46.3	63.8	67.8	71.4a	71.1	65.6	54.0	42.1	34.1

file://C:\Documents and Settings\wils2553\Local Settings\Temp\c.local.notes.data\Monthly Mean Temperature.htm

Table 2 (cont'd)

Monthly Mean Temperature

1966	28.0	29.5	39.4	45.3	55.7	69.6	75.3	72.8	62.9	51.6	44.8	32.4
1967	32.1	26.3	34.5	47.9	52.4	70.8	72.7	71.6	-999y	53.2	40.1	33.3
1968	21.3	26.2	40.1	51.7	56.5	67.2	74.7	72.1	65.8	55.8	42.2	29.9
1969	26.9	28.8	36.1	51.2	59.4	68.5	71.5	72.6	64.4	52.5	41.8	29.5
1970	20.4	28.7	34.6	47.4	59.8	66.9	73.4	73.1	66.9	54.3	43.6	31.4
1971	23.2	29.3	37.0	46.3	55.6	68.9	71.9	70.5	67.1	57.9a	40.9	35.9
1972	30.5	26.1	36.8	44.7	59.2	65.0	74.0	72.2	65.0	48.3	40.2	34.9
1973	31.0	28.0	42.7	51.1	56.0	70.9	73.9	73.4	64.7	54.9	44.5	35.4
1974	30.0	27.0	38.5	50.3	58.1	65.2	72.3	72.5	63.2	49.0	43.8	35.0
1975	32.6	31.4	36.5	44.0	62.3	68.4	73.0	72.6	60.5	56.0	47.2	32.7
1976	23.2	33.5	40.7	51.5	58.1	70.8	71.0	72.1	62.0	49.1	37.1	25.6
1977	17.6	29.9	44.0	50.9	61.3	66.2	73.5	70.8	65.2	51.0	45.1	30.2
1978	24.9	18.9	34.9	48.2	57.5	67.9	71.1	72.9	61.7	51.3	44.0	33.7
1979	29.1	19.8	42.4	48.8	60.9	66.4	72.6	71.8	64.2	52.0	46.9	35.0
1980	29.2	26.3	37.2	50.6	61.2a	66.2	75.2	74.9	67.3	50.8	39.4	27.2
1981	19.8	34.3	37.1	52.1	59.7	68.3	73.7	70.4	62.8	49.2	43.2	30.5
1982	20.2	31.3	36.7	46.9	61.1	64.7	72.5	68.9	64.2	53.3	45.8	37.9
1983	29.5	30.9	41.7	48.4	58.2	69.6	75.0	74.3	66.8	53.3	44.1	29.4
1984	23.1	35.0	33.1	48.5	57.8	70.3	71.7	73.7	62.2	57.3	43.1	38.1
1985	23.6	30.6	40.9	51.4	62.6	65.7	73.5	72.0	66.5	54.5	46.4	29.9
1986	29.2	28.4	39.9	49.4	61.8	67.5	72.5	69.5	62.7	53.5	39.6	34.2
1987	27.3	28.6	41.4	50.3	59.2	70.2	74.8	70.2	63.1	47.6	43.2	35.9
1988	22.3	30.2	40.5	48.3	60.2	68.6	77.0	75.9	63.3	48.6	44.5	32.0
1989	32.4	30.8	39.0a	48.2	59.7	70.7	72.9	70.8	66.1	54.8	42.7	21.5
1990	36.4	36.6	43.5	50.0	57.7	69.8	74.4	72.6	64.4	58.2	46.7	38.8
1991	29.8	35.3	41.9	52.4	65.9	70.9	74.9	74.3	64.5	54.5	44.2	36.3
1992	31.8	33.0	36.6	47.7	57.8	67.1	72.0	69.5	64.8	49.8	42.8	33.6
1993	34.2	25.9	35.1	50.5	61.9	69.8	75.6	74.3	65.0	51.4	43.0	33.6
1994	21.5	26.0	37.2	52.6	59.0	72.7	77.1	71.0	64.6	52.1	-999n	37.9
1995	35.0	27.6	43.4	49.7	58.3	70.3	76.3	74.5	61.7	57.9	40.1	29.0
1996	27.2	30.3	36.5	51.1	58.7	70.6	72.0	73.4	65.4	54.3	40.7	38.4
1997	29.5	37.2	40.1	48.8	57.8	69.0	74.9	-999z	64.4	53.7	42.1	35.9
1998	38.3	38.8	44.0	52.9	64.1	69.3	75.6	999z	68.8	55.5	44.9	40.4
1999	32.0	35.3	39.9	51.7	60.7	72.9	79.6	75.0	67.8	52.7	48.2	36.6
2000	28.7	33.4	45.6	49.3	61.5	70.2a	70.1	70.6	63.6	53.5	-999z	29.0
2001	28.1	33.5	37.6	51.1	61.3	70.5	72.2	76.2	64.9	54.7	47.9	40.5
2002	36.0	37.4	42.3	53.7	58.4	70.6	76.7	76.5	67.8	53.2	43.3	32.5
2003	25.4	26.6	39.6	47.6	57.8	67.3	75.4	76.0	66.4	52.0	47.7	34.3
2004	23.8	30.9	42.4	52.0	65.6	69.6	73.3	73.5	67.7	53.1	46.3	34.7
2005	28.5	33.4	36.3	52.7	57.4	73.5	76.8	77.7	70.5	56.1	46.2	31.6
2006	37.5	33.7	999g	53.2	61.6P	70.6P	77.2P					
	JAN	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Mean	28.2	29.9	38.5	49.2	59.3	68.5	73.4	71.9	64.6	52.3	43.2	32.3

Table 2 (cont'd)

Monthly Mean Temperature

Median	28.1	29.9	38.4	49.2	59.1	68.4	73.0	71.8	64.6	53.2	43.4	32.7	5

Note: Preliminary values not used to calculate monthly means and medians

Data Flags:

-999 = Missing Data.

a = 1, b = 2, c = 3, ..., or z = 26 or more missing days in a month or missing months in a year.

P = Preliminary Data.

Table 3

Monthly Precipitation

Monthly Precipitation

Station: Canoe Brook
COOP ID: 281335

Updated 9/2006

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNU
1931	2.08	2.58	5.65	2.79	3.20a	6.28	4.45	6.13	2.21	2.72	0.53	2.44	41.0
1932	4.61	2.12	5.23	2.77	2.38	2.89	2.66	1.75	2.74	7.37	11.36	2.44	48.3
1933	1.87	3.35	4.86	4.93	4.97	3.40	3.40a	8.57	9.66	1.91	0.67	2.79	50.3
1934	3.42	2.62	2.79	5.42	5.42	4.48	2.90	4.84	9.58	3.34	2.16	3.55	50.5
1935	3.22	2.60	2.31	2.15	1.14	3.62	4.58	1.71	5.20	4.70	4.11	1.21	36.5
1936	7.62	1.72	6.21	4.03	2.42	6.25	1.63	6.52	3.67	4.62	1.08	6.32	51.0
1937	6.33	2.96	2.92	5.18	3.14	4.94	2.59	6.85	2.79	3.97	5.42	2.02	49.1
1938	4.33	2.30	2.45	3.64	3.62	7.26	9.33	3.70	9.97	2.04	3.13	2.84	54.6
1939	3.65	4.45	5.77	5.17	1.24	3.76	2.34	4.94	1.98	3.33	2.59	1.55	40.7
1940	2.99	3.37	6.64	6.00	6.70	3.32	4.39	4.55	4.81	2.29	4.19	3.57	52.8
1941	3.12	2.41	3.60	2.34	1.67	3.48	6.78	5.25	0.27	1.85	2.76	4.37	37.9
1942	2.19	3.68	6.48	1.57	2.88	3.28	8.67	14.65	6.34	3.16	4.18	4.96	62.0
1943	3.02	1.91	3.05	3.06	7.02	3.35	3.85	3.08	2.45	7.86	3.30	1.09	43.0
1944	3.66	2.81	6.62	5.47	1.87	3.48	2.59	2.56	7.41	1.75	7.29	3.64	49.1
1945	3.64	3.30	2.73	4.23	6.11	5.22	13.71	5.92	7.62	2.62	6.83	4.66	66.5
1946	1.90	2.50	3.05	1.29	6.33	7.94	6.42	5.43	5.49	1.38	1.67	2.08	45.4
1947	3.73	2.20	3.15	5.28	8.17	4.01	5.09	5.78	3.03	2.01	11.24	3.39	57.0
1948	4.28	2.32	3.84	4.32	10.12	6.73	5.12	5.38	0.56	2.82	3.47	6.88	55.5
1949	6.39	2.83	2.23	4.63a	4.37	0.05	3.53	2.68	5.30	1.70	1.26	3.70	38.6
1950	2.62	4.10	3.65	2.32	3.62	2.91	6.23	4.84	1.88	1.92	6.05	4.96	45.1
1951	3.16	5.23	6.36	3.40	5.36	3.68	4.99	2.92	1.52	3.64	7.25	5.69	53.2
1952	5.66	1.97	5.20	5.59	5.80	5.84	4.67	5.90	4.63	0.78	4.19	4.35	54.5
1953	6.37	1.97	8.19	5.91	4.47	2.90	4.12	1.53	2.96	3.45	1.32	5.03	48.2
1954	1.75	1.90	3.68	2.63	4.69	0.86	1.64	7.11	6.23	2.02	5.99	4.33	42.8
1955	0.86	3.24	3.91	2.28	1.46	4.21	0.44	14.45	2.34	7.69	2.88	0.14	43.9
1956	1.23	5.26	6.30	3.22	2.26	3.76	6.03	3.67	4.04	3.02	4.10	4.58	47.4
1957	1.89	2.98	2.55	6.92	1.79	1.69	1.03	2.18	1.86	3.58	3.51	7.44	37.4
1958	5.27a	3.54	3.85	7.51	3.42	3.43	4.04	3.43	3.41	6.61	3.27b	1.29	49.0
1959	2.53	1.83a	4.22	2.57	1.48	5.48	3.35	6.36	3.41	4.67a	3.60b	5.47	44.9
1960	3.16	4.72a	1.90	3.84d	5.87	1.27	6.31	5.38a	6.95a	1.56	2.47a	2.53b	45.9
1961	3.23a	2.14a	3.88d	5.61a	2.71b	2.05a	-999g	3.30c	2.28	2.12	2.51a	3.45c	33.2
1962	2.60	4.34	4.21	5.20	1.38	3.04	2.15	5.79	3.94	3.50	4.44	2.73	43.3
1963	2.65	1.97	3.79	0.72	3.21	2.38	4.93	2.06	4.43	0.61	7.95	1.83	36.5
1964	5.29	3.28	2.59	5.94	1.20	3.62	7.31	0.19	1.32	1.08	2.67	4.98	39.2
1965	2.73	3.89	2.80	2.84	1.62	1.41	2.51	4.61	2.55	4.20	2.05	1.71	32.9

Table 3 (cont'd)

Monthly Precipitation

1966	3.08	4.19	2.62	2.21	5.41	0.84	1.00	2.70	9.41	4.43	3.51	5.07	44
1967	1.49	2.30	7.15	2.85	4.17	3.82	7.38	5.38	2.45	3.92	2.43	6.62	49
1968	2.69	0.84	5.16	2.28	11.10	5.73	2.95	2.85	2.79	2.17	5.82	4.80	49
1969	1.76	2.96	4.18	3.14	2.62	5.57	10.77	3.45	6.04	1.86	3.03	5.83	51
1970	0.50	3.92	4.25	3.71	2.56	2.41	2.37	4.58	2.03	3.06	6.28	3.09	39
1971	2.85	5.24	3.42	2.97	3.56	0.96	6.03	14.15	6.35	4.42	6.63	1.56	59
1972	2.12	5.62	3.78	3.28	7.46	11.21	5.19	1.71	1.65	4.97	10.79	6.20	63
1973	5.14	4.81	3.69	7.93	4.30	6.89	4.90	7.18	4.14	5.59	1.85	8.97	65
1974	3.68	1.94	5.14	4.16	4.07	3.06	2.11	5.36	7.95	2.48	1.60	5.60	47
1975	5.31	3.51	4.04	2.57	4.90	7.24	12.65	3.41	11.72	4.65	4.21	3.12	67
1976	5.54	2.40	2.61	3.52	4.39	3.87	2.91	5.12	2.85	7.39	0.39	2.38	43
1977	1.73	2.94	6.93	3.74	1.33	6.07	1.22	3.66	5.44	5.11	8.18	5.63	51
1978	8.73	2.03	4.85	2.58	7.36	2.50	4.50	11.13	5.82	2.06	3.09	4.61	59
1979	10.49	4.80	3.67	4.06	7.30	3.56	2.46	5.27	8.22	4.22	3.60	2.40	60
1980	2.08	1.12	8.17	7.98	2.37	4.25	3.24	1.70	1.81	3.83	3.73	0.54	40
1981	0.51	6.10	1.92	3.18	4.96	3.61	5.81	1.99	6.75	4.02	1.40	5.45	45
1982	6.12a	3.08	2.06	6.57	2.61	5.95	2.80	3.17	3.39	2.04	3.57	1.36	42
1983	4.96	3.10	9.61	11.38	4.90	5.79	1.76	3.72	2.22	7.13	5.93	10.87	71
1984	2.39	3.44	6.97	6.22	10.71	2.74	9.68	1.32	1.88	4.38	8.25	3.52	56
1985	1.25	2.45	1.47	0.88	6.30	4.96	4.98	5.66	6.99	1.79	8.35	1.05	46
1986	4.33	3.91	1.66	6.02	1.60	2.99	4.10	5.56	2.63	2.32	8.31	5.49	48
1987	6.05	0.59	3.62	5.54	2.42	3.32	5.51	4.90	5.21	5.06	2.56	1.81	46
1988	3.02	4.16	2.81	1.96	6.44	1.20	9.16	3.40	2.37	2.92	7.35	1.08	45
1989	2.05	2.63	3.98	3.66	9.20	5.34	4.58	3.63a	8.29	6.52	3.26	0.29	53
1990	5.18	1.87	3.09	3.84	5.71	2.58	4.24	9.90	3.26	8.76	3.94	6.28	61
1991	4.39	1.76	5.16	3.92	3.41	3.79	4.46	5.80	5.38	1.89	3.12	3.93	47
1992	2.12	1.52	4.08	2.09	2.66	8.29	4.44	3.49	3.97	1.10	7.22	5.15	46
1993	2.98	3.29	7.11	5.30	0.95	2.89	1.46	3.21	7.28	5.35	3.60	4.51	47
1994	5.79	2.34	5.17	2.21	3.60	5.31	4.31	4.25	1.76	0.93	4.23	2.50	42
1995	2.71	2.61	1.47	1.12	4.92	3.39	4.37	2.46	4.26	7.76	5.78	2.11	42
1996	5.78a	1.97	3.72	4.67	3.30	7.03	6.51	1.89	7.04	8.69	3.01	5.25	58
1997	2.94	1.41	3.53	3.15	2.84	1.94	8.29	-999z	3.66	2.22	4.44	4.38	37
1998	3.38	5.55	3.85	5.81	6.86	6.78	2.74	-999z	2.88	3.88	1.42	1.11	44
1999	7.64	2.24	4.56	2.50	3.26	1.31	1.55	5.83	12.76	3.29	3.70	3.19	51
2000	2.49	1.22	3.04	3.77	5.01	4.11	5.85	6.44	3.81	0.71	4.48a	5.01	45
2001	1.94	2.63	5.07	1.53	3.32	9.06	2.13	2.20	4.73	0.93	1.03	2.76	37
2002	1.76	0.47	4.21	4.60	5.33	5.25	2.26	3.90	5.12	6.40	5.35	3.73	48
2003	2.57	4.50	5.05	3.14	4.27	10.27	2.83	6.72	8.10	5.83	2.51	6.72	62
2004	2.56	1.25	3.01d	5.37	4.77	3.04	7.64	4.92	8.15	1.50	4.32	4.32a	50
2005	4.74	2.53	5.13a	3.56	1.43	3.86	3.97	1.58	3.31	13.95	4.95	3.97	52
2006	5.09	2.34	0.63	3.65P	3.49P	8.46P	4.69P	2.84P					
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Mean	3.62	2.93	4.19	4.00	4.27	4.19	4.58	4.76	4.62	3.75	4.18	3.82	49

Table 3 (cont'd)

Monthly Precipitation

Median	3.10	2.63	3.85	3.71	3.62	3.66	4.34	4.58	3.97	3.33	3.60	3.70	48.32

Note: Preliminary values not used to calculate monthly means and medians

Data Flags:

-999 = Missing Data.

a = 1, b = 2, c = 3, ..., or x = 25 or more missing days in a month or missing months in a year.

P = Preliminary Data.

Table 4

Monthly Snowfall

Monthly Snowfall

Station: Canoe Brook
COOP ID: 281335

Updated 8/2006

SNOW SEASON	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
1949-1950	-999z	-999z	-999z	-999z	-999z	-999z	0.7	4.7	0.0	1.0	0.0	0.0
1950-1951	0.0	0.0	0.0	0.0	-999z	999z	999z	4.0	-999z	-999z	0.0	0.0
1951-1952	0.0	0.0	0.0	0.0	0.0	-999z	-999z	-999z	-999z	-999z	-999z	0.0
1952-1953	0.0	0.0	0.0	0.3	1.3	7.0	9.4	-999z	0.4	0.0	0.0	0.0
1953-1954	0.0	0.0	-999z	0.0	2.0	0.0b	-999z	2.0	0.0	0.0	0.0	0.0
1954-1955	0.0	0.0	0.0	0.0	0.0	0.0	3.5	7.5	1.5	0.0	0.0	0.0
1955-1956	0.0	0.0	0.0	0.0	3.5	3.7	2.4	3.9	25.5	0.0a	0.0	0.0
1956-1957	0.0	0.0	0.0	0.0	0.0	0.0a	8.3	8.4	2.7	1.3	0.0	0.0
1957-1958	0.0	0.0	0.0	0.0	0.0	14.0	3.5b	17.1	19.5	0.5	0.0	0.0
1958-1959	0.0	0.0	0.0	0.0	0.0	3.5	1.5a	0.5	8.5	0.5	0.0	0.0
1959-1960	0.0	0.0a	0.0	0.0	0.5	10.5	3.5	6.2	21.4	0.0c	0.0	0.0
1960 1961	0.0	0.0	0.0	0.0	0.0	22.2a	29.0	24.0	2.8a	0.5	0.0	0.0
1961-1962	0.0a	0.0	0.0	0.0	2.5	16.0a	0.7	12.5	4.0	0.0	0.0	0.0
1962-1963	0.0	0.0	0.0	0.0	1.0	9.9	7.0	3.5	2.0	0.0	0.0	0.0
1963-1964	0.0	0.0	0.0	0.0	0.0	9.2	13.8	17.8	4.5	0.0	0.0	0.0
1964-1965	0.0	0.0	0.0	0.0	0.0	4.0	16.0	2.5	4.0	1.5	0.0	0.0
1965-1966	0.0	0.0	0.0	0.0	0.0	0.0	19.6	16.5	0.0	0.0	0.0	0.0
1966-1967	0.0	0.0	0.0	0.0	0.0	16.0a	0.5	27.0	18.5	0.0	0.0	0.0
1967-1968	0.0	0.0	0.0	0.0	0.0	-999z	8.6	0.0	1.0	0.0	0.0	0.0
1968-1969	0.0	0.0	0.0	0.0	2.0	0.0e	1.8	18.5	6.5	0.0	0.0	0.0
1969-1970	0.0	0.0	0.0	0.0	0.0	9.4	7.1	4.5	5.5	2.0	0.0	0.0
1970-1971	0.0	0.0	0.0	0.0	0.0	4.2	15.0	0.5	1.0	2.5	0.0	0.0
1971-1972	0.0	0.0	0.0	0.0	0.0	0.3a	3.8	17.9	2.0	0.0	0.0	0.0
1972-1973	0.0	0.0	0.0	0.0	0.0	0.0	2.5	1.3	0.5	0.0	0.0	0.0
1973-1974	0.0	0.0	0.0	0.0	0.0	3.5	7.5	6.9	2.0	0.0	0.0	0.0
1974-1975	0.0	0.0	0.0	0.0	0.0	0.0	3.4	11.0	1.8	0.0	0.0	0.0
1975-1976	0.0	0.0	0.0	0.0	0.0	0.8	7.1	5.3a	5.4	0.0	0.0	0.0
1976-1977	0.0	0.0	0.0	0.0	0.0	5.6	11.1	8.1	0.5	0.0	0.0	0.0
1977-1978	0.0	0.0	0.0	0.0	1.3	1.3	19.5	20.8	8.5	0.0	0.0	0.0
1978-1979	0.0	0.0	0.0	0.0	2.0	0.0	11.0	21.6	0.0	0.0	0.0	0.0
1979-1980	0.0	0.0	0.0	0.0	0.0	6.0	3.0	4.0	8.5	1.5	0.0	0.0
1980-1981	0.0	0.0	0.0	0.0	2.0	5.0	12.0	0.0	10.0	0.0	0.0	0.0
1981-1982	0.0	0.0	0.0	0.0	0.0	6.6	14.1a	1.0	0.5	12.0	0.0	0.0
1982-1983	0.0	0.0	0.0	0.0	0.0	3.5	9.0	7.5a	0.0	0.0b	0.0	0.0
1983-1984	0.0	0.0	0.0	0.0	0.0	6.5	20.5	0.5	16.6	0.0	0.0	0.0

Table 4 (cont'd)

Monthly Snowfall

1984-1985	0.0	0.0	0.0	0.0	0.0	6.5	15.8	12.0	0.0	0.0	0.0	0.
1985-1986	0.0	0.0	0.0	0.0	0.0	7.0	4.0	17.3	0.0	1.5	0.0	0.
1986-1987	0.0	0.0	0.0	0.0	0.0	2.5	16.9	9.3	3.0	0.0	0.0	0.
1987-1988	0.0	0.0	0.0	0.0	4.0	3.5	15.3	7.5	0.0	0.0	0.0	0.
1988-1989	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.5	2.3	0.0	0.0	0.
1989-1990	0.0	0.0	0.0	0.0	5.0	3.1	3.8	2.6	2.5	1.0	0.0	0.
1990-1991	0.0	0.0	0.0	0.0	0.0	8.8	6.3	1.0	2.0	0.0	0.0	0.
1991-1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	11.5	0.0	0.0	0.
1992-1993	0.0	0.0	0.0	0.0	0.0	1.0	1.8	13.1	17.5	0.0	0.0	0.
1993-1994	0.0	0.0	0.0	0.0	0.0	2.5	16.4	17.4	9.5	0.0	0.0	0.
1994-1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	0.0	0.0	0.0	0.
1995-1996	0.0	0.0	0.0	0.0	4.0	11.0	23.0a	17.0	10.5	0.0	0.0	0.
1996-1997	0.0	0.0	0.0	0.0	0.0	0.0	2.8	4.3	4.0	3.0	0.0	0.
1997-1998	0.0	-999z	0.0	0.0	0.0	2.6	1.6	0.0	4.5	0.0	0.0	0.
1998-1999	0.0	-999z	0.0	0.0	0.0	0.5	2.9	2.5	4.0	0.0	0.0	0.
1999-2000	0.0	0.0	0.0	0.0	0.0	0.0	6.1a	1.0	0.0	0.0	0.0	0.
2000-2001	0.0	0.0	0.0	0.0	-999z	12.8	7.6a	19.9	2.5	0.0	0.0	0.
2001-2002	0.0	0.0	0.0	0.0	0.0	0.0	6.7	0.0	0.1	0.0	0.0a	0.
2002-2003	0.0	0.0	0.0	0.0	0.0	13.6	4.7	25.3	8.9a	2.5	0.0	0.
2003-2004	0.0	0.0	0.0	0.0	0.0	11.7	14.9a	0.0	8.7	0.0	0.0	0.
2004-2005	0.0	0.0	0.0	0.0	0.0	0.5	11.7a	11.7	11.2	0.0	0.0	0.
2005-2006	0.0	0.0	0.0	0.0	0.0	9.8	1.0	16.8	0.3	0.0	0.0	0.
	JUL	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JU**
Mean	0.0	0.0	0.0	0.0	0.6	5.0	8.1	8.8	5.1	0.6	0.0	0.
Median	0.0	0.0	0.0	0.0	0.0	3.5	6.7	6.9	2.7	0.0	0.0	0.

Data Flags:

-999 = Missing Data.

a = 1, b = 2, c = 3, ..., or z = 26 or more missing days in a month or missing months in a year.

P = Preliminary Data.

Figure 9

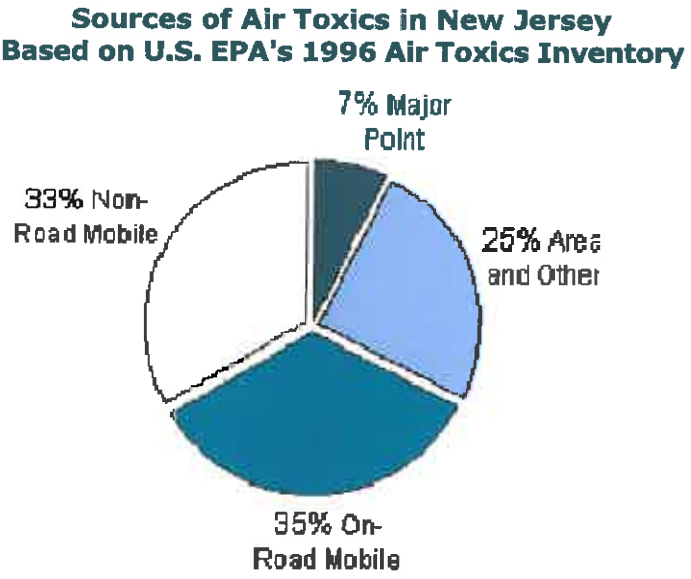

Sources of Air Toxics in New Jersey
Based on U.S. EPA's 1996 Air Toxics Inventory
7% Major Point
25% Area and Other
35% On-Road Mobile
33% Non-Road Mobile

Figure 10

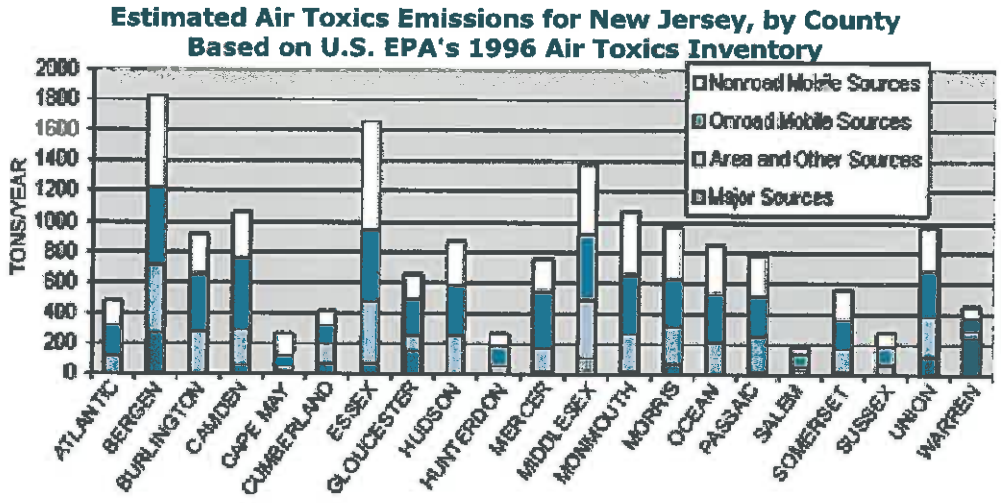
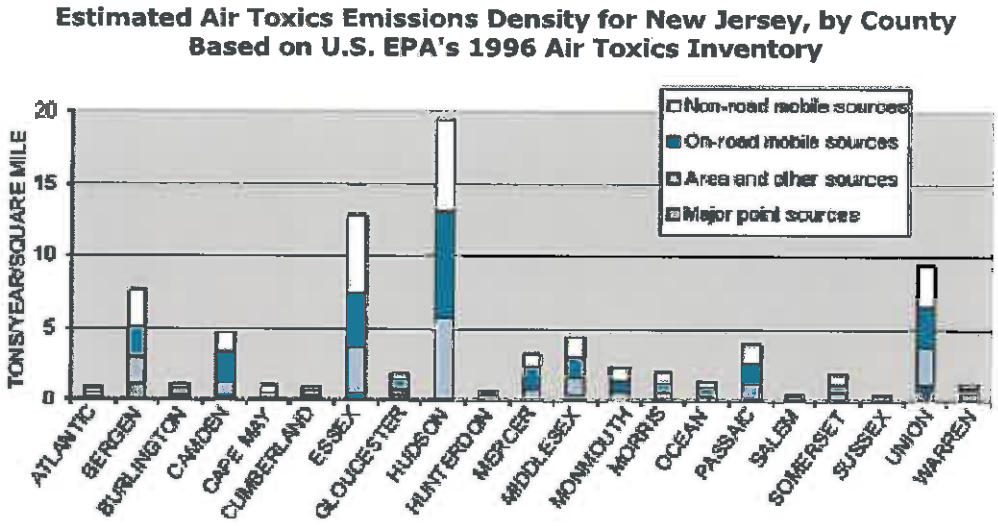


Figure 11



Chatham Borough Environmental Inventory — Hydrology

Introduction

Hydrology is defined as the scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere. The two areas of greatest concern to municipalities are: (1) surface water (stormwater runoff, streams, rivers, ponds and lakes), and (2) ground water (underground water supplies). The Borough of Chatham is subject to various surface water problems because of poorly draining soils and the effects of flooding along the Passaic River, and is also totally dependent upon the nature and extent of its ground water for supplying drinking water. The community is thus profoundly affected by local hydrologic conditions as they presently exist and as they are or may be altered through changes in local and regional land use.

Hydrologic Cycle

The hydrologic cycle is shown in Figure 12. This cycle is the manner by which water moves from place to place and from form to form, i.e. ice, liquid water and water vapor. Water vapor enters the atmosphere by evaporation (including transpiration by plants and animals) and returns to the surface as precipitation. On the land the water is either absorbed into the ground, evaporates, or runs off into streams or rivers and is returned to lakes and oceans. The cycle is quite simple, but its proper functioning is essential to man's existence.

Rainfall amounts and intensities of storms vary markedly. Gentle spring rains provide moisture for plants and help recharge groundwater, but heavy downpours during hurricanes and nor'easters cause erosion and flooding. Long periods of below-normal rainfall result in reduced runoff for reservoirs and less recharge for aquifers, and may cause drought conditions and imposition of emergency water usage restrictions. For more details on Chatham's rainfall amounts, please refer to the precipitation discussion in the Chapter on Weather and Air Quality.

Ground Water

Aquifers

Ground water represents the sole present source of potable water normally used by the Borough of Chatham. The only other potential source is the Passaic River, which is used by many nearby communities. Chatham's wells tap into the Buried Valley Aquifer Systems formed by valleys filled by sand and gravel during the Wisconsin Glacier. This is considered a semi-confined aquifer because most of the sand and gravel deposits are underlain by rock and overlain by impervious layers of clay and silt.

An aquifer is usually recharged by slow percolation of surface waters down through the various layers above the water-bearing sand and gravel in the aquifer itself. However, the aquifer system in Chatham and the immediate surrounding area are generally covered with impervious layers of silt and clay that prevent most local surface waters from rapidly penetrating through to the aquifer. The Chatham Valley portion of the aquifer is replenished mainly from outcrop areas outside the Borough where the sand and gravel layers intersect the surface and to a minor extent by fissures in the underlying rock and the overlying silt and clay layers (Figure 13.)

The Buried Valley Aquifer Systems underlying the northern portions of Chatham Borough extend west through Madison and north to Parsippany (Figure 14). The aquifer systems also extend eastward into Millburn and northward along the route of the Passaic River into Florham Park and Livingston. Some wells in this area also penetrate into the fractured sandstone and shale bedrocks below the buried valleys. There is evidence that some recharge to the aquifer from the Passaic River occurs north and east of Chatham.

Chatham Wells

Chatham and Madison Boroughs were the first to develop major wells for public use in the region in the late 1890's. Chatham's four original artesian wells were relatively shallow, drilled into the terminal moraine materials, and all flowed at the surface without pumping. Chatham Borough currently draws its water from the Chatham Valley of the Buried Valley Aquifer Systems underlying the northern portion of town. Its three wells are located at the Department of Public Works (DPW), located between the Middle School and Day's Brook.

The Buried Valley Aquifer Systems are characterized by a network of earlier river valleys filled with glacial outwash material by the Wisconsin glacier. These buried valleys are often contiguous and hydraulically connected to aquifers in the fractured bedrock below. After a 1978 application was initiated by Chatham Borough, the Buried Valley Aquifer was finally designated as a "sole source aquifer" in 1980 by the Environmental Protection Agency. This provides some protection for the over 600,000 people and scores of major industries and commercial properties that rely upon it.

It is important to note that the sustained static water level in our oldest operating well dropped 31 feet from 1931 to 1969. This was due to the rapidly increasing population in Chatham and the surrounding area during this period. This development not only increased the demand for water, but also increased the speed of stormwater runoff and reduced the recharge to the aquifer by adding more impervious surfaces, such as buildings and pavement. Static levels also dropped in the wellfields north and east of Chatham owned by the City of East Orange and the New Jersey American Water Company, which saw a 54 foot drop from 1925 through 1965, and in Madison's wells to the west, which saw a drop of 35 feet from 1955 to 1990. After the drought years in the early and mid-1960s and the slowing of regional population increases, many of the static levels in regional wellfields rose slightly and stabilized somewhat. However, dramatic drops can still occur. For example, the static level in Chatham's Well #3 dropped 15 feet between March and August in 1995.

The Chatham Valley of the Buried Valley Aquifer Systems has been one of the best portions of the aquifer from both a quantity and quality perspective. Because of its large storage capacity and linkages to other valleys, it has not been over-produced to date. Due partly to the relatively high volumes pumped from the East Orange and New Jersey American Water Co. wells in Millburn and Florham Park, the ground water flow tends to move from west to east under Chatham. As several Madison Borough wells have experienced contamination from Volatile Organic Compounds (VOCs), this has rightfully raised concern for potential contamination of Chatham's nearby wells just downgradient. Diversifying Chatham's supply options has, therefore, become an important issue and land parcels north and east of the DPW well sites are being considered for new wells. Emergency interconnections already exist to

Madison Borough and New Jersey American Water Co. Also, a wellhead protection ordinance was developed by the Chatham Borough Planning Board using a model ordinance developed by the Passaic Valley Ground Water Protection Committee under a grant from the NJDEP.

The current Chatham Borough well field has diversion rights up to a daily average of 1,750,000 gallons, and a monthly maximum allocation of 50,000,000 gallons. The last time Chatham pumped its maximum monthly allocation was in July, 1993. Normally Chatham Borough pumps about 900,000 gallons per day in the colder half of the year and about 1,100,000 gallons per day during the warmer half of the year. The lowest monthly quantity pumped during the 2001 - 2003 period was 23,300,000 gallons in November, 2003, and the maximum was 39,400,000 gallons in August, 2001. This translates to an average per capita consumption of 118 gallons per day during this period, compared to per capita consumption of 102 gallons per day in 1973. Commercial, industrial and apartment buildings account for about one-third of Chatham's water consumption.

Water Quality

Ground water is generally more pure than surface water. Water is filtered as it percolates through soils and rocks and microbial action breaks down contaminants. The water in Chatham fits this pattern and is treated only with chlorine for disinfection purposes within the distribution system, as required by state regulations.

Nearby communities drawing water from the Buried Valley Aquifer Systems have not been so fortunate. Significant contamination (typically VOCs) has required the installation of expensive treatment facilities for the public water systems in East Hanover, East Orange, Essex Fells, Fairfield, Livingston and Madison.

Chatham's water does have one somewhat disagreeable characteristic - it is hard. Hardness is a characteristic of water containing a high percentage of calcium and magnesium salts. About 8-10 grains (140-170 parts per million) is deemed to be in the moderately hard to hard range and many homes use water softeners to ameliorate the situation. While not generally considered a health problem, hard water creates problems in washing, requiring excessive soap usage because the calcium and magnesium in the water combine with soap to form insoluble compounds. In recent years Chatham has also seen increases in the sodium and chloride levels in its water, probably due to road salt storage at the DPW and increased salt usage on the major highway network in the region.

Surface Water

Introduction

Chatham's eastern boundary is the Passaic River. The river in this area runs generally from south to north, first touching the Borough at Stanley Park and then crossing the Borough's northern border at the Madison-Chatham Joint Meeting sewage treatment facility. For most of the way it follows a winding path past both wooded areas and built-up sections of town. It drops in elevation relatively fast from Stanley Park to the Main Street (Route 124) bridge, and thereafter drops more slowly as it proceeds north into Millburn and Florham Park.

There are no major tributaries of the Passaic River that flow through Chatham Borough, but two small streams, storm sewers and drainage ditches carry water toward the river from the higher elevations in town, generally flowing in a north to northeasterly direction. The two streams are Day's Brook and Harmon's Brook (Figure 15). Kelley's Pond (formerly known as Milton Avenue Pond) is the only standing body of water presently existing in Chatham Borough. It is a man-made pond constructed by the Department of Public Works around 1963. Before the Middle School was built in 1957, a natural pond existed in that location. Three natural springs were identified in the Borough: Moore's Spring, Ward's Spring, and Lum's Dairy Farm Spring. Ward's Spring was used for commercial bottled water in the late 19th century.

A glacial dell or kettle exists between Washington and Dellwood Avenues at the bottom of Greenwood Avenue. This was probably created by the slow melting of a large block of ice buried by the retreating glacier. Despite the fact that about 35 acres drain into the dell, and its bottom is about nine feet below any natural outlet, there is no permanent pond. The water level after even major rainfall events tends to drop below the ground surface in a day or two, indicating a significant deposit of sand and gravel soils, although the hill above it is mainly clay and rock.

Floodplains and Floods

Beside any stream, brook or river is an area called the floodplain. Floodplains function in a natural fashion to: (1) store flood waters and thereby reduce the inundation of downstream areas, (2) absorb and dissipate the energy of flood waters, and (3) provide a sediment trap for silt and debris-laden flood waters. Floodplains are divided into three areas: the channel, the floodway and the flood fringe. Both the floodway and the flood fringe comprise what is commonly known as the flood hazard area, and it is this area that is of the most concern to us. (Figure 16.)

In the Borough there are floodplains adjoining the Passaic River, Harmon's Brook and Day's Brook. The largest expanse of floodplain is located along the Passaic River beginning in the vicinity of the Summit Avenue Bridge and extending along the eastern and northern borders of the Borough. (Figure 17.) All these areas are characterized by relatively flat terrain, which is periodically filled with varying levels of water. These areas subject to flooding coincide with areas with the least ability to allow stormwater to infiltrate to the subsurface. See Figure 18.

It is common practice to describe the severity of any flood in terms of the recurrence interval, e.g. once per year, once in ten years, once in a hundred years. The recurrence interval is the average time in years in which a specific rainfall event or flood of a given magnitude is expected to occur or be exceeded based on historical data. In practical terms, this means that a flood of a certain magnitude will cause waters to back up onto the floodplain for a specific distance and floodwaters to reach certain levels at a given point. As these are average recurrence intervals, it also means that a given flood may occur in any year, more than once in a year, or in successive years, or not at all for several decades. While recurrence intervals for given rainfall amounts may not change much over a century, specific flood volumes and levels will increase as development of the land increases. The increased impervious surfaces and increased channeling and piping of stormwater ensure that less water is recharged to the ground and more runs off and at a faster rate.

The following table shows the frequency of storms of specific 24-hour rainfalls for the Chatham Borough area.

Storm Frequency	Rainfall (24 hours)
10 years	5 inches
25 years	5.8 inches
50 years	6.5 inches
100 years	7.3 inches

The severity of a flood is determined not only by the rate and duration of rainfall, but also the areal extent of the storm, the amount of development and impervious surfaces, the types of soil and the slope of the land. While the rainfall storm frequency table can be helpful in predicting flood levels, a better approach is to use the flood peak flows measured at the gaging stations maintained by the U.S. Geological Survey (USGS). These peak discharges have been correlated for many gaging stations and allow a more rational means to predict recurrence intervals of specific flood levels.

The State of New Jersey Department of Environmental Protection (NJDEP) promulgated land use regulations within the floodplain based on the flood levels for a 100-year recurrence interval. In addition, the Federal Emergency Management Agency (FEMA) prepares flood hazard insurance maps periodically, with the latest one for Chatham being updated in July 2001. Chatham Borough adopted amendments to its Land Development Ordinance based on the latest NJDEP rules and FEMA map in July 2001.

Passaic River Flow

The Upper Passaic River Watershed is about 50 miles long and consists of a drainage area of approximately 200 square miles. One of a number of USGS streamflow gaging stations on the Passaic River is located in Chatham at the southerly end of Stanley Park. Two other USGS stations are located on the Upper Passaic above Chatham - one at Bernardsville and the other at Millington.

The respective drainage areas for these three USGS stations are:

Bernardsville	8.83 square miles
Millington	55.4 square miles
Chatham	100.0 square miles

The USGS maintained a gaging station in Chatham from 1903 to 1911, and the current station has been in operation since September 19, 1938. Records are available for these periods for mean daily flows, and for peak gage height and streamflow in published reports and on the USGS website. Flows in the Passaic River have been recorded as low as 2 cubic feet per second (cfs) in summer months during droughts and over 1000 cfs during major rainfall events, such as hurricanes, tropical storms or nor'easters. The maximum gage height of 9.36 feet was recorded on August 2, 1973, with a corresponding peak flow of 3380 cfs. Flood stage for this location is 6.0 feet, corresponding to a peak flow of 1200 cfs. During the last 100 years, there have been 11 events with recorded peak flows exceeding 2000 cfs as shown in the table below:

Peak Flow, cfs	*Gage Height, feet*	*Date*
3380	9.36	Aug. 02, 1973
3000	8.30	Jan. 09, 1905
2860	8.00	Mar. 18, 1907
2560	7.90	May 29, 1968
2540	8.16	Aug. 28, 1971
2520	8.14	Sep. 27, 1975
2310	7.20	Oct. 11, 1903
2260	7.00	Mar. 04, 1910
2210	7.60	Sep. 17, 1999
2080	7.49	Oct. 21, 1996
2020	7.32	Aug. 16, 1942

As can be seen in the table above, the measured gage heights do not always correspond to the calculated peak flows. This may be due to instrument or transcribing errors or changes in the algorithm used to calculate flows. As a practical example, it is interesting to note that the October 21, 1996 storm caused flooding of only six inches in the conference room at the Madison-Chatham Joint Meeting wastewater treatment plant farther downstream on the Passaic River, while the aftermath of Hurricane Floyd on September 17, 1999, left twenty-two inches of water in this same conference room. Nine and one-half inches of rain were measured at the plant during Floyd, an amount much greater than the 100-year 24-hr storm of 7.3 inches.

The hydrograph in Figure 19 shows the typical rapid buildup and slow reduction in streamflow for a major storm, in this case Tropical Storm Floyd. Figure 20 shows the daily streamflows for 2001, with frequent rain events in the spring months sustaining streamflows continuously between 200-400 cfs and dry summer and fall months where streamflows rarely exceeded 20 cfs. Historical records indicate that March has averaged the highest monthly mean streamflows at 342 cfs, and September has averaged the lowest monthly streamflows at 93 cfs. The maximum monthly mean streamflow recorded was 735 cfs in January 1979, and the minimum monthly mean streamflow was 5 cfs in September 1906. The annual mean flow is 173 cfs, the highest annual mean flow was 305 cfs in 1984, and the lowest annual mean flow was 68 cfs in 1965 during an extended drought.

Water Quality

Water quality in the Upper Passaic River basin generally declined as population and development expanded rapidly in the watershed during the 20th century. A survey conducted in 1973 presented the following findings:

1. Higher concentrations of trace metallic elements than found normally in New Jersey waterways.
2. High suspended sediment (turbidity) at all survey locations and particularly high levels at the Chatham sampling site from construction activity.
3. Dissolved oxygen was undersaturated and decreasing with time at most sampling stations.
4. Biochemical oxygen demand was increasing at most sites.
5. Coliform bacteria counts were high and increasing.

6. The dissolved solids content was increasing.

During the latter part of the 20th century, the federal Clean Water Act and state legislation led to more stringent regulations on point source pollution, such as wastewater treatment plants, resulting in higher levels of treatment and higher quality plant effluents. As the effluents from the many wastewater treatment plants along the Upper Passaic River account for a substantial percentage of the streamflow during dry summer months, this has had a marked impact on the quality of the water during low flow periods. Two of the main concerns – toxic ammonia and Biological Oxygen Demand (BOD) - have been targeted, resulting in significant reductions.

The Passaic River's headwaters, emanating in Mendham Township, are considered to be generally of good to excellent quality. The waters are well oxygenated and contain low to moderate nutrient concentrations. They have received Federal Wild Trout Stream designation, and NJ Surface Water Quality classification of FW-2 TP (Cl). Farther downstream at Millington and Chatham the Passaic River is classified as FW-2 Nontrout. Dissolved oxygen is low at Millington station, but improves downstream near Chatham. Nutrient levels (phosphorus and inorganic nitrogen) worsen as you move downstream from Millington. Downstream from Chatham, the numbers and species of fish diminish significantly, due to increased pollution, siltation, removal of riparian vegetation and other forms of habitat destruction along the river.

In accordance with section 303(d) of the Clean Water Act, the NJDEP prepared New Jersey's 1998 list of impaired waterbodies, identifying those waters not attaining Surface Water Quality Standards (SWQS) after the implementation of technology based effluent limits at the wastewater treatment plants. The Passaic River at Chatham was considered impaired as it exceeded SWQS for total phosphorus, fecal coliform, cyanide and heavy metals. The USGS also found that the algae and macroinvertebrate populations in the Passaic River near Chatham were among the most degraded in the country. This was attributed to the highly degraded instream and riparian habitat due to deforestation and heavy industrialization, which in turn caused too much turbidity (siltation) and too high nutrient concentrations, notably nitrogen and phosphorus.

Despite these findings, in 2003, the NJ Division of Fish and Wildlife announced plans to begin stocking trout in the Passaic River an additional two miles farther downstream to Shepard Kollock Park in Chatham, an indication to some that stream quality could be improving enough to permit this demonstration.

The following table compares water quality data for samples taken from the Passaic River at the gaging station near Stanley Park with the effluent from the Madison-Chatham Joint Meeting (MCJM) wastewater treatment plant farther downstream.

	Passaic River 1997	*MCJM Effluent 2002*	*MCJM Permit 2002*
Dissolved Oxygen, mg/1	5.5 - 13.6	6.6 - 9.8	>6
Biochemical Oxygen Demand, mg/1	1.5 - 3.3	1.9 - 7.5	<8
Ammonia-N, mg/1	0.3 - 1.3	0.1 - 0.3	7.0(W) 2.0(S)
Phosphorus-P, mg/1	0.10 - 0.33	2.9 - 4.0	4.0(W) 4.4(S)
Fecal Coliform	130 - 24,000	2 - 28	<200
Enterococci	10-15,400	2-450	NA

Note: (W) and (S) indicate seasonal limits for Winter and Summer.

The table demonstrates that certain water quality parameters in the river are essentially equal to the effluent quality from the wastewater treatment plants discharging to it, but that bacteria counts in the river can vary markedly due to the effects of non-point pollution sources. Phosphorus removal is not currently part of the MCJM treatment process, but phosphorus is the subject of a joint study between the NJDEP and most of the wastewater treatment plants (including the MCJM) along the Upper Passaic River to determine whether it is a controlling nutrient and, if so, what reductions should be allocated to point and non-point sources.

New stormwater regulations were introduced by the NJDEP in 2004, which primarily address non-point source pollution. These regulations require municipalities to pass ordinances on litter, pet waste disposal, feeding of wildlife, fertilizer and pesticide use, and illicit sewer connections. It also requires development of stormwater management plans and sets standards for street sweeping, leaf collection and disposal of materials from catch basins, some of which were similar to what Chatham Borough's DPW already had in place.

Chatham Borough and Chatham Township and their Environmental Commissions have closely followed the development of non-point source pollution reduction measures and stormwater regulations. They have worked with the Great Swamp Watershed Association and the Association of New Jersey Environmental Commissions and Morris County to develop model ordinances and land use regulations in these areas. In the Fall of 2003 and the Spring of 2004, Chatham Borough's Environmental Commission coordinated the construction of a 280 foot long earthen berm at Shepard Kollock Park using NJDEP grants and donated labor and plant materials. The purposes of this landscaped berm and the reduced mowing of grass along the river banks are to provide a natural barrier to contaminated runoff, which will allow plants to take up many of the nutrients, and also provide a better habitat for birds, butterflies and other wildlife along the river.

Figure 12

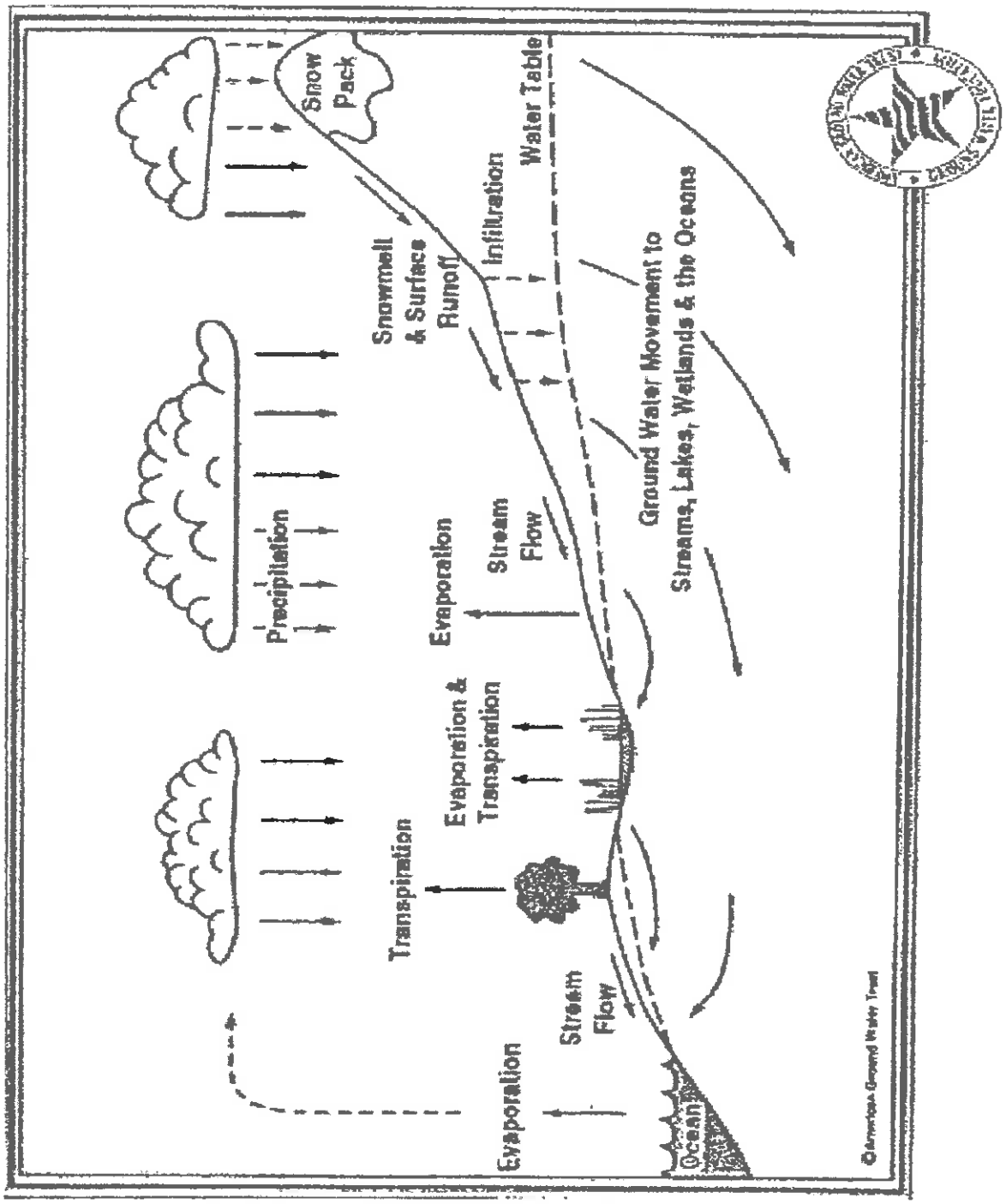


Figure 12 Hydrologic Cycle

Figure 13

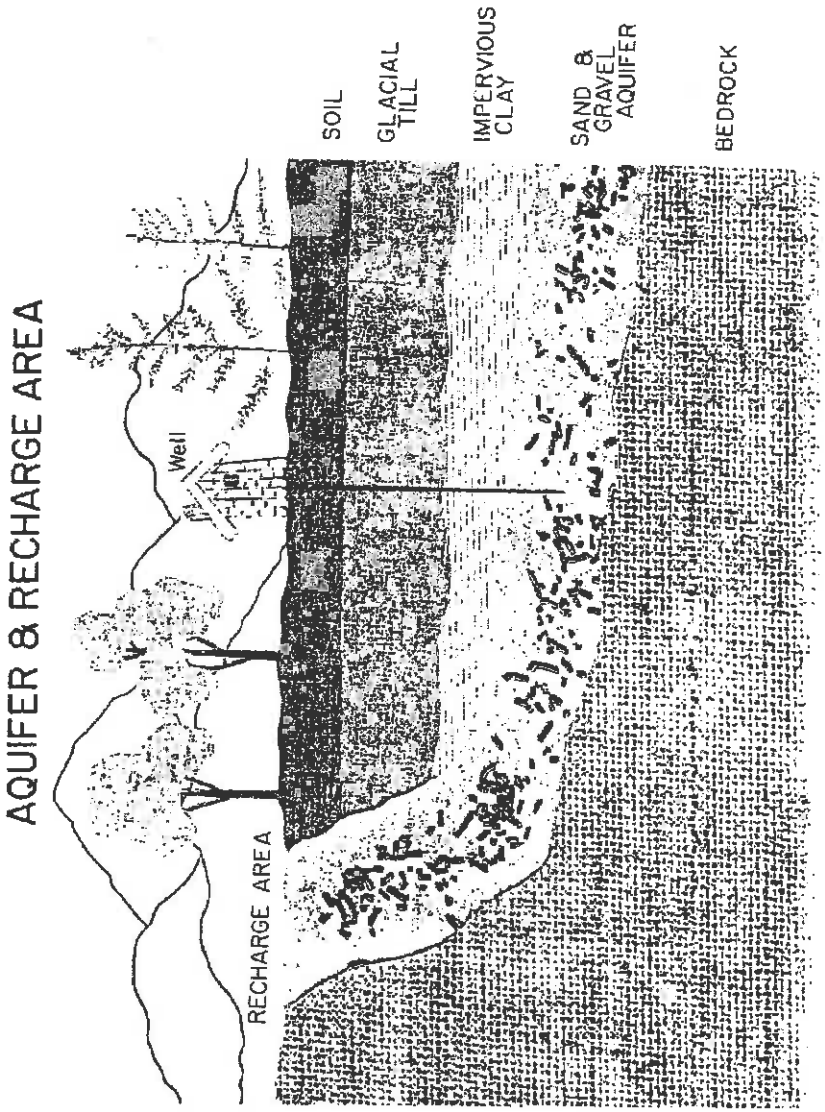


Figure 13 Aquifer and Recharge Area

Figure 14

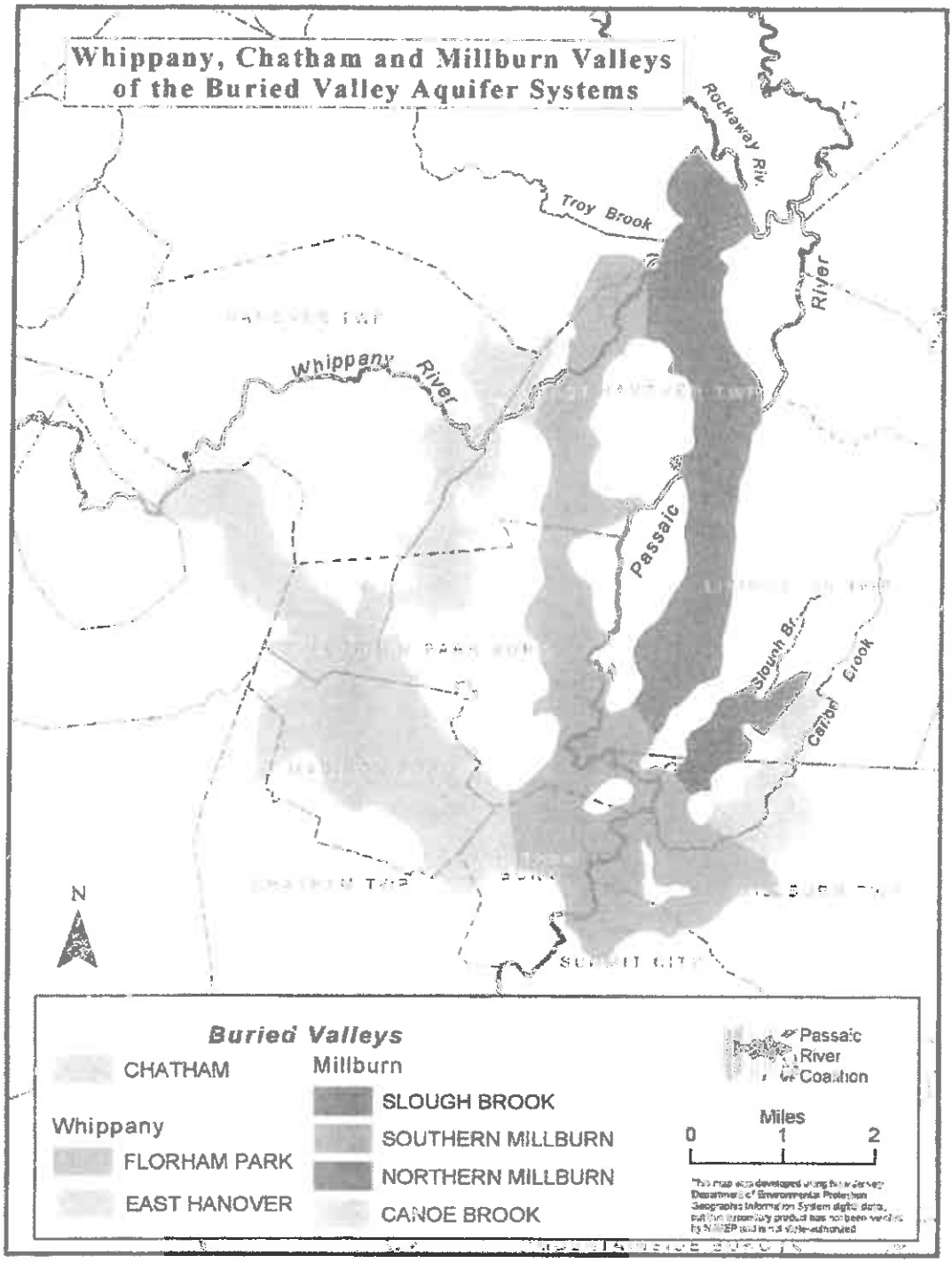


Figure 14 Buried Valley Aquifer Systems

Figure 15

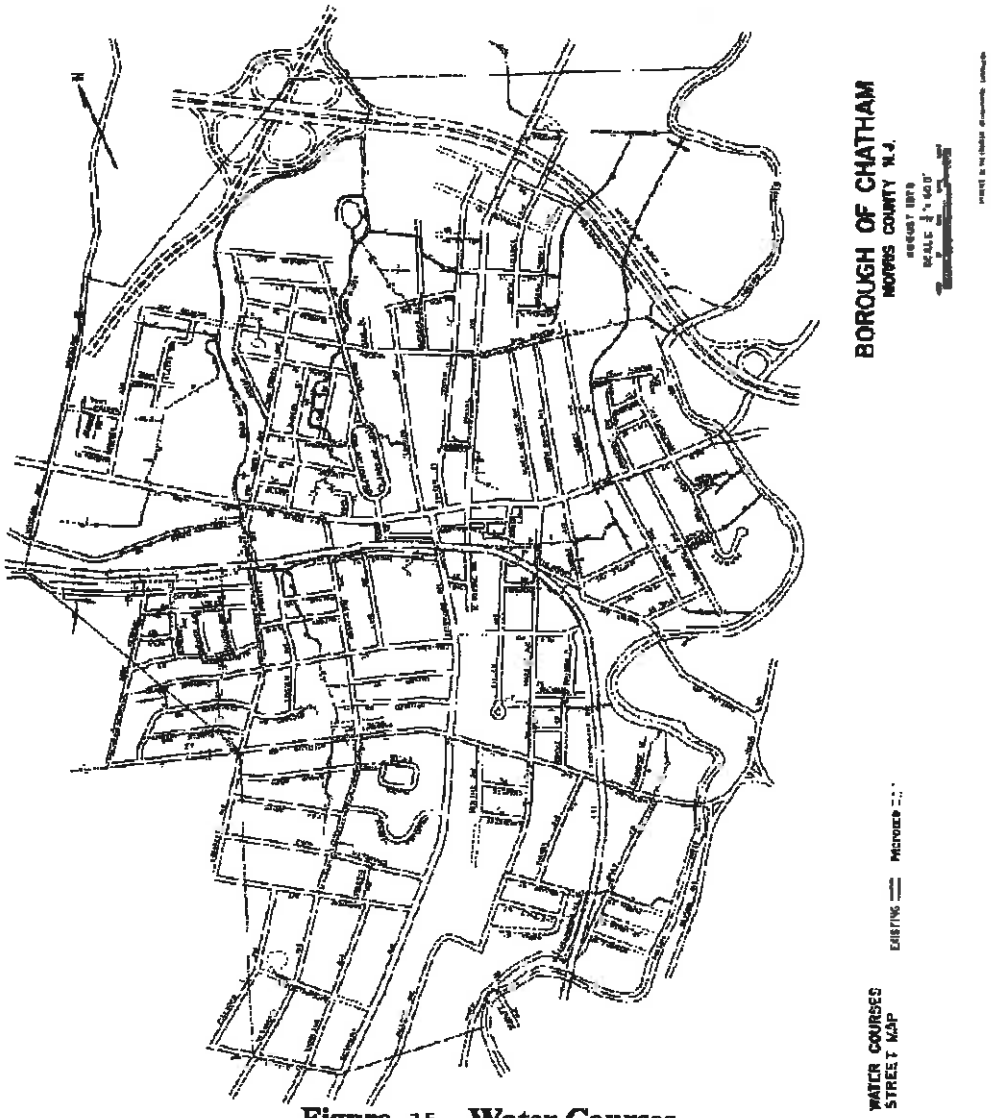


Figure 15 Water Courses

Figure 16

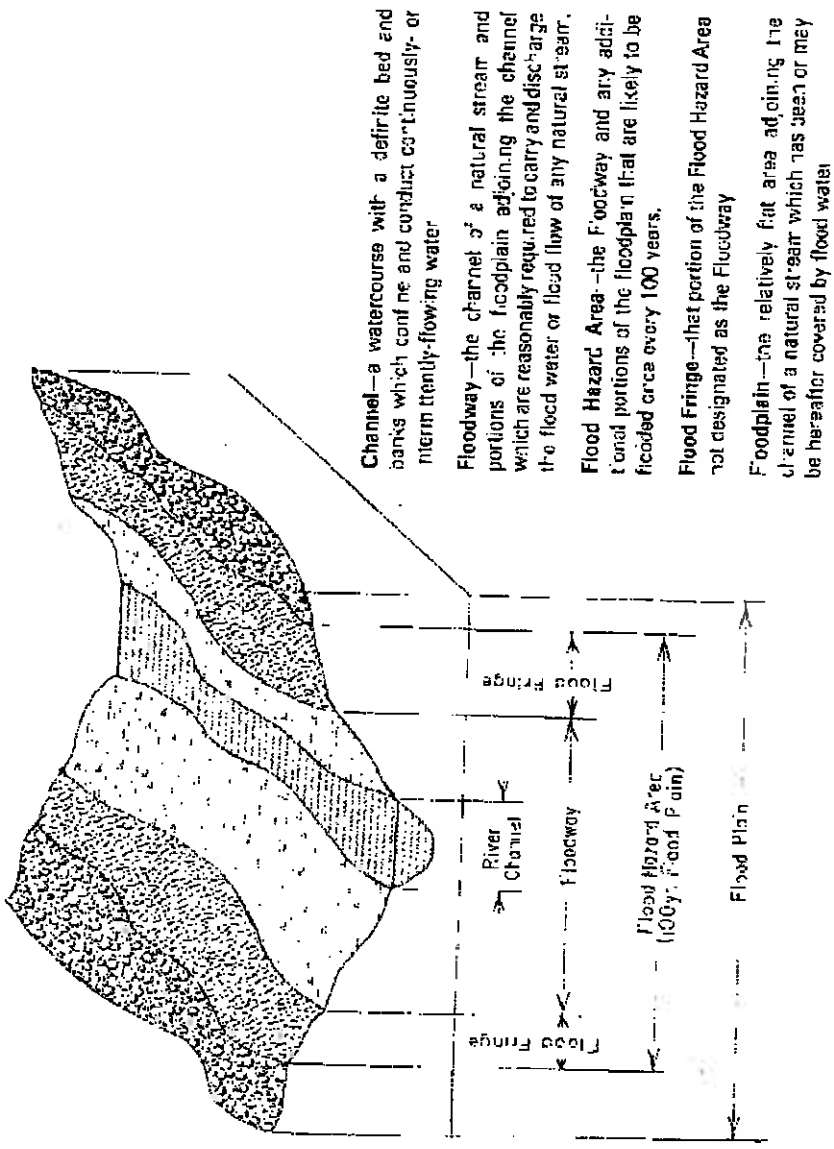


Figure 16 Diagram of Floodplain Areas

Figure 17

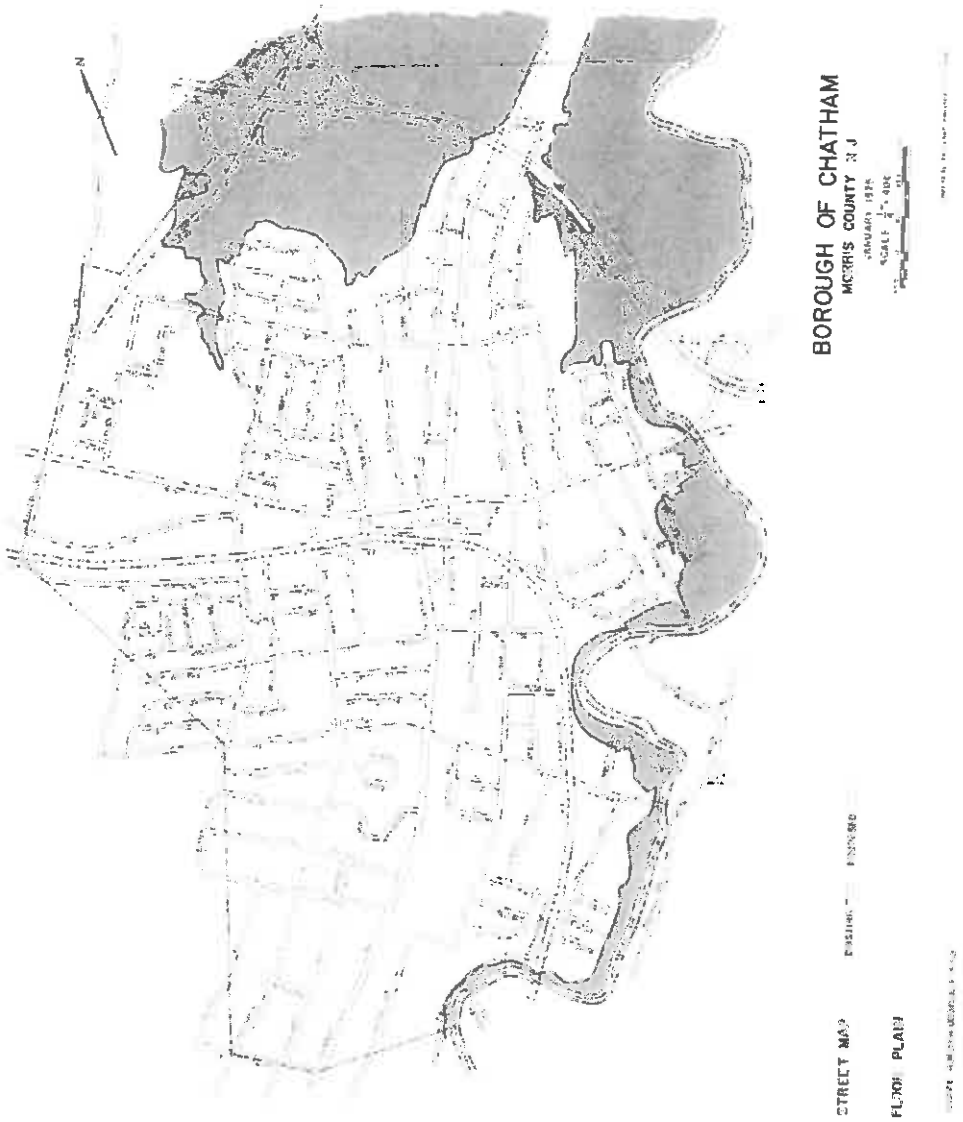
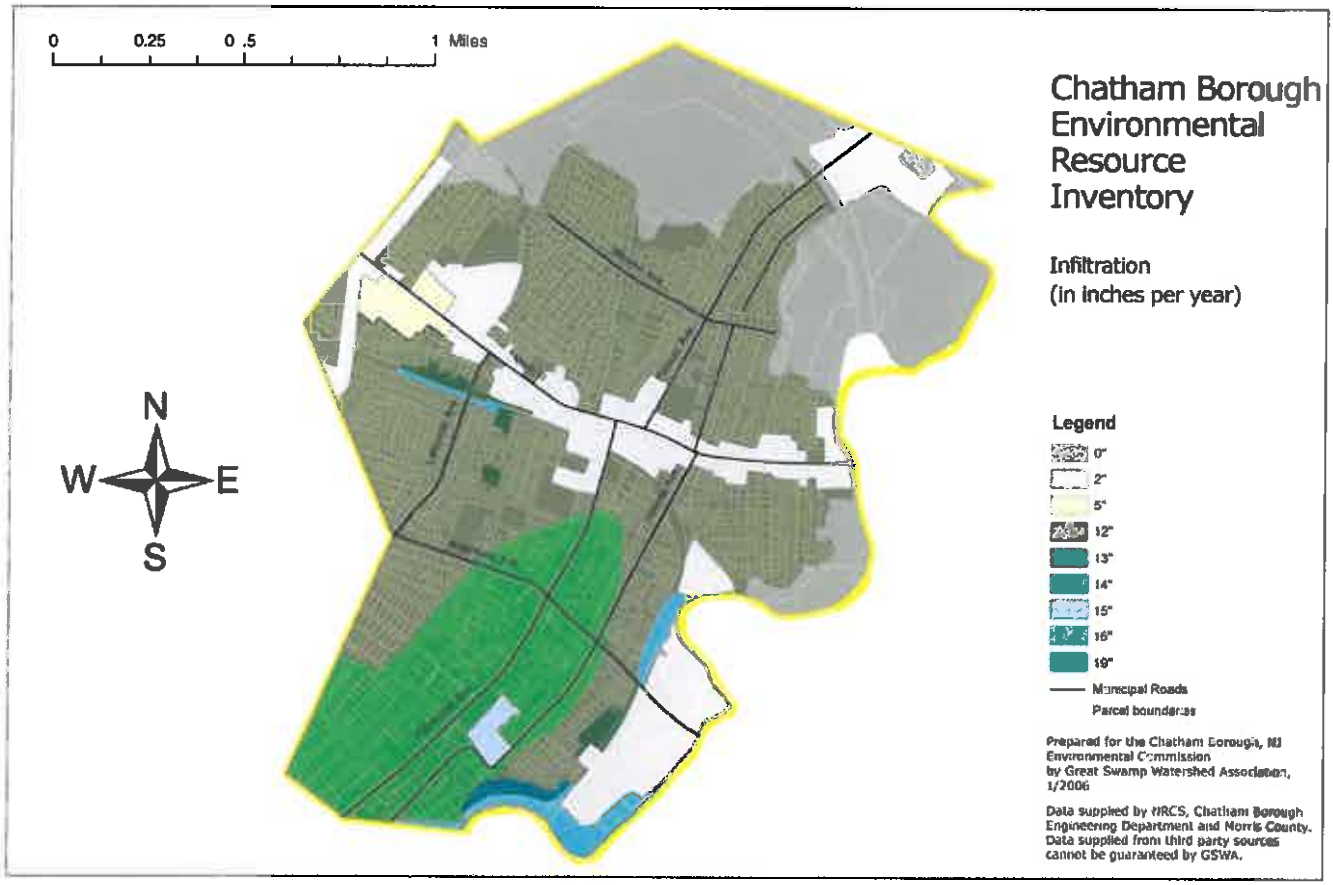


Figure 17 Floodplain Map

Figure 18


0
0.25
0 .5
1 Miles
N
W
E
S
Chatham Borough Environmental Resource Inventory
Infiltration
(in inches per year)
Legend
0"
2"
5"
12"
13"
14"
15"
16"
19"
Municipal Roads
Parcel boundaries
Prepared for the Chatham Borough, NJ Environmental Commission by Great Swamp Watershed Association, 1/2006
Data supplied by NRCS, Chatham Borough Engineering Department and Morris County. Data supplied from third party sources cannot be guaranteed by GSWA.

Figures 19 and 20

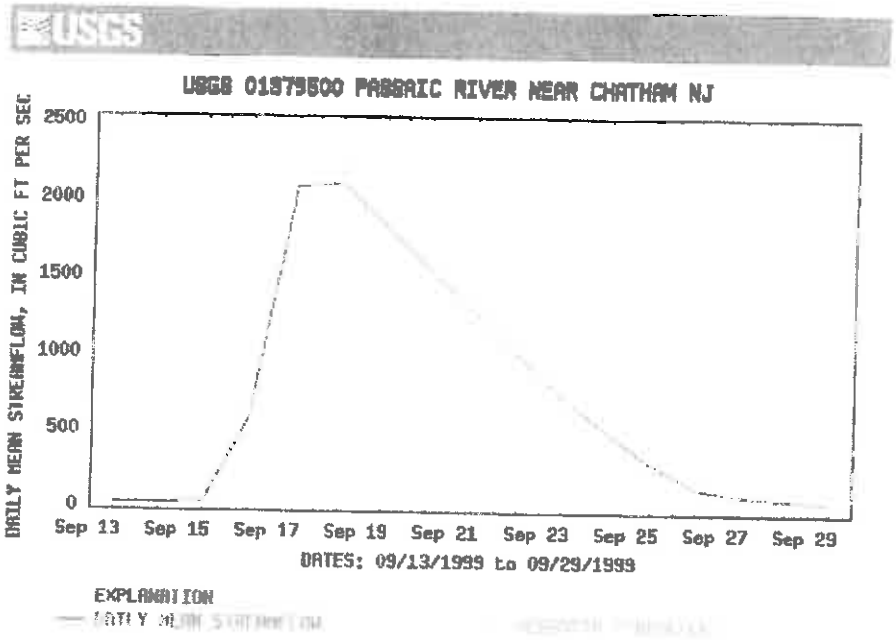


Figure 19 Tropical Storm Floyd Hydrograph

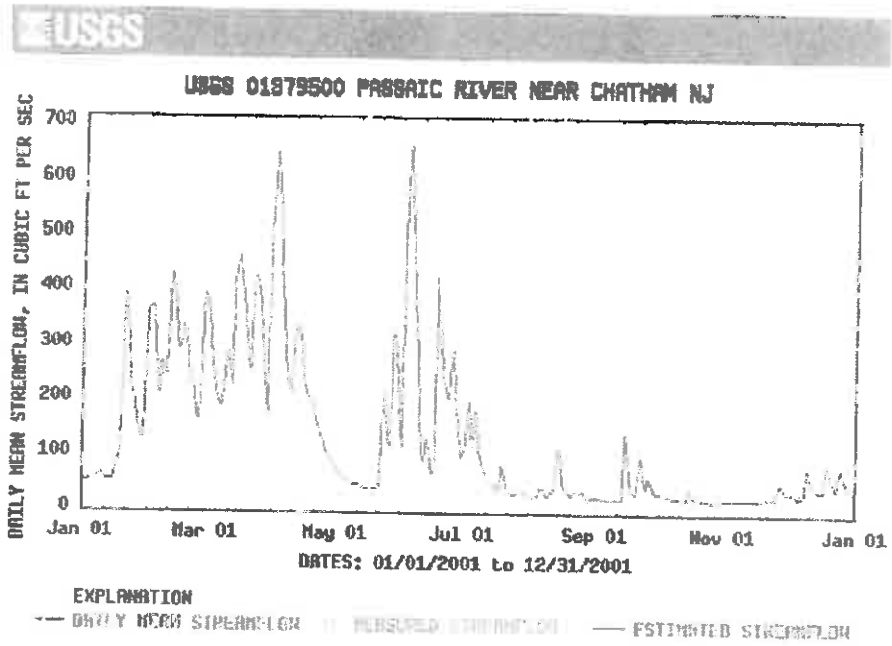


Figure 20 Passaic River Flows - 2001

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Chatham Borough Environmental Inventory - Soils

Formation of the Soils

Soil is a natural body on the earth's surface in which plants grow. It is a mixture of varying proportions of rock, minerals, organic matter, water and air. The main constituents are rock and mineral particles produced by the weathering process from the parent material of the soil. The parent material of soil is either local bedrock or material brought to its location by glacial ice, water, wind or environmental forces. These particles become mixed with decaying vegetation and animals that have fallen to the ground. The spaces between the combination of organic and inorganic particles fill with air and water and the end result is soil.

Soil Characteristics

Soils differ from one to the other in different localities and within short distances. The chemical composition and physical structure of the soil at any given location is determined by the kind of geological material from which it originates, by the vegetation cover, length of time that soil has been weathered, by the topography and by artificial changes caused by human activities.

The general texture of a soil depends on the proportions of particles of various sizes of which it is constituted. Soil particles are arbitrarily divided into sand, silt and clay. Particles of sand range in size from 2 to 0.05 mm. in diameter, those of silt from 0.05 to 0.002 mm. and those of clay smaller than 0.002 mm. In general, sand particles can easily be seen by the naked eye and feel rough or gritty to the touch. Silt particles can scarcely be seen without the aid of a microscope and feel like flour when rubbed through the fingers. Clay particles are invisible to the naked eye and form a gummy mass when wet.

Soils are classified according to the proportions of sand, silt and clay. Single soil classes seldom exist alone. Soil scientists use terms like sandy clay, silty clay, clay loam, sandy clay loam, silty clay loam, sandy loam, silt loam and loamy sand. Loam soils, for example, contain 7 to 27 percent clay, 28 to 50 percent silt and less than 52 percent sand.

The texture of a soil greatly affects its productivity. Soils with a high percentage of sand are usually incapable of storing water to provide the best plant growth and lose large amounts of plant-nutrient minerals by leaching to the subsoil. Soils containing a larger percentage of finer particles, for example, the clays and loams are excellent reservoirs for water and contain readily available mineral materials. Heavy clay soils composed largely of clay particles, however, tend to contain a water excess; these soils have a gummy texture rendering them resistant to cultivation and are frequently inadequately aerated for normal plant growth. The chemical composition of clay also allows the water to bond to the individual particles. The effectiveness of the bonding is increased by the unusually high surface-to-volume ratio of the clay particles. As a result, clay expands when wet. As it dries, it shrinks and cracks.

The organic fraction of soils is composed of undecayed plant and animal debris, together with variable amounts of an amorphous organic material called "humus". This organic fraction makes up 2 to 5 percent of the surface soils in humid regions, but may be less than 0.5 percent in

dry and sandy soils or more than 95 percent in peat soils. Peat soils or muck are typically located in swamp and marsh areas. An unusual characteristic of peat soil is its ability to burn when dried and ignited because of its high carbon content. A rough estimate can be made by observing the color of the soil; usually the darker the soil, the higher the percentage of organics. The spaces between the minerals and organic materials are occupied by water or air. The relative amount of water and air in soil depends on local precipitation and on the properties of the soil itself.

Water flows through the soil under the force of gravity until it reaches a depth at which all of the space between the particles is filled with water. This level is called the "water table". The depth of the water table below the surface of the ground varies with time, depending on precipitation level. In general, the water table reaches a high point in the late spring. The long-term average level of this high point is called the "seasonal high water table". It can be determined at any specific location by color changes in the soil. Long-term presence of water gives the soil a grayish color, whereas soil that has fairly steady exposure to air is a brownish or reddish color due to oxidation of iron in the soil particles. Red color in a soil, therefore, is generally an indication that the soil is well drained, not excessively humid and fertile. This generalization is particularly true in the southeastern United States but is not always true in other parts of the world, where reddish color in the soil may be the result of freshly formed mineral materials not chemically available for plant use. Grayish soils may be deficient in iron or oxygen, or these soils may have an excess of alkaline salts such as calcium carbonate. The gray discoloration is also present in soils that are flooded regularly.

Soil Profiles

Water that infiltrates into soil sorts the soil materials by carrying the finer particles into deeper pore spaces and leaving the coarser particles in place. The simultaneous process of accumulation takes place over a long period of time. The surface layer, or "A" horizon, is referred to as the topsoil or zone of leaching. The farmer is primarily interested in the properties of the "A" horizon, while the engineer is concerned with deeper layers that remain after the "A" horizon has been removed from a construction site.

The "B" horizon is called the sub-soil or zone of accumulation of material leached from the "A" horizon or formed in places as a result of weathering. Most soils in Morris County have a "B" horizon in which clays and associated oxides of iron and aluminum leached from the "A" horizon have accumulated. The "B" horizon is generally firmer and lighter colored than the "A: horizon but darker colored that the "C" horizon. Younger soils have a weakly developed "B" horizon. The "C" horizon is below the "A" and "B" horizons. It consists of material that is little altered by the soil forming process but may be modified by weathering. The "C" horizon is commonly called "parent material". This layer varies in depth from just a few feet to tens of feet.

Most of the soils in Morris County have distinct subsoil. It is believed that some of the lime and other soluble salts were leached before the translocation of iron and clay took place. Well-drained and moderately well-drained soils in Morris Country have a yellowish-brown or reddish-brown subsoil. These colors are mainly caused by thin coatings of iron oxides or sand and silt grams.

The infiltration rate is the rate at which water enters the soil at the soil surface. It is controlled by surface conditions. Hydrologic soil groups (HSG) are used to estimate runoff from precipitation. HSG also indicates the transmission rate -- the rate at which the water moves within the soil. This rate is controlled by the soil profile. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long duration storms. The four hydrologic soil groups are:

Group A: Soils having a higher filtration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well-drained to excessively-drained sand or gravely sand. These soils have a high rate of water transmission (greater than 0.30 in/hr).

Group B: Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well-drained or well-drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission (0.15 - 0.30 in/hr).

Group C: Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission (0.05 - 0.15 in/hr).

Group D: Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay that has high shrink-swell potential, soils that have a permanent high water table, soils that have a clay pan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission (0 - 0.05 in/hr).

As a result of urbanization, the soil profile may be considerably altered and the listed group classification may no longer apply. In these circumstances, use the following to determine HSG according to the texture of the new surface soil, provided that significant compaction has not occurred:

HSG Soil Textures

A) Sand, Loamy Sand or Sandy Loam

B) Silt Loam or Loam

C) Sandy Clay Loam

D) Clay Loam, Silty Clay Loam, Sandy Clay, Silty Clay or Clay

Some soils in the list are in Group D because of a high water table that creates a drainage problem. Once these soils are effectively drained, they are placed in different groups. Well drained, coarse texture soils with high infiltration capacity minimize surface runoff. Extensive root development in the surface layer also increases infiltration; bare, compacted soil increases runoff.

The physical characteristics of soils vary greatly. Analysis of Morris County soils is found in a soil survey completed by the US Department of Agriculture's Soil Conservation Service (S.C.S) and published in 1976. Soil scientists using geological and topographical maps and aerial photographs did this study. On-site investigations were also made by the soil scientists going through the different areas observing the length and shape of slope of the terrain, and the texture, color, mineralogy, permeability, water level and depth of soils. In order to analyze the soil characteristics, samples were taken using auger borings to a depth of 5 feet, or observations were made in pits by a backhoe to a depth of 8 to 10 feet. In developed areas, road cuts and foundation holes were observed.

Detailed descriptions of each soil series found in the area are given as well as interpretations about the potential use of each soil for farming, roads, dwellings, recreation, septic systems, engineering and other uses. Engineering properties such as depth of bedrock, seasonal high water table percolation rate, drainage potential, shrink-swell potential, etc., are also included. Limitations for soil uses are expressed as slight, moderate and severe. These terms are defined as follows:

> Slight Soils are relatively free of limitations affecting the intended use, or with limitations that are easy to overcome by use of normal equipment and/or methods.
>
> Moderate Soil properties are unfavorable but can be overcome by careful planning, design and management at somewhat greater costs.
>
> Severe Soil properties are unfavorable resulting from the effects of steep slopes, high water table, stream flooding, unfavorable soil texture, acidity, large numbers of stones, rock, etc. The limitations are such that they can be overcome only by exceptional, costly or complex measures.

Chatham Borough Soils

The Soils Map of Chatham Borough is taken from the Morris County Soil Survey. It shows the location of the different soil series and their relation to other landscape features. A soils series consists of all of those soils that are essentially alike in all major profile characteristics except the texture of the surface layer. Each area on a soil layer is identified by a series of letters and numbers. The first capitalized letter and any lower case letters that may follow are abbreviations for the name of the soil series (Pt for Pompton). The second capital letter signifies the average percent of slope of the area; nearly flat land is classified as A, and as the slope increases the lettering progresses from A to E or F. If the digit 2 is appended to the slope category, it denotes eroded soil. "No A" is Norton soil nearly flat. "No C2" is Norton Soil with a slope from 6% to 12% which has undergone prior erosion. The soils series plus its slope designation is called a "soils type". Soil series names like "Norton" usually derive from the place where a soil with a particular set of characteristics was first analyzed. These names have been systematized on a national basis by the SCS.

The General Soil Map is shown in Figure 18. Chatham Borough soils fall into three main soil associations. A soil association is a landscape with a distinctive pattern of soils, consisting of one or more major soils and several minor soils. The majority of soils in Chatham Borough

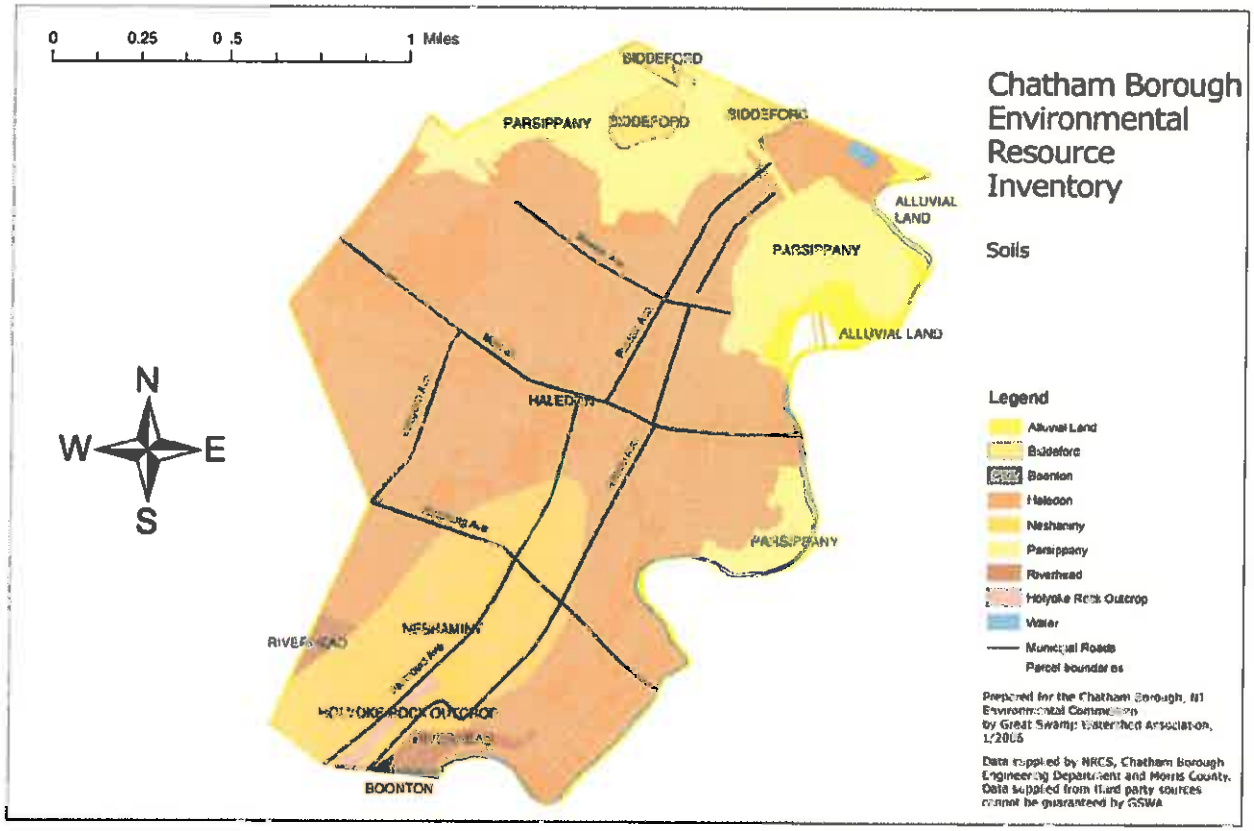
are classified as urban, which means they have been stirred, excavated or filled from between 20% to 80%. The source of the soils does, however, allow them to be divided into three relatively distinct areas.

Soils in the southern part of Chatham are primarily derived from the bedrock they over lay. The soils are classified as Urban Neshaminy (Uk) and are formed from the weathering of granite gneiss, red and brown shale and red and brown sandstone. Depth of bedrock is variable, and ranges from 1 foot to more than 10 feet. This complex is deep over a water table and has moderate permeability (Group B), rapid runoff, and a moderate to severe hazard of erosion.

The central part of the Borough consists primarily of soils in the Urban Haledon (Uh) Association. These soils are derived from glacial till that was deposited in this area. These soils are gently sloping silt loams, gravelly loams and stony loams. These soils generally have a high percentage of silt and fine sand.

The third soil classification is located in the northern section of the Borough in generally wooded and nearly level areas. These soils are classified as Parsippany or Biddeford, which are derived from the former basin deposits of glacial Lake Passaic. The soils in this area are poorly drained and contain a large percentage of clay. The water table is often near the ground surface during most of the winter and spring.

Figure 21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PARSIPPANY
NESHANNIN
RIVERHEAD
BOONTON
Chatham Borough Environmental Resource Inventory
Soils
Legend
Alluvial Land
Biddeford
Boonton
Haledon
Neshanny
Parsippany
Riverhead
Holyoke Rock Outcrop
Water
Municipal Roads
Parcel boundaries
Prepared for the Chatham Borough, #1 Environmental Commission by Great Swamp Watershed Association, 1/2005
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Chatham Borough Environmental Inventory - Vegetation

General

The eastern part of the United States enjoys deep humus soils, which can support heavy vegetation, forests, understory trees, shrubs, and herbaceous material.

New Jersey is located in one of the largest vegetative formations in this entire area, the Eastern Deciduous Forest Region. The varied geologic processes that have taken place in New Jersey have resulted in a very diverse and complex landscape, which provides an amazing variety of plant habitats for so small an area. Alternating periods of volcanic activity and inundation by the ocean; lifting, folding, and erosion of the land; and advancing and retreating glaciers have created a variety of landforms, rock materials, soils, and drainage patterns that are responsible for such divergent nonconforming places as sand dunes and cedar bogs. Our varied topography accounts for no less than 12 distinct major plant habitats.

Of these 12 habitats, two are represented in Chatham: North Jersey floodplains – relatively flat areas with wet conditions much of the time as a result of periodic inundation and generally poor drainage; and North Jersey uplands – higher lands, often with slopes and valleys, with good, but not excessive drainage.

Floodplain forests contain a rich diversity of plant growth. In the more poorly drained locations, typical trees include ash, pin oak, swamp white oak, silver maple, red maple, elm, and black gum. In the better drained outer floodplain, these may be joined by willow, river birch, sycamore, and box-elder. Most common shrubs are spice bush, arrow-wood, witch hazel, and some varieties of viburnum. Where the forest has been opened either by cutting or fallen trees, vines grow rampantly. These include poison ivy, Virginia creeper, Japanese honeysuckle, bittersweet, and wild grape. A great variety of herbaceous plants will be found, such as spring wildflowers (skunk cabbage, mayapples, jack-in-the-pulpit, spring beauties, dogtooth violets, etc.), ferns, sedges, and mosses.

In the upland habitats, three forest types may be found: Mixed Oak, Sugar Maple-Mixed Hardwoods, and Hemlock-Mixed Hardwoods. Temperature, exposure, and type of underlying rock formation have a bearing on these distinctions, but it is speculated that the Mixed Oak woods are largely the result of man's interference, through notable cutting and burning.

Chatham's upland woods are of the Mixed Oak type. Ample evidence of this is found in the number of large oaks growing throughout the community. (In a contest to find the largest tree in town, approximately two-thirds of the trees reported were oaks.)

In a typical Mixed Oak forest, red, white, and black oak dominate. Also to be found are scarlet and chestnut oak, hickories, red and sugar maple, ash, beech, elm, black cherry, and tulip trees. Understory trees include dogwood (the dominant species), sassafras, hop hornbeam, and ironwood. Typical shrubs include spice bush, viburnums, witch hazel, red and gray dogwood, and, in some instances, heath shrubs, including blueberries. The vines are much the same as in the floodplain woods, as are the herbaceous plants, with the addition of some species preferring better drainage.

Chatham's Vegetation

The area that comprises Chatham Borough was originally all essentially woodland, except for some marshy area in the floodplain. Here, as in most of New Jersey, the vegetation has from earliest times been altered by man's activities. Burning the woods to clear them of underbrush was a common practice among the Indians throughout the East, not only to provide the open woods preferred by many types of game, but also to facilitate travel. In addition, sites were cleared for villages, and wood was cut for utensils, canoes, shelter, and fuel.

With the coming of colonization, far greater changes took place. Land was cleared for farming. In areas not suitable for farming, forests were used as a place to graze livestock, and, even more importantly, for timber and firewood.

Our remaining open areas provide good examples of typical floodplain and upland woods of North Jersey.

Importance of Vegetation

Esthetic Value

It is difficult to think of anything that has more impact on the character or "feel" of a community than its vegetation. Even a community of outstanding architecture would appeal to few people if totally lacking in greenery, whereas one of frankly mediocre buildings can be nonetheless appealing if graced with particularly lovely or striking vegetation, either planned or natural. Seasonal changes of color enhance the landscape in both built-up and open-space areas.

The borough has five Landmark trees (defined as any exceptionally old, large in height or breadth, or any unique tree) that particularly add to its beauty:

Tree	Location
Gingko	Stanley Congregational Church
White Oak	Ogden Memorial Presbyterian Church
Elm	Orchard Road
Evergreen	Hillside Avenue
Larch	North Summit Avenue

Practical Values

Most fundamental of these practical values is man's complete dependence on vegetation for his existence. Plant life alone, through the process of photosynthesis, can convert non-living materials (carbon dioxide and water) into food for man's direct or indirect consumption. And only plant life produces oxygen in this process in a form compatible with human respiration.

In addition, wetlands provide protection against flooding and erosion and provide water storage; floodplains act as safety valves for flooding rivers and streams and help to replenish underground water supplies; forests protect slopes from erosion and loss of soil fertility, minimize run-off, and increase the rate of water infiltration into the ground.

Buffer zones are also integral to the protection of water resources. A buffer zone comprising shrubs and native trees along the Passaic River at Shepard Kollock Park provides protection to the river from pollution caused by run-off and prevents soil erosion while stabilizing the riverbank. This protection serves to improve the water quality for downstream users.

Making Life More Comfortable

Vegetation also does much to mitigate some of the unavoidable discomforts of life. For one thing, it has a moderating effect on climate. In summer, wooded areas act as natural air conditioners, often resulting in temperatures ten degrees lower than those in the city. Air currents spread the benefits of these lower temperatures to surrounding neighborhoods. In wintertime, these same areas form a protective windbreak; if evergreens are present, they can reduce wind velocity by as much as 60%, thus reducing the wind chill factor substantially.

Cleaner air is another plus provided by generous amounts of greenery, as trees and shrubs filter out large amounts of dust and pollution.

A further benefit is noise reduction. A 100-foot width of woodland is believed to absorb six to eight decibels of sound. Since a busy highway is said to generate up to 72 decibels, the value of wooded buffer strips between highways and homes is evident.

Conclusion

It is of utmost importance that we take steps to assure that our floodplains, woods, and natural vegetation areas be protected for both esthetic and practical reasons.

Note: Appendix A lists vegetation of Chatham Borough. Appendix B illustrates some common tree varieties.

Vegetation of Chatham's Woods and Fields

TREES

Ailanthus	*Ailanthus altissima* #
*Ash, White	*Fraxinus americana*
*Beech, American	*Fagus grandifolia*
*Birch, Black	*Betula lenta*
*Birch, Gray	*Betula populifolia*
*Birch, River	*Betula nigra*
Butternut (White Walnut)	*Juglans cinerea*
*Cherry, Black	*Prunus serotina*
*Cherry, Choke	*Prunus virginiana*
*Cherry, Sweet	*Prunus avium*
Crabapple	*Malus sp.*
*Dogwood, Alternate leaved	*Cornus alternifolia*
*Dogwood, Flowering	*Cornus florida*
*Elm, American	*Ulmus americana*
*Hickory, Pignut	*Carya glabra*
*Hickory, Shagbark	*Carya ovata*
Hornbeam, American	*Carpinus caroliniana*
Locust, Black	*Robinia pseudoacacia*
*Maple, Ash-leaved (Box Elder)	*Acer negundo*
*Maple, Norway	*Acer platanoides* #
*Maple, Red	*Acer rubrum*
*Maple, Silver	*Acer saccharinum*
*Maple, Sugar	*Acer saccharum*
Mulberry, White	*Morus alba*
*Oak, Pin	*Quercus palustris*
*Oak, Red	*Quercus rubra*
*Oak, Swamp White	*Quercus bicolor*
*Oak, White	*Quercus alba*
Sassafras	*Sassafras albidum*
*Shadblow (Shadbush)	*Amelanchier sp.*
Sycamore, American	*Platanus occidentalis*
*Tulip tree	*Liriodendron tulipifera*
Walnut, Black	*Juglans nigra*
*Willow, White	*Salix alba*

SHRUBS

Barberry, Japanese	*Berberis thunbergii* #
Bladdernut	*Staphylea trifolia*
*Blackberry	*Rubus allegheniensis*
*Dogwood, Gray Stemmed	*Cornus racemosa*
*Dogwood, Red Osier	*Cornus stolonifera*
*Dogwood, Swamp	*Cornus amomum*
*Elderberry	*Sambucus canadensis*
Honeysuckle, Tartarian	*Lonicera tatarica*
Privet	*Ligustrum sp.*
Raspberry, American Red	*Rubus idaeus strigosus*
Raspberry, Black	*Rubus occidentalis*
Spicebush	*Lindera benzoin*
*Sumac, Smooth	*Rhus glabra*
Rose	*Rosa sp.*
Viburnum, Arrowwood	*Viburnum dentatum*
Viburnum, Maple leaved	*Viburnum acerifolium*
Viburnum, Nannyberry	*Viburnum lentago*
Wineberry	*Rubus phoenicolasius*
Witch hazel	*Hamamelis virginiana*

VINES

Bindweed	*Convolvulus sp.*
Clematis	*Clematis sp.*
Climbing False Buckwheat	*Polygonum scandens*
*Grape	*Vitis sp.* #
*Greenbrier	*Smilax sp.*
Honeysuckle, Japanese	*Lonicera japonica* #
Myrtle (Periwinkle)	*Vinca minor*
*Poison Ivy	*Rhus radicans*
*Virginia Creeper (Woodbine)	*Parthenocissus quinquefolia*

sp. (plural spp.) = unidentified species
var. = unidentified variety

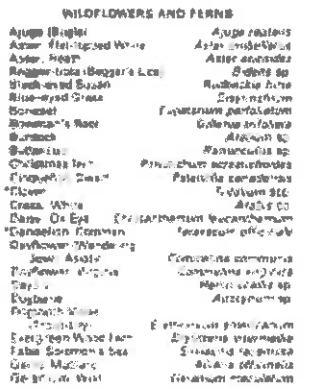
- INVASIVE SPECIES

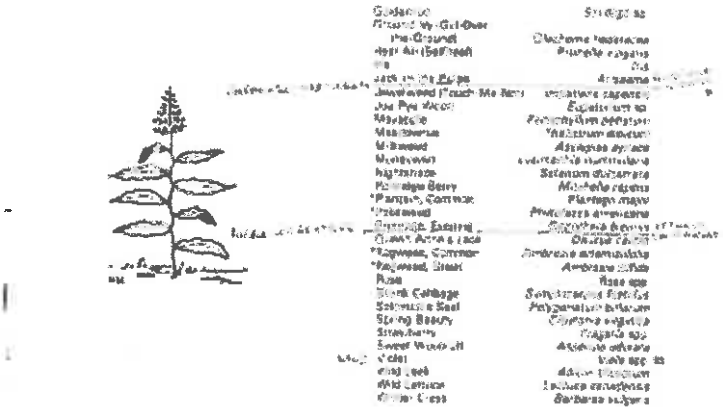
* [illegible]

[illegible]

NJ 226,942,653v2

Wildflowers and Ferns





PICTURE PAGE (LEAVES)

Red Oak

Pin Oak

White Oak

Ash-leaved Maple

Red Maple

Silver Maple

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Chatham Borough Environmental Inventory - Wildlife in Chatham

Chatham is a suburban community with an amazing amount of wildlife considering that the town is almost completely developed. Chatham has 202 acres of wetlands, 98 acres of uplands and 17 acres of marshy wetlands. Chatham is also well wooded along the Passaic River and throughout the town. Much of this is old growth, which appeals to many species of birds. Milton Woods, Wuhala Woods, Shepard Kollock Park and Stanley Park provide good habitat for our wildlife.

Habitat in Chatham consists of sunny open and wooded yards and town-owned parks and wooded areas. Any habitat that will support wildlife must provide food, water, protective cover and reproductive space for the territorial needs of the various species. In the past, Chatham was probably home to bobcat, bear, river otter, beaver, wild turkey and mink. Today we still see an occasional bear, river otter or wild turkey. Because of our proximity to the Great Swamp National Wildlife Refuge, we see wildlife that we might not normally see, i.e. coyote, red fox. Many mammals, particularly the white-tailed deer, have adapted to living with man in our suburban area. Does and fawns are a familiar sight in spring and summer.

Our avian friends also require the availability of food, water and protective cover. Because of our town's habitat, we have a great diversity of bird life. In the past 2 years, 89 species of birds have been sighted. We have resident as well as migratory birds. Before trimming back the shrubbery in the spring, we all should check to make sure that we don't have nesting birds. If you find nesting birds, wait until they are finished before trimming. The same applies to trees. The crows have particularly adjusted to suburban living as they scavenge through our garbage for breakfast.

Fish, amphibians and reptiles are found in and around the Passaic River as well as in our wetlands. Because of the characteristics of the Passaic River (slow moving), mainly scavenger fish are found. The fish we see most often are Carp and Brown Bullhead Catfish.

Habitat destruction is wildlife's biggest problem. For the future, it is important that we continue to protect, monitor and restore the habitat in our town so that we continue to have as much diversity in wildlife as possible.

Resident and Migrant Birds of Chatham - 2010

These birds have been seen over the last two years.

Blackbird, Red-winged

Cardinal

Catbird

Chickadee, Black-capped

Cowbird, Brown-headed

Crow
- American
- Fish

Dove
- Mourning
- Rock

Finch
- House
- Purple

Flicker, Northern Yellow-shafted

Gnat-catcher, Blue-gray

Goldfinch, American

Grackle
- Common
- Boat-tailed

Great Egret

Grosbeak, Rose-breasted

Gull, Ring-billed

Heron
- Great Blue
- Little Green

Hummingbird, Ruby-throat

Jay, Blue

Junco, Slate-colored

Killdeer

Kingfisher, Belted

Kinglet
- Ruby-crowned
- Golden-crowned

Mallard

Mockingbird, Northern

Nuthatch, White-breasted

Oriole, Baltimore

Owl
- Great-horned
- Eastern Screech

Phoebe, Eastern

Robin, American

Siskin, Pine

Sparrow
- Chipping
- Fox
- House
- White-throated

Starling

Swallow
- Tree
- Barn

Swift, Chimney

Thrasher, Brown

Thrush
- Hermit
- Veery
- Wood

Tit-mouse, Tufted

Towhee, Rufous-sided

Vireo
- Red-eyed
- Warbling

Vulture
- Black
- Turkey

Warbler
- Black and White
- Blackpoll
- Black-throated blue
- Black-throated Green
- Blue-winged
- Common Yellowthroat
- Northern Parula
- Redstart
- Yellow
- Yellow-rumped

Wild Turkey

Woodpecker
- Downy
- Hairy
- Pileated
- Red Belly

Wren
- Carolina
- House

Mammals Observed in Chatham

Bat, Brown
Black Bear
Chipmunk, Eastern
Coyote
Deer, White-tailed
Fox, Red
Mole
Mouse
Opossum, Virginia
Rabbit, Northern Cotton-tail
Raccoon
Rat, Norway
Skunk, Striped
Squirrel, Gray
Black
Flying
Woodchuck

Other Wildlife

TURTLES
Box
Painted
Snapping

FISH
Carp
Catfish, Brown Bullhead
Fathead Minnow
Sunfish

BUTTERFLIES
Cabbage White
Eastern Tiger Swallowtail
Monarch
Spicebush Swallowtail

MISCELLANEOUS
Cicada
Damselfly
Dragonfly
Insects - too many to list

AMPHIBIANS AND REPTILES
Bull Frog
Spring Peeper
Wood Frog
Red-backed salamander
Ring-neck Garter Snake
Corn Snake

Threatened and Endangered Species

Large nearby areas that are considered suitable for wildlife of conservation concern include the Great Swamp National Wildlife Refuge in Chatham and Harding Township and open fields in Harding Township according to the NJ Wildlife Action Plan.

The New Jersey Department of Environmental Protection (NJDEP) periodically updates their list of threatened and endangered species. This was most recently done in February, 2012, when they upgraded the status of several species and added new species to the list, and added a new category for species of special concern. At the same time the NJDEP released a major update to its Landscape Project species habitat mapping tool.

The Chatham Borough Conservation Land along the northern and eastern boundaries of the municipality, include three large tracts referred to as Milton Woods, Wuhala Woods and the River Road conservation area. In 2009 and 2010, the Environmental Commission hired three different environmental consultants to evaluate these properties for stewardship purposes, especially concentrating on invasive plant species. The consultants also identified these areas as potential habitat for certain threatened and endangered animal species.

The table below lists those species identified by residents, by the consultants and from the NJDEP Natural Heritage Program or Landscape Project, and their status according to the 2012 NJDEP listings:

Species	Status
American Bittern (Botaurus lengtiginosus)	State-listed endangered
Barred Owl (Strix varia)	State-listed threatened
Blue-spotted Salamander (Ambystoma laterale)	State-listed endangered
Bobolink (Dolichonyx oryzivorous)	State-listed threatened
Bog Turtle (Gluptemys muhlenbergi)	Federally threatened
Buttonbush Dodder (Cuscuto cephalanthi)	State-listed endangered
Cooper's Hawk (Accipiter cooperii)	State-listed species of concern
Corn Snake (Elaphe guttata guttata)	State-listed endangered
Fowlers Toad (Anaxyrus fowleri)	State-listed species of concern
Eastern Box Turtle (Lampropeltis getula getula)	State-listed species of concern
Grasshopper Sparrow (Ammodramus savannarum)	State-listed threatened
Great Blue Heron (Ardea herodias)	State-listed species of concern

Indiana Bat (Myotis sodalis)	Federally endangered
Long-eared Owl (Asio otus)	State-listed threatened
Northern Harrier (Circus cyaneus)	State-listed endangered
Northern Spring Salamander (Gyrinophilus poryphyriticus poryphyriticus)	State-listed species of concern
Red-headed Woodpecker (Melanerpes erythrocephalus)	State-listed threatened
Red-shouldered Hawk (Buteo lineatus)	State-listed endangered
Spotted Turtle (Clemmys guttata)	State-listed species of concern
Wood Turtle (Glyptemys insculpta)	State-listed threatened
Wood Thrush (Hylocichla mustelina)	State-listed species of concern

The map which follows was created using the tools available on the NJDEP website and shows the areas of Chatham Borough that may be suitable habitat for threatened, endangered or species of concern. It also shows potential vernal pond habitats.

The habitat ranks include:

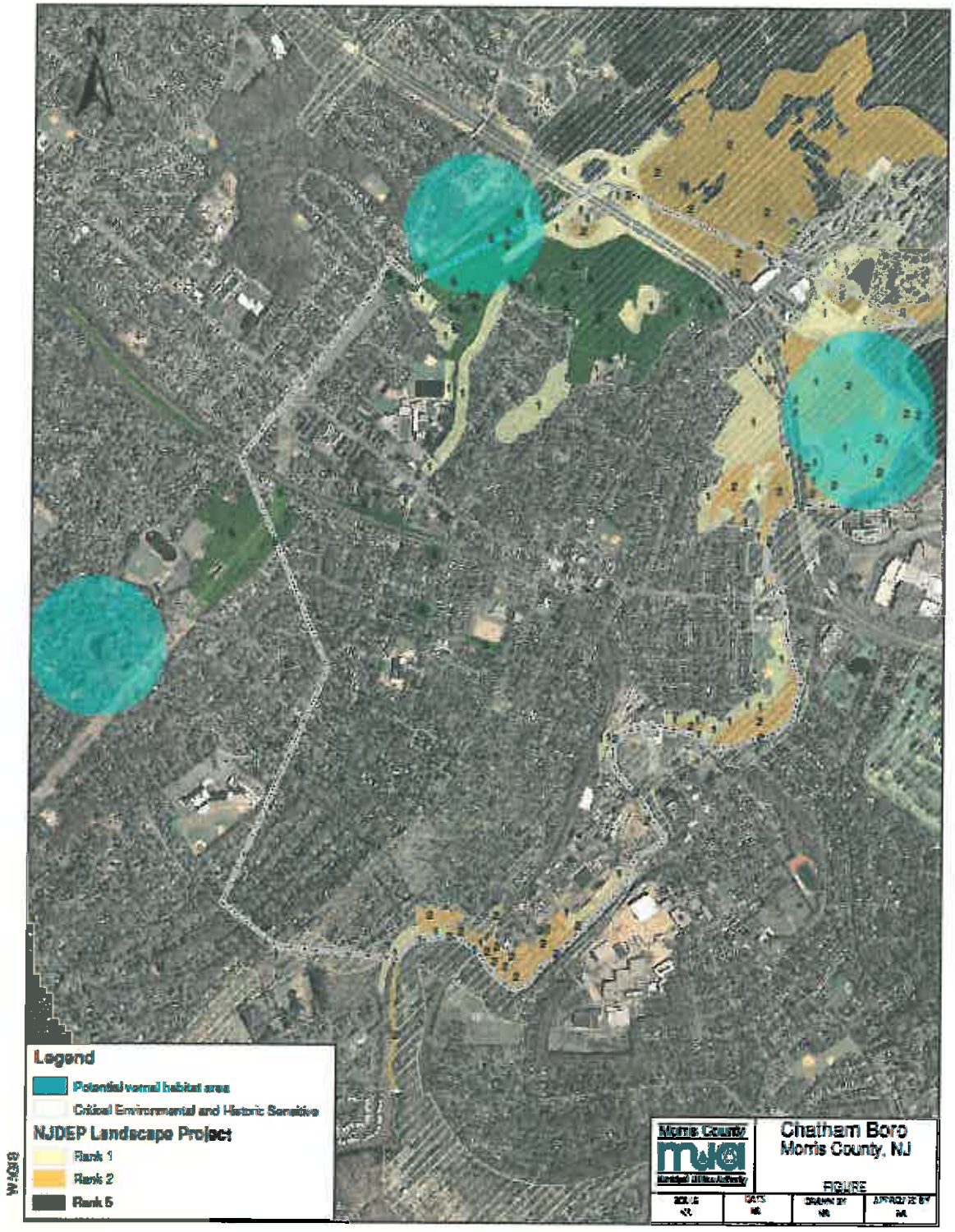
Rank 1 – assigned to species-specific habitat patches that meet habitat-specific suitability requirements, but do not intersect with any confirmed occurrences of such species.

Rank 2 – assigned to species-specific habitat patches containing one or more occurrences of species considered to be species of special concern.

Rank 3 – assigned to species-specific patches containing one or more occurrences of State threatened species.

Rank 4 – assigned to species-specific habitat patches with one or more occurrences of State endangered species.

Rank 5 – assigned to species-specific habitat patches containing one or more occurrences of wildlife listed as endangered and threatened pursuant to the Federal Endangered Species Act of 1973.



Potential Habitat for Threatened or Endangered Species

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Chatham Borough Environmental Inventory - Wetlands

Wetlands

Wetlands are lands that flood or are saturated at or near the ground surface frequently. They support the growth of vegetation that prefers saturated soil conditions. The water can come from rainfall, snowmelt, river overflow or ground water coming from beneath the soil surface. Wetlands, generally, include swamps, marshes, bogs and similar areas.

Wetlands are identified either by how wet they are throughout the year or by the type of vegetation they support. The federal definition of wetlands relies on hydric soils or the presence of wetland plants. New Jersey identifies wetlands based on a three part analysis of hydrology, soil and vegetation. A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. This definition includes several vague terms, such as "long enough during the growing season" and "in the upper part", that make the identification of hydric soils difficult and somewhat subjective.

Several types of vegetation can be used to identify wetlands. Some vegetation, referred to as obligate hydrophytes, grows only in wetlands. Obligate hydrophytes, however, comprise only 26% of the plants that grow in wetlands. Most other vegetation can grow either in wetlands or uplands. Species that can grow more often in wetlands than uplands are called facultative wetlands species. Those that are equally common in wetlands and uplands are called facultative species. Those that are more common in uplands but can be found in wetlands are called facultative upland species, and they can be found in wetlands between 1 and 33% of the time.

Wetlands provide many functions that are of value to people and wildlife. Wetlands provide for surface water storage, which is important for flood control. They assist stream flow maintenance, which preserves the aquatic habitat. Some wetlands can provide for ground water recharge, which replenishes aquifers. Wetlands related to surface water streams can provide for sediment removal and nutrient cycling, which assists in water quality protection, or in supporting aquatic life, which provides habitat for fish, shellfish and waterfowl. All wetlands serve as important habitat for fish, birds and other wildlife.

The function that any individual wetland area plays depends on its location, shape, vegetation, soils and hydrology. Wetlands along rivers can provide storage of flood waters and allow for sediment deposition. They also can provide habitat for fish, waterfowl and water birds, such as herons and bitterns.

Almost all amphibians depend on wetlands for survival. Amphibians breed in wetlands and many spend their entire lives in wetlands. The amphibians and turtles listed in the wildlife section of this Environmental Resource Inventory can be found in Chatham's wetlands.

Birds also use wetlands as areas for nesting and feeding. Species of birds that use wetlands for habitat include not only obvious shore birds, such as herons, egrets and ducks, but also many song birds, such as sparrows, wrens, blackbirds, warblers and kingbirds.

Chatham's wetlands are associated mainly with its surface water areas. See Figure 22. The wetlands in the Northwestern section of the Borough are associated with Kelley's Pond. Those along the Eastern border of the Borough are associated with the Passaic River. The Passaic River wetlands assist in temporary storage of flood waters, sediment deposition and filtration of surface water. The wetlands near Kelley's Pond serve as a ground water recharge area. All of the Borough's wetlands provide wildlife habitat.

Figure 22

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Chatham Borough Environmental Inventory - History and Cultural Factors

Chatham's Borough's 2.4 square miles (1,533 acres) are on land that, 200,000 years ago, was near the point where several streams converged to drain through the gap in the Watchung Mountains between Short Hills and Summit currently occupied by Route 24. When, 150,000 years ago, the Wisconsin glacier moved south over this area, Chatham was at its southern boundary at what is referred to as "terminal moraine" - deposits of sand and gravel. These glacial deposits also filled the streams, which were then covered by impervious materials such as clay, creating an aquifer system known as the Buried Valley Aquifer When the glacier retreated 20,000 years ago, the glacial deposits also plugged the Short Hills gap, causing the melting ice to create a lake, known as Lake Passaic, that stretched from Far Hills to north of Paterson, was ten miles wide in places, and averaged between 160 and 200 feet deep. The retreat of the Wisconsin Glacier left Long Hill (Fairmount Avenue Hill, the third of the Watchung ridges) to the south, which had been created from earlier volcanic eruptions that had spread sheets of basalt, and marshes to the north of the gap. Except for Fairmount Avenue Hill, Chatham lay beneath Lake Passaic.

When the ice cap melted near Little Falls that kept Lake Passaic dammed, Lake Passaic drained, leaving behind the Passaic River. The glacier also left behind sand and gravel pits near present day Yale Street, at the foot of Willow Street and near the Milton Avenue School.

The Lenni Lenape Indians chose the gap at Short Hills as the easiest way to the sea where they harvested fish and shells. Chatham started as a colonial settlement on the east and west of the Passaic River (Fishawack), at the crossing used by the Indians. In the 17th and 18th centuries, land was acquired from the Indians by the British for L55, and by 1721 John Budd of Philadelphia owned nearly all the land comprising the Borough of Chatham. He subsequently sold land to John and Daniel Day, farmers and merchants, and for a time the settlement on the river known as Day's Bridge. On November 19, 1773, it was named Chatham in honor of William Pitt the Elder, Earl of Chatham. The New Jersey Assembly, on February 22, 1789, created Chatham Township, to become effective March 1806; this township included what are now Chatham Borough, Chatham Township, Madison and Florham Park.

During the American Revolution, because of its strategic position, Chatham became an important point in the maneuvers of George Washington, who chose Morristown for his headquarters because it was protected by the configuration of the land, leaving only the small area where Chatham was located to be protected.

When it was found that "villages," which Chatham had become in 1892, had no power to establish public utilities, a group of citizens led by village president Frederick Harvey Lum persuaded the state legislature to pass a special act establishing the Borough of Chatham, March 1, 1897. The first public utility was the water department in February 1898 backed by a municipal bond issue. It is still run by the Borough. This was followed by electricity in 1901, provided at first by the Borough and then by Jersey Central Power and Light. Public Service brought in gas in 1909, and the Madison-Chatham Joint Meeting for sewage disposal was started in 1911.

The area gradually developed, encouraged by the fact that it was in the path of the various transportation lines connecting the Hudson River with Pennsylvania. New Jersey's first turnpike (chartered in 1801; completed through Chatham in 1804) crossed the Passaic River at what is now Main Street. Regular stage coaches ran along this turnpike and there was considerable traffic by wagon and on foot of immigrants going to Ohio through northern Pennsylvania. The Morris and Essex Railroad was chartered on January 29, 1835, and on September 14, 1837, the first train went through Chatham. This line was eventually electrified, and on December 18, 1930, the first electric train went from Hoboken to Morristown. A trolley line authorized in August 1911 operated from Summit, entered Main Street at what is now Tallmadge Avenue and continued on Main Street to Madison. This service ended in 1928, mostly because of the growing use of automobiles.

Geologic factors were also responsible for the industrial and general development of Chatham. When glacial Lake Passaic disappeared, the Passaic River remained; the river falls more than 20 feet from the point where it enters the southern boundary of Chatham at the Stanley Avenue Bridge until it reaches the Main Street Bridge. This allowed for the building of various water-powered mills from the middle of the 18th century to about the middle of the 19th. Geologic deposits left coal and iron in northern Morris County and in Pennsylvania, which, because of the available transportation, were funneled through Chatham on the way to the coastal cities. For a number of years the sand, gravel and clay left by the glaciers were used to make building materials locally, including bricks.

At the turn of the last century, urban dwellers came to Chatham to enjoy the countryside and breath the pure "mountain air". Also, many early Chathamites were commuters, riding trains between New York and Chatham. At the beginning of the twenty-first-century, Chatham has evolved into a fully-developed residential community that is facing the impact of increasing development in surrounding communities. As it has grown, Chatham has managed to preserve approximately 13% of its land area as open space, and, with the introduction of an Open Space Tax in 2002 and the adoption of an Open Space and Recreation Plan in the same year, has initiated efforts to preserve even more of the approximately [190] acres of the remaining undeveloped land in the Borough.

Development and Population

The town developed along Main Street, starting at the Passaic River and extending west. The population of Chatham was as follows:

1900	1361
1910	1874
1920	2421
1930	3869
1940	4888
1950	7391
1960	9517
1970	9566
1980	8537

1990	8007
2000	8436
2010	8962

By the early 1980s, the remaining large tracts of undeveloped open space in the Borough were located between Main Street and Myrtle Avenue, off Hillside Avenue at the southern end of the Borough, off Willow Street and off River Road. Each of these areas was later developed: the Myrtle Avenue tract was developed into homes and offices; the area off Hillside Avenue was developed into luxury homes; Willow Street was developed into a condominium complex; and the area off River Road was developed.

Park and Recreation Land

Chatham's first park, Reasoner Park, was established in 1896 when the railroad gave land it owned between the train station (then east of Fairmount Avenue) and Main Street to what was still only a village. Then, in 1919, the town bought the land upon which the Fairview Hotel had stood and built athletic fields and a playground, dedicated to the memory of those who had served in World War I. Memorial Park, as it was and is still called, also had a swimming pool. The park was financed by donations and by sweat equity – citizens worked side by side on three community days to construct the park.

Chatham owns additional public lands and parks as follows: Wuhala Woods, 86.6 acres; Shepard Kollock Park, 13.7 acres; Garden Park, 4.1 acres; Stanley Park, 1.8 acres; Milton Avenue Woods (once known as Brookside Grove) (behind Milton Avenue School), 7 acres; conservation land behind Milton Avenue School, 87 acres; conservation land off of Tallmadge Avenue, 11.4 acres; and conservation area off of Perrin, Bonnell and St. James Streets, 12.6 acres.

In 2002, Chatham and Chatham Township jointly purchased 6.5 acres of land lying on the borders of the town and adjacent to the high school football field (Cougar Field) to establish a new park, currently referred to as Woodland Park. In 2003, Chatham purchased 50 acres of land along the Passaic River from the New Jersey American Water Co. to add to Wuhala Woods.

Solid Waste and Recycling

Previously, Borough residents and commercial establishments were required to contract with private haulers for disposal of solid waste. In 1991, this system was replaced when the Borough established a solid waste utility that entered into a contract with a private waste hauler to collect and dispose of solid waste. Residents pay an annual fee for this service, plus they must purchase specially-marked garbage bags. This approach means that households that produce more solid waste pay more for solid waste disposal. Residents are not permitted to include yard waste or recyclables with solid waste.

The Borough established a mulch area behind the Milton Avenue School where residents could bring yard waste – leaves, grass clippings and branches. During the fall, the Borough collects leaves at curbside, and takes these materials to the mulch area. Residents can take compost and mulch from the mulch area for use in their yards.

In the early 1980s, the Environmental Commissions of the Borough and of Chatham Township, along with the League of Women Voters of the two towns, created a Recycling Committee to establish a voluntary recycling program. Glass, aluminum and newspapers were collected monthly. Also, community groups, including the Kiwanis, collected newspapers.

The Borough established a recycling center at the end of Summit Avenue where residents could bring glass, aluminum, newspapers, certain plastics, cardboard, magazines and junk mail for recycling. Voluntary recycling was replaced with mandatory recycling in 1987 in response to state law, and a biweekly curbside collection program was established. In 2006, the Borough added textiles to the materials that can be recycled, and arranged to have disposal bins placed at the recycling depot.

As of 2008, nearly 1500 tons of materials were being recycled annually through the Borough's recycling program and nearly 2770 tons of materials were being disposed through the solid waste program.

Other Environmental Initiatives

Since the Borough has only two manufacturing facilities - a chemical manufacturer and a manufacturer of deep drawn vessels - factory noise is not a primary problem, although there have been occasional problems with equipment at one of the sites. Those problems have been addressed by enforcing the noise ordinance. Beyond that, the major sources of noise in the Borough are from lawn maintenance equipment and traffic.

In 1997, in response to complaints from residents about the noise caused by leaf blowers, the Borough adopted a noise ordinance. This ordinance regulates the hours during which power equipment may be used outdoors. It also contains a nuisance component, prohibiting noise that is audible at a distance of 100' from the building, structure or vehicle that is the source of the noise. (The noise subject to this ordinance includes music, shouting, whistling and singing, animal noise and horns.) This ordinance can be enforced by the Construction Code Official and by the Police.

In addition, in 2005 the Borough adopted the State's Model Noise Ordinance, which regulates noise levels by time of day and by decibel level. This ordinance can only be enforced by persons who are trained in the use of noise measuring equipment (which the Borough does have).

Chatham Borough Environmental Resources Inventory – Regional Relationships

State Development and Redevelopment Plan

According to the New Jersey State Plan website, "The State Plan provides a vision for the future that will preserve and enhance the quality of life for all residents of New Jersey. The State Plan is the result of a cross-acceptance process that included thousands of New Jersey citizens in hundreds of public forums, discussing all of the major aspects of the plan - its goals, strategies, policies and application. This process ensures that the plan belongs to the citizens of New Jersey, whose hopes and visions have shaped it.

The purpose of the State Plan is to:

Coordinate planning activities and establish Statewide planning objectives in the following areas: land use, housing, economic development, transportation, natural resource conservation, agriculture and farmland retention, recreation, urban and suburban redevelopment, historic preservation, public facilities and services, and intergovernmental coordination (N.J.S.A. 52:18A-200(f)).

The State Development and Redevelopment Plan provides a balance between growth and conservation by designating planning areas that share common conditions with regard to development and environmental features:

- Areas for Growth: Metropolitan Planning Areas (Planning Area 1), Suburban Planning Areas (Planning Area 2) and Designated Centers in any planning area.
- Areas for Limited Growth: Fringe Planning Areas (Planning Area 3), Rural Planning Areas (Planning Area 4), and Environmentally Sensitive Planning Areas (Planning Area 5). In these planning areas, planning should promote a balance of conservation and limited growth—environmental constraints affect development and preservation is encouraged in large contiguous tracts.
- Areas for Conservation: Fringe Planning Area (Planning Area 3), Rural Planning Areas (Planning Area 4), and Environmentally Sensitive Planning Areas (Planning Area 5).

The State Plan Policy Map reflects these planning policies graphically. Therefore, the State Plan Policy Map serves as the underlying land use-planning and management framework that directs funding, infrastructure improvements, and preservation for programs throughout New Jersey. Simply stated the State Development and Redevelopment Plan with the State Plan Policy Map is a dynamic vision of New Jersey's development and conservation patterns. With that in mind, the State Planning Commission incorporates new data from state agencies, counties and municipalities on an ongoing basis."

In the current (2001) State Plan, Chatham Borough land was primarily placed in the Metropolitan Planning Area 1 (PA1) category, with some portions located along its northern and eastern borders as Environmentally Sensitive Planning Area 5 (PA5) category. The PA5 areas are mainly wetlands and floodplains of the Passaic River and its local tributaries, such as Day's Brook and Harmon's Brook. These areas are almost all owned by the municipality and have been zoned as Conservation lands.

The responsibility for the State Plan was moved from the Department of Community Affairs to the Office of the Secretary of State (OSS) for the latest round of revisions. According to the OSS website, "The State Planning Act requires the State Planning Commission to adopt a State Development & Redevelopment Plan. The State Strategic Plan is the revision to the 2001 State Development & Redevelopment Plan and sets forth a vision for the future of our State along with strategies to achieve that vision. It is the culmination of several years of work by the State and its staff in collaboration with county and local stakeholders and members of the public."

The Interim (Draft) State Plan has been undergoing cross-acceptance through several meetings and reviews with the counties and municipalities. During February 2012, several public hearings were held in different parts of the state to obtain comments on the Interim Plan.

Watershed Management Planning

According to the NJDEP website, "A watershed is the area of land that drains into a body of water such as a river, lake, stream or bay. It is separated from other systems by high points in the area such as hills or slopes. It includes not only the waterway itself but also the entire land area that drains to it. For example, the watershed of a lake would include not only the streams entering the lake but also the land area that drains into those streams and eventually the lake. Drainage basins generally refer to large watersheds that encompass the watersheds of many smaller rivers and streams.

To manage our valuable water resources, the Department administers a variety of programs aimed at protecting and restoring water quality, controlling water pollution and ensuring adequate water supplies. By managing watersheds, the Department can holistically address water pollution and supply issues so that more comprehensive strategies can be implemented."

Chatham Borough is located in Watershed Management Area 6 (WMA6) which is shown in the map below:

Watershed Management Area 6

As described by the NJDEP, "Watershed Management Area 6 represents the area drained by waters from the upper reaches of the Passaic River Basin including the Passaic River from its headwaters in Morris County to the confluence of the Pompton River. WMA 6 is characterized by extensive suburban development and reliance upon ground water sources for water supply. WMA 6 lies in portions of Morris, Somerset, Sussex and Essex Counties and includes the Upper and Middle Passaic River, Whippany River and Rockaway River Watersheds."

The WMA6 Public Advisory Committee (PAC) published a Watershed Characterization and Assessment Report for the Passaic River Basin in November, 2002. Within WMA6, several groups have made great progress in the watershed management planning process: i.e., the Whippany River PAC has prepared a nonpoint source control guidance manual and worked with NJDEP to develop an Action Now Strategy for the Whippany River Watershed; the Rockaway River Watershed Cabinet and Ten Towns Great Swamp Watershed Committee have each developed watershed management plans that were accepted by the towns in each watershed.

Water Quality Management Planning

According to the NJDEP website, "The State of New Jersey receives funds under Section 604(b) of the Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. §§ 1251 et seq., commonly referred to as the federal Clean Water Act (CWA)), to carry out water quality management planning activities under Sections 205(j) and 303 (e) of the Act. These activities include studies to determine the nature, extent and causes of water quality problems, and to establish point and nonpoint source pollution controls necessary to solve those problems."

It also states, "The Department of Environmental Protection (DEP) administers the Statewide Water Quality Management (WQM) Planning rules, N.J.A.C. 7:15 in conjunction with the Statewide WQM Plan, which together constitute the Continuing Planning Process conducted pursuant to the Water Quality Planning Act, N.J.S.A. 58:11A-1 et seq., the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq., and N.J.S.A. 13:1D-1 et seq., and as required by Sections 303(e) and 208 of the Federal Clean Water Act (33 U.S.C. 1251 et seq.). According to these rules, the Commissioner of the DEP shall not undertake, or authorize through the issuance of a permit, any project or activity that affects water quality and conflicts with the applicable sections of adopted WQM Plans or the Statewide WQM Planning rules."

After the NJDEP adopted revisions to the Water Quality Management Rules in 2008, the County of Morris assumed wastewater management planning responsibility for the County. Since that time, the Morris County Department of Planning & Development has been developing a countywide wastewater management plan (WMP.) On March 14, 2012, the Morris County Board of Chosen Freeholders approved the transmittal of the draft Sewer Service Area map to the NJDEP for review and eventual adoption. The Chatham Borough Sewer Service Areas from the draft WMP are shown in the map (Map 2M) below. Interestingly, this map shows municipally-owned parcels in white that suggests they are not serviced by sewers, but not all are parks. Some of these parcels have buildings which are serviced by sewers, including Borough Hall, the ECLC School and the Department of Public Works. Likewise, the Joint Library and the Municipal Pool in Memorial Park are serviced by sewers, but that portion of the Park is shown as Preserved Lands (Open Space) on the map.

Chatham Borough

Map 2M : Existing Sewered Areas (SSA)

January 22, 2010 **Interim Draft** 1 inch = 975 Feet

0 750 1,500 2,250 3,000 Feet

Notes:

All areas not mapped as sewer service areas default to the general service area with discharge to groundwater of 2,000 gallons per day less

All existing, new, or expanded industrial pretreatment facilities requiring Significant Indirect User (SIU) permits and/or Treatment Works Approvals, and which are located within the specified sewer service area are deemed to be consistent.

Pre-existing grant conditions and requirements (from Federal and State grants or loans for sewerage facilities) which provide for restriction of sewer service to environmentally sensitive areas, are unaffected by adoption of the WMP and compliance is required.

Please see municipal WMP Chapters for the existence of any applicable environmentally sensitive areas in which Federal 201 grant limitations prohibit the extension of sewer service.

The 300 foot riparian buffer has been applied to the applicable waterways and removed from the proposed sewer service areas on the mapping. Lesser width buffers have not been graphically removed from the sewer service area but are not proposed for sewer service. [Counties may map out the lesser width buffers also but the 300' buffers are the minimum, the lesser buffers are removed during the build-out analysis.] Jurisdictional determinations by the Department will be utilized to determine the extent of the sewer service area on individual lots.

Individual subsurface sewage disposal systems (ISSDS) for individual residences can only be constructed in depicted sewer service areas if legally enforceable guarantees are provided before such construction, that use of such systems will be discontinued when the depicted sewer service becomes available. This applies to ISSDS that require certification from the Department under the Realty Improvement Sewerage and Facilities Act (N.J.S.A. 58:11-23) or Individual Treatment Works Approval or New Jersey Pollutant Discharge Elimination System Permits (under N.J.A.C. 7:14A). It also applies to ISSDS which require only local approvals. Compliance with the connection requirement has been demonstrated through adoption of [name of municipality or sewerage authority] Ordinance [#].

Development in areas mapped as wetlands, flood prone areas, designated river areas, or other environmentally sensitive areas may be subject to special regulation under Federal or State statutes or rules. Interested persons should check with the Department of Environmental Protection for the latest information. Depiction of environmental features is for general information purposes only, and shall not be construed to define the legal geographic jurisdiction of such statutes or rules.

Pursuant to N.J.A.C. 7:15, Riparian zones are: 300 feet from top of bank (or centerline of a first order stream where no bank is apparent) for waters designated as Category One and all upstream tributaries within the same HUC 14; 150 feet for waters designated Trout Production and all upstream waters; 150 feet for water designated Trout Maintenance and all upstream waters within one linear mile as measured along the length of the regulated water; 150 feet for any segments of water flowing through an area that contains documented habitat for a threatened or endangered species of plant or animal, which is critically dependent on the surface water body for survival, and all upstream waters (including tributaries) within one linear mile as measured along the length of the surface water body; 150 feet for waters that run through acid-producing soils; and; 50 feet for all waters not designated as C1, trout waters, critically water dependent Threatened and/or Endangered Species Habitat, or associated with acid soils.

Surface waters that are designated Category One are listed in the Surface Water Quality Standards at N.J.A.C. 7:9B. The Department's 'Surface Water Quality Standards' GIS data layer was utilized to determine these waters. The applicable 300 foot buffer has been applied to these waterways and removed from the proposed sewer service areas on the mapping. Lesser width buffers have not been graphically removed from the sewer service area but are not proposed for sewer service. [Counties may map out the lesser width buffers also but the 300' buffers are the minimum, the lesser buffers are removed during the build-out analysis.] Jurisdictional determinations by the Department will be utilized to determine the extent of the sewer service area on individual lots.

Further, compliance with the riparian zone standard has been demonstrated by the adoption of [name of municipal Riparian Corridor Ordinance [insert ord #], which has been updated to be in compliance with the Flood Hazard Control Act Rules (N.J.A.C. 7:13) and Water Quality Management Rules (N.J.A.C. 7:15) was adopted on [insert date].

Existing DSW - STP (Sewage Treatment Plants)		
Map No.	Facility Name	NJPDES Permit No.
1	MOUNTAIN WATER POLLUTION CONTROL FACILITY	NJ0024937

Existing DGW (Discharge to Groundwater Facilities)		
Map No.	Facility Name	NJPDES Permit No.
1	MOUNTAIN WATER POLLUTION CONTROL FACILITY	NJG0089419

Existing TI (Discharge to Groundwater Facilities)		
Map No.	Facility Name	NJPDES Permit No.
1	22 JACKSON LLC	NJG0187928

Legend

- Wastewater Management Planning Area
- Municipal Boundaries
- Parcels
- Preserved Lands (Open Space)
- Septic Systems
- Lakes/Ponds
- Rivers/Streams
- Major Roads

Existing DSW (Discharge to Surface Water)

- Existing DSW STP

Existing DGW (Discharge to Groundwater)

- Existing DGW
- Existing TI

Existing Parcels Served by Sewer

- Morris WPCF - NJ0022497

Essex County

Union County

Chatham Township

Data Sources:

NJ Department of Environmental Protection

- NJPDES Surface Water Discharges in New Jersey, Dated 20090126
- NJPDES Regulated Discharge to Groundwater Facility Locations, Dated 20070718
- Lakes/Ponds, Rivers/Streams, NJDEP SWQS Dated approx. 2006

Morris County Planning & Development - GIS

- Wastewater Management Planning Area
- Municipal Boundaries
- Parcel Boundaries
- Major Roads (Labels)
- Existing Parcels Served by Sewer **
- Septic Systems in SSA **
- Preserved Lands

** Data contains municipal input and quality control

*Chatham Borough is not in the Highlands

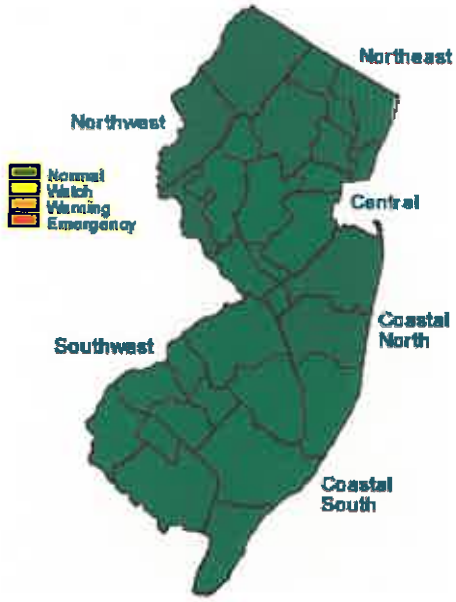
Municipal Locator

Department of Planning & Development | GIS Services
P.O. Box 900, Morristown, NJ 07963, Telephone: (973) 829-8120

NJDEP Drought Regions

According to the NJDEP Drought website, "New Jersey is divided into six drought regions – Northeast, Central, Northwest, Southwest, Coastal North and Coastal South. The drought regions generally follow natural watershed boundaries and account for regional similarities in climate and water supply sources, among other things. The drought regions allow the Department to respond to changing conditions in one region without imposing constraints in areas not experiencing a water shortage. The drought regions align with municipal borders because the primary enforcement mechanism for water restrictions during a drought emergency is the local police department."

A map of the drought regions can be found at www.njdrought.org and is shown below. Chatham Borough is in the Northeast drought region. When this was copied in March 2012, there were no drought regions, or portions thereof, in other than normal conditions. When drought conditions worsen, the sections in worsening conditions would change color according to the key.



The website goes on to state that, "The Department utilizes several drought indicators to assess the status of water supply and hydrogeologic conditions for each drought region. The indicators are precipitation, stream flow, shallow ground water levels, and reservoir storage (as applicable). Each indicator is weighted according to its importance within a particular region (e.g. reservoirs are a significant factor in the Northeast drought region because they are a critical water supply source there). The indicators are ranked according to the status of current conditions relative to a statistical average. Each is then evaluated as either: near/above normal, moderately dry, severely dry, or extremely dry. The indicators are one set of factors the Department uses to determine if a drought-related administrative action (i.e. watch, warning, or emergency) is warranted."

While the NJDEP uses reservoir storage as a significant factor in setting the drought severity level in the Northeast drought region, this is primarily because of the major reservoirs for the big cities, like Newark and Jersey City, which are located in this region. Most of the municipalities in this region actually rely upon groundwater from wells, not surface water from reservoirs.

Morris County Department of Planning and Development

The Morris County Planning Board is one of the Boards which fall under this Department of the Morris County government. According to their website, "The duties and powers of county planning boards include:

- Adopt a master plan showing the county planning board's recommendations for the development of the county.
- Advise the board of chosen freeholders in adopting and establishing an official county map, showing the highways, roadways, parks, parkways, and sites for public buildings or works, under county jurisdiction, or in the acquisition, financing or construction of which the county has participated or may be called upon to participate.
- Review of all subdivisions of land within the county and for the approval of those subdivisions affecting county road or drainage facilities.
- Review of site plans for land development along county roads or affecting county drainage facilities and for the approval of such development."

Included within the Master Plan are various sections or Elements similar to those in municipal master plans, but provided in a regional context. The Elements currently available on their website are: Farmland Preservation (2008), Future Land Use (1975), Historic Preservation (1976) and Open Space (1988). Other Elements available in hard copy and currently being scanned for display on the website include: Bicycle and Pedestrian (1998), Circulation (1992), Wastewater Management (1985) and Water Supply (1994).

Morris County Natural Resource Management Guide

In 2000, the Morris County Planning and Development Department, in conjunction with numerous scientists and consultants created the "Morris County Natural Resource Management Guide." The inventory process resulted in the emergence of recurring themes, including the interrelationships among all natural resources, the far-reaching implications of human impact, and the diverse opportunities for stewardship.

The final document consists of an inventory of natural resources and corresponding management recommendations. Topics covered include: Geology, Topography, Soils, Ground Water, Surface Water, Vegetation, Wildlife and Climatology.

An assortment of maps and illustrations serve to represent historical or existing environmental conditions. Sketches of flora and fauna on the report pages represent species likely to occur in the various communities within the county. Those species designated as threatened, endangered or rare are marked with an asterisk.

This document provides a regional context for the natural ecology of the larger area surrounding Chatham Borough, and highlights educational and natural recreational opportunities for its residents within a short distance.

Morris County Municipal Utilities Authority

Founded in 1958, the Morris County Municipal Utilities Authority (MCMUA) has been serving Morris County, NJ for over half a century. The MCMUA works to meet the water and solid waste needs for Morris County in a way that is cost-effective, efficient and good for the environment.

The MCMUA Solid Waste Division implements recycling, solid and hazardous waste programs throughout Morris County. The MCMUA Water Division sells drinking water to several municipalities and water companies. The MCMUA Water Division does not serve Chatham Borough, which has its own municipal water utility.

Included within the solid waste program are contracting for the operation of two strategically placed transfer stations within the county to collect solid waste and the transportation and final disposal of that waste in a manner to minimize liability to its municipalities. The hazardous waste programs include a permanent household hazardous waste facility (one of only three in the state), local household hazardous collections held periodically throughout the county, and a universal waste recycling program. The universal waste recycling program enables the commercial, institutional and regulated hazardous waste-generating community to recycle common or universal wastes which have hazardous characteristics, such as fluorescent light bulbs and dry-cell batteries.

The MCMUA owns and operates two compost facilities, one located in Mount Olive and one in Parsippany, for the recycling of leaves, grass and brush. These facilities accept natural vegetative waste from contracting municipalities, contractors and landscapers. The MCMUA sells and delivers truckload quantities of compost and mulch to Morris County residents from spring to early fall. Free compost and mulch is also provided to residents just outside the gates to pick up. Contractors and landscapers are not permitted to take the free mulch or compost but may purchase these materials in bulk from the MCMUA.

The MCMUA plans and implements the recycling programs of Morris County. Much of the recycling that occurs in Morris County is performed by individuals with the help of their municipality, recycling collectors and recycling markets. Additionally, the MCMUA provides educational and other recycling services when needed.

The MCMUA provides an "all-in-one" single-stream recycling collection program for participating municipalities that contract with the MCMUA for recycling collection services. The MCMUA enhanced single-stream recycling in Morris County by developing a public/private partnership with ReCommunity Recycling, in Mine Hill, NJ where they developed a single-stream collection and sorting facility to provide high-quality, re-sorted recyclables for the after-market.

Chatham Borough has had a resident serving on the Board of the MCMUA since 2007, including two years as Vice-Chairman and two years as Chairman.

Morris County Open Space and Farmland Trust

In November 1992, the voters of Morris County approved a non-binding referendum by a margin of 2 to 1 for the creation of the Morris County Open Space and Farmland Preservation Trust. The Board of Chosen Freeholders established the trust fund by resolution on December 22, 1992. The fund commenced on July 1, 1993 with a tax equal to one-half cent per $100 of total county equalized real property valuation. The Board of Chosen Freeholders annually reviews and sets the tax collection rate. The rate has been as high as 4 cents and is currently at 1.25 cents in 2012. Since its inception, four amendments have been approved by non-binding referenda; these amendments permit additional uses of trust fund dollars.

The trust fund is divided into three program areas: 1) Open Space Preservation; 2) Farmland Preservation; and 3) Historic Preservation. The open space program is further sub-divided into three specific program areas: 1) Municipal and/or qualified charitable conservancy projects; 2) Morris County Park Commission; and 3) Morris County Municipal Utilities Authority (MCMUA).

The Morris County Open Space Committee was created by the Board of Chosen Freeholders to review and evaluate applications under the Municipal and/or qualified charitable conservancy program and provide recommendations for funding. All recommendations are subject to the final approval of the Board of Chosen Freeholders. Chatham Borough has had as many as two representatives on this committee simultaneously, one as the Region VIII representative for the southeast corner of the county and one as the MCMUA representative (who also served one year as Vice-Chairman of the committee.)

The monies available to the Morris County Open Space, Farmland and Historic Preservation Trust Fund have been generally allocated in the following manner:
25% - to Municipal and/or Qualified Charitable Conservancy projects
25% - to the Morris County Agriculture Development Board for farmland preservation projects
20% - to the Morris County Park Commission for eligible projects
5% - to the Morris County Municipal Utilities Authority for eligible projects
20% - to discretionary projects within any of the four above specified categories, most of which has been allocated to municipal open space projects
5% - to ancillary County costs associated with the acquisition of open space and farmland

All funding recommendations are subject to the final approval of the Board of Chosen Freeholders.

The Morris County Park Commission was formed by referendum in 1955 to acquire and develop land for leisure and recreational use. The determination of which properties are to be acquired under this program is the responsibility of the Park Commission.

The MCMUA supports many efforts focused on protecting the environment including purchasing open space to protect the water supply, including wellhead protection areas, aquifers and their recharge areas. The determination of which properties are to be acquired under this program is the responsibility of the MCMUA.

The Morris County Agriculture Development Board (CADB) was created by the Board of Chosen Freeholders in 1983 to oversee preservation of farmland in accordance with the Agriculture Retention and Development Act (N.J.S.A. 4:1C). The determination of which properties are to be acquired under this program is the responsibility of the CADB.

The Morris County Historic Preservation Trust Fund Review Board was created by the Board of Chosen Freeholders in 2002 to review and evaluate applications under the Historic Preservation Trust Fund Program and provide recommendations for funding.

In 2012, the Board of Chosen Freeholders created a new program to help purchase flood-prone residential properties and convert them to permanently preserved open space. The freeholders said the Morris County Flood Mitigation Program was developed in response to increased, repetitive flooding in the county, especially the excessive flooding caused by Hurricane Irene in 2011.

The new program is the first of its kind at the county level in the state, and is meant to assist municipalities in the acquisition of residential properties, by expanding the flood plain mitigation efforts of the county's current open space initiative.

Under the terms of the Flood Mitigation Program, grant applications will be considered from municipalities for the acquisition of residences and lands associated with the residences that have experienced severe, repetitive flooding, or homes with over 50 percent damage from a single flood event.

Morris County will provide matching funds to municipalities in partnership with the Federal Emergency Management Agency, the New Jersey Department of Environmental Protection's Blue Acres program or the municipality, up to a maximum of 75 percent of the total project cost.

Morris County Green Table

The Morris County Green Table held its first meeting on February 23, 2000. This organizational meeting focused on partnership opportunities for land conservation in Morris

County. The participants, which included representatives from local, county, state and federal government, as well as nonprofit organizations, agreed that there was a need for a forum such as the Green Table and requested the Steering Committee to plan future meetings. Since the initial meeting, the Green Table has hosted two or three meetings each year to broaden awareness of local conservation efforts and opportunities throughout Morris County. Early meetings focused on acquisition and linkages of open space properties. More recent meetings have included more topics on improving utilization and stewardship of open space. Chatham Borough has a representative serving on the Green Table Steering Committee.

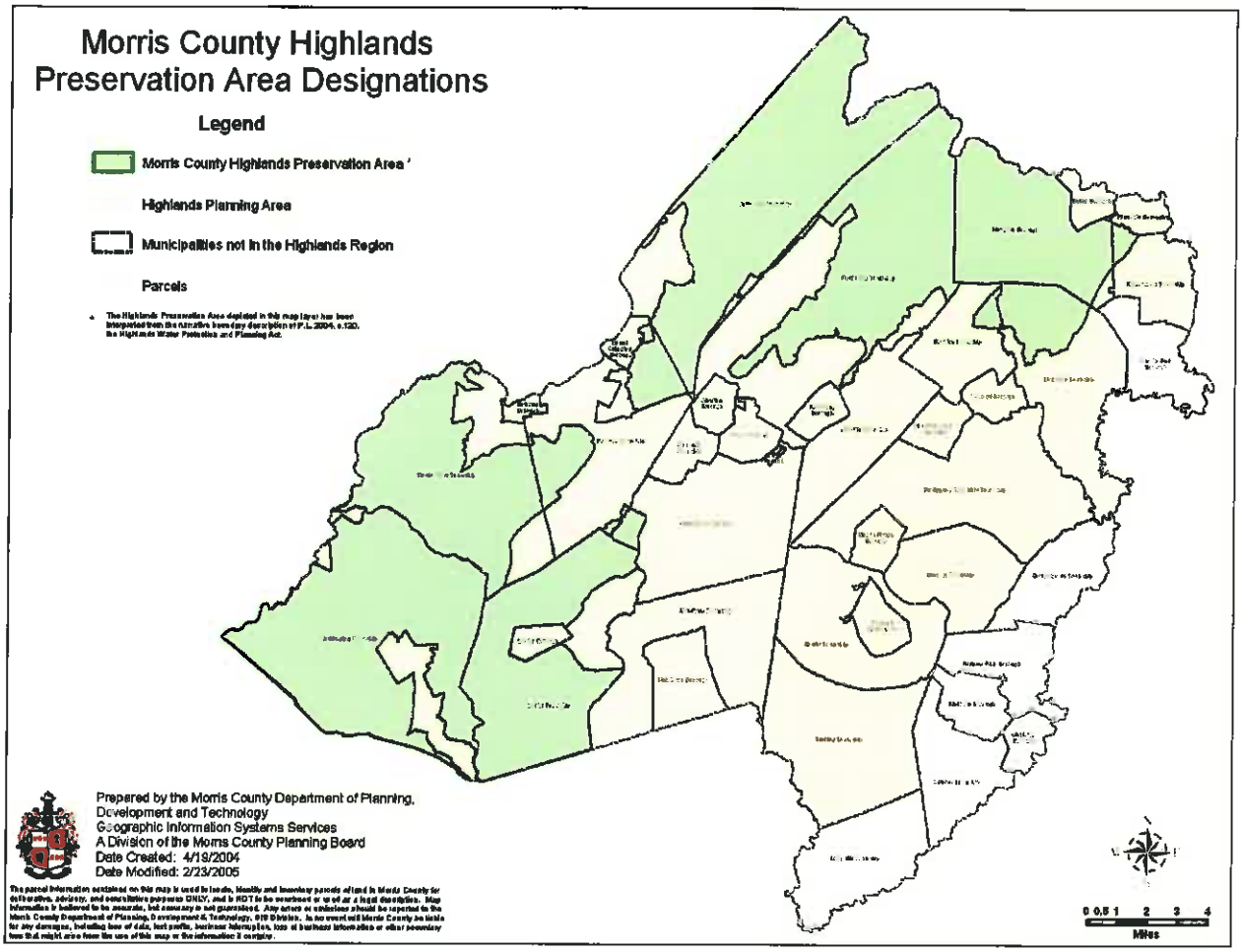
The Highlands Water Protection and Planning Act

The New Jersey Highlands is a 1,343 square mile area in the northwest part of the state noted for is scenic beauty and environmental significance. The region stretches from Phillipsburg in the southwest to Ringwood in the northeast, and lies within portions of seven counties (Hunterdon, Somerset, Sussex, Warren, Morris, Passaic, and Bergen) and includes 88 municipalities. The Highlands Region is a vital source of drinking water for more than half of New Jersey's families, yielding approximately 379 million gallons of water daily. In addition to water resources, the Highlands Region contains exceptional natural resources such as contiguous forest lands, wetlands, pristine watersheds and plant and wildlife species habitats. The region contains many sites of historic significance and provides abundant recreational opportunities. Approximately 110,000 acres of agricultural lands are in active production in the Highlands region.

On September 19, 2003, the Highlands Task Force was created through Executive Order. The Governor charged the Task Force to provide recommendations within six months on how best to advance conservation efforts, smart growth, regional planning and water resource protections in the region. The task force called for the identification of a Preservation Area in the Highlands to protect a core area of the most sensitive land, which the Legislature should then officially designate by statute.

The Highlands Water Protection and Planning Act was signed into law on August 10, 2004. Its purpose is to preserve open space and protect the State's greatest diversity of natural resources including the precious water resources that supply drinking water to more than half of New Jersey's families. The Highlands Act documents the geographical boundary of the Highlands Region and establishes the Highlands Preservation Area and the Highlands Planning Area. It required the Department to establish regulations in the Highlands Preservation Area and that the Highlands Water Protection and Planning Council (Highlands Council) develop a regional master plan for the entire Highlands Region.

The Highlands Council approved the Highlands Regional Master Plan (RMP) at its meeting held Thursday, July 17, 2008. The RMP became effective on September 8, 2008. Included within the technical reports that form the basis for the planning and land development rules are sections on the regional ecology, water resources, and scenic, historic and cultural resources.



Although most of Morris County is located in the Highlands region, as shown in the above map, Chatham Borough is not. However, as future development is more heavily restricted in the Highlands region (especially in the Preservation Areas), there will be greater development pressure on municipalities outside its boundaries, and these pressures will continue to be felt in Chatham Borough.

The Great Swamp National Wildlife Refuge

The Great Swamp National Wildlife Refuge (NWR) is one of 553 refuges in the National Wildlife Refuge System that is administered by the Department of the Interior's U.S. Fish and Wildlife Service. The National Wildlife Refuge System is a network of lands and waters managed specifically for the protection of wildlife and its habitat. It represents the most comprehensive wildlife management program in the world.

The Great Swamp NWR is located in Morris County, New Jersey, about 26 miles west of Manhattan's Times Square. Much of the NWR is located in Chatham Township, including its Morris County Outdoor Education Center, just southwest of Chatham Borough. The refuge was

established by an act of Congress on November 3, 1960, after extensive efforts by local area residents alarmed by the possibility of it becoming the site of a major regional airport. It consists of 7,768 acres of varied habitats and over the years, the refuge has become a resting and feeding area for more than 244 species of birds. Fox, deer, muskrat, turtles, fish, frogs and a wide variety of wildflowers and plants also call the refuge home.

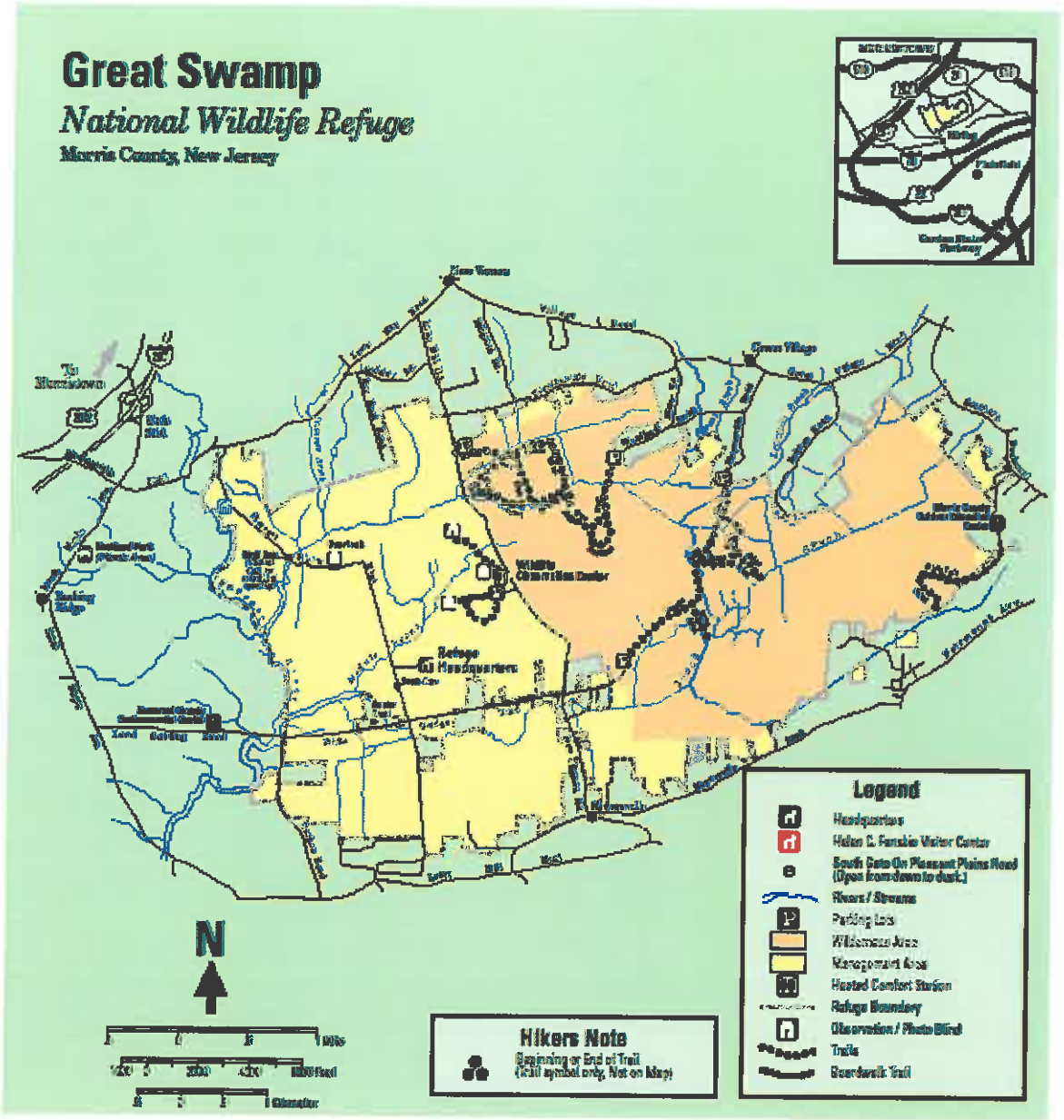
The Refuge provides an excellent opportunity for learning about a variety of ecosystems. The Friends of Great Swamp NWR provide much of the environmental education and interpretation available at the Refuge through guided tours and a Discovery Den located at the bookstore on Pleasant Plains Road. Two separate Environmental Education Centers in the swamp provide additional education and interpretation opportunities and are located adjacent to the Refuge.

The Friends of Great Swamp National Wildlife Refuge was established in 1999 in partnership with the U.S. Fish and Wildlife Service. Their focus is refuge-centric, supporting the goals, projects, and mission of the Great Swamp National Wildlife Refuge. Their operations and activities are managed by an all-volunteer board of directors and committees.

The Friends is part of a network of more than 200 friends groups nationwide, each associated with one or more national wildlife refuges, all committed to improving and protecting their unique refuge resources. They operate the Helen C. Fenske Visitor Center, located in Harding Township. Exhibits demonstrate the variety of habitats and wildlife that can be seen at Great Swamp NWR as well as the history of this Refuge. The Discovery Den has educational and entertaining activities for children.

Many residents of Chatham Borough and the surrounding municipalities are members of the Friends of the Great Swamp.

A map of the Great Swamp National Wildlife Refuge is shown below and available at http://www.fws.gov/northeast/greatswamp/



The Great Swamp Watershed Association

According to their website, "The Great Swamp Watershed Association (GSWA), located in Harding Township, NJ, is a nonprofit, member-supported environmental organization that monitors and protects water quality, and investigates and participates in land use issues in the watershed community, while working to strengthen environmental regulations in New Jersey. GSWA also provides environmental education to community groups, teachers and students to help everyone understand the important role we each play in protecting our drinking water and preserving the natural beauty of our environment.

The mission of the GSWA is to protect water and land in the ten towns served by the Great Swamp watershed for the benefit of present and future generations. These ten towns are: Bernardsville, Bernards Township, Chatham Township, Harding Township, Long Hill Township, Madison Borough, Mendham Borough, Mendham Township, Morristown and Morris Township.

Formed in 1981 by a small grass-roots group of concerned citizens, GSWA has grown to 2,200 members in over 40 New Jersey municipalities. Although the organization's work is centered primarily within the towns physically located in the watershed, the results of this work extend to the more than one million people who obtain their drinking water from the Passaic River."

Passaic River Coalition

The Passaic River Coalition (PRC) is an urban watershed association active in protecting water quality and quantity of the entire Passaic River watershed of northern New Jersey and Rockland and Orange Counties, New York. Since its establishment in 1969 and incorporation in 1972, the Passaic River Coalition has faced the challenges of a watershed beset with every conceivable environmental problem.

From the headwater streams in the Highlands of New York and New Jersey, through vast tracts of wetlands in the central basin, into the heavily urbanized lower valley and out to Newark Bay and the Atlantic Ocean, the Passaic River Coalition provides assistance and stewardship for the preservation and protection of over 1,000 miles of waterways.

The PRC focuses on improvements in land-water resource management and public health issues by working as an advisor to citizens groups, other environmental organizations, governments, and businesses. It has been in the forefront of many important initiatives to protect drinking water, preserve sensitive wildlife habitat, improve water quality, protect open space, and promote natural flood control management.

The PRC is noted for gathering scientific data and converting it into informed policy. The PRC uses the latest techniques like Geographic Information System (GIS) software, first used in 1991 to create maps and graphic displays that illustrate the physical, demographic, and socioeconomic characteristics of the River and its watershed in its reports, open space plans, and natural resource inventories.

The PRC has been involved in the creation of new surface supply systems such as the Monksville Reservoir and the development of three Water Supply Master Plans for New Jersey. The PRC has assisted in plans to restore Greenwood Lake, a primary water source for northern New Jersey and is creating the overall restoration guide for the Lake.

PRC staff are frequently asked to serve on federal and state committees that are discussing and defining important and technical environmental issues. The PRC has participated in federal and state task forces and project committees such as: Section 208 Northeast NJ Waste Water Management Planning Committee, NJ Pollutant Discharge Elimination System

permitting, New Jersey's watershed management area (WMA) programs, and the Congressionally-sponsored Lower Passaic River Restoration Initiative.

The PRC has been the primary agency seeking natural alternatives and cost-effective solutions to reduce flooding conditions. The PRC was instrumental in the creation and passage of the Blue Acres Program in 1995, securing $15 million for the acquisition of residential structures located within floodways, as well as catalyzing the renewal of the program with $12 million as part of the 2007 Garden State Preservation Trust refunding bond act.

In 1993, the PRC created a Land Trust to acquire properties of ecological significance and unique landscape character for water resource protection, and has acquired over 1,200 acres of dedicated open space. These parcels will become sites for passive recreation like hiking or birding, outdoor research areas for students and scientists, and places for threatened and endangered species to find sanctuary.

Several Chatham Borough residents have served on the PRC Board, including its current Chair.

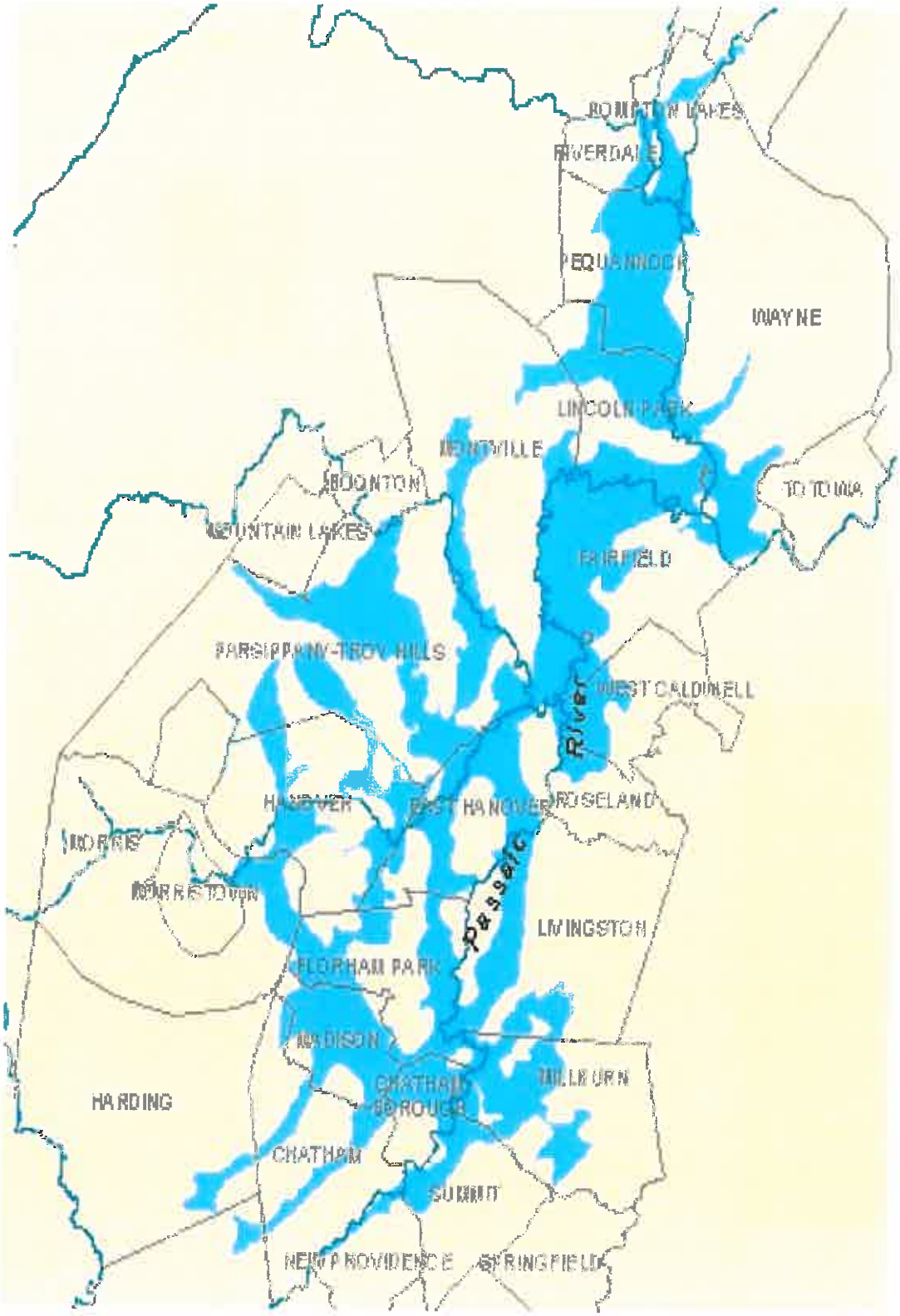
Ground Water Protection Committee

Alone in New Jersey in the area of groundwater management, the Passaic River Coalition established the Ground Water Protection Committee (GWPC) in 1980. Membership includes municipalities, county agencies and water utilities. The GWPC obtained federal recognition for the Buried Valley Aquifer system of the central Passaic (shown on the next page) as a sole-source aquifer and published studies on its contamination and protection.

The GWPC, working under a grant from the NJDEP, created a Well-Head Protection Program to keep groundwater hazards out of municipal wells. The report on this program and continued outreach efforts by the GWPC have been utilized by several municipalities, including Chatham Borough, to successfully pass Well Head Protection Area Ordinances. Copies of the educational video for this program, "The Ground Water Adventures of Walter Wet," have been purchased and used for educational purposes by persons in many states besides New Jersey.

The GWPC publishes educational materials and holds an annual Groundwater Summit on topics of concern to groundwater quality and quantities. Recent seminars have concentrated on winter de-icing practices to reduce the amounts of salts entering our aquifer systems.

Two Chatham Borough residents have continually chaired this committee since its founding.



Buried Valley Aquifer System

Morris 2000/Morris Tomorrow

Morris Tomorrow was formed in 1986 under the original name of Morris 2000, and disbanded in 2011. It was a unique partnership of corporate, civic and governmental leaders on one non-profit board devoted to improving the quality of life and the issues at hand in Morris County.

The broader spectrum of civic and corporate leaders allowed a more comprehensive approach to the county's problems. In response to rapid development and disappearing open space, it sponsored the Morris County Open Space Trust Fund.

It formed the Ten Towns Committee made up of representatives from the 10 municipalities in the watershed of the Great Swamp National Wildlife Refuge to create uniform development rules, and avoided threatened legislative actions.

It created TransOptions, an employee van pooling program; the Housing Partnership of Morris County, which helps low-income families find housing; the Raritan Compact and the Rockaway River Watershed Cabinet to address issues in those watersheds, and a number of workshops on diversity and on building models for collaboration and consensus.

It sponsored the Midday Morris lecture series, and a Quality of Life Index. It also sponsored the McFlowertown awards for projects that beautified the area in unique ways. Chatham Borough won two such awards, for its Downtown Improvement Project and its Community Garden. A Chatham Borough resident served on its board and several other residents worked on its various committees.

SEAMLESS

The Southeast Morris League for Strategic Solutions (SEAMLESS) was formed in 2000 in response to heavy regional development pressures. It includes representatives from many of the towns in the southeast portion of Morris County (and some from Essex and Union Counties) and several county agencies and environmental organizations. It provides a forum for regular monthly discussions on topics of regional interest from development and traffic to water quality and community gardens and farmers markets.

It provided the impetus for implementing a "Smart Growth" mixed-use development of a large tract of land after its corporate owner planned to develop it for multiple office buildings with high peak hour traffic issues. It sponsored a major traffic study with the county and several municipalities to define current bottlenecks and develop improvement plans.

Chatham Borough residents have been regular members and contributors to the organization and one is currently the co-chairman.

Shared Services

Chatham Borough has long been in the forefront of developing shared-services agreements with other municipalities and the county in order to provide cost-effective and efficient services to its residents. In 1911, Chatham Borough and Madison Borough created the Madison-Chatham Joint Meeting Wastewater Treatment Plant, which is strategically located in Chatham Borough to take advantage of the topography. Three members of the Molitor family from Chatham served the facility for a total of about 102 years cumulatively, each succeeding the other as superintendent from 1914 to 1984. In their honor it was renamed the "Molitor Water Pollution Control Facility." Costs for operation, maintenance and debt service of the plant are allocated between the towns based on the number of equivalent dwelling units and water usage.

The Library of the Chathams has been jointly funded by Chatham Borough and Chatham Township since September 1967, when the Township contracted to use the existing Chatham Borough Library on Main Street in Memorial Park. One of only six joint libraries in the state, costs for its operation, maintenance and debt service are allocated between the towns based on populations.

The School District of the Chathams resulted from the jointure of the Borough and Township school districts in 1986, the first two towns to re-regionalize K-12 districts in the state. Costs for the operating and capital budgets of the district are allocated between the towns based on equalized assessed valuations of real property. The Borough and the Board of Education share responsibilities for maintaining recreational fields and also share a salt storage shed.

Chatham Borough also shares an Emergency Squad, Joint Recreation program, Senior Center and a Community Garden with Chatham Township, shares Health Services and Confined Rescue Training with Madison Borough, has mutual aid agreements for fire service with Chatham Township, Florham Park and Millburn Township in Essex County and shares televised sewer line inspection equipment with Long Hill Township in Morris County.

During 2010 and 2011, Chatham Borough created a joint court with Madison, Harding Township and Chatham Township, contracted for construction services with Madison, contracted with Morris County for emergency dispatching operations, and joined with Millburn Township in Essex County and Summit City and New Providence in Union County for a salt brine operation for winter road de-icing.

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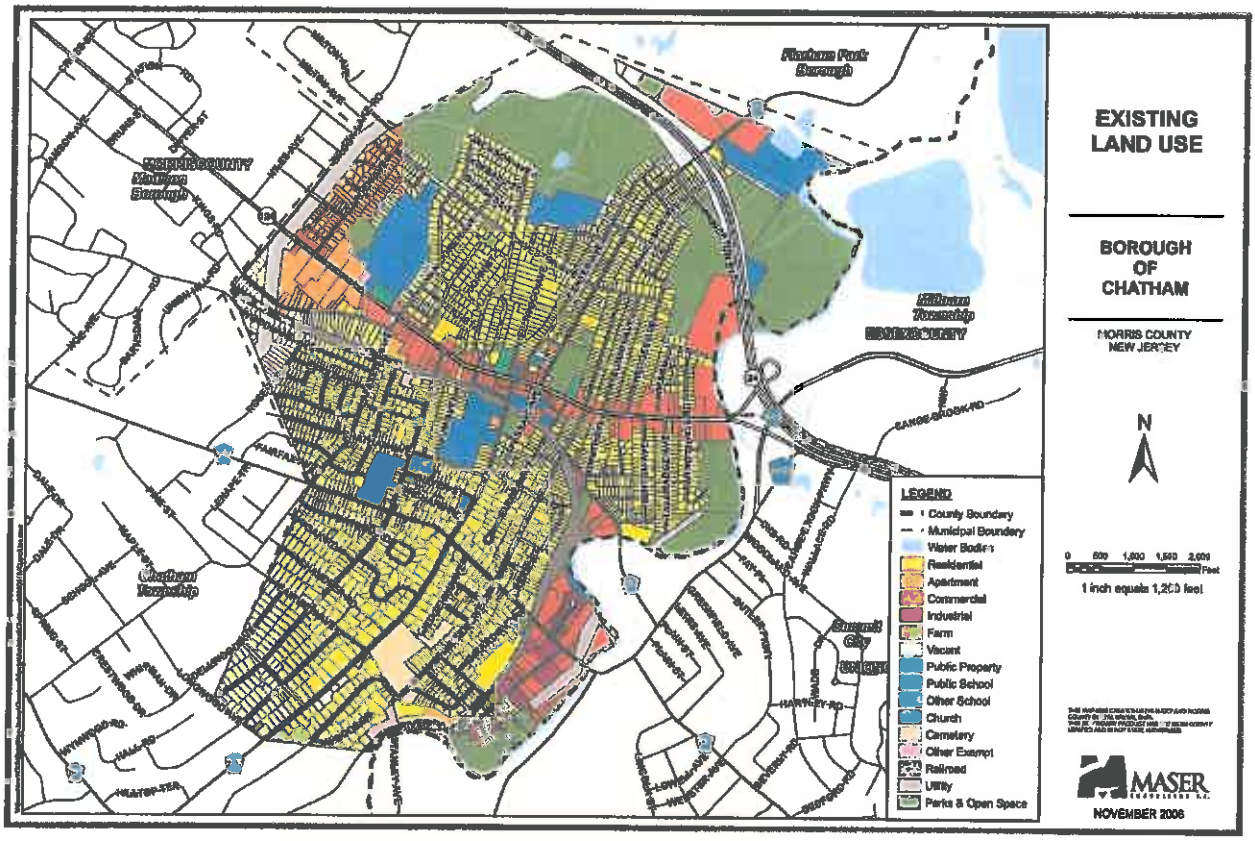
Chatham Borough Environmental Resource Inventory – Land Use

Existing Land Use

Chatham Borough has been essentially "built-out" for many years. As can be seen in the Existing Land Use Map below, Chatham Borough is mostly residential, with retail and office commercial properties along its Main Street and apartments mainly along the western end of Main Street, but a few along Lafayette Avenue, River Road, Fairmount Avenue and Bowers Lane. Industrial development is concentrated primarily between River Road and the Passaic River and on Commerce Street, with a large storage facility and athletic club on the north end of North Passaic Avenue.

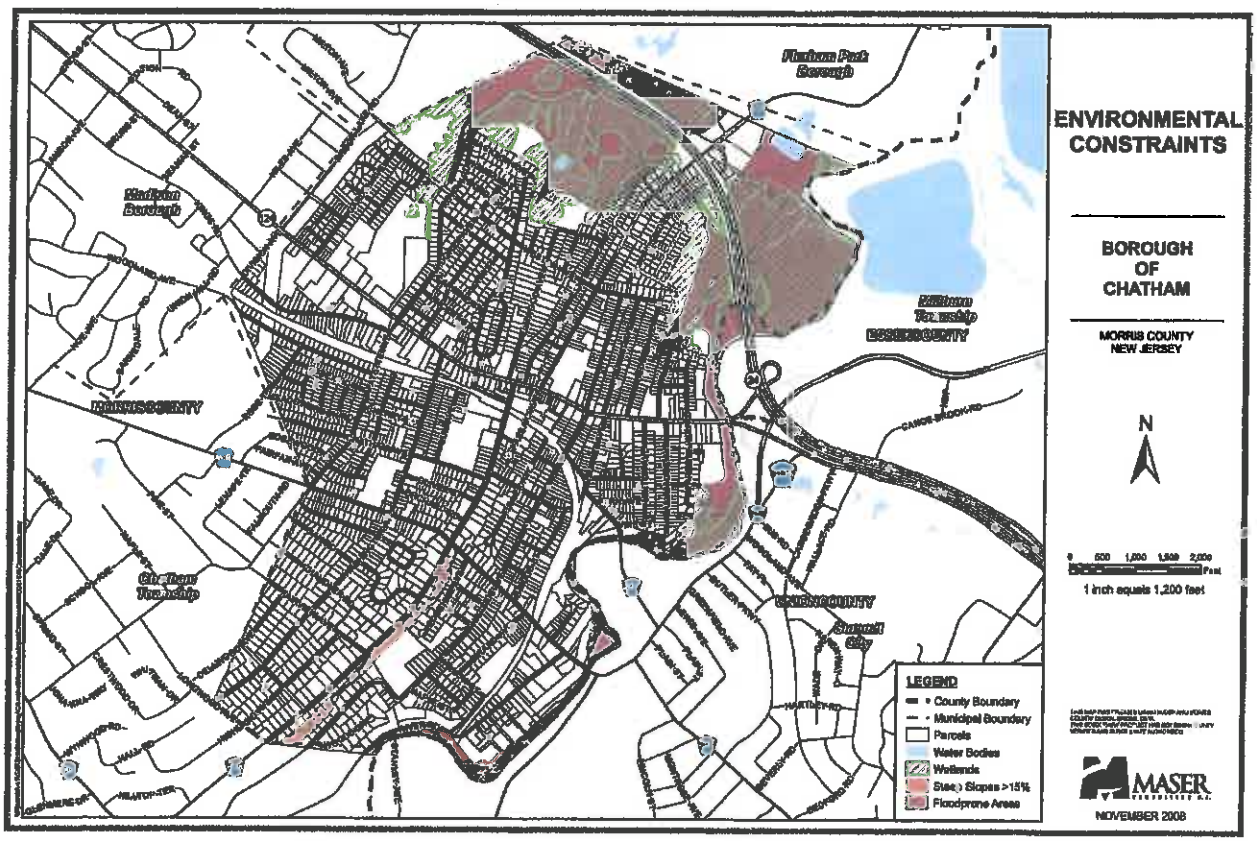


The Passaic River was a major factor in the early development of Chatham as it provided a source of power for several mills and the industrial and commercial development they supported. Main Street developed as the commercial hub for the early village moving west from the Passaic River as the earliest bridge was located there. Much of this now comprises the Chatham Historical District. Residential development eventually replaced early farms and estates as the population grew and more people moved west from New York City.

In recent years many of the older homes have been upgraded and added onto, but some have been torn down as part of the "McMansion" craze. This has occurred mainly on the larger lots in town, but some large lots have also been subdivided for two homes where the zoning allowed. Interestingly, there have also been a number of instances where persons purchased the adjoining lot to add it to their property and torn down the existing house on the other lot.

A few industrial and commercial properties have either added to or upgraded their buildings in the last few decades, but most have been on a smaller scale as business uses changed. The largest recent commercial development was the construction of the Westy Storage Facility on River Road in 2005.

As shown in the map below, there are a number of environmental constraints which have dictated the development pattern in town. Wetlands and floodplains exist along the Passaic River and the low areas in the northern portion of town. Steep slopes also exist along the eastern slope of the ridge parallel to Fairmount Avenue.



Transportation

Main Street (State Route 124) has always been the most traveled and congested roadway in town. In planning for many years, State Route 24 is a four-lane divided highway, cutting through the northern portion of the Borough, and was finally completed in 1992. It provides access only to Main Street from the east via a major interchange with Kennedy Parkway/River Road (County Road 649). The purpose of the new Route 24 was to relieve congestion on Main Street in Chatham and Madison, and provide direct access to State Route 287 in Morris Township. While Main Street traffic flows peaked at about 28,000 vehicles/day before Route 24 opened, they have only dropped to about 22,000 vehicles/day since. Route 24, however, carries over 92,000 vehicles/day, well over what it was projected to handle.

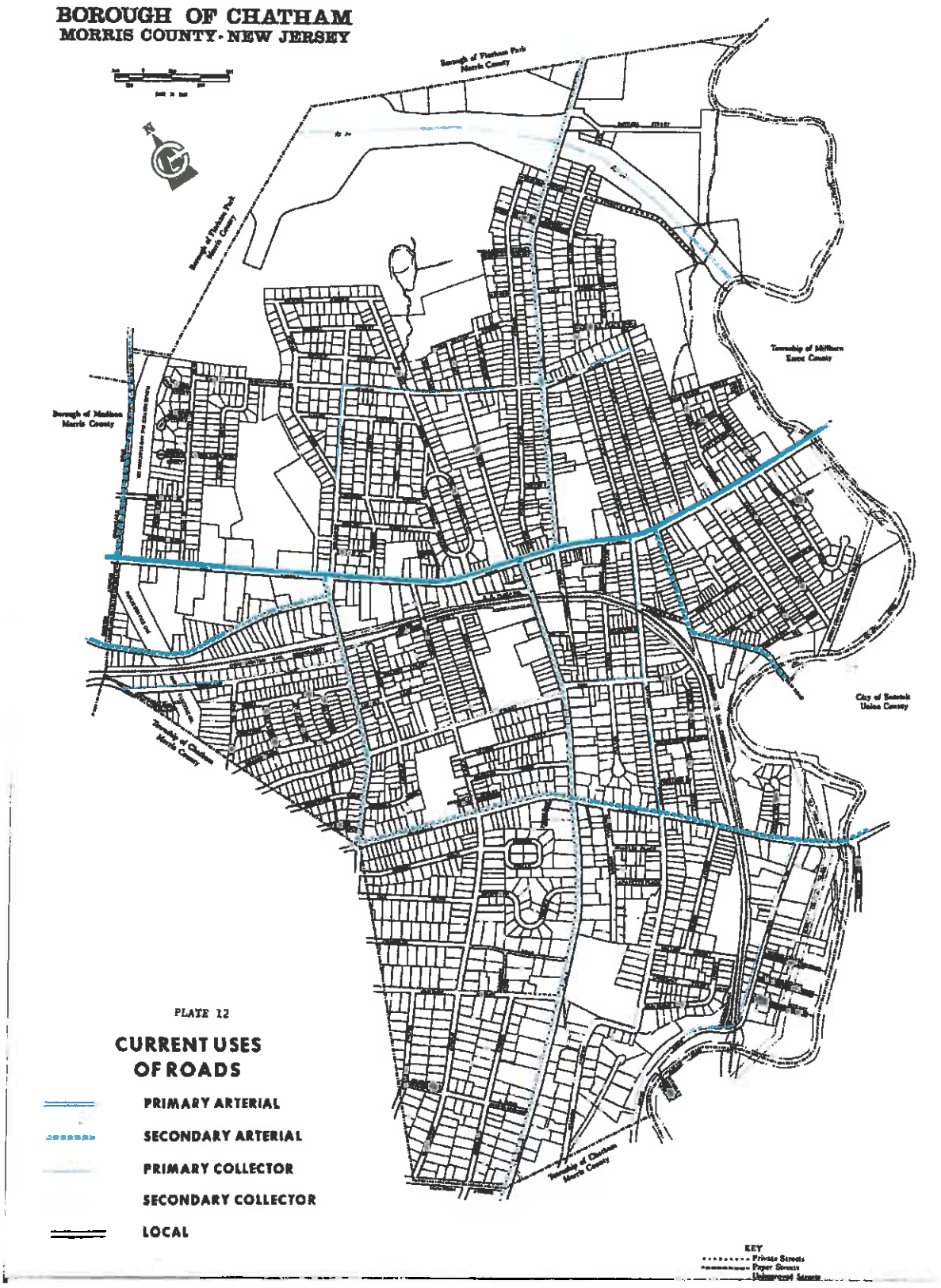
The only other east-west through road in Chatham is Watchung Avenue (aka The Shunpike) which is County Road 646, and is the second busiest road in town. There are no north-south through roads in town, but Fairmount Avenue (County Road 638) is a major road entering Chatham Borough on its southern border with Chatham Township and ends at Main Street. Drivers must then go east two blocks to North Passaic Avenue (County Road 607) to exit Chatham to the north into Florham Park.

The NJ Transit commuter railroad enters Chatham from Summit City to the south, and then comes north until it makes "the Big Bend" before reaching Main Street and then heads west to Madison. The Chatham Train Station was a major draw for people commuting into Newark and New York City when it was originally built and remains so today. Morris County is conducting a study of the Chatham, Madison and Convent Station ridership demand, parking facilities and access improvements in 2012 to try to enhance this commuting mode and reduce automobile congestion.

There is currently only one major bus route through Chatham which is run by NJ Transit along Main Street. Previous routes by Lakeland Bus on Main Street and Melni Bus on Watchung Avenue ceased operations in the 1990s when the Mid-Town Direct service was opened on the railroad.

Chatham Borough adopted a *Complete Streets Policy Plan* in March, 2012, which was made an amendment to the Circulation Element of the Master Plan. As stated in the Introduction to the *Complete Streets Policy Plan*, it "is intended to provide policy guidance on future transportation infrastructure investments to ensure that the needs of people of all ages and abilities are considered in transportation improvements and decision making."

The map which follows shows the current uses of the roads in Chatham – arterial, collector and local.


BOROUGH OF CHATHAM
MORRIS COUNTY - NEW JERSEY
Borough of Florham Park
Morris County
Township of Millburn
Essex County
Borough of Madison
Morris County
City of Summit
Union County
Township of Chatham
Morris County
PLATE 12
CURRENT USES
OF ROADS
PRIMARY ARTERIAL
SECONDARY ARTERIAL
PRIMARY COLLECTOR
SECONDARY COLLECTOR
LOCAL
KEY
Private Streets
Paper Streets
Unimproved Streets

Zoning

The existing transportation network, road and street layouts, have already been in place for as much as 100 years in some neighborhoods, and the linear infrastructure, such as water and sewer lines, stormwater system, electrical, telecommunications and cable systems follow them. Recognizing this and that there are very few large lots available, the Chatham Borough Master Plan and zoning are already essentially fixed. Other than some rezoning in the last few decades to accommodate affordable housing, and the rezoning of most of the areas that have major environmental constraints as Conservation land. The Chatham Borough Zoning Map on the next page reflects those constraints. The land use regulation changes in recent years have been primarily to make minor adjustments to setbacks, coverage and parking requirements.

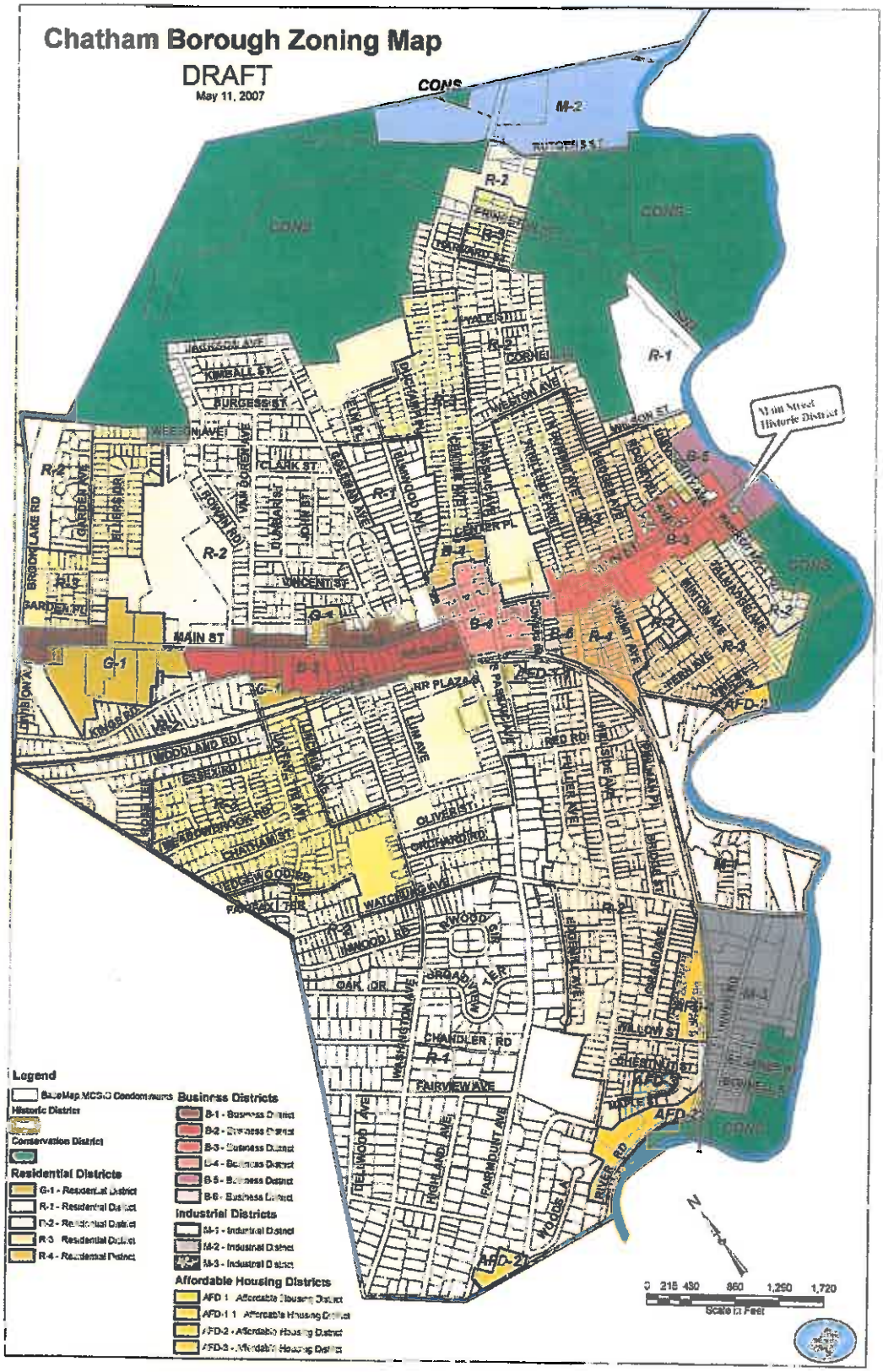
Open Space

Even before there were Open Space initiatives at the State and County level, Chatham Borough had wisely purchased considerable property along its northern and eastern borders. The first steps toward establishing a more formal open space program in Chatham Borough came in 1975. The Environmental Commission published a report that year, entitled, *Open Space: An Evaluation and Proposal for the Borough of Chatham.* The report detailed the benefits of open space with specific examples. It also included the first open space inventory in Chatham Borough, detailing the size and location of the then-open parcels in the Borough.

In 2001 the Environmental Commission completed a more detailed open space inventory and recommended the Borough Council establish an Open Space Committee, which it did. The Borough of Chatham established a dedicated open space tax for the acquisition of open space after the residents voted overwhelmingly in favor of a referendum to do so in November of 2001.

The Open Space Committee developed an Open Space and Recreation Plan in conjunction with the Morris Land Conservancy which was published in July 2002 and updated by the renamed Land and Historic Conservancy Committee in July 2010.

Based on recommendations from the Open Space Committee, the Borough purchased two parcels of land. One was purchased 50/50 with Chatham Township in 2002 that was partially within each town and adjacent to land owned by the School District of the Chathams and is known as Woodland Park. The other was purchased in 2003 along the Passaic River and adjacent to a smaller parcel owned by the Borough and referred to as Wuhala Woods. The Borough received grants from Green Acres, the Morris Land Conservancy and the Morris County Open Space and Farmland Trust Fund to help pay for these parcels.


Chatham Borough Zoning Map
DRAFT
May 11, 2007
Main Street Historic District
Legend
Historic District
Conservation District
Residential Districts
G-1 - Residential District
R-1 - Residential District
R-2 - Residential District
R-3 - Residential District
R-4 - Residential District
Business Districts
B-1 - Business District
B-2 - Business District
B-3 - Business District
B-4 - Business District
B-5 - Business District
B-6 - Business District
Industrial Districts
M-1 - Industrial District
M-2 - Industrial District
M-3 - Industrial District
Affordable Housing Districts
AFD-1 - Affordable Housing District
AFD-1.1 - Affordable Housing District
AFD-2 - Affordable Housing District
AFD-3 - Affordable Housing District
0 215 430 860 1,290 1,720
Scale in Feet